


2007 LOUISIANA
Soybean & Grain
RESEARCH & PROMOTION BOARD REPORT


Photo by Mark Claesgens

LSU AgCenter researcher Dr. Raymond Schneider retrieves one of his new spore traps at a research site in Baton Rouge.

Diverse Approaches Being Studied *to Battle Soybean Diseases*

Louisiana soybean farmers are once again looking to LSU AgCenter researchers to help them defend their crops against diseases.

Some of the biggest culprits are Asian soybean rust, Cercospora leaf blight and aerial blight.

LSU AgCenter scientists are employing a four-pronged strategy to help minimize disease damage to crops. That strategy involves working to develop new, resistant varieties; identifying the best fungicides and improving their performance; working with nutrients to maximize yield and minimize disease severity; and improving technology to identify spores of the pathogen so that disease forecasting models can be developed.

The most effective way to combat disease is the use of disease-resistant varieties, according to the experts.

LSU AgCenter researchers are working to develop varieties of soybeans that can withstand the onslaught of disease. Traditional breeding techniques could take many years, so researchers are employing molecular biology to develop new hardier strains to speed up the process.

But since no completely disease-resistant soybean varieties are on the market, soybean growers need other alternatives to ward off or minimize soybean diseases.

"At this time, the most effective way to combat diseases is with fungicides," explained LSU AgCenter researcher Dr. Raymond Schneider.

Some of the fungicides recommended against Asian soybean rust also are moderately effective against Cercospora leaf blight. Cercospora, unlike most fungal diseases, has been less responsive to fungicides and has been responsible for significant loss of soybean yields in Louisiana, according to experts and researchers.

Spray application tests with fungicides currently are being conducted on research plots near Erwinville and Baton Rouge and at a station near Quincy, Fla.

"Spray applications here (Baton Rouge) will go on sometime in the middle of August. We're working with different mixtures and rates," said Schneider. "We want to optimize management of disease with these fungicides by maximizing the number of applications consistent with an economic return."

Even though these applications have had a good overall track record to this point, one problem is that fungicides have been the only real line of defense, Schneider explained. Since fungi can develop resistance to the same applications of fungicides over time, researchers are exploring other mechanisms to grapple with these diseases.

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Irrigation of Soybeans on Rice Land *Shows Promise in Louisiana Delta*

In rice country, irrigation is a way of life. Producers level fields, build levees and then flood. But flooding a soybean field is a completely different matter – or is it?

If you ask Glen Daniels, Concordia Parish county agent with the LSU AgCenter, he'll show you how he's doubling the soybean bushels harvested per acre using irrigation techniques that are unusual for such crops.

For the past three years, Daniels has worked with the owners of the 26,000-acre Angelina Farm in the southern part of Concordia Parish to show that soybeans can be a rotational crop with rice.

"We've been able to do research on about 300 acres of beans here to see just how much irrigation plays a role in the production of soybeans," Daniels said, adding that he's been working with agents and specialists throughout the LSU AgCenter to make sure others agree the results are significant.

"I work with the manager of Angelina each year to see how much the use of irrigation in soybeans actually affects their yields," Daniels said. "I also monitor the beans from start to finish, but I call on experts like (LSU AgCenter water resources specialist) Bill Branch to come in and handle the technical stuff, like setting up the flow meters and determining the rate of water to put on the field and how soon to get the water off."

Unlike rice, which can actually live in a flooded condition, soybeans will drown if they are in standing water for a significant length of time.

"We try to get the water on and off the fields as fast as possible. Normally it stays on the field for about 48 hours," Daniels explained.

The LSU AgCenter agent said when he first started to look at planting soybeans on zero-grade (or flat) land, he tried to irrigate them like rice. "We found out quick that soybeans don't like as much water as rice," he said.

After a short period, however, Daniels said he noticed the soybeans were becoming stunted – turning yellow and dying.

That's when he went to Stoneville, Miss., in search of information, and he

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Photo by Johnny Morgan

LSU AgCenter county agent Glen Daniels examines the poly pipe and other equipment that are vital to the success of his soybean irrigation study. Daniels said the equipment has been instrumental in doubling the yields of some of the soybeans planted on this farm during the past three years. He said the key to the success of growing these beans as a rotational crop with rice is to get the irrigation water on and off the field as quickly as possible.

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Louisiana Soybean and Grain Research and Promotion Board

The Louisiana Soybean and Grain Research and Promotion Board administers both the national soybean checkoff and Louisiana's wheat and feed grains checkoff. The Board tries to address the most challenging production and market-related issues faced by Louisiana's producers through the investment of your checkoff dollars.

Only through continued funding of research can we address the production problems faced in Louisiana. This report describes some of the activities funded by checkoff dollars. A lot of effort is focused on addressing diseases, insects and other agronomic issues that most adversely affect our yields. Specific projects are addressing diseases in soybeans such as Asian soybean rust and aflatoxin in corn, varietal breeding for wheat and soybeans and improving the agronomic practices we use in Louisiana.

While research funding is the major focus of the Board, market development activities with the United Soybean Board, National Corn Growers Association, U.S. Grains Council and the National Grain Sorghum Producers Association also are supported. Long-term investments in new uses are paying off as we see new products brought to market and the continued growth in renewable fuels such as soy-diesel and ethanol.

Your checkoff dollars make these efforts possible. On behalf of the Board, I would like to thank you for your support of this program.

Sincerely,
Byron F. Lemoine III, Chairman
Louisiana Soybean and Grain Research and Promotion Board

Photo by Mark Claesgens

Front Row: left to right - Leslie Rodrigue, Byron Lemoine, Donald Zaunbrecher. Back Row: left to right - Raymond Schexnayder Jr., Donald Schexnayder, J.K. Bordelon, Jerry Hunter, Donald Marshall. Not Shown: Ike Boudreaux and Darrell Vandeven

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Small Grains Breeding Yields BIG Results

Sungrains, the cooperative small grains breeding program of five southeastern U.S. universities, has yielded big results with the release of two new oat varieties and two new wheat varieties.

The oat varieties were developed cooperatively by the LSU AgCenter and the University of Florida. One, LA99106, was developed primarily at the LSU AgCenter, and the other originated in the Florida program.

In addition, Sungrains released two wheat varieties developed by the University of Georgia.

"Sungrains is thriving and doing well," said Dr. Steve Harrison, a small grains breeder in the LSU AgCenter.

The new LSU AgCenter variety is very high grain yielding and has been near the top of tests in Louisiana and surrounding states for several years, Harrison said. It also topped the Louisiana forage trials this year.

"We feel that LA99106 will meet the demand for a high-quality oat that serves as both a grain and forage," Harrison said. "It has proven to possess superior yield characteristics with excellent lodging scores. Of particular note is the high resistance to crown rust and stem rust."

It is the seventh oat variety released by the LSU AgCenter since 1997, and LA99106 has higher grain yield, test weight and forage yield than most publicly available varieties, Harrison said.

Because one of the leading uses for oats in Louisiana is early winter pasture for dairy cows, Harrison is high on LA99106 as a forage crop.

"It has high quality and grows well in the fall," Harrison said. "It provides good early grazing, has a high forage yield and fits very well with dairy production."

Oats are a low-input crop, Harrison said. They require minimum inputs and low-nitrogen fertilizer and have low seed cost.

Oats are growing in popularity as a forage in the South. Because of growing pressure on corn prices, many cattle producers are finding it difficult to afford to finish cattle exclusively with grain, so they're turning to winter pastures with oats to compensate. For example, Harrison estimates Texas has about 1 million acres of oats that provide pasture for cattle.

Although the new variety is a good grain yielder, not much oat acreage in Louisiana or the South is devoted to oats as grain. Some growers, however, have developed niche markets to provide grain to horsemen. Harrison estimates 15,000 to 20,000 acres are grown for grain in Louisiana each year.

"The market potential and benefits are quite large from a farm perspective," he said.

Oats also are widely used for wildlife food plots in the South to provide winter forage for deer.

In addition to oats, Harrison devotes a significant portion of his efforts to developing new wheat varieties adapted to Louisiana.

"Wheat is generating a lot of excitement in the farming community this year," Harrison said. "Louisiana acreage grew last winter and is expected to grow even more this year. Every bag of seed will be planted this fall, weather permitting."

Rising wheat prices can be attributed to worldwide shortages.

"Global production problems will create tremendous demand," Harrison said. "The excitement is proof wheat will be a profitable cash crop."

Harrison cites a cold winter in 2007 as contributing to a shortage of seed wheat for the coming season.

A good variety is LA841, which is a major player in Louisiana, where it was planted on about one-half of the acreage last year and is expected to be widely planted again this year.

As for new variety development, Harrison said he's getting close to having a scab-resistant wheat variety ready for release. He said it should do well in the rice-producing areas of the state and that its performance potential should be the same as LA841.

"We had a good year in research both in data collection and in the crossing program," Harrison said of his small grains program. "And with the Sungrains cooperative, we're able to expand our program.

"We leverage funding from the Louisiana Soybean and Grain Research and Promotion Board," Harrison added. The board "is critical for providing base funding," but the variety royalties provide the funds to purchase equipment beyond what would be available from the board. Grants from federal agencies also support research activities, he said. Rick Bogren

Photo by Mark Claesgens

LSU AgCenter small grains researcher Dr. Steve Harrison examines wheat in a research plot on the AgCenter's Ben Hur Farm in Baton Rouge.

Photo by Mark Claesgens

LSU AgCenter researcher Dr. Cristina Sabliov, at left, and student Mark Gabriel have developed a second prototype for microwave extraction of soy isoflavones.

Team Develops Second Prototype *for Microwave Extraction*

An LSU AgCenter team has developed a second prototype to conduct continuous microwave extraction of soy isoflavones.

Dr. Cristina Sabliov, an assistant professor in the Department of Biological and Agricultural Engineering, has been working for 18 months on a process that could quickly extract bioactive compounds – like vitamin E and isoflavone oils – from plant materials such as soybean flour or rice bran.

"These oils could have uses in vitamin supplements or functional foods," Sabliov said.

Mark Gabriel, a junior in the department, designed the first microwave prototype, which provided a means of pumping a mixture of soybean flower and extraction chemicals through the specially designed apparatus.

After initial research, the scientists decided they could improve the process, so Gabriel designed a second prototype. The design of the new prototype allows researchers to investigate different parameters of extraction to increase the yield of the bioactive compounds. "This newer design allowed us to test the process at different time intervals," Gabriel explained.

This process is quick and involves less labor than batch extraction, Sabilov said, adding, "A conventional solvent batch extraction could take hours, with the solution soaking overnight."

Sabliov and Gabriel conducted tests varying the time the mixture spends going through the extraction process, which, in turn, varies the final characteristics of the mixture. They compared those results to a batch extraction method.

The team – which also includes Dr. Dorin Bolder, Dr. Marybeth Lima and Dr. Zhimin Xu – is fine-tuning this process of extraction, which would take mere seconds using the technology they are developing. This would be a significant advancement over the present solvent-based technology used to extract isoflavones.

Tests conducted so far have revealed that the continuous process could extract a volume of isoflavones more quickly than current batch extraction methods. The team also learned the new continuous extraction offered more consistent results than batch extraction.

In addition to the small prototypes, the team has a large microwave extractor in the works. This system looks nothing like a conventional home microwave, but the function is similar. Even with a large prototype, however, the team is not abandoning work on the small units.

"We still have more to learn from the small prototypes before we can move toward a system that can handle large quantities of solvent and flour," Sabliov said. The next steps will be to continue improving the design to achieve the optimum operating parameters for this process. Tobie Blanchard

Extruded Soybean Meal *Shows Promise as Chicken Feed*

LSU AgCenter research has shown soybean meal made by extrusion could be as good as conventional soybean meal for use in chicken feed.

Dr. Lee Southern in the School of Animal Sciences performed a laboratory analysis on extruded soybean meal and then conducted two feeding studies with chickens. He used corn/soybean meal diets with conventional soybean meal and with extruded soybean meal to determine growth performance and carcass traits.

"There wasn't a lot of difference," Southern said.

The extrusion process extracts soybean oil by pressing the beans rather than by using a solvent, which is what processors conventionally use.

The extrusion process, Southern said, leaves more oil in the meal – 7 percent versus virtually none from solvent extraction. In addition, the heat from pressing destroys the anti-nutritional factors that cause soybeans to be indigestible for nonruminants, including chickens and pigs, as well as people, dogs and cats.

Because most diets for pigs and chickens have oil or fat added to increase the energy level, soybean meal with higher oil content could be cost-effective for chicken producers.

Southern conducted a series of two experiments to evaluate extruded meal as chicken feed. First, he analyzed the meal for amino acid concentration. Then he used the resulting data to develop a variety of feeds using corn with conventional solvent-extracted soybean meal and with extruded soybean meal. The diets were based on chemical evaluations of both types of soybean meal, which were then blended with corn and other components to arrive at the diets used in the feeding trials.

The initial 18-day feeding study used six diets that were fed to small groups of broilers to determine average daily gain, average daily feed intake and feed efficiency. The diets – using corn with both types of soybean meal – were designed to measure the results with a protein-deficient diet, an energy-deficient diet and a diet with adequate protein and energy components.

Once Southern determined the adequate diets in the first experiment were indeed adequate, he used the results to test larger groups of birds.

From the study, Southern concluded the amino acid digestibility in the extruded meal was slightly less than for the conventional meal, but when the variation among samples was considered, there was no difference.

"When diets were formulated that take into consideration the higher energy value of the extruded soybean meal and the actual amino acid values of both meals, broiler growth was the same for both," Southern said. "Broilers fed the extruded meal tended to eat less feed, which suggests that the energy value of this soybean meal is slightly higher than predicted.

"Carcass evaluation showed broilers fed both soybean meal types had similar carcass weights, but breast yield was lower for broilers fed extruded meal," he added. "This indicated a redistribution of the meat or excess fat deposition."

Southern said the extruded meal "results in similar growth performance of broilers as those fed conventional soybean meal when the different nutrient content of the meals is used in diet formulation."

He also said the nutritional value of extruded soybean meal is good – with a little less protein but more oil than conventional soybean meal. "It's very nutritious," he said. "We need to know as much about it as we can."

Southern said the research suggests the diet they developed had a slight amino acid deficiency that led to the reduced breast meat.

"It could be overcome with more research to evaluate the diets," Southern said. A more extensive and careful biological and chemical evaluation of extruded soybean meal could answer the question of the differences in production.

"The soybean meals are very similar," he said. Rick Bogren

New Recommendations Could Result From Studies

Results from a 2006 LSU AgCenter study could lead to changes in fertilizer recommendations for growing soybeans in acidic soils if those results continue to hold up in future studies. In addition, studies with corn could eventually lead to an efficiency indexing system to help farmers choose varieties.

LSU AgCenter soil scientist Jim Wang said his research in 2006 showed fertilizer for soybeans in acidic soils is unnecessary if the soil phosphorous level is detected at 30 parts per million under the Mehlich III testing protocol. The threshold previously used under the old testing procedures was 37 parts per million, he said.

"We hope to at least confirm with 2007 results," Wang said about repeating the studies of the potential new threshold level again this year. With Mehlich III, there is no change for the threshold for the potassium level in soil, he said.

In addition to the work with soybeans, Wang is on an LSU AgCenter team studying nutrient uptake efficiency in corn. That project also involves Dr. Don Boquet, Dr. Rick Mascagni, Dr. David Lanclos and J. Cheston Stevens.

Preliminary results from last year's tests appear to show that the more efficient corn varieties have the best yields.

In those tests, fertilizer with identical amounts of nitrogen, zinc, potassium, phosphorous and other elements were used on test plots at the Northeast Research Station at St. Joseph, and the levels of those nutrients were determined through tissue samples before the corn was harvested. The tests studied nutrient efficiencies in plots with conventional tillage and minimal tillage.

The research will be repeated this year, and if the data confirm the 2007 results, it's possible an efficiency indexing system could be created to help farmers choose varieties, Wang said. Bruce Schultz

Photo by Colleen Cookson

The LSU AgCenter's soybean breeding program at its Red River Research Station in Bossier City is focusing on the development of high-yielding, disease-resistant varieties adapted to the environmental conditions of Louisiana and the Gulf Coast region. LSU AgCenter soybean breeder Dr. Blair Buckley says Cercospora leaf blight is an important one to consider because fungicides have not been efective against it. Buckley also says, "Commercial seed companies have not been breeding with this disease in mind." Other diseases and environmental stresses being emphasized in Buckley's work to develop better soybean varieties are frogeye leaf spot, aerial blight, Asian soybean rust, and drought and salt tolerance. As part of the project, crosses are made throughout the year in the greenhouse and in the field, Buckley said. Mary Ann Van Osdell

Soybean Cultivars, Fungicides Evaluated for Disease Management

LSU AgCenter scientists continue to evaluate soybean varieties for agronomic characteristics and resistance to naturally occurring diseases.

Diseases reduced Louisiana soybean yields about 11 percent or 3.16 million bushels in 2006, experts estimate.

Resistant varieties and fungicides are the major components of disease management programs.

Fungicides are used to reduce the effects of soybean diseases when genetic resistance is not available. More than 30 fungicide trials were conducted by LSU AgCenter scientists in 2006, and 21 of those were at the Macon Ridge and Northeast research stations, said LSU AgCenter plant pathologist Dr. Boyd Padgett, who directed many of the trials.

"New fungicides have emerged in recent years, and older ones not previously labeled for use on soybean recently have been approved for managing Asian soybean rust," Padgett said. Evaluations of fungicides used in other countries are still being conducted in Louisiana, as well, he said.

Additional research also is being conducted to assess the impact of diseases on yield and quality.

"Yield loss assessments are targeted for Asian soybean rust, Cercospora leaf blight, frogeye leaf spot, pod diseases and aerial blight," Padgett said. "Results from this research will identify disease-resistant varieties, provide information on efficacy of new fungicides, determine which products are most beneficial, quantify yield losses from diseases and define when fungicides are likely to be most economical."

Environmental conditions also are monitored during the growing season in an effort to determine their effects on disease development. Some parameters recorded are leaf wetness period, ambient temperature, relative humidity, rainfall, wind speed and wind direction.

Such evaluations are the basis for recommendations from LSU AgCenter researchers and extension experts. Mary Ann Van Osdell

Photo by Boyd Padgett

Cercospora leaf blight was the culprit discovered in this soybean field at the LSU AgCenter's Macon Ridge Research Station last fall. Researchers say Cercospora is a particular problem for Louisiana growers, because fungicides have shown only limited effectiveness against the disease.

Microscopic Clues Analyzed to Defend Against Rust

Dr. Zhi-Yuan Chen and his colleagues in the LSU AgCenter are looking for clues about Asian soybean rust and its lifecycle, and they are taking the work to a microscopic level.

The hope is that learning more about the survival of rust spores over winter, how the disease infects the leaves of soybean plants and how those plants defend themselves against the disease ultimately will lead to better ways of controlling Asian soybean rust and its potentially devastating consequences to soybean crops.

This work is just part of a much larger effort devoted to monitoring the disease and its progress in the state, developing recommendations on controlling it with fungicides, searching for potentially resistant soybean germplasm, working on economic decision aids to help farmers assess whether fungicide applications will be cost-effective and investigating various cultural practices to see if they can help to control the disease.

"Based on our study, we believe that soybean rust spores can survive typical Louisiana winter conditions and cause a new cycle of infection in the next growing season," Chen, a plant pathologist, said of the results so far. "We also have compared soybean leaf protein changes before and after rust infection using state-of-the-art proteomic techniques in an effort to understand how the soybean plant defends itself against rust infection at the molecular level."

Researchers working on the project have identified several proteins that are induced upon rust infection

"These proteins have been sequenced to determine their identity," Chen explained. "One of these proteins is a pathogenesis-related protein 10, which has been shown to enhance resistance to scald disease in barley and blast disease in rice.

"We are trying to clone the gene from the soybean plant and develop ways to increase its protein level in soybeans to enhance disease resistance." Tom Merrill

Asian Soybean Rust
Getting Foothold in Area

Asian soybean rust appeared earlier and seemed to be spreading farther this year – giving experts reasons to suspect the disease could get a foothold if it goes unchecked.

Since the disease was first discovered in South Louisiana in 2004, LSU AgCenter experts have been cautiously watching it and working on ways to prevent it from devastating the state's soybean crop.

Until this year, most appearances of the disease had come later in the season, but it showed up in sentinel plots of soybeans in June and was discovered in production fields in central Louisiana in mid-July. Discoveries in additional areas were continuing in early August.

"This is the first time we've seen a significant infestation in a commercial field with the surrounding areas also infested," Dr. David Boethel, vice chancellor for research in the LSU AgCenter, said of the July discoveries. "The good news, however, is that our scientists have been on top of the situation – watching sentinel fields, communicating with farmers and consultants, conducting research and doing much more to combat this problem. I think the soybean producers in the state have been warned and have been poised to take action."

Among the potential actions are the use of fungicides to try to stem the effects of the disease, which has proven to be devastating to soybean crops in areas of South America. LSU AgCenter researchers are pursuing a variety of avenues to try to prevent such damage here. They also are staying in touch with other experts across the country who are monitoring the situation.

"There seems to be a marked increase in the commercial fields that are positive now," LSU AgCenter plant pathologist Dr. Clayton Hollier said in early August. "It would seem to say that the fungus has built up enough that it is starting to spread and move more easily."

Asian soybean rust was first discovered in the United States in 2004, when its windborne spores are thought to have come in on storm winds that summer. Although it's been known to exist since the early part of the 20th century, it was largely confined to Asia until recently – when it spread to Africa and then on to South America around 2000.

Since the initial U.S. discovery in South Louisiana, it has been seen in kudzu, another host plant, and on soybeans in a variety of Southern states, including Florida, Georgia, Alabama, Mississippi, Texas and Arkansas.

"Environmental conditions this year have been conducive to promoting this and other soybean diseases," Hollier said. "There are areas of Texas where there had never been rust before that are now showing up with rust as a result of the storms they've had go through there this summer."

The July discoveries in Louisiana came when much of the state's soybean crops were in the latter parts of the plants' reproductive cycles, known as R4, R5 and R6, where the soybean pods are formed and begin to fill.

"What the findings in these fields and the sentinel plots really give us and the farmers is a warning to be looking at commercial fields very carefully," LSU AgCenter soybean specialist Dr. David Lanclos said. "The whole point is to really get out and scout for signs of disease."

The LSU AgCenter experts said growers need to look carefully at plants and to be sure to examine areas well within the canopies of the plants for signs of disease – rather than taking a look at just the tops. They also said to look carefully around tree lines where shade may keep plants cooler and allow moisture to stay on them a little longer.

In addition to rust, soybean producers also can face other plant diseases such as aerial blight, Cercospora, pod and stem blight and anthracnose.

"Our parish agents, state specialists and research scientists have been working very hard monitoring soybean fields throughout the state," said Dr. Paul Coreil, vice chancellor of extension for the LSU AgCenter. "This excellent teamwork has resulted in the best possible notice to growers on rust identification in fields and management options. We hope that will limit the economic impact of this new crop disease." Tom Merrill

Photo by John Chaney

LSU AgCenter research associate Rose Berggren, at right, explains the basics of using a hand lens to check for signs of Asian soybean rust. The explanation about viewing soybean leaves for county agents Matt Martin, at left, and Hubert Wilkerson, center (with lens), came during an August workshop and field tour organized by LSU AgCenter experts. County agents, crop consultants, agribusiness representatives and others from across Louisiana and Mississippi participated in the event, which was designed to boost surveillance for the plant disease.

Irrigation of Soybeans on Rice Land Shows Promise in Louisiana Delta

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said professionals from Phoenix were even called to share how they were growing cabbage on zero-grade land.

"They showed us how to get the water on and off as soon as possible," Daniels said. "So we put in spin ditches, and this helped give the water some push, so we could get it off pretty fast."

That process basically involved a series of trenches throughout the field that helped to drain the water, he explained.

Daniels said the research on the Angelina Farm over the past three years has proven yields can be doubled with proper irrigation.

The average yield for soybeans in Louisiana is about 30 bushels per acre, but Daniels said they are consistently harvesting between 55 and 60 bushels on his research plots.

"Last year we had a severe drought – and I mean it was bad. Some of the growers didn't even cut their beans, but we were cutting on average 55 bushels on these research plots," he said.

Branch, an agricultural engineering specialist whose LSU AgCenter work includes irrigation techniques, said rice traditionally has accounted for 60 percent of the irrigated acreage of agricultural crops in Louisiana – and for about 75 percent of the irrigation water used. Cotton, corn and soybeans account for most of the remaining irrigated land.

"Irrigation for these crops is seen as 'insurance' in growing seasons like last year's when there were some no-rainfall periods during the growing season," Branch said.

Daniels said the findings of the research so far show soybean yields can be increased tremendously if the irrigation is timed right. But he pointed out that there are still problems to be resolved with getting the water off the zero-grade fields as quickly as he would like.

Selection of the right soybean varieties, such as Terral TV49R12 and Delta King DK, also is a key in zero-grade irrigation, Daniels said, explaining that those varieties have more water tolerance.

Johnny Morgan

Looking for *Best* Soybean Combo

Dr. Ernie Clawson is looking for a combination that produces optimum soybean yields. Clawson, an LSU AgCenter agronomist at its Northeast Research Station in Tensas Parish, is studying row spacing, planting dates and maturity groups to find the best combination for soybean production.

In the study, soybeans were planted in narrow rows – 20 inches apart – and wide rows were on a 40-inch row spacing. Results in 2006 showed that when beans were planted in late March or early April, narrow rows yielded more than wide rows.

Photo by Mark Claesgens

LSU AgCenter agronomist Dr. Ernie Clawson explains some of his 2006 research with soybean maturity groups, planting dates and row spacing at a field day this year. Clawson is continuing the work, which is aimed at finding the optimum combination for soybean yields.

The yield difference between row spacings was less when the beans were planted from mid-April to mid-May. "There's not as much pronounced difference," Clawson said.

His work confirms that Maturity Group IV is higher yielding than MG III. Within a given row spacing, yields of MG IV generally were greater than MG III, regardless of planting date. And a single MG V variety performed well at early planting dates.

"We're not ready to make a recommendation for Maturity Group V beans, but we are pleased with the results so far," Clawson said.

Further research is needed to verify the results obtained in 2006, and a similar study is under way in 2007, he said. Bruce Schultz

Diverse Approaches Being Studied to Battle Soybean Diseases

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That third approach is to adjust plant nutrients.

In one test, the LSU AgCenter planted a soybean crop for a comprehensive potash test during the last week of June 2007. Potash was applied immediately before those plantings, and other sources of chloride, such as ammonium chloride, plus manganese and boron will be applied at later stages.

Results from similar tests last year at a Florida research station clearly showed a reduction in severity of Asian soybean rust, and an earlier study conducted in Louisiana showed severity of Cercospora leaf blight also had been reduced.

"We don't expect that using these nutrients… would eradicate the fungus or completely eliminate the disease," Schneider explained. "But it may be possible to increase fungicide efficacy to the extent that a second application may be eliminated."

Even if the tests are successful, it will be important to determine whether these applications are cost-effective for commercial soybean farmers, Schneider pointed out.

A fourth method of defense being studied by LSU AgCenter researchers is the development of spore-trapping technologies, which help predict the onset of Asian soybean rust.

Researchers know Asian soybean rust is spread by windborne spores, so they've observed samples from Vaseline-coated microscope slides in spore traps made from PVC pipe. Those primitive tests have been inexact, however, because it's hard to distinguish the Asian soybean rust spores from other rust spores.

That's why the United Soybean Board is funding research to advance the effectiveness of spore-trapping technology. Schneider, who already has developed a new trap that is being tested near Baton Rouge, is coupling his work with that of researchers throughout the country.

For instance, spore trap research at the University of Florida's station near Quincy is aimed at identifying pathogens that could cause the Asian rust disease and other diseases, while University of Minnesota researchers are working on a DNA-based technology for use on spore traps. In addition, experts at Penn State are working to develop a computer simulation component to the technology.

The traps also might be used to monitor and study how the rust pathogen overwinters on kudzu plants along the Gulf South. Success with this "disease-alert" system could give farmers the extra time they need to react effectively.

"While a disease like Cercospora leaf blight is more of a 'Louisiana-specific problem,' Asian soybean rust is a national threat," Schneider said, adding, "It's a disease that could attack huge soybean-producing states like Iowa or Illinois."

Overall, coming up with solutions to the Asian soybean rust problem has become a national research collaboration.

"While a disease like Cercospora leaf blight is more of a 'Louisiana-specific problem,' Asian soybean rust is a national threat," Schneider said, adding, "It's a disease that could attack huge soybean-producing states like Iowa or Illinois."

In fact, in 2006, the disease had already spread as far north as southern Illinois.

"That's why there's a national interest in researching Asian soybean rust," Schneider said, pointing out that even Florida, which doesn't have a commercial soybean crop, has pitched in to combat the disease.

Schneider said the University of Florida's research area near Quincy is a premiere place to research Asian soybean rust because it's close to sites where rust pathogens overwinter on kudzu before blowing to soybean crops. That means it's one of the most likely places in America for Asian soybean rust to develop substantially.

"Usually when they (the Quincy, Fla., research site) plant soybeans, they're guaranteed to get rust," Schneider said. "But, this year, they're having drought; so that means Louisiana is now the center of the Asian soybean rust research in the country.

"A lot of farmers are depending upon what we find," he added. "Many of them look to us for recommendations to help prevent or fight disease and to maximize their crops." Randy LaBauve

Photo by Mark Claesgens

LSU researcher Dr. Ray Schneider checks instruments used to evaluate spore trapping devices. The equipment was funded by the United Soybean Board, and data from the site are used in research by a variety of universities across the country.

Scientists Look for Effective IPM Systems

Researchers with the LSU AgCenter are working to give corn and grain sorghum producers flexible integrated pest management plans that maximize yields, are cost-effective and decrease the time spent in the field.

The challenges are many, however. Researchers and farmers face problems such as the decreasing number of insecticides available for use with corn and grain sorghum, the discovery of new pests and the surge of others.

Some of the major challenges include:

- Many insecticides proven successful in fields are no longer practical to use for a variety of reasons.
- Emphasis on efficiency means producers are looking for more seed treatments to control pests and decrease the time required to plant the crop – as opposed to spending time, effort and money on conventional herbicide sprays and soil-applied insecticides.
- Insects, much like weeds, are developing resistance to the chemicals being used to control them. But developing and registering new chemicals is costly and a risk some companies are not willing to take.
- The cost of re-registering certain products through federal and state regulatory agencies also can exceed the potential financial gains for the respective chemical companies, which means some products simply go off the market.
- Other registrations are not being renewed because of environmental concerns. An example of this problem is the insecticide Furadan.

LSU AgCenter entomologist Dr. Rogers Leonard says growers in Louisiana are at a disadvantage from those in the Midwest because of the number of seed and seedling pests that attack field corn here.

Photo by Fangneng Huang

Moodna businuella is a relatively new pest on corn in Louisiana – so new that it does not yet have a common name. The pest, which is one being studied by LSU AgCenter entomologist Dr. Fangneng Huang, causes damage when its larvae tunnel between rows of corn kernels.

"Our corn fields are subjected to a high number of pests, and those insecticide-use strategies that work across the Midwestern Corn Belt are not as effective across the Gulf South area," Leonard explained.

Without an effective pest management system, growers may see as much as a 50 percent loss in stand and similar losses in grain yield, according to Leonard.

"We've found that for some Louisiana pest complexes growers need to increase the rate of insecticide on seed from 50 to 100 percent to obtain effective pest management and optimal yields," Leonard said.

Leonard notes that the sugarcane beetle is one pest that requires a much higher rate of insecticide. Some species of wireworms also require higher rates, although not as high as those needed for the sugarcane beetle.

The LSU AgCenter researcher is examining insecticides in the neonicotinoid class in seed treatment applications. Products in that class marketed under the commercial names of Poncho, Cruiser and Gaucho 600 have shown promise and are available as treatments on seed.

"Unfortunately, there are very limited research efforts from university scientists in the Gulf South area," Leonard said. "There are not as many entomologists working on corn as those in cotton and soybeans. This is an area that would greatly benefit from more focused research."

Dr. Fangneng Huang is another LSU AgCenter scientist who is examining pests of field corn and grain sorghum. One of those is an old resident of Louisiana, the sugarcane borer. Another, Moodna bisinuella, is so new, however, that it lacks a common name.

The sugarcane borer has surpassed the European corn borer and southwestern corn borer as the No. 1 pest of corn in Louisiana. The situation is so serious that Huang's work has even led him to identify the only sugarcane borer colony in the world that is resistant to Bt corn.

"This Bt-resistant colony will allow us to do many things in the area of corn pest management research," Huang said. "It will allow us to evaluate novel toxins developed by chemical companies that may be incorporated into newer Bt technology.

"It will also allow us to perform genetic research on resistant insects and determine what gene is responsible for its resistance to the toxins in Bt corn," he added.

Moodna bisnuella was first identified in the United States during 1984 in North Carolina. Its first documented appearance on corn in Louisiana was in 2004.

Because it is a new pest, very little is known about its biology – such as its reproductive cycle and where the insect overwinters. In addition, those Bt corn varieties that are so effective against corn stalk-boring caterpillars appear to have less activity on this pest.

Preliminary research suggests that late-planted corn and grain sorghum are most vulnerable to M. bisnuella. According to Huang, one Louisiana farmer estimated a loss of nearly 30 percent to an infestation of this pest in 2004.

Because it is an invasive species from Central America and little is known about it, Huang says he first will investigate potential strategies for managing this new pest with currently available products. Craig Gautreaux

2006-2007 Louisiana Soybean and Grain Board Funded Projects

The Louisiana Soybean and Grain Research and Promotion Board funded these projects in various LSU AgCenter departments, research stations and regions during the past year. Projects list researchers, total funding and the portions allocated from soybean funding or feed grain funding.

Plant, Environmental and Soil Sciences

Weed Management and Biology Research in Soybeans and Corn. Dr. James L. Griffin, $32,250 (all from soybean funding)

Small Grain Breeding, Variety Development and Testing. Dr. Steve Harrison, $65,000 (all from feed grain funding)

Improving Soil Tests for Soybean and Grain Crops of Louisiana. Dr. Jim Wang, $23,577 ($11,577 soybean funding/$12,000 feed grain funding)

Planting Date, Row Spacing and Variety Effects on Performance of Maturity Group III and IV Soybeans. Dr. James Board, $6,000 (soybean funding)

Biological and Agricultural Engineering

Deposition Efficiency of Pesticide Application. Dr. Roberto Barbosa, $12,500 (soybean funding)

Continuous Microwave Extraction of Soy Isoflavones. Dr. Cristina Sabliov, $19,000 (soybean funding)

Communications

Louisiana Soybean and Grain Research Report. Frankie Gould, $6,500 ($4,500 soybean/$2,000 grain)

Entomology

Evaluation of Corn Borer Damage in Extension Corn Demonstrations. Dr. Jack Baldwin, $5,000 (feed grain funding)

Management of Soybean Insect Pests. Dr. Matthew Bauer, $57,250 (soybean funding)

Emerging Insect Pest Problems in Field Corn and Grain Sorghum. Dr. Fangneng Huang, $15,000 (feed grain funding)

Food Science

Extraction, Purification, and Antioxidant Properties of Soy Isoflavones from Detailed Soy Flakes. Dr. Zhimin Xu, $20,000 (soybean funding)

Plant Pathology and Crop Physiology

Biology and Control of Major Diseases of Soybeans. Dr. Raymond Schneider, $77,725 (soybean funding)

Managing Mycotoxin Contamination in Louisiana Corn. Dr. Kenneth Damann, $50,000 (feed grain funding)

Developing a New Strategy to Control Soybean Rust Disease Through a Proteomics-Based Approach. Dr. Zhi-Yuan Chen, $62,250 (soybean funding)

Veterinary Science

Developing Soybean Resistance to Asian Rust Pathogen. Dr. Svetlana Oard, $25,400 (soybean funding)

Central Region

Irrigation of Soybeans on Precision-Graded Land. Glen Daniels, $6,474 (soybean funding)

Dean Lee Research Station

Louisiana Soybean Verification Program 2007. Dr. David Lanclos, $34,500 (soybean funding)

Soybean and Grain On-Farm Demonstration Program. Dr. David Lanclos, $30,500 ($12,950 soybean/$17,550 grain)

Reducing Aflatoxin in Corn. Dr. Steven Moore, $20,000 (feed grain funding)

Evaluating Early-Season Soybean Varieties for Production in Louisiana. Dr. Steven Moore, $23,500 (soybean funding)

Evaluation of Different Levels of Soybean Hulls as a Supplement for Steer Calves from Weaning until Ryegrass Turnout. Dr. David Sanson, $3,000 (soybean funding)

Macon Ridge Research Station

Refining Field Corn and Grain Sorghum Insect Pest Management Strategies. Dr. B. Rogers Leonard, $14,500 (feed grain funding)

Evaluation of Soybean Cultivars and Fungicides for Disease Management in Northeast Louisiana. Dr. Boyd Padgett, $12,430 (soybean funding)

Evaluating Selected Insecticide Use Strategies in Louisiana Soybeans. Dr. B. Rogers Leonard, $9,500 (soybean funding)

Wheat Disease Management in Louisiana. Dr. Boyd Padgett, $12,283 (feed grain funding)

Managing Production Risks in Irrigated Soybeans with Planting Dates, Varieties and Row Spacing. Dr. Don Bouquet, $20,000 (soybean funding)

Northeast Research Station

Planting Date, Row Spacing and Variety Effects on Performance of Maturity Group III and IV Soybeans. Dr. Ernest Clawson, $20,000 (soybean funding)

Cultural Practices That Influence Corn Yield Performance and Aflatoxin Accumulation. Dr. Henry Mascagni, $25,000 (feed grain funding)

Cultural Practices That Influence Grain Sorghum Yield Performance. Dr. Henry Mascagni, $12,000 (feed grain funding)

Soybean Weed Control Research. Dr. Donnie K. Miller, $28,000 (soybean funding)

Feedgrain and Wheat Weed Control Research in Northeast Louisiana. Dr. Bill Williams, $24,830 (feed grain funding)

Red River Research Station

Soybean Breeding and Variety Development. Dr. Blair Buckley, $26,013 (soybean funding)

Total Soybean Funding $524,819

Total Feed Grain Funding $275,163

Total Project Funding $799,982

March Toward Antidote for Aflatoxin in Corn Continues

For the past eight years LSU AgCenter plant breeder Dr. Steve Moore has been looking for ways to combat aflatoxin in corn. For the first time, this year he is evaluating lines developed in his own breeding program.

Moore, an LSU AgCenter researcher and plant breeder at the Dean Lee Research Station near Alexandria, has about 3,000 screening plots he's studying at the research station to try to find a commercially viable line that's resistant to the fungus that leads to aflatoxin.

"Aflatoxin, a deadly toxin, is a byproduct of Aspergillus flavus, a naturally occurring fungus," Moore explained.

The fungus is found in the soil all over the country and is harmless until conditions are right – such as drought. But under such conditions the fungus emerges and leads to the development of the cancer-causing toxin.

Moore, who is working with his research associate Mildred Deloach, said the objectives for his research are to identify new genes that provide superior resistance to aflatoxin and to incorporate them into commercial corn cultivars, as well as to evaluate using glufosinate and using atoxigenic fungi to reduce aflatoxin.

"Aflatoxin-contaminated grain is a major production concern for Louisiana corn growers and can be devastating throughout the southern United States," Moore explained. "Although resistant lines have been identified, resistance has not been transferred into commercially useful hybrids at the desired level of performance."

The LSU AgCenter researcher said developing resistant germplasm that can be placed into commercial application is the primary objective of his research. Another area getting attention in his research this year, however, is the ability for glufosinate, a key ingredient in Liberty herbicide, to help reduce the toxin.

"We know that Liberty raises the ammonia level in the corn, which breaks down aflatoxin, but last year our results weren't where we would have liked," Moore said, adding, "We believe the application of the herbicide was not at the right time. So this year we are applying the glufosinate each week that it's not raining."

In addition to using genetic and chemical technologies to control the fungus, biological controls have shown some effectiveness in cotton.

But Moore said his results with such atoxigenic strains in corn have not shown significaant results. Those tests involve using naturally occurring strains of the Aspergillus flavus fungus that have been shown not to produce aflatoxin. In this process, the atoxigenic strains of the fungus are used to compete with the toxic strains at infection sites on ears of corn.

Moore said the work is progressing at a good pace, but he does not see an end to aflatoxin research any time soon.

"If we got to a point where we produced a variety that is consistently resistant to aflatoxin, then we would proclaim victory, but we would probably have to search for resistance to future biotypes," Moore said.

Fortunately for farmers, Moore said, the rainy conditions the South and Southwest have seen this summer probably mean there shouldn't be much of a problem with the fungus this year. But in other years the monetary loss aflatoxin causes to producers can be very significant.

"In 1998, when corn was at $2.50 per bushel, farmers were getting about half that if they had the fungus in their fields," Moore said. "Now that corn is selling at $3.50 per bushel, it would just depend on how severe the contamination was as to what producers were paid."

Moore said there are 40,000 to 60,000 corn lines globally to choose from and that he tries to plant a least 300 of these lines each year. From the lines he has planted, Moore selected more than 30 he hopes will show better resistance than what is available now.

The increase in the state's corn acreage for biofuels just makes the work to prevent aflatoxin even more important, according to Moore, who said, "The more corn is grown, the more important my work becomes."

Johnny Morgan

Photos by John Chaney

LSU AgCenter agronomist Dr. Steve Moore uses paper bags to collect pollen from the tassels of corn and then transfers pollen to the silks by inverting the bag. Moore's purpose is to develop corn with improved resistance to aflatoxin.

Photo by Mark Claesgens

LSU AgCenter scientist Dr. Bill Williams talks about his weed control research during a field day last summer at the AgCenter's Northeast Research Station. Williams' work in 2007 is focused on emerging weed problems and whether those are resulting from species shifts or herbicide resistance.

Keeping Weeds Under Control
in Feed Grains, Wheat

Louisiana feed grain and wheat producers have to deal with continually shifting weed populations and post-harvest weed control.

Emerging weed problems, whether because of herbicide resistance or a species shift, is a major thrust of research in 2007, according to LSU AgCenter experts.

Feed grain and wheat weed control research conducted at the AgCenter's Northeast Research Station during 2006 focused on evaluation of burndown programs for corn and grain sorghum; evaluation of weed control programs for corn, grain sorghum and wheat; and evaluation of new herbicides for weed control in corn and wheat.

Despite excellent weed control from the herbicide glyphosate, several producers are reporting increased problems with annual grasses and teaweed, said LSU AgCenter weed scientist Dr. Bill Williams.

"The cause of these problems has not been documented but may be due to the increased use of glysophate and decreased use of residual herbicides," Williams said. "Or the problem may be associated with the increased use of shorter-season varieties that allow more time for weeds to mature and set seed following harvest."

Research for controlling teaweed after corn harvest will continue through 2007, Williams said.

In studies so far, the herbicides Permit and Yukon applied alone prevented new teaweed emergence but resulted in less than 50 percent control of existing teaweed, Williams said. Atrazine herbicide also prevented new teaweed emergence but was ineffective at controlling existing teaweed populations, he said, adding, however, that herbicide combinations of Yukon plus Unison resulted in best teaweed control.

The LSU AgCenter weed scientist said other research in 2006 confirmed the 2005 results that effective weed control before planting is required to maximize corn yields.

Additional research projects being planned or under way will evaluate experimental and/or new herbicides for ryegrass control in wheat, perennial weed management, morningglory control and johnsongrass management. Wheat response to herbicides also will be evaluated, and efforts to determine wheat varietal tolerance to the herbicide Sencor will be expanded, Williams said.

The LSU AgCenter researcher also said possible weed resistance to glyphosate will be carefully scrutinized.

"We collected samples of ryegrass from a producer's field that were suspected of glyphosate resistance," Williams said. "In the initial screening, the suspect ryegrass tolerated a four-times rate of glyphosate."

Williams said, however, that the ryegrass in question was very large, so scientists cannot be certain if resistance to glyphosate was the issue or whether the results were due to size or other factors.

"This is an area we will spend quite a bit of time with," he said.

Mary Ann Van Osdell

Researchers, Farmers Form Winning Team
With Crop Demonstration Program

Farmers, researchers and agricultural professionals across the state have formed a winning team in the LSU AgCenter's On-Farm Crop Demonstration Program.

Officials say the program's success is one reason for its growing popularity.

"We are bringing the research generated at research stations to farmers," said Dr. David Lanclos, LSU AgCenter soybean, corn and grain sorghum specialist. "The Crop Demonstration Program has grown to be one of the largest and most successful programs in the country."

The program allows professionals to create outdoor classrooms in farmers' fields across the state – places where they can demonstrate proven technology and showcase the production concepts being tested in corn, soybean and grain sorghum fields.

These crop demonstrations are larger than traditional research plots, represent real-world production and help LSU AgCenter county agents, specialists and other experts share information with farmers to help them keep their operations profitable.

Through the efficient use of volunteers, the crop demonstration program has expanded from 30 farm locations in 2003 to 91 in 2007.

To further enhance the educational mission, farmers are joining the team by offering land and equipment to be used in the Crop Demonstration Program. Seed companies also are providing seed to test new varieties and hybrids, agricultural agents are providing leadership in selecting farm locations, and company representatives are pledging their support to enhance the successful program.

Through the years, the program has expanded to test more varieties, evaluate fertilizers, study the benefits of lime, establish planting dates, demonstrate new equipment, test disease and nematode control methods, establish insect management techniques, test irrigation methods, compare tillage methods, compare harvesting techniques, study the use of yield monitors and global position systems, and incorporate precision agricultural practices in farming.

These enhanced studies are readily accepted by farmers and industry leaders, because they are planted on commercial farms throughout the crop-producing areas of the state, experts say.

"We only plant varieties in these replicated core blocks that make the LSU AgCenter recommended list," Lanclos said. "And the recommended varieties have been extensively tested in small plots at research stations in the state for a minimum of two years."

The real-world results over the years have led to even greater interest in the program.

"The response by farmers to the program has been outstanding," said LSU AgCenter county agent Keith Collins of Richland Parish.

The wealth of data collected from the large plots on different farms gives good information about soil types and cultural practices under different farming methods, Collins explained.

"We use the data to prepare a regional report for farmers in Northeast Louisiana, and they like the localized information," Collins said, adding, "Many of the farmers in the area are benefiting from the information obtained from the program."

Louisiana farmers recently have set new yield records in the production of soybeans and other grain crops in the state. Experts say some of this success could be the result of farmers planting improved varieties and adopting proven production techniques on their farms.

Ken Fairchild, who farms soybeans and corn in East Carroll and West Carroll parishes, has cooperated in the program. He harvested an average of 79 bushels of soybeans and 180 bushels of corn per acre last year.

"The Crop Demonstration Program is a great one," said Fairchild. "I especially like the team who walks through the fields to check for plant problems.

"Perhaps, if they find a problem in the test plots, they can help me handle it in my crop before it gets too severe," he said.

Fairchild said he hopes to be a part of the Crop Demonstration Program team for "many years to come" and that "the program is well worth the investment."

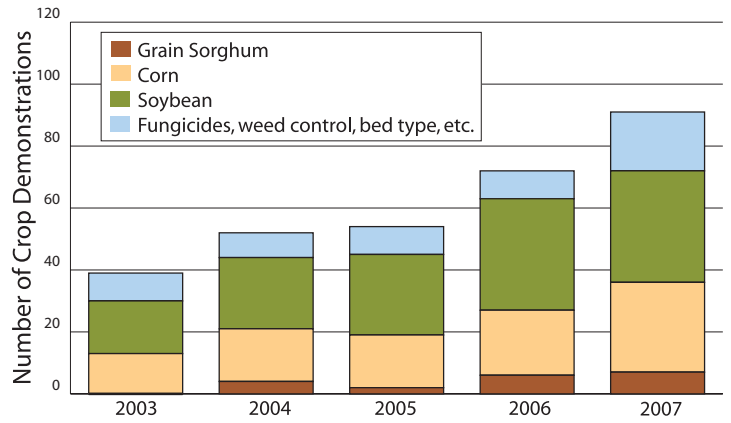
Farmers can observe the benefits of selecting an improved variety or altering production practices in the Crop Demonstration Program because the tests are planted in fields near their commercial operations.

"This program is a win-win situation," Lanclos said, adding, "The program depends on the cooperation of farmers, seed companies and county agents and adds a local flavor to research being conducted by the LSU AgCenter." John Chaney

Photo by John Chaney

LSU AgCenter research associate Rob Ferguson loads a planter hopper with corn seed to plant as part of a crop demonstration project located in a field near Alexandria. The crop demonstration program allows farmers an opportunity to observe numerous corn varieties being planted in their fields. Ferguson works with LSU AgCenter soybean specialist Dr. David Lanclos.

Figure 1. 2003 to 2007 Crop Demonstrations Totals.



The number of crop demonstration projects has grown substantially over the years.

Louisiana Soybean & Grain Research & Promotion Board
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Table 1. 2007 Crop Demonstrations

Parish	Grain Sorghum (Milo)	Bt Roundup Ready Corn	Roundup Ready Corn	Soybeans, Maturity Group 3	Soybeans, Maturity Group 4	Soybeans, Maturity Group 5	Louisiana Soybean Research Verification Program	Corn Fungicide Tests	Soybean Fungicide Tests	Raised Bed Versus Flat Land Soybean Planting
Acadia					X		X			X
Avoyelles	X		X			X	X		X	
Beauregard	X	X	X		X	X				
Caldwell		X								
Concordia	X	X	X		X	X	X	XXX		
East Carroll		XX	X	X	X		X			
Evangeline										XX
Franklin		X			X					
Iberia				X	X					
Jeff Davis						X			XX	X
Madison			X		X					
Morehouse	X	X	X		X					
Ouachita		X	X		X					
Pointe Coupee		X	X	X	X	X		X		
Rapides	X		X					X		
Dean Lee Research	X	X		X	X	X		X	XX	
Richland		X	X	X	XX			X		
St. Landry	X	X	X		X	X	X	X	X	
St. Martin										
Tensas		X	X		X			X		
West Baton Rouge							X			
West Carroll		XX	XX	X	X		X			
Totals	**7**	**15**	**14**	**6**	**16**	**7**	**7**	**9**	**6**	**4**