Vol. 53, No. 1, Winter 2010
Published Since 1957

LOUISIANA Agriculture

Assuring Our Future Through Scientific Research and Education

75th Livestock Show

Fighting invasive salvinia

New tool for rice development

Burden Center beauty

LSU AgCenter Research & Extension

Support the LSU AgCenter

Agriculture is one of the primary economic engines for Louisiana. The agriculture industry, which encompasses many facets in the farm-gate-to-dinner-plate spectrum, is all together about a $30 billion piece of the Louisiana economy. And it only promises to grow as the demand continues to escalate for more plants and plant products to be used as biofuel. As our population increases, the demand for more food and fiber produced in our agriculture industry will likewise increase.

The LSU AgCenter, which is headquartered in Baton Rouge, conducts agricultural research at 20 research stations across the state and in 11 departments on the LSU campus. The results of this research are then extended to the farmers, consumers and business people of Louisiana through extension agents, who are located in extension offices in all 64 Louisiana parishes (counties).

The LSU AgCenter research and extension programs have a long history of doing good things for Louisiana. The focus areas have changed as the needs have changed. Currently, focus areas include:

- Develop new crop varieties as old ones succumb to the destructive diseases, weeds and insects in our climate.
- Enhance the animal agriculture business, which includes poultry, cattle, dairy, shrimp, oysters and crawfish.
- Preserve Louisiana's coast and wetlands through the knowledge gained from traditional crop development.
- Come up with new biofuels and uses for agricultural waste to help our environment and reduce dependence on foreign oil.
- Create food products that are functional, which means enhanced with ingredients that help people meet their nutritional needs and lose weight.
- Prevent childhood obesity and thus slow the overweight epidemic that is hurting individual health and the state's economy.
- Keep housing sustainable and affordable through educational programs provided from our LaHouse model home.
- Help youth grow into responsible adults through our 4-H program, of which more than 4 million young people have been part since its beginnings in Louisiana in 1908.

Our array of programs is broad and impressive. Our knowledge of agriculture, natural resources, food and fiber makes us a unique contributor to the state's educational network. Unfortunately, our budget has been cut to the point where we face eliminating many of these programs, which have made such a difference in the lives of the people of Louisiana.
Unlike other institutions of higher education, we cannot raise tuition to offset these losses.

If you would like to learn more about who we are and what we do, I encourage you to go to our 2009 Annual Report, which is online. The link to this report – www.lsuagcenter.com/annualreport2009 – goes to a Web page that includes our highlights from 2009 and links to more information.

The LSU AgCenter is here to serve you, and we will continue to do so as long as we exist. Please let me know if you have any questions.

Bill Richardson
Chancellor

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Assuring Our Future Through Scientific Research and Education

On the Cover:
Dr. Brent Robbins is grateful for the lessons in life he learned from the 4-H livestock project and has helped his daughter, Karen, with her sheep project (see page 18). Photo by John Wozniak.

What's New?

Ag products, animals fascinate students at exhibit

LAKE CHARLES, La. – More than 800 children learned about animals and the origins of their food at Ag Adventures on Feb. 3-4, held in conjunction with the LSU AgCenter's Southwest Regional Livestock Show.

LSU AgCenter personnel and 4-H Club members staffed the presentation. During the 90-minute walk through different exhibits, students learned about wetlands ecology, crawfish, proper diet, the importance of hand washing and horseback riding and experienced throwing a lariat while in a saddle.

They had the chance to see and touch a calf, goats, a horse, chicks, chickens, rabbits and sheep and put their hands into several containers of different grains such as rice and corn.

Debra Shamsie, a kindergarten teacher at Prien Lake Elementary, brought her class to Ag Adventures. She said her lessons in the days before attending the event focused on agricultural products.

"But seeing it in pictures is nothing like seeing it in real life," Shamsie said. "That's what they get here. They get to see the actual size of the animals. This is fantastic."

Megan Riley, also a kindergarten teacher at Prien Lake Elementary, said the outing reinforced what she has been teaching. "We've been talking about the different things that come from animals," she said. Riley said lesson plans provided by the LSU AgCenter prepared her pupils for what they would experience at Ag Adventures.

The children "were really excited about coming here," she said. "For the last two weeks, this is all they have talked about."

Helen Page, LSU AgCenter 4-H agent in Calcasieu Parish, said students from 18 schools came to the event.

Children who live in cities and have never been on a farm get the most out of it, Page said. But even children who live on a farm benefit from the program. ■

Bruce Schultz

Recycling wood, feral hogs topics at forest landowner forum

CALHOUN, La. – Topics ranged from value-added chemical products from recycled wood to feral hogs at a forum for forest landowners on Jan. 16 at the LSU AgCenter Calhoun Research Station.

LSU AgCenter scientists are conducting research on wood liquefaction, a process in which treated wood is ground and liquefied in a solvent to separate chemicals originally used in the preservative from non-toxic liquefied wood.

The research involves both improving and refining the liquefaction process and developing applications of liquefied wood for value-added products, said Hui Pan, LSU AgCenter scientist working on the project.

The recycling technology benefits the treated-wood industry – both manufacturers and end users of treated wood products – as well as forest landowners, Pan said. The process will help manufacturers and end users reduce their legal liability associated with current disposal methods.

Calling Pan's work "exceptional research," Buck Vandersteen of the Louisiana Forestry Association said that after Hurricane Katrina, St. Tammany Parish had piles of distressed trees and lumber. "Had we had this research Dr. Pan is doing here, we could possibly have utilized that distressed wood," he said.

Corralling and trapping feral hogs are ways to control them on forest land, said Don Reed, LSU AgCenter forestry and wildlife specialist.

In a 2008 survey, 80 percent of the respondents reported feral hogs on their land, and 95 percent indicated problems with food plots and timber resources, Reed said.

He warned landowners to wear gloves when butchering a feral hog.

Photo by Bruce Schultz

Howard Cormier, LSU AgCenter area equine agent, explains to kindergarten students from Prien Lake Elementary in Lake Charles the purpose of a horseshoe during Ag Adventures held at Burton Coliseum.

What's New?

Meat infected with the disease brucellosis is safe to eat once it is cooked, but raw meat should be handled with disposable latex or rubber gloves, Reed said.

Brucellosis in people can cause serious flu-like symptoms that last for months to years. Domestic swine are vaccinated for the disease.

Reed said feral hogs are the most prolific wild game animal in North America and can weigh up to 400 pounds.

Tending to travel in groups, their home range is influenced by the abundance of food. "They are opportunistic omnivores," Reed said. They eat most anything in their path – plant or animal or even carrion. ■ **Mary Ann Van Osdell**

State conservation award goes to LSU AgCenter

The LSU AgCenter has been named 2009 Conservation Communicator of the Year in the 46th annual Governor's Conservation Achievement Recognition Program. This is one of several awards given by the Governor's Office to top conservation organizations and individuals. The awards and presentation event are conducted by the Louisiana Wildlife Federation.

The award was for the video series "Wet Work," which was produced for the AgCenter's 4-H Youth Wetlands Education and Outreach program. The videos, along with other program materials, have been delivered to hundreds of educators and tens of thousands of students.

"Winning this award is further validation of the impact our wetlands educational program has on the youth of Louisiana," said 4-H Youth Wetlands Education and Outreach program director Ashley Mullens.

The Youth Wetlands Education and Outreach program is a statewide environmental enrichment curriculum that teaches students about critical wetland issues, introduces them to restoration technology and challenges them to become knowledgeable environmental ambassadors for the state of Louisiana.

The wetland outreach program is funded primarily by the Louisiana Department of Natural Resources and the Office of Coastal Protection and Restoration. Other curriculum sponsors are America's Wetland Conservation Corps, Louisiana Sea Grant, Barataria-Terrebonne National Estuary Program and the LSU AgCenter's 4-H Youth Development. ■ **Randy LaBauve**

Crop consultants honor sugarcane scientist

ALEXANDRIA, La. – The Louisiana Agricultural Consultants Association inducted Ben Legendre, LSU AgCenter sugarcane scientist, into the Agricultural Hall of Fame during the organization's annual conference in February 2010.

Legendre, previously the LSU AgCenter sugarcane specialist and now director of the LSU AgCenter Audubon Sugar Institute, has conducted sugarcane research over the past three decades.

"The distinguished award is well-deserved by Dr. Legendre," said David Boethel, LSU AgCenter vice chancellor for research. "His expertise is recognized internationally, and it's good that consultants in his backyard have seen it fitting to honor him."

The LACA also awarded $2,000 scholarships to two LSU AgCenter doctoral students and an undergraduate LSU student.

The two Ph.D. candidates, Tracy Price, who studies under Boyd Padgett, LSU AgCenter plant pathologist, and Rebecca Melanson, working with Jong Ham, LSU AgCenter plant pathologist, tied for the scholarship. Matt Baeurle, an undergraduate majoring in agricultural pest management, also received a $2,000 scholarship sponsored by Dow Agro Sciences. ■ **Bruce Schultz**

Photo by Bruce Schultz

Ben Legendre of the LSU AgCenter was selected for the Agricultural Hall of Fame by the Louisiana Agricultural Consultants Association.

Training course focuses on seafood safety

A safe food supply doesn't just happen, as 28 people could tell you after attending a three-day training session on Hazard Analysis & Critical Control Points, commonly called HACCP, at the LSU AgCenter on Feb. 2-4.

The class included individuals from Louisiana, Alaska, California, Colorado, Texas, Illinois and Arkansas. They represented processing company owners, boat owners, dock owners and company employees as well as U.S. Food and Drug Administration (FDA) employees, who attended to become HACCP certified as part of their responsibilities as field inspectors.

HACCP is a management system in which food safety is addressed through the analysis and control of biological, chemical and physical hazards from raw material production, procurement and handling, to manufacturing, distribution and consumption of the finished product.

"That includes everyone in the processing chain, from dock to final processing and even fishing vessels that process on board," said Lucina Lampila, an LSU AgCenter seafood specialist and registered dietitian.

The FDA is responsible for seafood safety, and the U.S. Department of Agriculture (USDA) is responsible for safety of other meat and poultry products. ■ **Rick Bogren**

Photo by Johnny Morgan

Two Department of Wildlife & Fisheries biologists ease through cypress knees and giant salvinia at Lake Bisteneau in northwest Louisiana to the area where salvinia weevils will be released in an effort to destroy the invasive species.

Fighting the Blob
Efforts to Control Giant Salvinia

Seth Johnson, Dearl Sanders, Lee Eisenberg and Keith Whitehead

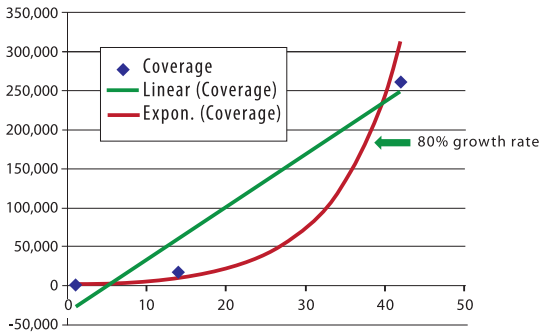
The 1958 science fiction cult classic movie "The Blob" featured an alien amorphous creature that consumed whatever it touched and was nearly impossible to stop. In 1998, science fiction became science fact when the invasive plant giant salvinia was first identified in Toledo Bend Reservoir in Louisiana. An initial infestation estimated to be less than 400 acres in 1999 has expanded to more than 70,000 acres in 20 Louisiana lakes, seven bayous or rivers, the Atchafalaya Basin, the Red River and the coastal fresh water marsh from Lafitte to Morgan City.

Giant salvinia is a floating fern native to southern Brazil. The plant consists of a series of horizontal stems with a pair of floating leaves at each node. The plant can be distinguished from other floating ferns by the presence of leaf hairs on the upper leaf surface that first divide and then rejoin at the tip in an eggbeater shape. As the plant matures, the older leaves begin to curl at the edges and can form dense mats several layers thick. With wind and water movement, these mats often become several feet deep – deep enough for people to walk on.

The plant has an extremely rapid growth and reproductive rate. Although it reproduces by fragmentation or budding, it is incapable of producing viable spores. An observer has reported, "A

Seth Johnson, Professor, Department of Entomology, LSU AgCenter, Baton Rouge, La.; Dearl Sanders, Professor and Coordinator, Bob R. Jones-Idlewild Research Station; Lee Eisenberg, Research Associate, Department of Entomology; and Keith Whitehead, Research Associate, Bob R. Jones-Idlewild Research Station, Clinton, La.

Figure 1. Total Coverage 3 Points



single plant has been described to cover 40 square miles in three months."

In a controlled situation of optimum growth, a population covering 70 square yards was able to cover about 1,390 square yards in 14 days and 26,670 square yards in 42 days. In this trial the plant was able to achieve exponential growth with an estimated daily growth rate of 80 percent near day 35 (Figure 1). At this stage, the plant was able to double its coverage area every 36 hours. This underscores the ability of giant salvinia to rank in the top tier of invasive plants – aquatic or terrestrial.

Giant salvinia does its environmental damage in three ways. First, it displaces all other floating vegetation, native and nonnative. Second, once dense mats are formed, virtually all sunlight is blocked, killing all the submerged vegetation. Finally, as the submerged plants and older salvinia die and decay, dissolved oxygen levels in the water are depleted, forcing fish and other aquatic animals to flee or die. Observers have reported that entire fishing villages in New Guinea were abandoned when lakes were overwhelmed with the weed in the late 1960s.

The LSU AgCenter began herbicide-screening trials in 1999 and continued them through 2009, evaluating 20 potential herbicides for their effect on giant salvinia. Included in the various trials were all herbicides with existing aquatic labels, herbicides with potential aquatic labels and herbicides with active or pending labels for use in rice. (Herbicides labeled for use in rice can more easily be registered for use in aquatic situations.) Figure 2 lists the common name of the herbicides tested, including the five that provided at least 90 percent control in small plots.

The herbicides fluridone and penoxsulam are total-water-volume treatments in which the plants absorb the herbicide from the water. Control is a function of herbicide concentration and contact time. Loss of concentration or contact time results in reduced control. The remain-

Photos by Johnny Morgan

Dearl Sanders, weed scientist, prepares to load giant salvinia infested with salvinia weevils into tubs at the Gheens, La., breeding site for transport.

Figure 2. Herbicides Screened Since1999

2,4-D
Triclopyr
Copper carbonate
Chelated copper
Mesotrione
Imazamox
Imazapyr
Carfentrazone
Bensulfuron methyl
Sulfometuron methyl
Flumioxazin
KJM44
BASF 800
Topramezone

At least 90 percent control from:
Diquat
Glyphosate
Glufosinate ammonium
Fluridone
Penoxsulam

Salvinia weevil larvae burrow in the rhizomes of giant salvinia and feed on the plant, causing the leaves to first darken and then drop off. The adult weevils consume the leaves and buds.

Photo by Katherine Parys

Age is determined by the color of the weevil. When the weevils freshly emerge, they are light brown. As they age, over a week old, they get dark brown to black. The weevil on the left is less than a week old, and the one on the right is older than 1 week.

ing herbicides are foliar treatments that require direct contact with plant leaves. Because of the tremendous regrowth potential of the weed, any that escape must be treated to maintain control. Multiple applications are essential, but they increase the overall cost of control. So far, 10 years of herbicide trials indicate that chemical control of giant salvinia will be difficult and costly.

Introducing an aquatic weevil

Cyrtobagous salviniae – an aquatic weevil native to Brazil, Bolivia and Paraguay – has been used successfully for the biological control of giant salvinia in a number of countries, including Australia, Fiji, Ghana, India, Kenya, Malaysia, Namibia, Papua New Guinea, Republic of South Africa, Sri Lanka, Zambia, Zimbabwe and recently the United States. The adults, which average 2.5 millimeters in length, are sub-aquatic in nature and can be spotted on or under leaves, within the leaf buds or among the roots of giant salvinia plants.

The weevil is a specialist whose larvae burrow in the rhizomes of the plant. Adults consume leaves and buds. Feeding on buds inhibits growth of the plant. Feeding by the larvae causes the leaves to first darken to brown and then drop off. The combined feeding of larvae and adults kills the plant. Populations may reach a density of 250 adults and 750 larvae in one square yard, which Australian researchers consider necessary to achieve control. In 2001, researchers from the USDA Agricultural Research Service released weevils from the Brazilian strain in a major salvinia infestation at Toledo Bend Reservoir in Sabine Parish, La., as well as on the Texas side. The weevils established at a number of locations, and salvinia biomass was dramatically reduced at several of the infestation sites.

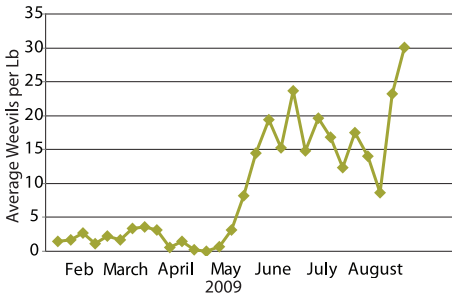
Photo by Lee Eisenberg

Figure 3. Weevil density estimates are obtained by processing a known weight of salvinia on the Berlese Funnel, which is a separation and extraction device that relies on positive geotaxis in response to the desiccation of the plant material on a screen beneath a 125-watt heat lamp, which forces the weevils down the funnel into a collection bag with a few salvinia plants.

The Brazilian salvinia weevils have been described as light ivory-colored when they emerge, turning brown within 1-2 days and then darkening to black after 5-6 days. The adults deposit eggs 6-14 days after emergence, but not when temperatures are below a constant 70 degrees. After mating, females typically deposit one egg every 2-5 days in shallow holes excavated in plant tissue. Females can continue to lay eggs for 60 days. In the laboratory, eggs hatched in 10 days at a constant 78 degrees, but did not hatch below a constant temperature of 68 degrees or above a constant temperature of 97 degrees. The larvae rapidly begin to burrow within the rhizomes, where they undergo three developmental stages over 23 days. Larvae cannot survive at constant temperatures below 61 degrees. When they pupate, their cocoons can be found attached to roots or rhizomes under water.

The AgCenter established a salvinia weevil nursery on a 6-acre pond on the

Figure 4. Weekly Population Levels for *C. salviniae* at a Field Site, Gheens, La.



privately held Golden Ranch Plantation at Gheens in Lafourche Parish in May 2007. The pond was seeded with 1,000 pounds of giant salvinia collected from infested waters on the property in May 2007. The surface of the pond was covered with salvinia by July 15. The pond was fertilized with ammonium sulfate at regular intervals to maintain optimum nutrient levels for salvinia and weevil growth. In August 2007, the pond was seeded with 10,000-12,000 weevils collected from a heavily infested pond on the Texas side of Toledo Bend near Center, Texas. The population, however, was predominately male (about 9 to 1), and after the overwintering population died in spring 2008, the population was too low to be detected.

In May 2008, the pond was reseeded in several locations with a total of 880 pounds of giant salvinia with 11 weevils per pound collected from Toledo Bend near Egret, La. The weevil population increased over the summer, and the Louisiana Department of Wildlife & Fisheries began releasing them in other areas in October 2008, when the weevil population was two to three per pound of salvinia. The weevil population was monitored once or twice a week from November 2008 to August 2009 by collecting and processing six random samples and processing them in Berlese Funnels (Figure 3). A subsample of the weevils was dissected, and their reproductive status was determined.

The weevil population was stable at 1-1.3 per pound from November 2008 to February 2009. In February and March the population increased as weevils started to emerge after passing the winter as immatures. Weevils became reproductively active and started laying eggs in March and in April, but the population dipped to less than one per pound because of a die-off of weevils that passed the winter as adults.

The second-generation weevil population from eggs laid in March by overwintering and emergent weevils began an exponential increase in early May, continuing to a peak of 24 per pound of salvinia on June 16, 2009. In mid-May, when the weevil population reached about three per pound, approximately 20 percent of the salvinia had died and sunk.

By early July, approximately 67 percent of the pond was clear, and the weevil density was approximately 18 per pound. By early August more than 90 percent of the pond was clear, and the only salvinia was located around the edges, where the weevils were concentrated at more than 27 per pound (Figure 4).

The Department of Wildlife & Fisheries began to collect and transport the weevil-infested salvinia on June 15 when the weevil density peaked. More than 30 tons of salvinia with approximately 1.8 million weevils were transported to Lake Bistineau near Bossier City, where some weevil effects on the giant salvinia problem should be apparent sometime in 2010. An additional half million weevils were harvested and transported to four other north Louisiana lakes. Additional weevil nurseries started in September 2009 and planned to start in spring 2010 will produce weevils available to attack the giant salvinia problem in Louisiana in 2011. ■

Acknowledgments
Sterling Blanche from the LSU AgCenter Rice Research Station for statistical analysis and the Louisiana Department of Wildlife & Fisheries for funding.

Photo by Johnny Morgan

James Seales, left, and Kevin Houston, both biologists with the Louisiana Department of Wildlife & Fisheries, worked with LSU AgCenter scientists in spreading the salvinia weevil, which are in the plants being dumped into Lake Bistineau.

Using constructed wetlands to protect Louisiana water quality

Eddie P. Millhollon and Darinda R. Dans

Nearly 8 million tons of nitrogen in commercial fertilizers are applied annually in the Mississippi-Atchafalaya River Basin, which makes up about 40 percent of the contiguous United States. The Mississippi and Atchafalaya rivers drain the basin, carrying runoff containing nearly 3.5 billion pounds of nitrogen annually into the Gulf of Mexico.

The influx of nitrogen and other nutrients into the Gulf stimulates algal growth. As algae and other organic matter settle to the bottom of the Gulf, the decomposition process depletes the water of oxygen, resulting in a hypoxic zone – a zone having less than 2 parts per million of dissolved oxygen. These low oxygen levels adversely affect aquatic life, sometimes resulting in death, which is why the hypoxic zone is often referred to as a "dead zone."

This zone reached a record area of more than 8,400 square miles in 2002. Increases in the use of fertilizer, particularly nitrogen fertilizer, in the Mississippi-Atchafalaya River Basin have been implicated as the cause of the increasing size of the hypoxic zone. The creation and restoration of wetlands between farmland and streams have been suggested as one method to reduce nitrogen movement into the Gulf of Mexico.

Louisiana is known for its extensive system of wetlands, bayous, rivers and lakes enjoyed by generations of people for outdoor recreation, giving rise to the state's slogan of "Sportsman's Paradise." Experts estimate Louisiana had more than 25,000 square miles of wetlands during the colonial period of the 1780s. Over the next 200 years, as the population of Louisiana grew, wetlands, regarded as having little value, were drained or filled at a rate of 58 square miles per year so they could be used for agriculture or urban development.

By the 1980s, the area occupied by wetlands had declined by nearly half to 13,726 square miles. Between 1986 and 1997, however, the rate of annual wetland loss in the United States declined dramatically, and wetlands had a small increase from 1998 to 2004, largely because of increasing awareness of their environmental importance. The reversal in the decline resulted from restoration of existing wetlands and creation of new wetlands. Because 80 percent of the loss of U.S. coastal wetlands has occurred in Louisiana, much of the current restoration efforts are focused here.

The Red, Mississippi and Atchafalaya rivers are the three largest rivers in Louisiana. The Red originates in the Texas Panhandle and travels through northwest Louisiana, flowing south-southeast until it joins the Atchafalaya and Mississippi rivers. The Red River drains nearly 7,800 square miles of land area within the Red River Basin in Louisiana and has the highest sediment load in the United States.

The Louisiana Department of Environmental Quality (LDEQ) has divided

Photo courtesy of Terraserver

Figure 1. Aerial photograph of the Red River Research Station showing the source of runoff, the constructed wetland system and the Flat River.

Eddie P. Millhollon, Associate Professor, and Darinda R. Dans, Research Associate, Red River Research Station, Bossier City, La.

Louisiana into water quality subsegments, 71 of which are within the Red River Basin. In 2004, the LDEQ indicated 75 percent of the water bodies within the basin were impaired, meaning they did not support their designated use for fish and wildlife propagation.

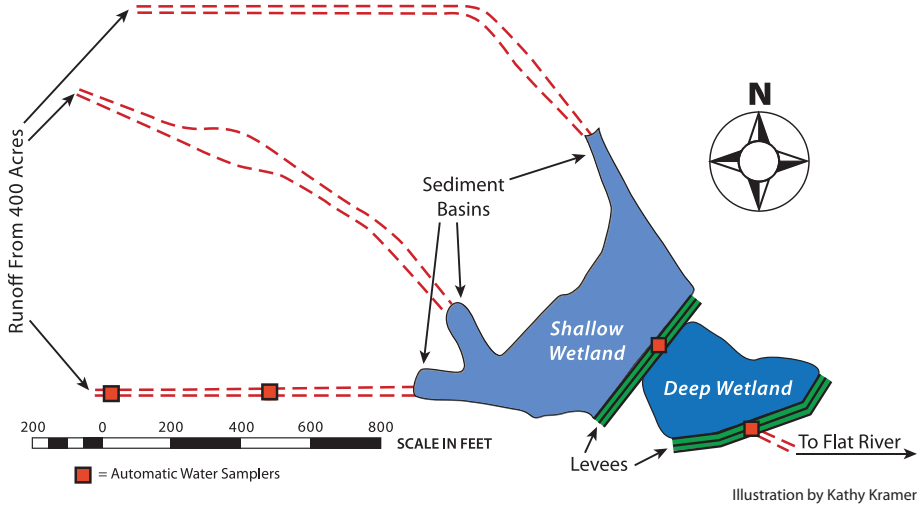
The Flat River, a tributary to the Red River, extends from approximately 34 miles north of Shreveport to Loggy Bayou, south of Bossier City, draining approximately 117 square miles of land, 60 percent of which is agricultural. The Flat River is one of the water bodies LDEQ identified as impaired. In 2008, the U.S. Environmental Protection Agency (EPA) concluded that for the water quality of the Flat River to meet designated use standards, the amount of nitrogen entering the river must be reduced by 30 percent and phosphorus by 62 percent. In addition, the amount of sediment entering the river must allow the concentration of dissolved oxygen to be maintained at 5 milligrams per liter during the summer.

Constructed wetlands provide an effective and economical way of improving effluent water quality through biological and physical means and are being used worldwide to cleanse effluent from municipalities, rural communities and single dwellings, as well as agricultural and urban storm runoff. The layout of the LSU AgCenter Red River Research Station in northwest Louisiana is an ideal location to determine if a constructed wetland can improve the quality of runoff water before it enters an impaired Louisiana water body.

The station is divided into 4- to 8-acre sections for growing crops such as cotton, soybean, corn, wheat and grain sorghum. Runoff from nearly 400 acres on the station flows to the southeast corner and then enters the Flat River (Figure 1). In 2003, LDEQ provided funding through the Federal Clean Water Act to design and construct a wetland to accommodate that runoff. The primary objectives of this project were to determine if it is practical to construct a wetland of sufficient size to successfully detain runoff from 400 acres of agricultural land and to determine the effectiveness of this system in reducing nutrient and sediment loads before the runoff enters a water body.

The design of the constructed wetland system is shown in Figure 2. Runoff enters the system by way of three grassed drainage ditches. At the point where the ditches enter the wetland, basins were created to allow some of the sediment to settle out before the runoff enters a shallow wetland of approximately 4.5 acres with an average depth of 18 inches.

Figure 2. Diagram showing the constructed wetland system and the location of automatic water samplers.

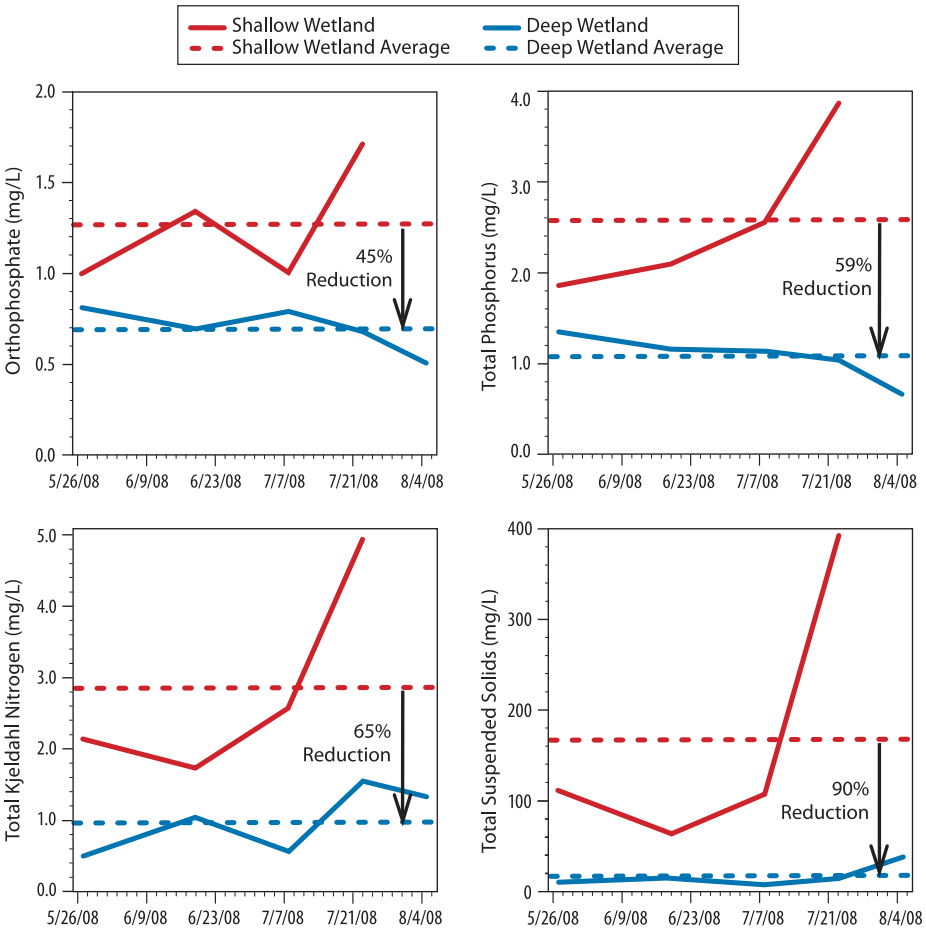


The shallow wetland was planted with six native wetland plant species and three cultivated grass species. Plants and microorganisms in the shallow wetland provide the biological processes necessary for improving water quality. Depth in the shallow wetland is regulated by two v-notch weirs attached to two 48-inch culverts that connect it to a deep wetland, the final stage of the wetland system.

The deep wetland is approximately 10 acres and has a maximum depth of 9

(See Wetlands on page 30)

Figure 3. Changes in water quality parameters in the shallow and deep wetlands receiving runoff from 400 acres of agricultural fields in 2008.



Choosing Varieties and Root Media for Successful Greenhouse Tomato Production

Hanna Y. Hanna

Small greenhouse tomato operations are common in the United States. Rising transportation expenses, which now account for a substantial part of tomato production costs, provide new opportunities for marketing locally produced tomatoes at a reasonable price. Growers can produce a vine-ripened, attractive fruit to sell on the day of harvest at producer premises, farmer's markets, road-side stands and local grocery stores. However, they have to reduce production costs and increase plant yield to gain market share among major producers.

The choice of an acceptable-yielding tomato variety with appropriate fruit qualities and longer shelf life is a vital grower decision. Failure to select an appropriate variety may lead to lower yield or less market acceptability. The tomato variety called Trust has been among the most recommended varieties in Mississippi and was popular in Louisiana, Texas and Alabama. The fruit shelf life of Trust, however, is short because of moisture loss through fine cracks on the fruit shoulder. Newer varieties, such as Geronimo and Quest, are being evaluated for yield, fruit quality and shelf life.

Growing media for tomato production include rockwool, perlite and shredded pine bark. Research at the LSU AgCenter Red River Research Station has indicated that perlite can be recycled to save money. Information on the initial cost of the media and their impact on tomato yield will help tomato growers reduce production costs and enhance plant yields.

The North American market demands large fruit. Fruit pruning – selectively removing individual fruit – is used to increase fruit weight and size by limiting the number of fruit per cluster and reducing competition among fruit. Previous recommendations for fruit pruning ranged from three to five fruit per cluster.

Two studies were conducted simultaneously and independently from 2006 to 2008 in two identical 30-by-96-foot greenhouses at the Red River Station to address these industry concerns. The objectives of the first study were to evaluate yield, fruit weight, fruit quality and shelf life of Geronimo, Quest and Trust varieties planted in perlite and pruned to three or four fruit per cluster. The objectives of the second study were to determine the initial cost of perlite, pine bark and rockwool as growing media and their effect on the yield of Quest variety pruned to three or four fruit per cluster.

In the first study, Geronimo, Quest and Trust, selected from among 10 previously evaluated greenhouse varieties, were planted in 5-gallon grow bags filled with perlite. Geronimo was selected because it produced high yields; Quest was selected for its shiny fruit; and Trust was selected because it has been popular among growers in Mississippi and Louisiana.

Five-week-old plants of all three varieties were transplanted in the grow bags. Two transplants were planted at a 3-inch depth and spaced 7 inches apart in

Table 1. Effects of variety and cluster pruning on tomato marketable yields, cull yields and fruit weight. Tomato yield is pounds per plant.

	Total yield	Cull	Avg. fruit wt (oz)
Tomato variety			
Geronimo	29.2	1.1	8.1
Quest	24.6	1.1	7.8
Trust	21.8	2.0	7.4
Cluster pruning			
Three fruit	25.8	0.7	8.2
Four fruit	24.6	2.1	7.4

Table 2. Tomato fruit nitrogen, potassium, sodium, pH, sugar and shelf life of three tomato varieties. Shelf life is expressed as percentage of fruit that remained marketable after one week of storage at 67 degrees.

Variety	Nitrogen	Potassium	Sodium	pH	Sugar	Shelf life
	ppm		ppm	%	%	%
Geronimo	58.1	1874	30.7	4.28	4.27	83.2
Quest	62.5	1974	29.9	4.29	4.34	92.2
Trust	68.6	1922	29.5	4.33	4.29	78.1

Table 3. Effects of growing media and cluster pruning on Quest marketable and cull yields and fruit weight. Tomato yield is pounds per plant.

	Total yield	Cull	Avg. fruit wt. (oz)
Growing medium			
Perlite	23.8	1.5	7.6
Pine bark	22.2	1.7	7.7
Rockwool	21.8	2.1	7.4
Cluster pruning			
Three fruit	23.5	0.8	8.1
Four fruit	21.7	2.7	7.1

Table 4. Growing medium and transplant container costs to plant 640 tomato plants in a 30-by-96-foot greenhouse at the Red River Research Station, based on 2006 and 2007 retail prices.

	Medium	Grow bags	Transplant container	Total
Perlite	$591.48	$73.28	$20.85	$685.61
Pine bark	$351.92	$73.28	$20.85	$446.05
Rockwool	$461.17	———	$169.60	$630.77

Hanna Y. Hanna, Professor, Red River Research Station, Bossier City, La.

each bag. Fruit clusters were pruned to remove excess fruit and flowers as soon as three or four fruit per cluster were visible in each treatment.

For fruit quality analysis, three to five ripe fruit having similar color and size were selected and liquefied in a food processor at early, mid and end-of-harvest season. Fruit nitrogen, potassium, sodium, pH and soluble solids (sugar) were determined. To test for shelf life, approximately 10 pounds of marketable fruit were harvested from each plot weekly, packed in tomato cartons and stored for one week in a cooled room at 67 degrees. After the storage period, firm fruit with no skin discoloration, shrinking or deterioration were considered marketable. The sum of marketable and unmarketable fruit for the entire season was determined and the percentage of marketable fruit was calculated for each trial.

In the second study, plants of Quest variety were grown for five weeks and transplanted into grow bags filled with perlite or pine bark. Plants for the rockwool treatment were grown in rockwool cubes for five weeks before being transplanted into rockwool slabs. Retail cost of growing media, transplant media and containers to grow 640 plants in one greenhouse was determined based on invoices received from suppliers.

Plants for both tests were grown from late November to early July in 2006, 2007 and 2008, according to LSU AgCenter recommendations. Fruit was harvested from early March to early July and graded according to U.S. Department of Agriculture standards. Early marketable yield was fruit graded medium or larger in the first five harvests. Total marketable yield was the marketable fruit graded medium or larger in all harvests. Cull yield was the unmarketable fruit.

Results of the first study indicate that Geronimo produced the highest early and total marketable yields; Quest produced intermediate yields; and Trust produced the lowest yield (Table 1). Geronimo and Quest produced lower cull yields and heavier fruit than Trust. Pruning clusters to three fruit significantly increased total marketable yield, reduced cull yield and increased fruit weight (Table 1). Trust produced fruit with higher nitrogen and pH (less acid) than the other two varieties. Quest fruit had higher potassium and sugar than Geronimo fruit. Fruits of all varieties had similar sodium content (Table 2).

High nitrogen is not desirable as a quality component. But potassium is essential for fruit quality, and sodium is important for fruit taste. Approximately 92 percent of Quest tomatoes remained marketable after storage for one week at 67 degrees. Geronimo had 83 percent marketable fruit, and Trust had 78 percent marketable fruit (Table 2). Trust fruit had shorter shelf life because fine cracks on the shoulder led to moisture loss during storage. This defect was more common in Trust than in Geronimo and least common in Quest fruit.

The second study indicates Quest plants grown in perlite produced greater total marketable yield than plants grown in pine bark or rockwool. Perlite-grown plants produced significantly lower cull

(See Tomatoes on page 30)

Photo by Mary Ann Van Osdell

Hanna Y. Hanna at the Red River Research Station.

PROFITABILITY

of Greenhouse Tomato Production in Louisiana

Roger A. Hinson

According to the latest LSU AgCenter estimates (2008), 20 greenhouse tomato producers in the state had a total of about 130,000 square feet in production, with sales of more than $1 million at an average price per pound of $1.50. Greenhouse capacity averaged 6,500 square feet or just over two of the 30-foot-by100-foot greenhouses, which are typical of these operations. With good management and marketing, greenhouse tomato production can be profitable.

Although greenhouse tomatoes are growing in popularity, the most common kind of tomato available to U.S. consumers is produced in unprotected outdoor fields and usually harvested at the mature green stage. These field tomatoes have been criticized by consumers because, while they can withstand storage and handling in wholesale distribution, that often is at the expense of taste. Producers of field tomatoes believe that neither retailers nor consumers understand the storage requirements of tomatoes and argue that the standard tomato provides acceptable quality and taste if handled properly. Field tomatoes are particularly well-suited to the food service market because they slice well, have a more predictable cost and acceptable color, and are cheaper than greenhouse tomatoes.

But the greenhouse tomato has garnered a growing niche market. Consumers have responded to superior quality characteristics offered by greenhouse tomatoes including taste and appearance. Some greenhouse tomatoes are sold on the vine in clusters of four to six individual tomatoes still on the vine. This preference is reflected in an expansion of the greenhouse tomato's share of the overall tomato market, at the expense of field tomatoes. Greenhouse tomatoes are preferred because the modified climate in these structures produces more uniform tomatoes. Pests are more controlled, often leading to reduced pesticide use. And the tomatoes are harvested at a riper stage, which is perceived to offer a superior flavor than when picked at a mature green stage.

In Louisiana, far more field tomatoes are produced than greenhouse tomatoes. According to the latest LSU AgCenter estimates (2007), there are 278 producers of field tomatoes with 581 acres in production. The total output was 806,000 lugs (20-pound boxes) with an average price of $16.50 per lug for sales of more than $13 million.

Roger A. Hinson, Professor, Department of Agricultural Economics & Agribusiness, LSU AgCenter, Baton Rouge, La.

U.S. greenhouse tomato production grows

Canada was ahead of the United States in adopting the greenhouse method of growing tomatoes, which the Canadians adopted from the Dutch, as a way of extending a short growing season. Canada remains an important exporter to the United States of greenhouse tomatoes in parts of the year. Canada's success led to expanded greenhouse production in the northeast United States first and then along the eastern Rocky Mountains (Colorado, Arizona and New Mexico).

Mexico, an important exporter of field tomatoes to the United States in late fall, winter and early spring, has also adopted greenhouse production, often in less capital-intensive structures, compared to those in Canada and the United States.

Greenhouse tomatoes captured about 43 percent of the U.S. market in 2003, up substantially from the 1998 value of about 25 percent. Of that share, the Canadian product accounted for about 37 percent, the U.S. had 30 percent and Mexico, 28 percent. Canada is the dominant producer of greenhouse tomatoes for the U.S. market in the spring, summer and fall. The Canadian industry is efficient and has sufficiently high yields to put substantial pressure on U.S. tomato prices. Canadian tomatoes compete directly with the U.S. field-grown tomato for the retail grocer market. Noting that, U.S. and Mexican producers have responded by expanding greenhouse production to supplement their traditional role as suppliers of field tomatoes.

Commercial U.S. greenhouse production moved to the Southwest and West to pursue the higher-priced, cool-season market. The U.S. industry is technologically comparable to the Canadian industry, with high yields and consistent year-round product. Mexico's combination of field and greenhouse tomatoes, however, competes across the entire year. Another of Mexico's advantages is its varying levels of technology. Some production is from technologically up-to-date greenhouses, while other production is from lower quality houses and from structures that provide only shade. Overall, Mexican

producers have lower costs, but yields are lower as well. While Mexico's industry is challenged by lower-level technology and inconsistent product quality, its ability to supply all year and its productive area and volume of production make it a significant force in the industry.

Locally grown appeals to consumers

Louisiana greenhouse tomato growers have a single or a few greenhouses. They target local markets, both direct to consumer and through grocers with one or a few stores. Their claim of locally grown is a product characteristic that an increasing number of consumers want. Local means many things to the consumer, including fresher, healthier, safer, environmentally friendly, and supportive of local business enterprise. The intent of sellers to the local market is to bypass some of the participants in the commercial system and get a price per unit closer to that paid by the consumer in the traditional large chain grocery store. The trade-off is that growers assume marketing functions that place a substantial claim on their time.

Greenhouse production offers the advantage of extending the season, making tomatoes of superior quality available for extended periods of the year. These factors contribute to premium prices for direct-to-consumer sales and offer a point of differentiation for the local greenhouse tomato. However, the volume of product going through these markets often is not large. Other direct markets include direct sales to grocers. To expand sales, growers must understand what buyers really want when they choose greenhouse tomatoes.

Table 1. Effects of yields and prices on net returns per greenhouse above total expenses for greenhouse tomatoes, mostly fresh market sales, 660 plants in grow bags in 30′X100′ poly house.

Yield (boxes)	Base price: $1.25 per lb. or $18.75 per 15 lb. box @$14.75	@$16.75	@$18.75	@$20.75	@$22.75
	Net returns per greenhouse, dollars				
@720	-6,654.17	-5,214.17	-3,774.17	-2,334.17	-894.17
@820	-5,395.17	-3,755.17	-2,115.17	-475.17	1,164.83
@920	-4,136.17	-2,296.17	-456.17	1,383.83	3,223.83
@1,020	-2,877.17	-837.17	1,202.83	3,242.83	5,282.83
@1,120	-1,618.17	621.83	2,861.83	5,101.83	7,341.83

If a grower's production volume exceeds the local direct market, alternatives include sales to regional assembly point markets such as cooperative wholesalers or institutional users such as restaurants, cafeterias or schools – and even bulk sales to the national markets. These are excellent components of some growers' strategies. Price per unit is lower because wholesalers provide many supply chain services, so the grower hands marketing activities to others and can focus on production. Some growers may find that revenues and profit from an operation devoted to wholesale sales is preferable overall because the markets are much larger.

Profitability depends on yield and price

Production of tomatoes in greenhouses along the Gulf Coast requires a house design that is modest in cost and that can provide protection against cold with reasonable efficiency. The greenhouse must be ventilated and cooled in warmer seasons, and it must facilitate efficient management of production activities and pest control. Generally, a two-season crop (spring and fall) has been the dominant system, though single-crop regimes are being evaluated. With good management, yields of 20 to 25 pounds per plant space in a combined spring and fall season are typical.

The LSU AgCenter published greenhouse tomato budgets in 2007, and these budgets were updated to 2009 levels using agricultural equipment price indexes and production input cost updates from 2009 budget projection files. These provided detailed cost estimates of each activity in the production system for fixed and variable costs. For some, or perhaps many, Louisiana growers, labor is provided by the grower and family members. If this labor is not paid, it may not be considered by the grower as a cash expense. In this budget, the opportunity cost for each hour of labor required for production is included, so the total cost estimate may be high from the point of view of some growers.

Production cost was estimated on the basis of one 30-foot-by-100-foot poly-covered greenhouse with standard ventilation, heating and irrigation equipment. Spring and fall crops are produced in grow bags set in rows with a total plant count of 660 per house, with appropriate irrigation and fertilization system, pest control, and with the assumption that management generally follows LSU AgCenter best practices. The detailed activity cost budget is available on request. With these assumptions, calculated total costs per greenhouse per year were $17,706. The base assumption for yield was 15 and 7 pounds per plant space for the spring and fall crops, respectively, for a total of 22 pounds. Total yield for the greenhouse was 920 boxes of 15 pounds each, after including post-farm loss of 5 percent.

Because Louisiana growers are assumed to sell this premium product primarily to the local direct market, prices generally reflect that situation. The U.S. Department of Agriculture reports tomato wholesale and retail prices and recently has included the premium greenhouse

(See Profitability on page 30)

Photos by Mary Ann Van Osdell

External and Internal Parasite Control

for Cow-Calf and Stocker Beef Production

Sidney M. DeRouen, James E. Miller, Lane D. Foil and Glen T. Gentry

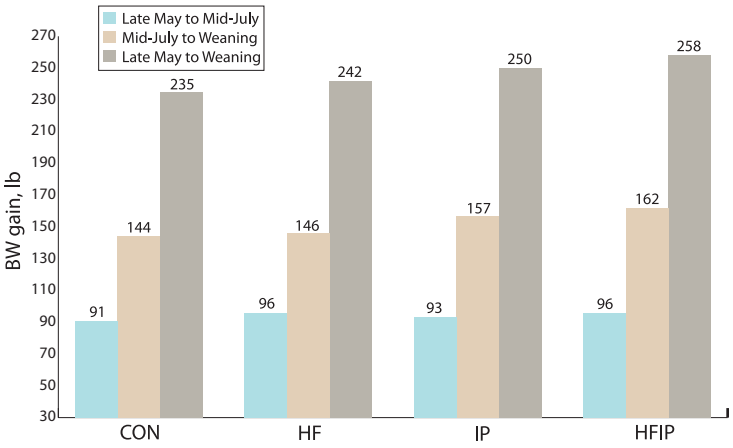
Numerous studies have demonstrated improved productivity and economic benefits of controlling either external or internal parasites in cow-calf herds and in stockers – young animals not yet ready for fattening or breeding. Research is extremely limited, however, on the combined effects of both horn fly and nematode control in beef cattle production.

The horn fly is one of the major blood-sucking external parasites of cattle. Annual economic losses from horn fly infestations in U.S. cattle production have been estimated to be more than $875 million. Horn flies feed up to 20 times a day on cattle, causing stress and annoyance, which may result in reductions of milk production and growth rate. Horn flies can be found year-round in the South; however, peak populations occur in the spring, summer and early fall, which coincides with the preweaning phase of a spring-calving system and stocker grazing of warm-season forages such as Bermuda grass.

Cattle of all ages, but particularly young cattle, are infected by a diversity of internal parasites. Gastrointestinal nematodes (GI), the most common internal parasites affecting cattle, can cause significant production losses in hot and humid regions, including Louisiana. Industry experts estimate $2.5 billion is spent annually on pharmaceutical products by the U.S. cattle industry to control internal parasites.

A study of the effects of horn fly and internal parasite control on cow-calf and stocker production was conducted at the Hill Farm Research Station in Homer and at the Reproductive Biology Center in St. Gabriel. The study produced 668 cow-calf records with three trials conducted at each location. Each of the trials began in late May and concluded between late September and early October when the calves were weaned. Length of the trials ranged from 115 to 124 days.

Figure 1. Calf preweaning weight gains over three trials at two locations. Treatments: CON=no horn fly or internal parasite control; HF=horn fly control; IP=internal parasite control; and HFIP=horn fly and internal parasite control.



For the stocker study, three trials were conducted at the Hill Farm. Each trial began in early to mid-May and lasted 84, 98 or 112 days. A total of 168 weaned stockers were used (56 per trial). They were grazed in one of eight 2-acre Coastal and common Bermuda grass pastures. Stockers were pastured together before initiation of each trial. They were then stratified by sex and weight and randomly assigned to eight replicate treatment groups.

For both studies, four treatments were used:

1) Control, no treatment for horn flies or GI nematode (CON).
2) Treatment for horn flies with insecticidal ear tags applied to cows or stockers (HF).
3) Treatment for GI nematodes with an oral drench of fenbendazole administered to calves and stockers (IP).
4) Treatment for both horn flies and GI nematodes combining treatments 2 and 3 (HFIP). Treatment groups were rotated among the pastures to minimize possible pasture effects.

At the initiation of each trial, cows and stockers assigned to the HF and HFIP treatments were fitted with one insecticide-impregnated ear tag. In addition to the ear tags, insecticidal sprays and pour-ons were applied to the treated groups in July, August and September for additional fly control. Each week throughout the trials, estimates of the

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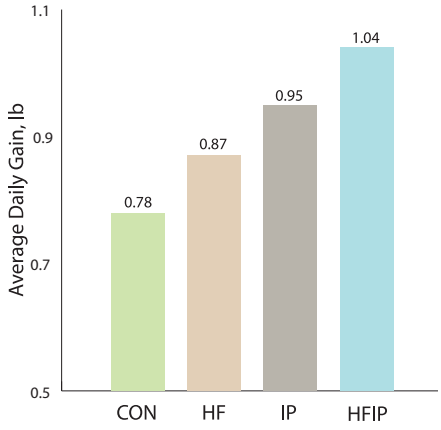
Figure 2. Stocker average daily gains over three trials. Treatments: CON=no horn fly or internal parasite control; HF=horn fly control; IP=internal parasite control; HFIP=horn fly and internal parasite control.



number of horn flies per side were conducted for randomly selected cows and stockers. All counts were made before 8:30 a.m. with the aid of binoculars.

In late May, mid-July and late August (about 40-45 days apart), calves assigned to IP and HFIP treatments received an oral drench of fenbendazole. Fecal samples were individually collected from all calves and stockers to determine nematode fecal egg counts. Efficacy of deworming was determined by the fecal egg count tests.

Cows, calves and stockers were weighed, and cow body condition scores were determined using a system ranging from 1 (emaciated) to 9 (obese) throughout each trial. Cows were tested to determine pregnancy when their calves were weaned.

The levels of horn fly control at the Hill Farm were marginal for both cows (47 percent) and stockers (48 percent); whereas higher levels (72 percent) of horn fly control were achieved at the Reproductive Biology Center. A probable explanation for this lack of acceptable fly control at the Hill Farm could be because of the development of insecticide resistance by the horn flies. Calf growth performance in response to horn fly control alone resulted in no significant weight gains (Figure 1). Likewise, no significant weight gain advantages appeared for the stockers treated for horn flies alone (Figure 2).

Reductions in fecal egg counts for the treated calves and stockers compared with untreated animals ranged from 95 percent to 100 percent in both studies, indicating that fenbendazole was effective in reducing GI nematode infections. The IP calves compared with CON calves responded with greater weight gains, primarily as result of improved gains from mid-July to weaning (Figure 1). These results suggest that a greater response in calf growth should be expected when calves are dewormed at 4 to 5 months of age rather than 2 to 3 months of age. Results showed no significant weight gain for the stockers treated for GI nematodes alone compared with untreated stockers (Figure 2).

The overall lower rates of stocker gain in our study may have contributed to the lack of significant differences between stockers treated and not treated for internal parasites. One explanation for the overall lower rates of gain may be periodic droughty conditions during the trials that resulted in limited forage availability during those times.

Total gain for HFIP calves were 23 pounds greater than CON calves (Figure 1). Likewise, stockers treated for both horn flies and GI nematodes responded with increased average daily gains of 0.26 pounds and average total gain of 25 pounds compared with nontreated stockers (Figure 2).

Contrary to growth performance, cow reproductive and maternal performances were not influenced in this study. Cows showed no significant treatment effects for any of the response traits – body weight change, body condition score change and pregnancy rate.

Improved weight gains from horn fly and internal parasite control lead to economic incentives to consider. Excluding labor, which for many Louisiana beef producers is their own, the cost of treating for both horn flies and GI nematodes was approximately $4.53 for each cow-calf pair and $6.75 for each stocker. This is far less than the value of additional weight gains that resulted from these treatments. At current prices, investing in the cost for both treatments would result in a better-than-fourfold return for beef producers. ■

Acknowledgments
Technical assistance provided by Pat DeRouen, Lee Faulk, Mike Kearney, Brooke Leibenguth, Jared Pitchford, Gorden Reger, Mike Turpin, Brandon Weeks and Cole Younger.

Cattle at the Hill Farm Research Station.

Photo by Mary Ann Van Osdell

Livestock Show marks 75 years of grounding youth in reality

Livestock projects have continued to ground energetic youth in reality. And 2010 marks the 75th annual LSU AgCenter Livestock Show – an event celebrating all that young people have learned about raising beef, dairy cattle, goats, hogs, poultry and sheep – knowledge that helps mold them into hard-working, responsible adults.

Louisiana 4-H alumnus Kermit Coulon had never been farther than Alexandria – 30 miles from his home in Hessmer – before attending his first state livestock show in 1942 at the Parker Coliseum in Baton Rouge. Because his family had no truck to transport his cow, they hired a driver, who then had to nail makeshift boards around the truck bed to see that Kermit's cow could make it safely to the event.

"When we came to Parker Coliseum and saw that building, the scope of it, the magnitude of it, we were amazed," Coulon said. "We slept on the 5th floor of the football stadium for free. That was far better than at district shows, where we slept in the barn with our animals."

Coulon, later a 4-H agent in St. James Parish, returned home from the state show in 1945 as sort of a local hero after being named the state champion in the Guernsey heifer division.

"I was the king of the walk. At the next 4-H meeting, the agent called me up and recognized me. All of the champions were listed in the paper."

Now in her first year as a high school agricultural education teacher, Lafayette native Amber Latoilais was the first in her family to show livestock.

"I was kind of a pioneer in the family," Latoilais said. After attending a school 4-H meeting, she told her dad she was going to show sheep.

"He said, 'What?' After seeing I was serious, he said, 'I guess you're showing sheep.' It ended up being one of the best decisions of my life."

Latoilais made it to the state competition each of the nine years she showed animals, winning in 2004 as the state premier exhibitor for sheep. Her sister and brother followed in her footsteps by also showing livestock.

"My dad took time off work to be with us. It's awesome because we were able to spend time together as a family that maybe we would not have been able to otherwise," Latoilais said.

Deputy Commissioner for the Louisiana Department of Agriculture and Forestry, Dr. Brent Robbins, a veterinarian and former livestock show winner with sheep, is grateful for the benefits of showing livestock.

"I can't brag enough on these kids and their level of responsibility. My daughter is up at 5 in the morning taking care of her sheep. And every evening she is feeding them and giving them fresh water," Dr. Robbins said.

He remembers spending hours alongside his father – hand-shearing, blocking and carding sheep. "We were able to talk about things."

Because of her involvement with the livestock project, Latoilais started her own sheep shearing business to save money for college. That money covered her textbook costs to attend the University of Louisiana at Lafayette, where she earned a degree in agricultural education.

"Even if I hadn't gone into agriculture, all the biology and sciences going through it (raising livestock) would have helped me. I already knew parasites and diseases, kingdoms and scientific names," Latiolais said.

Many of the participants in the AgCenter Livestock Show have made lifelong friendships that they continue to maintain.

"Families at the livestock shows looked after each other and still do. In the barn, you were a big family and that was special," Dr. Robbins said.

Latiolais said one highlight of the annual state show was making friends from around the state and then meeting them again. "It's a livestock reunion thing. We still keep in touch," she said. ■ **Randy LaBauve**

Brent Robbins, Louisiana State Fair, 1971

Courtesy of Brent and Karen Robbins


Karen Robbins, Louisiana State Fair, 2009

Photo by John Wozniak


Karen Robbins, 16, takes care of her sheep for her 4-H livestock project.

It all began in 1936 . . .

First prize 4-H Club judging team at the first state show (New Orleans Livestock Show at the Jefferson Parish Racetrack) May 1936, St. Tammany Parish group.

4-H Club Calf Show at LSU Livestock Show Pavilion in April 1937, showing the line-up of Lightweights at judging time.

1985 Sale of Champions on the steps of the state capitol marking the 50th anniversary of the livestock show. Photos from the LSU AgCenter archive

2010 marks an impressive milestone for the LSU AgCenter Livestock Show – the 75th show. The show's longevity, adaptability and continued popularity among youth are indicators of the event's success. In 2009, nearly 6,700 youth were enrolled in 4-H livestock projects.

The first state show was held in 1936 at the Jefferson Parish racetrack. It was for both adults and junior 4-H entrants. That year 4-H club members had already begun an awareness campaign to help reduce tick problems with calves – ultimately leading to the lifting of a federal quarantine on livestock in the state.

In 1943, the livestock competition for youth, known as the Junior Livestock Show, was opened to FFA members as well as 4-H'ers, helping to increase the number of participants. As more categories were added, participation increased as well. Until the 1940s, youth could compete only in the calf, dairy and fat barrows divisions. Now, they compete in categories for various breeds of beef and dairy cattle, goats, hogs, poultry and sheep.

In 1999, the Gerry Lane Premier Exhibitor Awards Program was established to give champion awards to youth demonstrating outstanding mastery over livestock concepts and skills. The awards are based on performance in tests of each youth's knowledge of the livestock industry, practical exercises demonstrating skills and the ability to communicate effectively. Participants have to pass an exam, take part in a skill-a-thon, write an essay, prepare a resume, and show poise and confidence during an interview with livestock show officials.

In 2009, Price LeBlanc, a Baton Rouge automobile dealer, established a $40,000 endowment to fund the Price LeBlanc Champion Livestock Award, which is presented to one grand champion market animal each year and rotates among five species – steers, swine, sheep, chickens and goats.

Generous benefactors have always been vital to the show's success. Community leaders and businesses have been offering scholastic premiums to champion participants, allowing them to earn at least market value for their champion animals. This was not always the case. During the early years, champion animals were sold at auction.

In 1937, the 4-H Baby Beef Show, as it was called then, was moved to the LSU Livestock Show Pavilion (now the Reilly Theater on the LSU campus). The following year, the event travelled only a couple hundred feet to the newly completed LSU Parker Coliseum and its adjoining livestock barns. Even though the Coliseum was one of the largest and most advanced show facilities in the country, the event steadily grew in size, eventually burgeoning beyond the building's capacity. This consistent growth prompted the LSU AgCenter to find a larger facility for the event. In 2004, the state livestock show moved to the Lamar-Dixon Expo Center in Gonzales. The livestock competition has been held there every year since then.

As an illustration of the event's historical growth, the first annual show in 1936 had only 35 calves entered in the junior division. When the event reached its 50th year in 1985, there were nearly 5,000 livestock entries (the grand champions were sold on the steps of the state Capitol that year). Current LSU AgCenter Livestock Shows have been averaging more than 3,000 youth and 6,000 animal entries per year.

Over the course of the show's history, the standards have changed. It used to be that any 4-H or FFA member with livestock could compete in the state show. Now, competitors must win at parish and district levels to make it to the state show. Despite all the changes, the central focus remains youth development. Young participants are still learning responsibility and achievement as the true reward for hard work, just as they did in 1936. The real value of the LSU Livestock Shows has been to help youth become winners in life.

■ **Randy LaBauve and Tom Merrill**

Molecular Marker
A Tool in Rice Variety Development

Herry S. Utomo, Steve D. Linscombe, Donald E. Groth, Ida Wenefrida and Sterling B. Blanche

The most important traits to consider when developing new rice varieties are grain yield, milling and grain quality, disease resistance, maturity, resistance to lodging (plants falling over) and seedling vigor. Stability of these traits across different environments and seasons is critical for consistent production.

The capability to manage extensive breeding populations and large-scale yield tests is enhanced by improved research facilities that include precision-leveled research fields, underground irrigation systems and modern planting and harvesting equipment. Standardized multi-location trials aid in the identification of stable, high-performing lines. Weather data and forecasting and timely applications of fertilizer and weed and insect control enhance the ability to maintain plant health and vigor through the growing season. In recent years, more efficient ways to produce new varieties are achieved through better understanding and identification of the functions of individual genes.

Photo by Bruce Schultz

Herry Utomo injects amplified DNA fragments into wells to reveal their properties for genetic analyses.

The knowledge of a gene's function and behavior within various environments provides a framework for future variety development. A wealth of information on rice breeding, genetics and molecular biology is accessible around the world. Selection methods, breeding techniques, sophisticated experimental designs and data analyses are important tools for developing new varieties. These tools are valuable in unraveling both simple and complex gene functions and behaviors.

Appropriate experimental designs and statistical analyses provide a way to clarify gene function and interactions, whether between two interrelated genes, among multiple gene families or with the environment. These methods, however, provide only an indirect view of gene functions. Recently available DNA marker technology is a new tool that offers direct examination of gene functions and interactions.

Because DNA is the origin of genetic information, it provides a physical layout to link observed traits directly to specific chromosomal regions. A direct analysis of gene functions can be conducted more precisely and in greater

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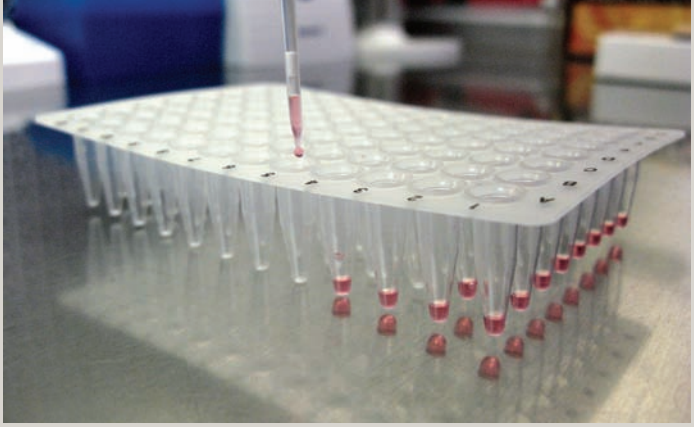


A PCR reaction mix is placed into a 96-well plate to simultaneously analyze 96 different rice lines in a single reaction.

detail than before. Far more descriptive interactions related to various important traits in crop production may be obtained from molecular marker analyses. Thus, DNA markers improve the precision of identifying specific genes and relating them to important traits in crop production, something that previously was difficult and costly. This new tool can be used to further enhance the efficiency and effectiveness of breeding programs.

DNA markers can be used to identify or verify varieties, breeding lines, first-generation hybrids, seed purity or intra-varietal variations based on their unique genetic code. These analyses are easier and more accurate than observational evaluations. A few well-selected markers are typically adequate for providing definitive determinations of varieties, hybrids or red rice (a weedy relative of cultivated rice). Research on molecular markers has contributed to a better understanding of genetic diversity, population structures, genetic relationship among subspecies, genetic relationships within specific seed collections and family relationship among breeding lines and varieties. The information generated can help realize and manage the overall genetic potential for developing improved varieties.

Current molecular marker work at the Rice Research Station includes gene introgression – moving genes from other rice species, un-adapted foreign rice germplasm or wild rice into the gene pool of Louisiana rice. This gene introgression is being conducted for a number of traits, such as resistance to blast and sheath blight, drought tolerance, starch content and aroma. Gene introgression is considered one of the most successful practical uses of molecular markers.

Marker-based scanning can be used in a backcross breeding program to increase the speed of establishing a new gene in desirable varieties more efficiently than through conventional breeding methods. Using the same technique, lines with essentially identical genetic make-ups, but which differ in a few selected genes, could be developed with greater precision.

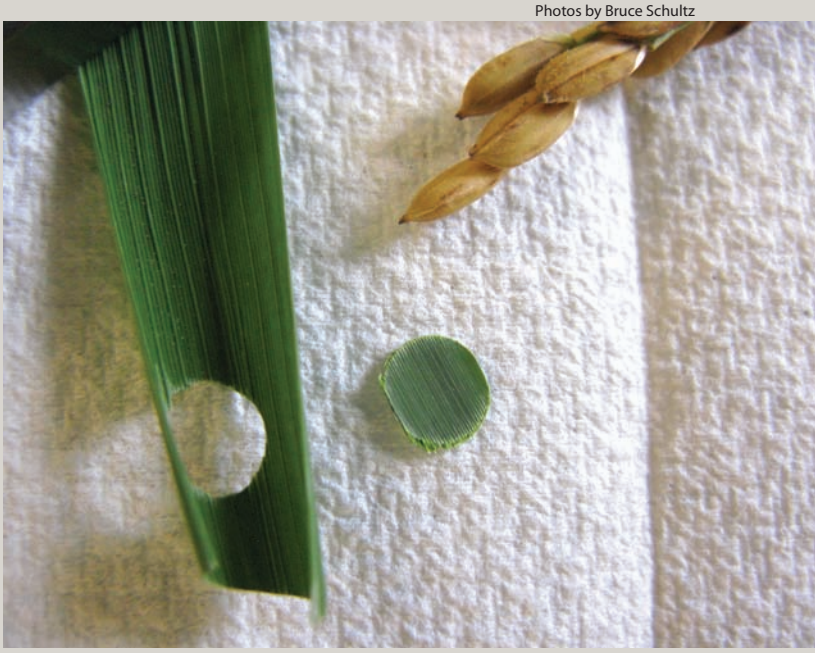
Marker-assisted gene pyramiding has been used successfully to combine multiple genes to provide a broader spectrum of resistance to rice blast and bacterial leaf blight. Because individual genes have unique reactions against specific pathogens, and some of them have overlapping effects, selection based solely on phenotypic disease reactions or symptomology could be problematic. Using molecular markers linked to individual disease-resistance genes can help overcome this problem and improve selection efficiency for disease-resistant rice varieties.

Various DNA markers are available for use in rice breeding programs. Rice Station researchers use simple sequence repeat (SSR) markers in most marker-assisted selection activities. More than 2,240 SSR markers are publicly available. The newest marker type includes Single Nucleotide Polymorphism (SNP), which can focus on a small portion of DNA and more accurately locate specific (and unique) chromosomal regions (genes). It is the most abundant type of marker that can be identified through direct comparison of the genome – or the complete DNA sequence. Because most breeding lines are composed of closely related genotypes, SNP markers are quickly becoming the marker of choice to accurately search for specific genes in a breeding program.

Marker-assisted selection has the potential to expedite the development of new lines through gene pyramiding and introgression. As in other crops, most economically important traits are quantitative in nature and can be attributed to the interactions between two or more genes and their environment. These traits are governed by QTLs (quantitative trait loci), which are regions of DNA often found on different chromosomes. Breeding for quantitative traits has been a slow and inaccurate process because of the potential for multiple genes and their interactions, which frequently vary according to the environment. Marker-assisted selection, as a tool for identifying the presence of multiple genes affecting a single trait, can assist plant breeders. Though not necessarily genes themselves, markers are stretches of DNA closely linked to the genes that underlie the trait in question. QTLs can be molecularly identified to help map regions of the genome that contain genes involved in specifying a trait. This can be an early step in identifying and sequencing these genes. While QTL mapping techniques are currently available, their applicability is still limited. Ongoing research at the Rice Station seeks to improve their direct applicability in large-scale rice breeding programs.

To fully integrate molecular marker technology into variety development programs, it is necessary to customize the information for a specific range of conditions such as locally adapted rice varieties and growing regions. However, this requires tremendous investment and

Photos by Bruce Schultz



A tiny part of rice leaf (¼-inch diameter) from one plant can provide adequate DNA materials to run more than 100 separate DNA or gene analyses.

represents the current bottleneck as to why successful use of available mapped QTLs into variety development remains limited.

A potential drawback of traditional QTL mapping studies is that they can take several years before the results can be used. By the time the work is completed, the recurrent parent used in the population development may have been replaced by new (and genetically different) varieties. A promising way to avoid this problem is to integrate commercial plant breeding and genomic technologies through a specific crossing scheme, which could allow the development of marker profiles, QTL mapping and new varieties to be advanced simultaneously.

The genetic diversity of cultivated rice accounts for only 5 percent of the overall diversity found in the rice genus. This wealth of genetic resources could provide a valuable genetic pool that can be used to boost the yield potential beyond current productivity levels through the introduction of rice genes from noncultivated germplasm. The diversity in wild species offers novel alleles – gene forms – not present among cultivated species. These genetic resources can be used to rediscover critical alleles hidden or lost during the early domestication process and along the progression of modern breeding processes.

Some of these exotic rice germplasm resources appear to have many new yield-related QTLs that can potentially be used to improve cultivated rice. A project such as this is best-suited for molecular marker and QTL technologies because traditional breeding methods would require tremendous expenditures of time, money and labor resources.

Genome sequencing of wild species and map alignment at international levels could provide a roadmap to unravel the potential of wild rice species. The idea of unlocking wild genetic variation to improve global grain production has gained renewed interest. DNA markers can be the tools to rediscovering valuable alleles and channeling them into the pipeline of variety development programs. ■

New Methods to Evaluate Optimum Rice Planting Dates

Sterling B. Blanche and Steven D. Linscombe

One of the first and most important decisions Louisiana rice producers face during the growing season is when to begin planting their rice crop. Many variables are factored into this decision, including variety selection, seeding rate and method, and weather conditions. The choice of planting date will have a season-long effect on the rice crop, and ultimately, on grain yield.

Sterling B. Blanche, Assistant Professor, and Steven D. Linscombe, Professor and Director, Rice Research Station, Crowley, La.

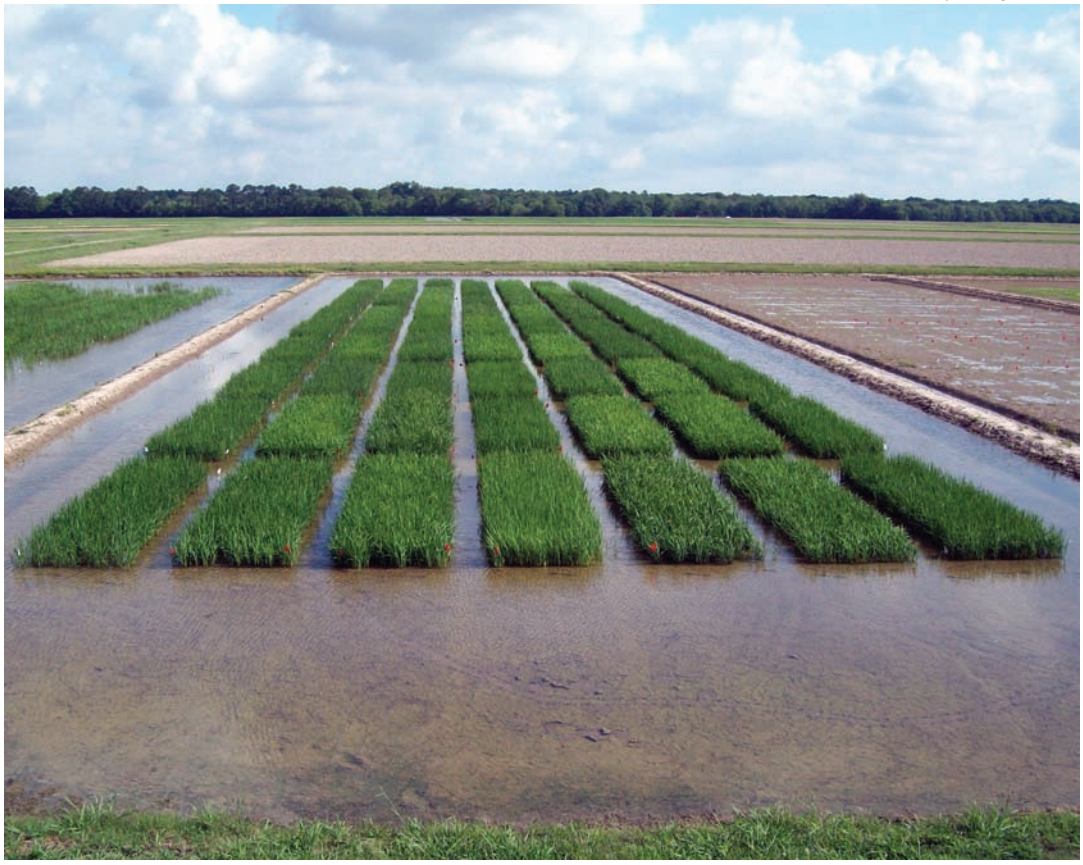
Planting dates represent complex environments that include both static (soil type, latitude, etc.) and dynamic (soil and air temperature, soil moisture and fertility, etc.) factors. Confounding this is that the dynamic characteristics of planting dates are not always consistent from year to year.

Researchers at the LSU AgCenter's Rice Research Station have historically conducted annual date-of-planting studies to determine the optimum window for rice planting. In these studies, several commercial varieties and a range of planting dates from February (too early)

Photo by Sterling B. Blanche

Water-seeded rice in the date-of-planting trial.

Photo by Sterling B. Blanche



Each "planting date" contains 15 rice varieties replicated three times.

to July (too late) are evaluated. Traditionally, average grain and milling yields have been used to identify the optimum planting dates. While mean yields are an important part of the equation for identifying the best planting date, they do not address the variation associated with each date. An estimate that quantifies the variability among varieties at a given date could be a benefit for rice producers.

An ideal rice variety could be defined as one that performs consistently across years, geographic locations and planting dates. Measuring the variation associated with varieties across planting dates can aid in the selection of desirable, widely adapted varieties or those that provide the most flexibility in a difficult-to-characterize planting window.

Field Studies

To help answer these questions, LSU AgCenter researchers conducted field experiments from 2003 to 2005 at the Rice Station using commercially available rice varieties and six planting dates spaced roughly two weeks apart. Short-grain, medium-grain and long-grain varieties were evaluated for rice grain yield and whole-kernel milling yield (the percentage of whole grains remaining after the dehulling and milling processes).

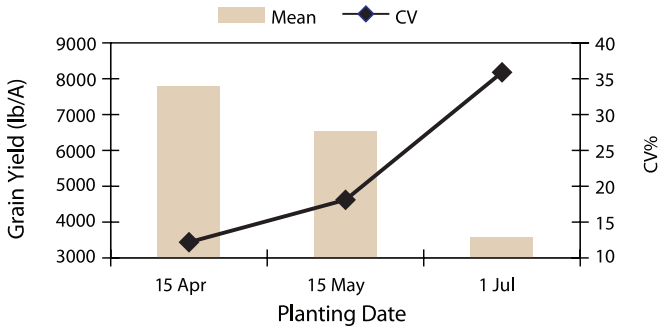
Effect of Planting Dates

Figure 1 shows mean rough rice yield and the coefficient of variation (CV) for three planting dates. The research results indicate earlier planting dates resulted in higher grain yields than later planting dates, and the highest grain yield was observed at the April 15 planting date. An evaluation of the variation in yields (CVs) also indicated that early planting is more desirable than late planting. Both the April 15 and May 15 planting dates had low CVs, but the CV for the July 1 planting date was 36 percent. Whole-kernel milling yields also were higher and more consistent at early planting dates compared to late planting dates. The results clearly suggest that early planting is beneficial for consistently high rice grain and whole-kernel milling yields.

Yield and Stability

A second objective of the study was to evaluate rice varieties when planted across a range of dates. Based on rice grain yield alone, Jupiter was the best variety, but it was relatively unstable with a CV of 32.3 percent, the second highest in the study. A high CV suggests that grain yield was very high for some planting dates, but significantly lower in others. CL161 exhibited superior rough rice yield, and with a low CV, it consistently provides high yield potential regardless of planting date. Also, CL161 was the best variety for whole-kernel milling yield, both in terms of mean performance and stability. When it is necessary to plant on the early or late end of the planting window, CL161 would be a good candidate. Based on LSU AgCenter research, the ideal planting date in southwest Louisiana for high grain and milling yields should be April 15 or earlier, which is in agreement with the currently recommended planting window of March 15 to April 20. This planting date exhibited the highest yield potential and excellent milling quality and was consistent for all varieties included in the study. ■

Figure 1. Mean rice grain yield and coefficient of variation (CV) of 3 planting dates.



Liriope and monkey grass groundcover varieties

Allen Owings, Regina Bracy, Yan Chen and Roger Rosendale

Groundcovers continue to be popular landscape plants in the southeastern United States. The two most popular groundcovers in Louisiana are liriope and monkey grass (also called mondograss). Monkey grass is closely related to liriope.

Many new liriope and monkey grass varieties have been released by wholesale nurseries over the past 10 years. Most of these have not been tested under landscape growing conditions in the Southeast. Growers and landscapers want improvements over existing varieties in terms of growth habit, disease resistance (primarily to anthracnose fungus that causes spotting and browning of leaf blades), uniformity in sun and shade performance, and winter aesthetics.

Over the past few years, the LSU AgCenter has evaluated seven new varieties and three standard varieties grown in Louisiana for seasonal landscape performance by measuring visual quality, plant height, plant spread, flowering characteristics and disease presence. A landscape evaluation of new liriope and monkey grass varieties was initiated at the LSU AgCenter Hammond Research Station (USDA hardiness zone 8B) in fall 2007. New liriope varieties evaluated were Cleopatra, New Blue, Marc Anthony, Emerald Goddess, Super Blue and Odom's Big Blue. A new monkey grass, Crystal Falls, also was included. Standard liriope varieties included for comparison were Big Blue, Evergreen Giant and Jeanerette.

New varieties

Marc Anthony is a new release from Plant Development Services Inc. (PDSI), of Loxley, Ala. It is an improved variegated-foliage variety with new foliage originating as golden yellow and green. Foliage becomes white and green when mature. Lavender blooms peak in midsummer. It is reported to reach 16 inches tall, is recommended for USDA hardiness zones 5-9 and is recommended for full sun to partial shade.

Allen Owings, Professor, Regina Bracy, Professor and Resident Coordinator, Yan Chen, Assistant Professor, and Roger Rosendale, Research Associate, Hammond Research Station, Hammond, La.

Cleopatra, another new release from PDSI, is a clumping liriope with foliage spreading up to 15 inches. In midsummer, lovely lavender spikes rise from the dark green foliage to create a wonderful accent. It is reported to reach a height of 24 inches and is recommended for USDA hardiness zones 5-9 for full sun to partially shaded locations.

New Blue, a new liriope from PDSI, sports a truly clumping growth habit and deeper foliage (dark green) and bloom (lavender) colors. New Blue is reported to reach heights of 15 inches. It is recommended for USDA hardiness zones 5-10 in full sun to partial shade.

Emerald Goddess from Rode Groundcovers in Florida is a liriope with lavender flowers. The mature height is 12-15 inches. It is faster-growing than most other varieties. It is reported to have superior resistance to common fungal and bacterial plant pathogens. Dark green foliage is retained in winter. Floral display is advertised to have better intensity, height, uniformity and duration than other liriope varieties. It is recommended for USDA hardiness zones 5-10.

Super Blue, a new selection from Big Blue, has much more vigorous growth than other Big Blue selections. This variety is available from KPS Sales, Apopka. Fla.

Other liriope varieties included in this study are Jeanerette (a commonly sold variety in Louisiana), Odom's Big Blue (a new selection of Big Blue from Country Pines Nursery in Forest Hill, La.) and Big Blue (obtained from Doug Young Nursery in Forest Hill, La.). Evergreen Giant, commonly used in Louisiana landscapes, also was included. The new monkey grass included in this study was Crystal Falls from Head Ornamentals in Seneca, S.C.

Other new liriope varieties available but not included in these studies include Supergreen from PDSI and Mayan Blue from KPS Sales.

Research study

One-gallon containers of these varieties were planted in late fall 2007 in a randomized design with two replications of five plants each. Spacing was 18 inches between plant centers. Beds were located in full sun in a fine sandy loam soil amended

(See Liriope on page 31)

Table 1. Plant height and seasonal visual quality ratings (5 = superior landscape performance) of liriope and monkey grass varieties evaluated in LSU AgCenter (Hammond Research Station, Hammond, La.) landscape trials, 2008.

	Plant Height	Visual Quality Ratings			
	(in)	March	June	Sept	Dec
New Varieties					
Cleopatra	12.5	3.0	3.8	4.0	3.8
Crystal Falls	15.5	4.3	3.1	3.8	4.2
Emerald Goddess	19.5	3.5	4.1	4.8	4.5
Marc Anthony	10.5	2.5	3.5	3.6	3.3
New Blue	12.5	3.0	4.1	4.1	4.0
Odom's Big Blue	13.5	2.9	3.5	3.6	3.5
Super Blue	21.2	4.6	4.8	4.9	4.6
Industry Standards					
Big Blue	14.0	2.9	3.6	3.6	3.5
Evergreen Giant	17.2	2.7	2.8	1.9	2.3
Jeanerette	11.0	2.6	3.4	3.5	3.5

Woody ornamental shrubs

Allen Owings

Every year plant breeders introduce new shrubs for landscape use. At the same time, people are just starting to plant a few shrubs introduced in earlier years. The LSU AgCenter Hammond Research Station evaluates landscape performance of many new ornamental plants, including flowering shrubs. Some new shrubs worthy of being highlighted include new gardenias, Indian hawthorns, crape myrtles, loropetalums and azaleas.

Frostproof gardenia is the best variety for landscape use in Louisiana.

New gardenias

One of the newest shrubs being marketed in Louisiana is Frostproof gardenia, a plant that home gardeners should start enjoying. Frostproof is widely used by landscape professionals.

This gardenia is much improved over other gardenia varieties. Its characteristics include fast growth, site adaptability and suitability to poorer growing conditions – all improvements over August Beauty, Mystery and dwarf varieties. Frostproof initially was propagated in the Forest Hill, La., area and has now become distributed across the entire southeastern United States. It reaches a mature height of 5 feet with a spread of 4-5 feet. Homeowners can plant this variety for a low-maintenance, good-performing gardenia – which has not been common in the last few years.

Another new gardenia is Jubilation. This variety is being promoted in the new Southern Living plant program and has performed well in LSU AgCenter evaluations. Jubilation has compact growth and will mature at a height of 4 feet with a 3- to 4-foot spread. It has good re-blooming potential.

More loropetalums available

The newest loropetalum, which is commonly called Chinese witch hazel, is Purple Diamond and is highly recommended by the LSU AgCenter. Purple Diamond has the most intense purplish foliage of any of the loropetalums and has a tighter growth habit that can be maintained in a more typical shrub-like shape instead of a small tree-like shape common to the older loropetalums.

Most loropetalums have purplish to burgundy foliage seasonally and pink or fuschia-colored flowers in the spring about the time azaleas finish blooming. The unique foliage color of Purple Diamond lasts year-round. This variety reliably blooms for 4-6 weeks in midspring and sometimes blooms to a lesser degree in late summer.

Emerald Snow is another new, white-flowering variety of loropetalum with green foliage and a mounding growth habit. Plants reach 3-4 feet tall.

(See Ornamentals on page 31)

Allen Owings, Professor, Hammond Research Station, Hammond, La.

Photos by Allen Owings

Autumn Lilac is the newest of the 24 varieties in the Encore azalea collection.

Research wrapped in beauty *at the Burden Center in Baton Rouge*

In 2004, the LSU AgCenter transformed a former hay field into a 25-acre turf grass and ornamental horticulture research area as the newest addition to the Burden Center in Baton Rouge, a facility dedicated to the viability and success of Louisiana's commercial nursery, landscape and turf grass industry.

"Much of the research results also are adaptable to home lawns and gardens," said Pat Hegwood, the center coordinator.

Originally called Windrush Plantation, the tract now known as the Burden Center was acquired by John Charles Burden in the mid-19th century and is home to a wide array of formal and informal gardens and woods in addition to horticulture research.

John Charles Burden's descendants include Steele Burden, a former landscaper for the LSU campus; Ione Burden, his sister and former assistant dean of women at LSU; and Jeanette Burden, the widow of their brother, Pike Burden. In 1966, they donated 50 acres to LSU, and over the succeeding years, they donated additional tracts until the final parcel was given in 1992, for a total of 440 acres at the Burden Center.

The Burden family stipulated in the act of donation that the property be used for horticultural and agronomic research, for development of a Rural Life Museum and as a green area devoid of buildings not necessary for these purposes. To secure LSU's future adherence to these stipulations, the Ione Burden Foundation was formed.

Over the years, the focus of research at Burden Center has changed. In 1979, when Warren Meadows was appointed resident director of the Burden Research Plantation, as it was known then, the research included soybeans and other agronomic crops such as wheat.

"Very little horticultural research was in progress," Meadows said.

When he started at Burden, Meadows learned Ione Burden was more interested in the development of the horticultural research program there than Steele Burden.

"Nevertheless, they both wished to see more horticulture activity and less soybeans occupying the property," Meadows said. "The increased emphasis on urban horticulture research, I believe, would have met with Mr. Burden's approval."

Now, AgCenter researchers conduct plant trials throughout the year at Burden to evaluate the performance of landscape bedding plants and vegetable plants appropriate for south Louisiana. Warm-season and cool-season plants are rotated annually in approximately 5,000 square feet of raised beds.

The researchers evaluate a broad range of landscape plants to determine disease and insect resistance, bloom quality and duration, cut flower potential, cold and heat tolerance, and overall landscape performance and adaptability. In addition, Burden Center is home to trials to evaluate various varieties of tomatoes, sweet potatoes, strawberries and many other commercial and home garden vegetables and fruits.

Zhijun Liu of the School of Renewable Natural Resources has several projects at Burden Center. He's growing 21 campotheca trees for a study with the M.D. Anderson Cancer Center in Houston. Seeds from the trees contain camptothecin, a naturally occurring compound that holds promise in cancer therapy.

Liu is also growing a second tree, eucommia, for studies in cooperation with the LSU School of Veterinary Medicine and Pennington Biomedical Research Center. Eucommia bark contains substances that have anti-hypertension properties.

Adjacent to the original Burden home, which was on the last donated parcel, Windrush Gardens feature about 15 acres of semiformal gardens with winding paths, lakes and open areas, all designed and planted by Steele Burden.

Sweet potato researchers at Burden Center are studying host-plant resistance to sweet potato weevils and banded cucumber beetles. Sweet potato weevils are a pest under quarantine and are not present in most north Louisiana parishes. Other research includes screening lines from the AgCenter breeding program for resistance to major diseases and determining the role of viruses in the decline in yield and quality of sweet potato varieties.

Other researchers use the facilities at Burden Center to evaluate performance of varieties of strawberries, mahaws, figs, peaches and pawpaws while vegetable studies include tomato variety performance and new technologies and practices to improve the profitability for small and medium-scale fresh-market producers.

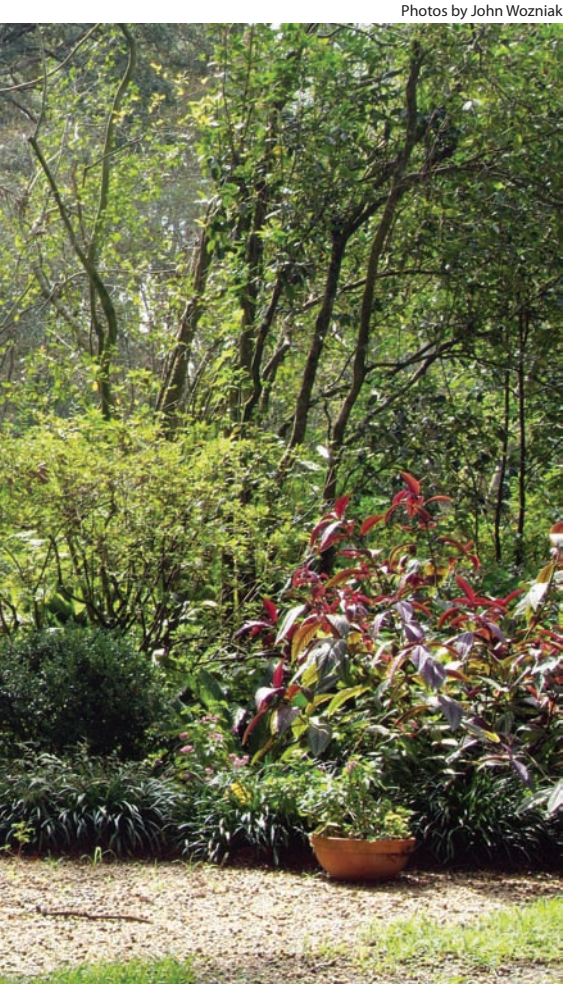
The AgCenter's fig breeding and selection program recently released new varieties ORourke, Champagne and Tiger. Other fruit research is investigating low-chill peach varieties for coastal areas and pawpaws for fruit production and landscape use.

Sustainable agriculture research includes organic vegetable production, summer and winter cover crops, production practices and variety trials. Extension demonstration projects feature field days and organic vegetable production demonstrations.

In the greenhouse, researchers are working with tomatoes and hydroponic lettuce. In addition, they're investigating the effects of heat stress on bedding plants and developing a method for determining heat tolerance.

Pat Hegwood, coordinator at Burden, points out features of Trees and Trails, a 5-mile system of pedestrian, recreational and educational trails at the center. The backbone of these trails was originally designed by Steele Burden as meandering paths through part of the Burden Woods.

Photos by John Wozniak



The Burden Center also hosts ongoing evaluations of roses, crape myrtles and bedding plants to develop recommendations for the production and landscape industry. Plant researchers are looking at postharvest longevity of sunflowers, rose diseases and poinsettia stem strength. Turf grass research includes a national turf grass evaluation and research in plant nutrition and weed control. Researchers also are evaluating the use of biodegradable containers and investigating particle size and distribution of various wood products for use as a soilless substrate.

The original Windrush Garden is a 3.5-acre area around the original Burden home with formal gardens including bronze and marble statues and water features. The Burden Center maintains it exactly as it was when Steele Burden designed it.

"We don't add to it or take anything away," Hegwood said. "We have a documented inventory of the original Windrush Garden."

Over the intervening years, the cultivated garden area has grown to about 15 acres but still in keeping with Steele Burden's original design. In the newer area, the AgCenter has been adding and enhancing the garden with newer plant varieties. In areas where Steele Burden planted camellias, the AgCenter has planted camellias; where he planted azaleas, the AgCenter has planted azaleas.

Complementing Steele Burden's original plantings, the AgCenter acquired more than 450 identified camellia varieties from the private collection of Violet Stone in 2002. Now planted in several locations at Burden Center, the camellia gardens are supported by the Baton Rouge Camellia Society, which propagates plants from the collection and sells them. Burden Center receives a portion of the proceeds of the sales.

Burden Center is a member of All-America Rose Selection's nationwide network of approved public gardens. AARS public gardens contain a minimum of 800 rose bushes and offer special displays of outstanding new varieties chosen by AARS for their beauty, novelty and vigor. The garden at Burden Center was recognized with an "Outstanding Rose Garden Maintenance Award" for 2009, Hegwood said.

Private evaluators found the garden to be in excellent condition and "a tribute to the AARS varieties on display," Hegwood said.

Other features at Burden Center include:

−The Barton Arboretum, which has a pond and gazebo.

−A Memorial Live Oak Garden features trees that have been dedicated to friends of the AgCenter.

−The Steele Burden Memorial Orangerie, part conservatory and part interpretive in construction.

−The Ione E. Burden Conference Center, which includes a 2,400-square-foot meeting room served by a kitchen and outdoor area for conferences and workshops.

Along with the AgCenter's research and demonstration activities, LSU A&M operates the Rural Life Museum in a 16-acre corner of Burden Center. Through its extensive collection of tools, utensils, furniture and farming equipment, the museum preserves and interprets an important part of the state's and nation's rural heritage. The museum also serves as a research facility for LSU students engaged in heritage conservation studies.

Rick Bogren ■

Influence of RAISED BEDS, ROW SPACING and SEEDING RATE on WHEAT produced on alluvial soil

Rick Mascagni, Steve Harrison, Kelly Arceneaux and Bubba Bell

Wheat acreage fluctuates widely from year to year, primarily because of grain and fertilizer prices and weather patterns affecting planting and harvest. Marketing small grains in late spring when wheat is harvested provides growers with much-needed cash flow to cover the costs of production of summer crops such as soybeans. Management practices, particularly drainage, are very important in maximizing yield and profitability.

The use of raised beds for wheat production facilitates double-cropping with soybeans and should provide better drainage for the wheat crop. Some Louisiana soybean growers are using wide beds (72-80 inches) with 15- to 16-inch drilled rows for soybean production. These wide beds work well for a variety of crops, including cotton, soybean and sugarcane. Wide beds offer significant advantages in controlling soil moisture, both irrigation and drainage, and are amendable to narrow row spacing.

A wide-bed cropping system that includes wheat in the winter would increase flexibility and offer rotational advantages, particularly if the soybean planter can be used to plant wheat. Row spacing of 15-16 inches – wider than the conventional 7- to 10-inch spacing – has been shown to reduce wheat yield slightly in Ohio. Because wheat in Louisiana continues to grow and produce tillers – or additional plant shoots – all winter the crop may be able to compensate for wider rows without significant yield loss. An additional concern is whether or not seeding rates should be adjusted with wide rows, which may offer additional savings to growers. Wider row spacing for wheat may improve planting efficiency for a double-crop such as soybeans.

This study was designed to evaluate the influence of raised versus flat seedbeds, conventional (7-inch) versus wide row spacing (14-inch) and normal versus reduced seeding rate on yield performance of five wheat varieties produced on an alluvial Mississippi River soil.

Field experiments were conducted in 2006-07, 2007-08 and 2008-09 on Tunica silty clay at the Northeast Research Station near St. Joseph. Seedbed treatments were the conventional flat seedbed and 80-inch-wide, raised beds. Rows were spaced at 7 inches and 14 inches. A small-grain plot planter was used for planting. Seeding rates were 12 and 24 seeds per square foot – approximately equivalent to a seeding rate of 47 or 94 pounds of seed per acre – averaged across the five varieties. The adapted varieties AGS 2060, AgriPro Coker (AC) 9553, Delta King (DK) GR9108, Pioneer brand (PB) 26R61 and Terral LA841, which differ in tillering ability, were evaluated across row spacings, seeding rates and bed types. Tillers per plant were determined by comparing the number of seedlings with the final number of grain heads. Grain yield at 13 percent moisture was determined by harvesting complete plots with a small-plot combine.

Average yields across all treatments ranged from 52.6 bushels per acre in 2008 to 70.7 bushels per acre in 2009 (Table 1). There were no yield differences between wheat grown on raised beds and wheat grown without beds when averaged across years and combinations of seeding rates and varieties. In 2007, the flat system significantly out-yielded

Table 1. Influence of seedbed averaged over row spacing, seeding rate and variety on wheat yield on Tunica silty clay in St. Joseph, La., 2007-2009.

Seedbed	2007	2008	2009	**Average**
	bushels per acre			
Flat	68.5	50.9	67.8	**62.4**
Wide bed	58.7	54.3	73.5	**62.2**
Average	**63.6**	**52.6**	**70.7**	

Table 2. Influence of row spacing averaged over seedbed and seeding rate on wheat yield of five varieties on Tunica silty clay in St. Joseph, La., 2007-2009.

Variety	2007		2008		2009		
	7-inch	14-inch	7-inch	14-inch	7-inch	14-inch	**Average**
	bushels per acre						
AGS 2060	64.4	65.4	52.7	57.1	74.1	77.0	**65.1**
AC 9553	66.5	65.1	51.0	49.1	66.5	65.5	**60.6**
DK GR9108	60.5	60.7	46.5	46.5	69.8	65.9	**58.3**
PB 26R61	62.1	65.8	53.9	60.6	69.9	74.4	**64.5**
Terral LA841	64.5	61.1	54.1	54.2	73.4	69.7	**62.8**
Average	**63.6**	**63.6**	**51.6**	**53.5**	**70.7**	**70.5**	

Rick Mascagni, Professor, Northeast Research Station, St. Joseph, La.; Steve Harrison, Professor, and Kelly Arceneaux, Research Associate, School of Plant, Environmental & Soil Sciences, LSU AgCenter, Baton Rouge, La.; Bubba Bell, Research Associate, Sweet Potato Research Station, Chase, La.

Table 3. Influence of seeding rate and row spacing averaged over seed bed and variety on wheat yield on Tunica silty clay in St. Joseph, La., 2007-2009.

Seeding rate	2007		2008		2009		
	7-inch	14-inch	7-inch	14-inch	7-inch	14-inch	**Average**
Seeds/sq foot	bushels per acre						
12	63.5	62.0	51.2	52.1	70.8	69.6	**61.5**
24	63.7	65.3	52.1	55.0	70.7	71.5	**63.1**
Average	**63.6**	**63.6**	**51.6**	**53.5**	**70.7**	**70.5**	

the bed system, whereas the raised bed system was significantly better in 2009, a year with excessive rainfall during winter tillering (November-December 2008). Total rainfall for the months of October through May ranged from 35.0 inches for 2006-07 to 42.8 inches for 2008-09. Rainfall was excessive in the fall of 2008, totaling 18.9 inches in November and December, and raised beds produced higher yields as a result. Averaged across the three years, yields were 62.4 bushels per acre for the conventional, flat seedbed and 62.2 bushels per acre for the raised, wide beds. Although the soil evaluated in this study had poor internal drainage, surface drainage was adequate, and water did not pool after a rainfall in any year of the trials.

Average yields ranged from 60.6 bushels per acre for AC 9553 to 65.1 bushels per acre for AGS 2060 (Table 2). Across years, AGS 2060 was the most consistent high-yielder, while DK GR9108 had the lowest yield. Grain yields in wide rows were equal to those in narrow rows. This indicates that in Louisiana, wheat appears able to compensate for wide spacing, and growers should be able to plant wheat using soybean planters without significant yield reductions, assuming that weed control and fertility levels are adequate to permit plant tillering.

The five wheat varieties generally responded similarly to different row spacings, although some differences in some combinations occurred in 2009. In 2009, PB 26R61 had higher yield for the 14-inch spacing, while yield differences between spacing treatments for the other four varieties were small. The effect of row spacing on the number of tillers depended on year. In 2007, tillers per plant for the low seeding rate was 27 percent higher on the narrow versus the wide row, while tillers were 15 percent lower on the narrow row with the high seeding rate. In 2008, row spacing did not affect tiller numbers for either seeding rate.

The influence of seeding rate and row spacing, averaged over seedbed and variety combinations, on wheat yield is shown in Table 3. Yields were increased only by 2.6 percent with the high seeding rate of 24 seeds per square foot, averaged across trials and row spacing. For the wide row spacing, yields were slightly higher for the 24- versus 12-seeds-per-square-foot rates. Yield differences between seeding rates for the narrow row were small.

This study indicates that advantages of raised beds on soils with good surface drainage are probably minimal, but raised seedbeds can increase wheat yield when excess rainfall occurs during tillering. Additionally, yields for the wide, 14-inch row spacing were equal to yields for the conventional, 7-inch spacing. This implies that growers can use soybean planters to plant wheat, which saves money on equipment costs and improves efficiency of planting a follow-up crop such as soybean without decreasing wheat yields. ■

Photo by Steve Harrison

Early February wheat yield plots showing staked areas for stand counts with 7-inch and 14-inch row spacings.

Wetlands

(Continued from page 11)

feet. The deep wetland provides anaerobic conditions for important biological transformations of unwanted chemicals and serves as a "polishing" area where remaining sediment can settle out and further improvements in water quality can occur. As in the shallow wetland, the depth of the deep wetland is regulated by two v-notch weirs attached to two 48-inch culverts. From the culverts, runoff flows to the Flat River.

The effectiveness of the constructed wetland system in improving water quality is determined by sampling at four locations along the path of runoff through the system using automatic water samplers (Figure 2). In addition, samples are collected from the shallow and deep wetlands during times when runoff is not flowing through the system to monitor changes in water quality caused by runoff retention in these two areas.

Figure 3 illustrates the system's effectiveness in improving the quality of water runoff during the spring and summer in 2008 when field activity, including fertilizer application and soil cultivation, was at its peak. The EPA had stated that sediment flow into the Flat River needed to be reduced for dissolved oxygen content to be maintained at 5 milligrams per liter during the summer, and sediment content in the runoff, as measured by changes in total suspended solids in the shallow and deep wetlands, was reduced an average of 90 percent.

The constructed wetland system also was effective in reducing nutrient levels in runoff before release into the Flat River.

Fertilizer, especially nitrogen, in runoff into tributaries that flow into the Gulf of Mexico has been implicated as the primary cause of the hypoxic zone that occurs every summer off the Louisiana coast. This study monitored two forms of nitrogen. Total kjeldahl nitrogen, which is a combination of organic nitrogen, ammonia and ammonium, was reduced 65 percent as runoff moved from the shallow to the deep wetland and then finally to the Flat River. Nitrate level reductions were greater in 2008 (67 percent) compared to 2009 (1.1 percent), but levels in both years were less than 0.5 milligrams per liter, which is significantly lower than the 10 milligrams per liter maximum allowed in drinking water by the EPA.

Two forms of phosphorus also were measured. Comparing total phosphorus – or all forms of detectable phosphorus present – indicated a 59 percent reduction between the shallow and deep wetlands. Orthophosphate, which is the form of phosphorus readily available to plants, was reduced 45 percent.

Louisiana's vast network of streams, bayous, rivers, lakes and wetlands supports an incalculable wealth of wildlife and recreational resources. These natural resources must be protected for future generations to enjoy. It's been said that wetlands are nature's water-filtering system, and the results of this research demonstrate the wisdom in that statement. The 14.5-acre constructed wetland system in this research project provided significant improvements in the quality of water runoff from more than 400 acres of agricultural land. This is equivalent to 3.6 acres of wetland for every 100 acres of runoff. This system will continue to be monitored to determine the longevity of its effectiveness in improving water quality of runoff from the research station into the Flat River. ■

Tomatoes

(Continued from page 13)

yield and heavier fruit than rockwool-grown plants (Table 3). Results also indicated that tomatoes grown in pine bark or rockwool produced similar total marketable and cull yields but different fruit weights. As in the first study, cluster pruning to three fruits significantly increased total marketable yield, reduced cull yield and increased fruit weight (Table 3). It was more expensive to grow tomatoes in perlite and least expensive in pine bark (Table 4).

Quest produced higher total marketable yields than Trust in this study, and the fruit had significantly less nitrogen, higher acidity, longer shelf life and a shiny color that gives it a marketing edge over Trust. Geronimo produced higher yields than either Quest or Trust, but the fruit had less potassium and sugar than Quest and lacked the shiny color and the shelf life of Quest. Geronimo and Quest should be considered as replacements for Trust by growers in the Southern states. Geronimo should be considered for its higher yield and Quest for its adequate yield and shiny fruit that has superior shelf life. It is recommended growers grow these varieties on a small scale first because possible environmental effects may affect their results.

Tomato breeders release few greenhouse varieties each year, and knowledge about their performance is extracted from the description released by the company. Many smaller growers, particularly new ones, depend on communication with established growers to choose a variety. For example, Trust has been more popular than any other variety in Southern states because of grower interaction during workshops. This study indicates that Geronimo and Quest can be appropriate alternatives to Trust and can help growers produce more yield per unit area and extend fruit shelf life. Geronimo's higher yield can compensate for its less-than-optimum shelf life.

Perlite can be recycled for many years to reduce production cost without negative impact on yield. Rockwool can be steam-sterilized and reused once and then must be disposed of because of fiber breakdown during steam sterilization and handling. A significant cost is associated with the disposal of rockwool. Pine bark properly composted to grower's specifications is hard to find and is difficult to recycle because it turns to slush as it continues to decompose during the growing season.

This study indicates that tomatoes grown in perlite produce higher yields, which can make up for some of the initial cost of the medium. Perlite can be recycled successfully for many years to reduce production expense in following years. Properly recycled perlite can save money, time and natural resources.

In the past, tomato growers were not persuaded to prune clusters to an exact number of fruit because of conflicting reports about the optimum number of fruit that can lead to higher yields and heavy fruit. These two studies indicate that fruit was heavier and plants produced more marketable yield and less cull yield if only three fruit were left on each cluster.

Smaller-scale growers in Louisiana and other states are encouraged to consider these recommendations:

- Plant Geronimo or Quest.
- Prune clusters to three fruit.
- Use perlite as a growing medium and recycle it properly.
- Heat plants at the root level.

These recommendations may help the local producer survive serious competition from imported greenhouse tomatoes. ■

Profitability

(Continued from page 15)

tomato in these price reports. The greenhouse tomato average price as reported

by the LSU AgCenter was $1.50 per pound in 2008. To be conservative, the base price for this budget was chosen as $1.25 per pound to represent sales to a range of customers.

To address the issue of profitability, a procedure that shows an estimate of profit over a range of prices and yields is used. The base price of $15 per box was decreased and increased in $2 intervals from the base and is presented at the top of the table. Yield was assumed to be 920 lugs and was decreased and increased in 100 unit intervals. See Table 1 on page 15.

The calculations in the body of the table are revenue (price times quantity) minus fixed and variable costs. When yield is below the base, the profit estimate is adjusted for lower labor and box costs, and those costs are adjusted upward when yield is above the base. This procedure results in an array of profit estimates based on ranges in price and yield.

Changing profit levels are illustrated in this section by varying price across ranges that might well occur in the marketplace, and the impact of yield on profitability is included by ranging above and below the base in increments of 100 boxes.

As indicated in Table 1 (on page 15), the base price and yield combination provides a small loss (almost $450) after total costs specified in the budget are paid. But a 100 box increase in yield increases profit to more than $1,200, and an increase of $2 per box provides profit of almost $1,400. On the other hand, lower yields and prices would decrease profit quickly. This table illustrates gross revenue and net return can be very volatile in this market.

A caution regarding this profitability analysis is that it does not include costs of preparing the product for market and marketing costs incurred by growers, particularly those who sell direct. These costs were not included because they vary greatly depending on the individual grower's circumstances and choices. There can be substantial direct and implicit costs for direct sales at outlets away from the farm, such as farmer's markets. Travel expenses in the form of vehicle costs, the opportunity cost of travel time to farmer's markets, and the amount of grower time dedicated to selling at the market are examples. Hauling to a wholesale customer can be a significant expense. These costs should be identified for the individual situation and considered when choosing enterprises.

Given these considerations, there appear to be profitable opportunities in greenhouse tomato production. Before investing in a greenhouse or beginning production, growers should consider the size of their market and the degree of competition from other producers and from retailers in their market area. Growers should know where they expect to sell, and agreements with managers of those sales outlets should be discussed. Understanding the selling process and using effective marketing and promotion techniques, along with effective management of the production process, improve the odds of having a profitable enterprise. ■

Liriope

(Continued from page 24)

with fine pine bark. Plants were mulched to a depth of 2 inches with baled pine straw, and mulch was refreshed twice a year to maintain depth of coverage. Plants were fertilized with 12-6-6 fertilizer at the recommended rate in early spring and midsummer 2008. A drip irrigation system was used as needed to prevent drought stress. No insecticides or fungicides were applied. Weeds were controlled with selective hand removal, spot applications of the herbicide glyphosate and pre-emergent applications of the herbicide pendimethalin. All these practices were continued in the 2009 evaluation season.

Twice-monthly visual quality ratings were taken on plants January through December 2008. Visual quality ratings were based on a scale from 1 to 5 (1=dead, 2=below-average landscape performance, 3=average landscape performance, 4=above-average landscape performance, 5=superior landscape performance) using 0.5 increments. Height measurements from the soil line to the tallest plant were taken in October. Spread measurements representing the average of the widest portion of the plant canopy and the measurement perpendicular to the widest portion were taken in October. Anthracnose ratings based on a scale from 1 to 5 (1=no leaf spotting, 3=moderate leaf spotting, 5=high leaf spotting) were taken in December.

Best-performing varieties

The best-performing liriope variety in the 2008 trials was Super Blue; Cleopatra, New Blue and Emerald Goddess were above-average performers. Odom's Big Blue, Big Blue, Marc Anthony and Jeanerette did not perform as well as the other varieties tested. Evergreen Giant had below-average landscape performance because of root rot (common to this variety) most of the year. Crystal Falls monkey grass had good quality ratings in winter, spring and fall, but quality ratings in the summer were low because of sun scorch damage to the foliage. Super Blue was the tallest variety.

Anthracnose ratings indicated no disease on Super Blue, Emerald Goddess and Evergreen Giant. Slightly susceptible varieties were Odom's Big Blue and Crystal Falls. Varieties moderately susceptible to anthracnose were Marc Anthony, Jeanerette and Cleopatra. Highly susceptible varieties at the end of 2008 were Big Blue and New Blue. ■

Ornamentals

(Continued from page 25)

Razzle Dazzle crape myrtles

The Razzle Dazzle dwarf crape myrtles are a new series of crape myrtles developed by world-renowned horticulturist and plant breeder Dr. Mike Dirr from the University of Georgia. The Razzle Dazzle dwarf crape myrtles have been developed with the trustworthy attributes of easy care and mildew resistance as well as exceptional color and compact habit. Mature height is 4 feet.

These plants have being evaluated for flowering, cold hardiness and disease resistance at the LSU AgCenter Burden Center in Baton Rouge and the Hammond Research Station in Hammond. The series features five varieties, and Cherry Dazzle (cherry-red flowers) has the longest bloom time and is the most vigorous grower.

Indian hawthorns

The newest Indian hawthorns are Spring Sonata and Snowcap. Spring Sonata is in the Southern Living plant program. Foliage is larger than other Indian hawthorns, and peak bloom in the spring at the Hammond Research Station is 10-14 days later than other varieties.

Snowcap, a new patented variety, is a dependable shrub with a dense habit

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and clean, dark green foliage, which is disease-free and turns burgundy as the weather turns cooler.

The best pink-flowering Indian hawthorn continues to be Eleanor Tabor, which is reliably free of fire blight and *Entomosporium* leaf spot – two major disease problems common to these popular plants.

Drift roses

The new Drift series roses from Conard-Pyle/Star Roses were created in response to increased consumer demand for smaller, everblooming plants. Drift roses fit a special niche in the shrub-rose market.

Drift roses are a cross between full-size groundcover roses and miniatures. From the former they kept toughness, disease resistance and winter hardiness. From the miniatures, they inherited their well-managed size and repeat-blooming nature. The low, spreading habit of Drift roses makes them perfect for small gardens and combination planters.

They are available in Coral, Pink, Red and Peach – all varieties being evaluated in LSU AgCenter plantings at the Hammond Research Station and Burden Center. Pink has been the best landscape performer, followed by Peach, Coral and Red. New colors for 2010 are Apricot and Sweet.

Photo by Allen Owings

The new Drift series roses offer a small growing alternative to shrub roses commonly used today.

New landscape shrub rose

Carefree Celebration is a new landscape shrub rose that has proven to be an excellent plant. Introduced in 2007 and then evaluated at the LSU AgCenter, this variety has rich orange-colored flowers on plants reaching heights of 4-5 feet. Petal count is 15-18.

Carefree Celebration is similar to the Knock Out rose varieties; it stays in almost continual bloom from late March/early April until the first killing frost. Blackspot and *Cercospora* leaf spot disease are very limited on this variety.

Encore azaleas

Encore azaleas are the most widely known of the multi-seasonal-blooming azalea varieties. These plants were developed by Robert "Buddy" Lee of Independence, La., and are marketed by Plant Development Services Inc. of Loxley, Ala. Several wholesale nurseries grow Encore azaleas in Louisiana.

These plants are marketed as "the azalea that knows no season." They are reliable for spring, summer and fall bloom in Louisiana. Bloom time each year can vary from three to four months and up to eight months.

The newest Encore azalea is Autumn Lilac, which will debut in 2010. All Encore azaleas are on display in the Margie Jenkins Azalea Garden at the LSU AgCenter Hammond Research Station. They are being evaluated for growth habit, flowering, lace bug resistance and overall landscape performance. ■