

Louisiana Soybean & Grain

RESEARCH AND PROMOTION BOARD REPORT

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AgCenter scientists study new ways to control weeds

Most farmers depend on herbicides to keep troublesome weed populations in check. But some of these unwanted plants manage to survive regardless of the chemical sprayed on them, creating a supply of seed that fuels future generations of weeds.

Lauren Lazaro, an LSU AgCenter weed scientist, is studying ways to reduce the amount of weed seed left in fields at the end of the season.

“At harvest time, if there are weeds that are present, they’ve escaped other management practices, typically herbicides,” she said. “At that point, chemicals are no longer an option for management, and we don’t want those seed going back into the soil seed bank.”

For inspiration, Lazaro is looking to Australia, where the concept of post-harvest weed seed control has taken off. She is concentrating on a practice called narrow windrow burning, which has become popular in Australia in the past decade and is beginning to catch on in the United States.

Soon after harvest, weeds are funneled into windrows and set on fire. The rows are formed using a chute attached to the back of a combine.

Farmers could build their own chutes for about \$300, Lazaro said.

“It’s really straightforward, and I feel like it’s a viable option for growers in Louisiana,” she said. “It’s cost-effective. It works — it’s just if they’re willing to adopt it.”

Because the practice is still new to Louisiana, some questions remain about how it will fit into operations here. For example, it may not work as well in certain crops or in some areas of the state.

That is because of plant moisture, which can vary by crop and geography — factors Lazaro is studying. If weeds are still too “green,” they could tangle in the combine or be difficult to burn.

Lazaro also wants to find out what long-term effects the technique may have.

“If we use narrow windrow burning repeatedly, every year, what are the weeds going to do?” she said. “Are they going to shift to release their seeds earlier in the growing season? Are they going to shift more towards grasses or prostrate weeds instead of upright weeds, where the combine is able to pull them in?”

She said it’s important to remember that any management strategy can become ineffective if not employed alongside other tactics.

“This is just another tool in the toolbelt,” Lazaro said. “It’s something that should be incorporated into a management plan and used in rotation. If we overuse it, we can lose it, just like chemical weed control.”

Other researchers in the AgCenter continue to study the performance of several herbicides.

Weed scientist Donnie Miller is evaluating the Balance GT system, which includes a soybean variety that can withstand applications of the isoxaflutole-based Balance herbicide.

Miller also is studying the Xtend and Enlist systems, which use dicamba and 2,4-D, respectively. He is developing weed management strategies for Xtend and Enlist soybeans that are double-cropped with wheat. In Xtend soybeans, he is examining the feasibility of co-applying insecticides and herbicides.

Weed scientist Daniel Stephenson’s research focuses on weed control in Liberty Link and dicamba-resistant soybeans.

“We are also evaluating the effect of simulated drift of mesotrione and isoxaflutole, which will be utilized in soon-to-be commercialized herbicide-resistant soybean technology, on soybeans not tolerant to these herbicides,” he said.

Stephenson also is working to identify herbicides for controlling ragweed parthenium, a weed that has recently become a major problem in Louisiana row crops.

Olivia McClure



Windrows of weeds are burned to limit how much weed seed goes back into the soil seed bank after harvest. Photo provided by Lauren Lazaro

From the
Louisiana Soybean and Grain
Research and Promotion Board

The Louisiana Soybean and Grain Research and Promotion Board directs your checkoff funds to research projects that address Louisiana’s most important production and marketing issues. The projects represent comprehensive efforts to address short-term or immediate needs of the industry and long-term, recurring work for sustainable soybean production systems.

The board administers Louisiana’s wheat and corn checkoff and the national checkoffs for soybeans and grain sorghum in Louisiana. By working with the national programs, the board is able to obtain funds for research specific to Louisiana’s needs. The board works in collaboration with regional and national organizations for opportunities to cost share in projects specific to Louisiana. This approach allows your funds to more efficiently support projects that will identify solutions to increase production or reduce input costs. These partnerships are particularly important as federal and state research funds become more limited.

Yield and quality issues affecting the Louisiana soybean and grain industries are a moving target, and every year is different. The funded projects have to be flexible to address emerging issues and develop quick solutions. Drought is one issue affecting soybeans and grains. AgCenter scientists are studying which methods of irrigation can save water without sacrificing crop yields while also researching whether soil moisture sensors can be used to schedule irrigation in Louisiana.

Research projects evaluate existing recommendations and adapt novel technologies to manage production-limiting factors. Just as important are the long-term projects to develop varieties or specific traits for Louisiana’s environment. In this publication you will find research summaries on a variety of germane topics, including soil testing, irrigation, diseases, insects and feral hogs and drones. This report describes some of the activities funded by your checkoff dollars.

We encourage you to get involved in the checkoff programs. The next board meeting, November 15 to 16, 2018, in Baton Rouge at the LSU AgCenter, will include reports on funded projects and reviews of new proposals. On behalf of the board, I thank you for your support of these programs.

Sincerely,
Charles Cannatella
Chairman, Louisiana Soybean and Grain Research and Promotion Board



Soybean and Grain Research and Promotion Board members
From left to right back row: Garrett Marsh, Darrell Vandeven, Kim Frey, Dan Turner, Damian Glaser. Front row from left to right: Dustin Morris, Charles Cannatella, Carlos Polotzola, Glen Brown, Scott Wiggers. Not pictured, J.K. Bordelon, Thomas Ater.
Photo by Olivia McClure

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Hollier retires from plant pathology

After 35 years of helping Louisiana farmers fight crop diseases, LSU AgCenter plant pathologist Clayton Hollier has retired.

Hollier had a split appointment among extension, research and teaching. He was responsible for plant pathology education programs for rice, small grains, feed grains, sugarcane, ornamentals, turfgrasses and forages. He also had a partial research appointment to assess crop losses from diseases.

“The most rewarding portion of my job was educating our LSU AgCenter clients about the crop diseases that they were encountering or likely to encounter,” Hollier said. “The payoff was a smile and a thank you because of their success.”

Hollier returned to the AgCenter part time to develop and implement a faculty mentoring program to help extension faculty.

“My job is to focus on the extension component to help them be the best extension specialist possible, realizing that in graduate school we learned how to do research, and most have had teaching experience, but we did not learn how to be extension specialists,” Hollier said.

Boyd Padgett, a plant pathologist and, most recently, the AgCenter Central Region director, will return to the field and take over much of Hollier’s former responsibilities.



Researchers studying benefits of sugarcane, soybeans in rotation

LSU AgCenter researchers are studying cultural practices and fertility management for soybeans.

AgCenter rice specialist Dustin Harrell is conducting his research in southwest Louisiana, while Al Orgeron is working in the southeastern part of the state.

Harrell said a date-of-planting study for different maturity groups has been underway for six years at the H. Rouse Caffey Rice Research Station near Rayne and the Dean Lee Research Station in Alexandria.

“This is probably the final year of that project,” Harrell said.

Results indicate the best time for planting in southeast Louisiana is mid-April to early May.

Harrell said a fertility study of potassium and phosphorus examining application timing and rates is being conducted at a new location in Calcasieu Parish on the Johnny Hensgens farm.

“We should have some new data there,” he said.

Al Orgeron, AgCenter southeast region pest management specialist, is studying soybeans in rotation with sugarcane at the Sugar Research Station at St. Gabriel and at the Iberia Research Station near Jeanerette.

Cane farmers are interested in identifying soybean varieties with good yield potential. They are focused on soybeans that are ready for harvest in August, so late-Group III and early to mid-Group IV soybeans are preferred, he said.

“Getting beans off fallow cane beds in a timely fashion is critical to a successful operation because cane yield is compromised when planted after August,” Orgeron said.

Orgeron is also working with Todd Spivey, AgCenter soybean specialist, and Josh Copes, AgCenter weed scientist, to assess the impact of seeding rates on soybean yields.

He has an ongoing study that is looking at seed treatments aimed at protecting soybeans from disease and insects in a sugar cane soybean rotation system. His research in 2016 and 2017 showed no yield benefit from the addition of fungicide, insecticide or the combination of these products on seed prior to planting.

“So far, we have not observed any statistical yield bump from adding these products,” Orgeron said.

The growing conditions after planting in 2018 have been different from the previous two years, said Orgeron.

“It was extremely cold and wet after planting on March 23,” he said.

In April, Orgeron observed a slight reduction in the number of cucumber beetles found on plants from insecticide-treated seed, he said.

Bruce Schultz

Soybean studies show soil texture key to predicting nematode damage

LSU AgCenter nematode specialist Charles Overstreet has found variable soil textures can affect nematode damage to soybeans, results similar to findings in cotton. His experiments over the past three years, primarily at the LSU AgCenter Northeast Research Station in St. Joseph, also has analyzed nematicide performance against nematodes in soybeans.

“We’ve been looking at site-specific applications of nematicides on cotton for a number of years with great results,” said Overstreet. “But we didn’t have information on whether these same nematicides would work well in soybean production systems, and now we know they do.”

One part of the study looked at different soil textures in the same fields and how they affected nematode populations and the health of the plant. The results consistently showed greater nematode plant damage in lighter, coarser soils and minimal damage in finer clay soils, just as the researchers had anticipated.

Using a Veris machine that records electrical conductivity in soils, researchers have been able to make maps of variable soil textures. The results help predict which areas of the field are likely to be damaged by nematodes and those that won’t.

“Once we found over 200,000 reniform nematodes in a pint of soil from a cotton field,” said Overstreet. “We can find heavy populations of nematodes in clay soils and still not show any damage, yet the same level of nematodes in lighter soil really clobbers the plants.”

Overstreet said he believes lighter soils are susceptible to drought, increasing plant chances for disease or pathogenicity, while heavier soils have more nutrient and water-holding capacity. Lighter soils show the best results when using the nematicide Telone to combat nematode populations, according to Overstreet.

As was found in cotton tests, researchers achieved good soybean yields when the fumigant was applied to lighter soils, but there was hardly any response from

soybeans in heavier clay soils.

“Even though nematodes were present in high levels in both soil textures, that’s exactly what we saw in cotton,” Overstreet said. “Telone is expensive, so we can use this information to make more cost-effective management decisions, spraying only where there’s going to be a benefit.”

Southern root knot and reniform nematodes have caused problems in both cotton and soybeans. Researchers were surprised to discover newer soybean varieties didn’t show the nematode symptoms or damage that had been present in cotton.

“This year, I set up root knot and reniform resistant varieties in multiple soil textures,” said Overstreet. “We want to know how much of the variety component is impacted in these heavier soils.”

Grain sorghum is not grown much in Louisiana because it is not profitable. But, because it has high drought tolerance and can grow in almost any soil, Overstreet is studying nematode-resistant varieties, just in case it ever is used as an alternative.

“We’re not showing a lot of damage to grain sorghum from the nematodes,” said Overstreet. “It does help keep the populations down, but the problem is it wasn’t always an economic option.”

These studies have enhanced knowledge about nematodes in soybeans, grain sorghum and other row crops. Overstreet appreciates the opportunity to discover more.

“It’s a hotbed of nematodes here at the station, nothing that wouldn’t be found on a typical farm field,” he said. “It has exactly what I was looking for – variable soil texture.” **Randy LaBauve**

Feral hog bait delivery system being studied

The population of feral hogs in the state is continuing to grow, but LSU AgCenter scientists are working to decrease their numbers.

Researchers at the AgCenter Bob R. Jones-Idlewild Research Station are refining a sodium nitrite bait targeted at the invasive species, said AgCenter animal scientist Glen Gentry.

For the past five years, Gentry and others have sought ways to deliver the bait in a humane, yet lethal way. The challenge is that the sodium nitrite loses its potency when exposed to air.

“Sodium nitrite is known to pull moisture from the air once its container is opened,” Gentry said. “Once that happens, the chemical loses its lethal properties.”

While corn seed has been used as the bait, researchers found the pigs actually like pogie fish more, he said. A major problem with using this type of bait is keeping it encapsulated, Gentry said.

“We want to make sure that when the pigs find the bait that none is spilled,” he said.

Gentry said in order to hold the population at current levels, 70 percent of the hog population would have to be eliminated.

Sodium nitrite is effective in taking the oxygen out of the pig’s blood through the formation of methemoglobin. The process causes them to become drowsy, lie down and die, Gentry said.

“All mammals, including humans, have an enzyme that is able to change methemoglobin, which cannot bind oxygen, back to hemoglobin,” Gentry said. “But pigs don’t have as much of this enzyme, so it takes less sodium nitrite to overload their system.”

Gentry is defining the effective lethal dose of sodium nitrite, an effective delivery medium and selective bait delivery system.

Laws and regulations require that the poison must be publicly acceptable and produce a humane death.

“Sodium nitrite is basically a food preservative and is also used as an antidote for cyanide poisoning,” Gentry said. “It takes just 8 grams of sodium nitrite to kill a 100-pound pig,” Gentry said.

During the research period, a number of traps have been used to catch the pigs. But research shows the pigs become educated and won’t come close to the traps if they are not caught when the traps are triggered the first few times.

A 2013 AgCenter survey showed feral hogs are responsible for more than \$55 million in damage to agricultural enterprises statewide. Of the crops listed, soybeans took the greatest hit, with famers losing more than \$18 million.

Johnny Morgan



LSU AgCenter animal scientist Glen Gentry examines sodium nitrite being used in research to control feral hogs. Gentry said much of the research now is focused on effective ways of encapsulating the chemical, which loses its effectiveness after prolonged contact with air. Photo by Johnny Morgan

Corn, soybean studies search for improved yields

In a new study measuring various factors affecting corn yield, AgCenter researchers are working to evaluate the effects of tillage, plant populations and fertilizer use along with insecticide rates and fungicide applications.

The research involves deep tillage versus no deep tillage; plant populations of 40,000 versus 32,000 plants per acre; starter fertilizer versus no starter fertilizer; foliar fungicide versus no foliar fungicide; and insecticide rates of Poncho 1250 versus Poncho 250. In addition, a higher rate of fertilizer will be used to compare with the AgCenter recommended rates.

Each treatment will be evaluated by itself and then in various combinations. AgCenter corn specialist Dan Fromme is working with AgCenter plant pathologist Trey Price and AgCenter agronomist Josh Copes on the study.

“We want to know what practices are worth the most in returns,” Fromme said.

The lowest input rates are AgCenter recommendations, which will then be compared with higher plant populations and fertilizer rates.

“We’ll do economic evaluations at the end of the year,” Fromme said.

Fromme’s plots are on the AgCenter Dean Lee Research Station station near Alexandria, while Copes and Price will have plots at the AgCenter Northeast Research Station in St. Joseph.

Fromme also is managing the on-farm demonstration program that produces the annual hybrid recommendation guide. This year the evaluations are at 18 locations, each with 13 to 14 hybrids. Conducted on individual farms, the producers follow their regular production practices, with the final result compiled in the annual hybrid report.

“Hybrid selection is one of the most important management decisions a farmer can make,” Fromme said. “And the results are surprising sometimes. Every year is different.”

Fromme also is working with Justin Dufour, an AgCenter agent in Avoyelles Parish, on a project evaluating variability in plant spacing and planting depth.

“Uniform stand is important, so we’re looking at planting at different depths and different times to get variability,” Fromme said.

In soybeans, AgCenter soybean specialist Todd Spivey is evaluating different seeding rates to determine an optimum rate.

One grower with 7,000 acres is planting 155,000 seeds per acre, Spivey said. Cutting back from 150,000 seeds per acre to 130,000 seeds per acre, for example, could save around \$8.50 per acre in seed costs in a conservative estimate.

AgCenter recommendations range from 110,000 to 140,000 seeds per acre but are generally in the 120,000 to 125,000 seeds per acre range.

“The high rate is only necessary when planting early or late to assure a good stand, sort of like insurance,” Spivey said.

Keeping in mind the AgCenter generally recommends 120,000 to 125,000 seeds per acre, Spivey is planting trials using 50,000 to 175,000 seeds per acre in 25,000-seed increments.

“We want to start at a level that’s too low and go to a sufficiently high level where yields will plateau,” he said.

Last year, the test was planted at the Dean Lee station. This year, Spivey added trials at the AgCenter Sugar Research Station in St. Gabriel and the Macon

Ridge Research Station in Winnsboro as well as farmer fields in West Carroll, Pointe Coupee and Avoyelles parishes. Plots at the stations comprise four 30- to 40-foot rows, while plots on cooperator fields are 12 or 16 rows 200 to 250 yards long.

One of Spivey’s objectives is to evaluate the planting rates in different environments.

“We should have some really good data this year,” he said.

Spivey also is conducting a fertilizer study focusing on potassium by applying the nutrient at rates higher than current recommendations.

“Can we? Do we need to? Is it economical?” Spivey said are the questions the study is expected to answer.

He’s looking at timing with fall, spring and split applications with rates of 0, 30, 60, 90 and 120 pounds per acre and then comparing yields in both timing and application rates along with soil test results.

“They’re always interrelated,” he said.

The tests are being conducted at Dean Lee as well as the Northeast Research Station in St. Joseph.

“We have two different soil types at Dean Lee and one other at St. Joseph,” he said.

Another fertility study is evaluating supplemental nitrogen use at three rates along with a no-nitrogen control.

“We want to know how supplemental nitrogen application affects biological nitrogen present in the soil and if we can increase yield without spending too much money,” Spivey said.

“I’m excited for the work we do here through these grants,” Spivey said. “I think growers will get good information for the money being spent.”

Rick Bogren



Todd Spivey, LSU AgCenter soybean specialist, in a soybean field at AgCenter Dean Lee Research Station station near Alexandria. Photo by Rick Bogren



Dan Fromme, LSU AgCenter corn specialist, in a corn field at AgCenter Dean Lee Research Station station near Alexandria. Photo by Rick Bogren

Connection between defoliation and corn yield studied

Boyd Padgett, LSU AgCenter plant pathologist, is overseeing a study of the correlation between defoliation of corn plants and yield.

Corn leaves are being removed at various growth stages, Padgett said, and the amount of leaves removed will be compared to yields.

The project is being conducted at two AgCenter facilities, the Dean Lee Research Station near Alexandria and the Ben Hur Research Station in Baton Rouge.

He said defoliation can occur because of disease or because of physical damage caused by adverse weather or insects. A damaged leaf that is not functioning in the photosynthesis process and doesn’t fall off the plant could cause a yield drag, he said. The project is in its second year. **Bruce Schultz**

Variety and hybrid trials are building blocks for yield improvement

Finding a variety or hybrid that will perform to its full potential is a goal all producers strive for. While it may not be as difficult as finding a needle in a haystack, it does take a trial-and-error approach.

Helping to mitigate the error part, scientists with the LSU AgCenter continue to conduct core block demonstration plots at sites across Louisiana for crops, including corn, sorghum, soybeans and wheat. These locations serve as test plots for many varieties and hybrids and give producers a firsthand look at how well they will perform based on soil types, insect and disease pressure, cultural practices and other factors.

AgCenter researchers Dan Fromme, Boyd Padgett and Todd Spivey are responsible for 44 core block demonstration sites of corn, grain sorghum, wheat and soybeans.

Fromme conducts the corn and sorghum trials. He has 17 off-station corn plots in 15 parishes. Fromme is also conducting an additional trial at the Dean Lee Research and Extension Center near Alexandria.

While the site numbers are similar to previous years, planting conditions for corn were not as favorable as last year. Many of the plots were planted later due to this year’s wet, cool spring, which caused much of the state’s corn crop to get off to a late start.

Interest in grain sorghum in Louisiana has been tepid in recent years. Low prices and the uncertainty of sugarcane aphid infestations led to one of the lowest total acres of sorghum ever planted in Louisiana.

Because of interest being so low, only two off-station sorghum demonstrations were planted during 2018 in two parishes. Fromme has two on-station demonstrations in two different soil types located at Dean Lee.

Interest in wheat has also been down considerably. Three consecutive years of poor harvest conditions along with heavy scab disease pressure led to low yields and low test weights. These conditions caused most growers to abandon any plans of growing wheat.

The 2018 wheat harvest was a success — albeit a small one — on approximately 15,000 acres.

Padgett reported some fields had yields of more than 70 bushels per acre and test weights in the low 60s. He is hopeful that this year’s success will spur more growers to plant wheat this fall.

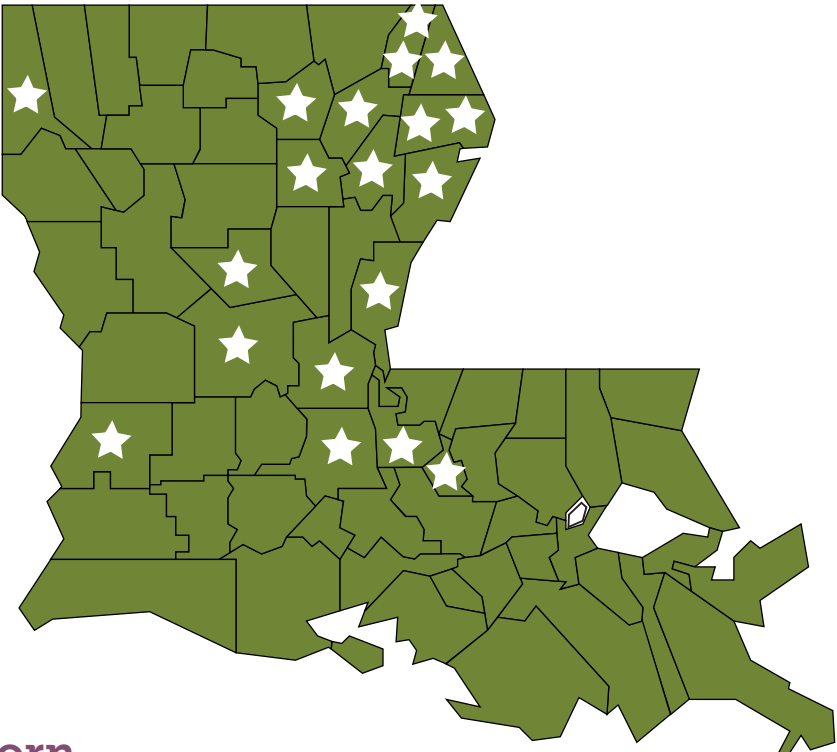
With so few growers interested in wheat, Padgett had only three demonstration plots. They were located in Avoyelles, Beauregard and Caddo parishes. The plots in Avoyelles and Caddo focused on variety performance, while the Beauregard location focused on evaluating fungicides for scab management.

Soybeans are Louisiana’s largest crop in terms of acreage, occupying between 1.3 and 1.4 million acres.

Spivey is in his first full year serving as the state’s soybean specialist. He has 19 demonstration plots across 16 parishes, including one at the Louisiana State Penitentiary at Angola. Fifteen of the plots are Group IV beans, and the rest are Group V.

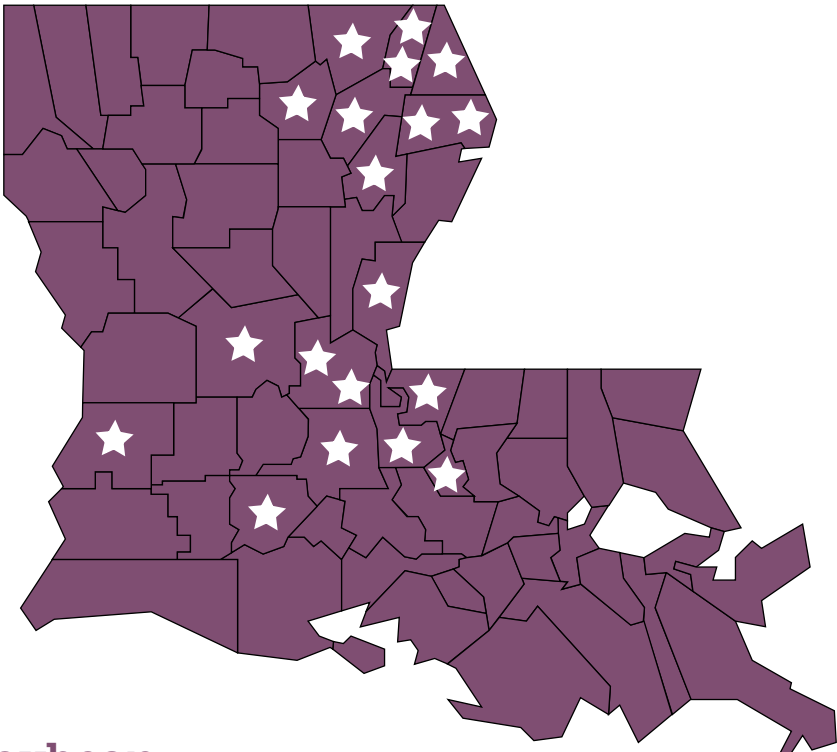
Like corn, many of Spivey’s plots were planted later than he would have liked, but the cool weather dictated that much of the state’s soybean crop be planted during May when conditions were more favorable.

Results of the demonstration plots will be published at lsuagcenter.com in late 2018. **Craig Gautreaux**



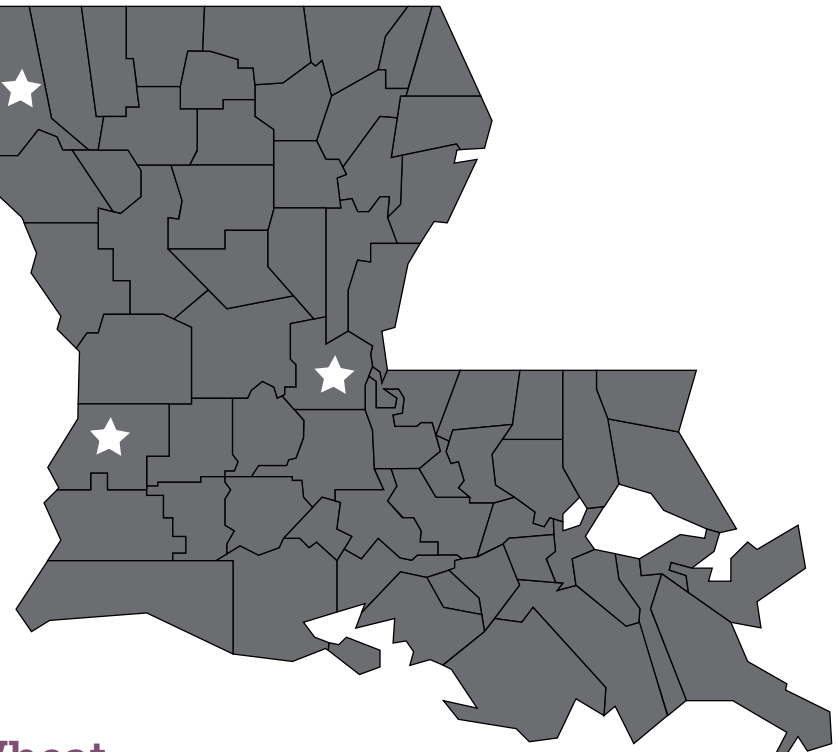
Corn

Avoyelles, Beauregard, Caddo, Caldwell, Concordia, East Carroll, Franklin, Grant, Madison (2), Ouachita, Pointe Coupee, Rapides, Richland, St. Landry, Tensas, W. Baton Rouge, W. Carroll (2)



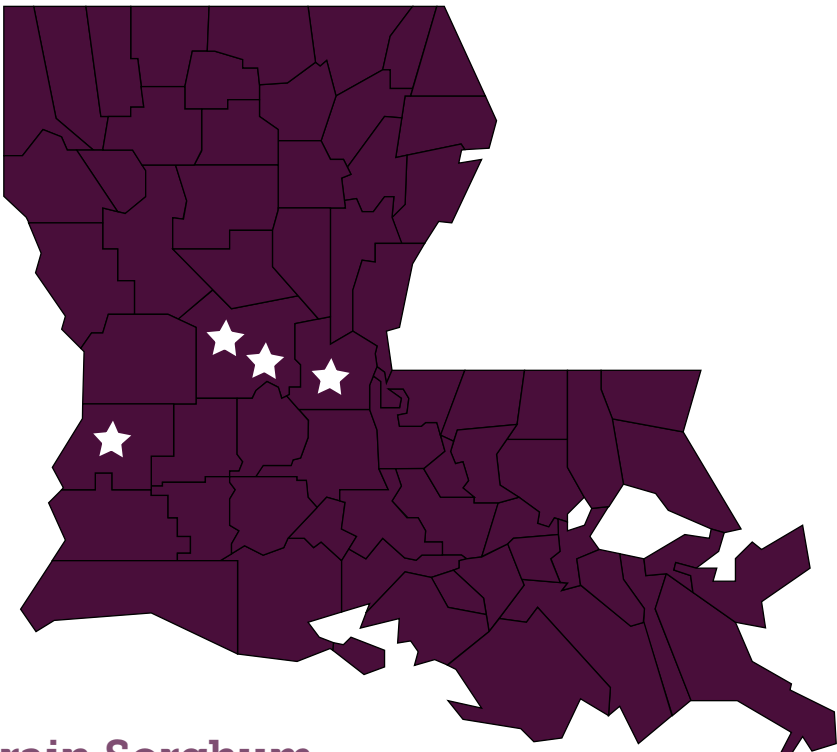
Soybean

Acadia, Avoyelles (2), Beauregard, Concordia, East Carroll, Franklin, Madison (2), Morehouse, Ouachita, Pointe Coupee, Rapides, Richland, St. Landry, W. Baton Rouge, W. Carroll (2), W. Feliciana



Wheat

Avoyelles, Beauregard, Caddo



Grain Sorghum

Avoyelles, Beauregard, Rapides (2)

AgCenter scientist closes in on better sprayer cleanout

An LSU AgCenter researcher is getting closer to developing a better way to clean sprayers that are used to apply farm chemicals.

Zhijun Liu has spent the past two years working to formulate a plant-based solution that effectively removes pesticide residue. Sprayers must be thoroughly cleaned to get rid of leftover product, which can damage the equipment itself as well as subsequent crops being sprayed.

The cleaning process is difficult and time consuming, however. Many pesticides — especially those that are emulsifiable concentrate formulations, meaning they include solvents and surfactants — are not water soluble. Water alone will not completely wash away those products.

Commercially available cleaning products can help, but they still do not remove all the residue, Liu said.

In testing his plant-based cleanout solution, Liu has found that residues of 2,4-D herbicides vary considerably depending on which form of the ingredient the product contains.

2,4-D in the form of amine salt is water soluble, so its residue is easier to remove, Liu said. Acid formulated to a suspension concentrate is more difficult to clean, and acid ester formulated to an emulsifiable concentrate is even harder.

In each of those situations, Liu said, his cleanout solution removes leftover herbicide better than water.

Liu also has learned that cleaning results can vary by product brand.

“Formulating ingredients can be different due to proprietary nature,” Liu said. “For example, Sterling Blue by Winfield Solutions, Engenia by BASF and XtendiMax by Monsanto all use dicamba salt as the active ingredient, but formulating ingredients are proprietary. It is the formulating ingredients that could make a difference in retaining dicamba residues.”

Liu has been fine-tuning his formulation based on his findings and is now getting ready for additional testing.

“Significant progress has been made, and it is time to move the work from the lab to fields,” he said. “If the field testing validates, the next step would be to approach product manufacturers and explore university-industry collaborations.” **Olivia McClure**

2018 Soybean and Grain Research and Promotion Board-funded projects

Agricultural Economics and Agribusiness.....\$41,000

Knowledge Transfer on Water Policy Reforms, Irrigation Practices and Technology to Promote Profitable Irrigation Water Management, *Naveen Adusumilli*

Economic Analysis of Farm Programs and Commodity Costs and Returns for Soybean and Grain Production in Louisiana, *Michael Deliberto*

Economics of Water-Yield Relationship in Soybean Production in Louisiana, *Krishna Paudel*

Biological and Agricultural Engineering.....\$30,000

Nanoparticles for Improved Pesticide Delivery, *Cristina Sabliov*

Communications.....\$5,000

Louisiana Soybean and Grain Research and Promotion Board Report, *Frankie Gould*

Dean Lee Research Station.....\$287,691

Corn On-Farm Demonstration Program, *Dan Fromme*

Response of Corn to Variability in Stand Uniformity, *Dan Fromme*

Evaluation of Disease Resistance and Other Disease Management Practices in Louisiana Wheat Varieties, *Boyd Padgett*

Development of UAV Technologies For Soybean and Small Grain Crops, *Randy Price*

Agronomic Research to Improve Soybean Production in Louisiana, *Todd Spivey*

Soybean On-Farm Demonstration Program, *Todd Spivey*

Improving Soil Fertility and Agronomic Management in Louisiana Soybean Production, *Todd Spivey*

Evaluation and Determination of Weed Management Strategies in Louisiana Soybeans, *Daniel Stephenson*

Weed Management Strategies for Louisiana Feed Grain Crops, *Daniel Stephenson*

Factors Impacting Corn Yields in Louisiana, *Dan Fromme*

Entomology.....\$106,500

Best Management Practices for Sustainable Insecticide Resistant Soybean Looper, *Jeff Davis*

Explore Resistant/Tolerant Varieties for Managing Sugarcane Aphid in Louisiana Sorghum, *Fangneng Huang*

IPM For Louisiana Soybean Insect Pests, *Jeff Davis*

Sustaining Transgenic Bt Corn Efficacy for Louisiana Crop Growers, *Fangneng Huang*

Idlewild Research Station.....\$40,000

Development of Control Options for Feral Swine in Soybean Fields, *Glen Gentry*

Macon Ridge Research Station.....\$138,130

Enhancing Field Corn Insect Pest Management Strategies for Louisiana, *Sebe Brown*

Enhancing Grain Sorghum Insect Pest Management Strategies for Louisiana, *Sebe Brown*

Enhancing Soybean Insect Pest Management Strategies for Louisiana, *Sebe Brown*

Developing Management Strategies for Corn and Wheat Diseases, *Trey Price*

Developing Management Strategies for Soybean Diseases, *Trey Price*

Managing Foliar Diseases and Head Blights of Grain Sorghum, *Trey Price*

Northeast Research Station.....\$253,894

Compatibility of Cover Crops and Fall-Applied Residual Herbicides, *Josh Copes*

Evaluating Pre- and Post-Harvest Field Management Strategies in Corn, Grain Sorghum and Soybean Production Systems in Louisiana, *Josh Copes*

Soybean Weed Control Research in Northeast Louisiana, *Donnie Miller*

Evaluation of the Use of Unmanned Aerial Vehicles in the Production of Soybeans, *Donnie Miller*

Investigating Cover Crop Impacts on Row Crop Production in North Louisiana, *Josh Copes*

Soybean Seed Quality as Affected by Maturity Group, Row Spacing and Harvest Aid Application, *Josh Copes*

Evaluation of Drought-Tolerant Corn Hybrids on Alluvial and Loessial Soils in Northeast Louisiana, *Rick Mascagni*

Plant Pathology and Crop Physiology.....\$330,936

Using Molecular Biology to Control Soybean Diseases: Cercospora Leaf Blight and Rust, *Zhi-Yuan Chen*

Cercospora Leaf Blight Disease of Soybean — Explore New Approaches for Management, *Zhi-Yuan Chen*

Identifying Sources of Inoculum to Determine Effective Management Strategies for Cercospora Leaf Blight and Purple Seed Stain, *Vinson Doyle*

Development of Foliar Treatment and Soil Amendment Methods to Promote Soybean Health, *Jong Ham*

A Study of Cultural and Fungicidal Practices to Reduce the Impact of Frogeye Leafspot and Cercospora Blight on Yield and Quality — Final Report, *Clayton Hollier*

Soybean Scouting Program for Disease and Disease Resistance, *Clayton Hollier*

Yield Loss of Corn to Incremental Defoliation, *Clayton Hollier*

Management of Plant-Parasitic Nematodes in Soybean, *Charles Overstreet*

Building the Framework to Develop Integrated Management Strategies for Taproot Decline, *Vinson Doyle*

Evaluation of Soybean Cultivars and Fungicides for Disease Management in Southern Louisiana, *Clayton Hollier*

Development of New Iron Formulations for Management of Cercospora Leaf Blight of Soybean, *Raymond Schneider and Sara Thomas-Sharma*

Development of a Rapid Laboratory Protocol for Screening for Resistance to Cercospora Leaf Blight in Soybean, *Raymond Schneider*

Red River Research Station.....\$179,443

Soybean Breeding and Variety Development, *Blair Buckley*

Evaluation of Plant Response to Soil Moisture Regimes in Soybeans, *Stacia Davis*

Effect of Skip-Row Furrow Irrigation on Crop Growth, Water and Nutrient-Use Efficiency in Soybean and Corn Production Under Different Soil Types, *Syam Dodla*

Management of Phosphorus and Potassium Fertilization in Soybean Under Different Irrigation Regimes, *Syam Dodla*

Developing Optimum N, P and K Fertilization Rates for Soybeans and Corn Under No-Till Conservation Agriculture, *Syam Dodla*

Evaluating the Functional Aspects of Mixed Application of Cover Crop on Crop Productivity and Soil Health in Louisiana, *Changyoon Jeong*

Renewable Natural Resources.....\$40,000

Washout Solutions for Cleaning Spraying Equipment Used in Soybean Weed Management, *Zhijun Liu*

H. Rouse Caffey Rice Research Station.....\$64,910

Evaluation of Soybean Cultural and Fertility Practices in Southwest Louisiana, *Dustin Harrell*

School of Plant, Environmental and Soil Sciences.....\$295,300

Molecular Mapping and Expression Profiling for Development of DNA-Based Markers to Complement Wheat Breeding, *Niranjan Baisakh*

Soil Test Recommendation Comparison of Four Laboratories in the Midsouth, *Edward Bush*

Integration of Cover Crops in Louisiana Production Systems, *Lisa Fultz*

Small Grain Breeding, Variety Development and Testing, *Stephen Harrison*

Soil Fertility Research: Improving Yield and Alleviating Disease in Soybean Production, *Brenda Tubana*

Nitrogen Budget and Management Improvement Using Enhanced-Efficiency Fertilizers for Louisiana Grain Crop Production, *Jim Wang*

The Effect of Moisture Content on Harvest Weed Seed Control in Various Cropping Systems in Louisiana, *Lauren Lazaro*

Phenological Shifts in Flowering and Seed Set Due to Selection Pressures of Harvest Weed Seed Control, *Lauren Lazaro*

Impact of Fertilization and Planting Dates on Cover Crops, Biomass Production and Nutrient Turnover on Soybean-Corn Rotation Systems, *Brenda Tubana*

Improving Micronutrient Fertilization for Soybean Production, *Jim Wang*

Southeast Region.....\$36,000

Soybean Production Research in Fallow Sugarcane Production Systems, *Al Orgeron*

Total Funding for 2018.....\$1,848,804

Understanding of soybean taproot decline disease evolving

Scientists are gaining new understanding of a disease that has killed soybean plants in several states.

Initially called a “mystery disease” more than a decade ago, soybean taproot decline has become common in Louisiana.

Taproot decline has also been found in Alabama, Arkansas, Mississippi, Missouri and Tennessee, said Trey Price, a plant pathologist at the LSU AgCenter Macon Ridge Research Station in Winnsboro who expects the disease’s presence to be confirmed in a few other soybean-growing states soon.

“Since we’ve taught people how to identify the problem, reports have gone up in recent years,” Price said.

Taproot decline begins with orange discolorations in the leaves, and then the pathogen causes interveinal chlorosis. It leads to blackened taproots and lateral root sections. In some instances, most of the taproot is missing when the plant is inspected.

Researchers have learned the disease is caused by a species of *Xylaria*, fungi commonly found growing on dead wood, Price said. While most in the genus are “wood rotters,” he said, there are some disease-causing species.

Vinson Doyle, a mycologist in the LSU AgCenter Department of Plant Pathology and Crop Physiology, is studying the fungus along with Teddy Garcia-Aroca, a graduate student in the department.

The fungus seems to initiate new infections from soybean debris — mainly stems — left over from the previous season, Price said. Because seedlings are often killed, Price assumes the fungus affects soybeans soon after planting.

“If you dig up symptomatic plants, more often than not you will find a blackened soybean stem from the previous season in contact with soybean roots from the current season,” he said.

The pathogen’s origin is unknown, but research is ongoing.

“There are many unanswered questions concerning taproot decline, and it takes a considerable amount of time and resources to research specific topics,” Price said.

While the disease has attracted attention and caused discussion in the past 15 years or so, soybean taproot decline likely isn’t a new threat, said Garcia-Aroca.

“Even though this disease was recently reported, we think it has been present in soybean fields for a long time, maybe decades,” he said. “We think it probably went unnoticed or was misdiagnosed for similar-looking diseases, such as sudden death syndrome and Thielaviopsis.”

The best way to avoid taproot decline, Price said, is to practice crop rotation. Soybean monoculture and reduced tillage practices lead to large amounts of soybean debris in fields, so tillage operations that speed up soybean debris decomposition will lessen the incidence and severity of taproot decline. But Price still recommends reduced tillage practices to maintain soil health, reduce erosion and prevent contamination of water sources.

While he has not specifically researched weather’s role in the disease, Price said hot and dry weather appears to lessen the severity of taproot decline incidences.

Price and others are seeking several other solutions to taproot decline. Varieties that are resistant to taproot decline may be available, but further study is needed.

“We continue to look at seed treatments and in-furrow fungicides but have not identified anything that works well yet,” Price said. **Kyle Peveto**



Taproot decline begins with orange discolorations in the leaves. Then the disease causes interveinal chlorosis. Photo by Trey Price



The stroma of a *Xylaria* fungus is attached to soybean debris in a field where taproot decline disease was found. Photo by Teddy Garcia-Aroca

Making informed decisions is critical to turning profit

Profitability is essential for a farming operation’s survival. But determining the point where losses turn into profits is always a moving target and consists of many variables.

To help simplify the process, Michael Deliberto, an economist in the LSU AgCenter Department of Agricultural Economics and Agribusiness, has helped develop tools that allow producers to input farm operation data and determine the point of profitability using factors such as cost inputs, land rental rates and the market price of the commodity.

“No two production fields are alike,” Deliberto said. “We provide annual cost estimates based on components such as fertilization cost, disease and weed management programs, and fuel expenses. Farmers can customize the programs on factors that are unique to their fields, such as historical yields or land and rent costs. This will allow farmers to see what yields and the prices he or she will need to receive to determine their break even points.”

Deliberto said that these tools, which are electronic spreadsheets, also allow producers to compare the profitability of competing crops. This aspect helps farmers determine which crop appears to be the more profitable commodity based on current market conditions and cost of production.

“We provide a user’s guide for every spreadsheet,” Deliberto said. “They can be obtained from the LSU AgCenter website, and both parish extension agents and the state crops specialists have access to them.”

Deliberto said some aspects in the decision tools cannot be accounted for.

Trade agreements or tariffs placed on farm commodities can affect profitability and market uncertainty. Weather events also cannot be predicted, but they can have some degree of accountability in the spreadsheets by adjusting the yields based on how the weather influences the yields.

Risk management also is addressed, including issues regarding crop insurance and farm program payments.

“The spreadsheets are a good way to evaluate when crop payments may be triggered. Their amounts as prices and yields change throughout the growing season,” Deliberto said.

According to Deliberto, a strength of the spreadsheets is that the producer only has to supply a minimal amount of data to see results. The spreadsheets are unique by parish and examine other factors, such as whether the crop is irrigated or not.

Because the spreadsheets have a parish component, they take into account the variables of an area. Farms in Tensas Parish are not being compared with farms in Beauregard Parish, and the variability of production costs are in line with that geography.

“The main goal is to deliver interactive spreadsheets that are tailored to the individual farmer,” Deliberto said. “This is applied research, and we can deliver something useful for producers in enabling them in making better-informed decisions.”

According to Deliberto, producers must develop a comprehensive marketing strategy to give them a higher probability of turning a profit. This strategy can be created based on information growers have on hand and from using that information to customize the spreadsheets made available to them from the LSU AgCenter.

For producers to receive the maximum benefit from the spreadsheets, they should have accurate data from their farms and start using the spreadsheets early in the decision-making process to get a better understanding of what crops look the most promising as they pertain to making a profit. **Craig Gautreaux**

Soil scientists research nitrogen efficiency, silicon for plant protection

National studies of commercial enhanced-efficiency nitrogen fertilizers on row crops have shown some success in improving efficiency of plant uptake and decreasing losses of greenhouse gases while minimizing nitrate runoff.

Until recently these fertilizer compounds have not been adequately tested in the hotter, more humid South, according to Jim Wang, a soil chemist with the LSU AgCenter.

“We’re looking at slow-release, solid fertilizers with urea and ones with coated urea to find the best use efficiency with wheat,” said Wang. “For corn, we’re using controlled-release liquid nitrogen fertilizers, which contain compounds that are urea inhibitors or nitrification inhibitors, and combinations of both, to see how much of these compounds we should apply and when we should apply them, if at all,” said Wang.

The LSU AgCenter started the research of enhanced-efficiency nitrogen fertilizers in 2016 on wheat and expanded the tests to corn in 2017.

One aspect of the study explores possible cost-saving nutrient credits through the U.S. Department of Agriculture Natural Resources Conservation Service. When nitrogen stabilizers are applied to different cropping systems, they could potentially conserve soil nutrients.

“This is very important because it’s a way to improve water quality and decrease greenhouse gases,” said Wang. “Both liquid and solid enhanced-efficiency fertilizers have significantly reduced nitrous oxide and ammonia gas loss.”

Field studies at the Red River Research Station in Shreveport and the Central Research Station in Baton Rouge include tests on new production compounds that have not yet been commercialized. Although the research has shown greater use efficiency in the vegetative part of plants, it has not yet translated to better yields, according to Wang.

“One reason may be because we applied the amount of nitrogen fertilizer at the maximum or sufficient level,” he said. “We changed the strategy and will see if a lower amount of nitrogen is going to make a difference and enhance the use efficiency and directly impact the yield.”

Enhanced-efficiency nitrogen fertilizers currently cost 10 to 15 percent more than regular types. But advances in technology will likely bring those costs down, according to Wang.

“If we’re saving by reducing gas loss and water quality improvement, and if we see an increase of use efficiency, then we will be able to see the direct benefit,” Wang said.

Crops in Louisiana are susceptible to disease and insects because of the long, hot and humid summers. Brenda Tubana, a soil fertility scientist with the LSU AgCenter, has found some success with silicon fertilization in bolstering plant strength against biotic and abiotic stresses.

“Silicon enhances the plant’s physical barrier, which limits pathogen access to plant tissues,” said Tubana. “That’s why silicon fertilization could possibly reduce the need of chemical control for diseases and eventually increase plant production.”

In one LSU AgCenter field test, soybean plants were fertilized with the mineral wollastonite, which has small amounts of iron, magnesium, and manganese substituting for calcium, and others with silicate slag, a byproduct of steel production. Plants treated by both silicon sources had a lower rating of Asian soybean rust disease and better yields compared to non-treated plants.

Research with silicon fertilizer on wheat is being conducted at two LSU AgCenter facilities, the Macon Ridge Research Station in Winnsboro and the Northeast Research Station in St. Joseph.

The silicon fertilization study, now in its fourth year, has shown that light textured soils tend to have less plant-available silicon, and clay soils tend to have higher levels of this nutrient element. Most soils, at some point, need liming to bring down acidity and raise pH. That’s another task where wollastonite and slag excel, Tubana said.

“The demand for silicon by most crops grown in Louisiana, like rice, soybeans and wheat is quite high,” said Tubana. “The idea of using slag may be advantageous because you’re not only correcting the pH, but you’re also adding silicon.”

A spin-off study within the project is happening at the Bob R. Jones-Idlewild Research Station in Clinton. Research on silicon fertilization of soybeans focuses on its ability to help fend off herbivores, such as deer, which eat and destroy large crop portions.

“The deposition of silicon in soybean shoots can create a hard outer layer, making it stronger,” said Tubana. “We’ve seen reports where wild rabbits and locusts preferred unfertilized forage, likely because of difficulty chewing silicon-fertilized grasses.”

Other research for the silicon project is developing robust testing procedures that indicate if plants need silicon applications and investigating the economic feasibility of using slag or wollastonite. While the slag is relatively cheap, transportation costs could be a concern.

Tubana is working on a different Soybean and Grain Promotions Board-funded project, unrelated to the silicon study, which evaluates planting dates and fertilization impact on cover crops in a soybean-corn rotation system. The main focus is determining management practices to optimize cover crops as a way of improving nutrient recycling.

“Cover crops assimilate nutrients that are supposedly left in the field during a fallow period,” said Tubana. “When the cover crop is chemically burned down, its accumulated biomass should benefit the main crop to follow.”

Wang has another distinct research project that started in 2018 and is partially funded with a Soybean and Grain Board grant. The study investigates how the micronutrients molybdenum, boron and iron chelates may benefit soybeans.

“We are testing these separately and in combinations in soybean fields at the Dean Lee Research Station in Alexandria and the Red River Research Station near Shreveport,” said Wang. “These micronutrients can influence nodule formation, and we want to find out if the micronutrients blend with major elements to promote transfer of nitrogen within plants.” **Randy LaBauve**



LSU AgCenter soil chemist Jim Wang works with mini-plot water sample collectors, which are used to trace how much nitrogen goes to the plant, soil and water. Photo by Randy LaBauve

Pest management research could save producers money

New research on pests in soybeans and corn should decrease the amount of money growers spend on pest control.

“After the cold weather we had this winter, we were expecting the numbers of redbanded stink bugs to be lower,” said LSU AgCenter entomologist Jeff Davis.

This should be the case for many of the insects that plague Louisiana crops. Researchers are watching the soybean looper very closely, he said.

In fields across the South, soybean loopers are now showing resistance to some pesticides.

Davis said his colleagues from across the South are sending him soybean loopers, and he is testing them for resistance. He is finding that some loopers have developed resistance levels so high that they will not ingest the pesticide.

The loopers are not a problem during the early part of the growing season but start showing up in high numbers in July, he said.

Research is also continuing on the control of the redbanded stink bug.

“Along with the redbanded stink bug, another pest that we’re looking at is the kudzu bug,” he said. “The kudzu bug is easy to kill, where the redbanded stink bug is a lot harder.”

Anything that kills the redbanded stink bug will also kill a lot of the other insects, he said.

Davis is also evaluating new integrated pest management tactics, which means using a number of different approaches to control insects. He is analyzing new chemicals, better timing schedules for spraying and improved winter cover crop management.

New chemicals coming soon do a good job of taking care of the redbanded stink bug, but they are not quite ready for release yet, Davis said.

Davis is working to find better timing schedules for sprays because when pests are at their highest, the beneficial insects are in the field, too.

When soybeans are in the R2 and R5 stages, the female-to-male ratio of the redbanded stink bugs is high. At this time of the year the females outnumber the males nearly two to one.

“The question is, can we time our sprays to target the females?” said Davis. “The problem is at growth stage R2 there are more beneficial insects in the fields.”

Davis is also studying ways to improve winter cover crop management.

“Cover crops do great things, like hold moisture and put nutrients back in the soil,” Davis said.

As soon as the stink bugs leave wheat fields, they will head for clovers, which may be used as a cover crop. From there they move on to soybeans.

“Actually, we’ve found that clovers are a better host for the redbanded stink bug than soybeans,” Davis said.

AgCenter entomologist Sebe Brown is studying several insect pest problems that need to be controlled in field corn and soybeans.

“In field corn, we are trying to provide the growers with the best information for the most common pests,” he said.

The study is in first year for corn and is showing corn earworms developing resistance to certain organisms in Bt pesticide.

Although Bt products are not performing as well as they have in the past, they will continue to be used, Brown said.

Brown is continuing his research on soybeans and is looking at different types of seed treatments because soybeans tend to be planted early, and slow growth could increase damage from insects.

“The slower the plants grow, the greater the chance of insects causing damage,” Brown said. “With early-planted soybeans, it’s a little like corn. Both are normally planted during suboptimal conditions.”

Brown is evaluating insecticidal control strategies, use rates and application timings against redbanded stink bugs, soybean defoliating caterpillars as well as corn earworm,” Brown said.

Brown said he is now reevaluating some of the older insecticides, which are still labelled for soybeans and examining different rates for effective control.

In another project, researchers are spraying a virus onto the soybean plant to kill loopers. Brown said the study is ongoing, and he hopes to have some results to share soon. **Johnny Morgan**



Sebe Brown, LSU AgCenter entomologist, inspects corn plants for insect infestations. Photograph provided by Sebe Brown

Three new scientists join AgCenter

The LSU AgCenter recently hired three scientists whose work aims to improve soybean and grain production in Louisiana. **Olivia McClure**



Todd Spivey

Todd Spivey was named the state soybean specialist in 2017 shortly after receiving his doctorate from North Carolina State University. His research background includes work in insect pest management, soil fertility, irrigation and long-term tillage systems.

As the soybean specialist, Spivey helps farmers, consultants, AgCenter agents and others with all aspects of soybean production. Spivey’s office is at the Dean Lee Research and Extension Center near Alexandria.



Lauren Lazaro

Lauren Lazaro, who joined the AgCenter in 2017, is a weed scientist who focuses on weed ecology and how management tactics affect weed populations over time. She received her doctorate from Southern Illinois University and previously was a postdoctoral researcher at the University of Arkansas.

Lazaro also conducts research on harvest weed seed control, and she teaches both undergraduate and graduate courses at LSU. She is based in Baton Rouge.



Sara Thomas-Sharma

Plant pathologist Sara Thomas-Sharma began working at the AgCenter in 2018. She earned her doctorate at the University of Georgia and completed postdoctoral training at Kansas State University and the University of Wisconsin–Madison.

Thomas-Sharma’s research interests include applying the tools of epidemiology, molecular biology and ecology to improve the management of diseases in field crops, especially soybeans. She is based in Baton Rouge, where she also teaches a general plant pathology course.

Scientists study irrigation practices

As irrigation has grown more common on Louisiana farms, LSU AgCenter researchers are studying the most efficient and beneficial ways to apply water to crops.

While farmers implement long-term fixes to improve the soil's water-holding capacity — such as planting cover crops and experimenting with poultry litter as fertilizer — irrigation is an immediate solution in dry times.

“It is more like an insurance plan for a dry year when the soil can’t hold the little rainwater we get in a dry year,” Davis said.

AgCenter scientists are studying which methods of irrigation can save water without sacrificing crop yields. They also are evaluating if soil moisture sensors can be used to schedule irrigation in Louisiana.

Davis is comparing two major types of soil moisture sensors available to producers. Volumetric water content sensors estimate the amount of water in the soil, and soil water potential sensors estimate the pressure the plant must use to pull water from the soil, Davis said.

“The sensors are basically a tool to tell you how much moisture is in the ground,” Davis said. “It’s up to the person using the sensor to interpret it.”

The study analyzes soybeans irrigated on schedules determined by the two types of sensors and another method, evapotranspiration, which relies on climate data and a mathematical formula to decide when to irrigate and how much water to apply. These three methods are compared against non-irrigated soybeans.

“This is a really good irrigation year because it is so dry in our area,” Davis said. “We are plugging along and getting everything out, so we are going to get some good results.”

In dry years sensors can help farmers save money by running pumps less and using less water, but the sensors have benefits in wet years, too, Davis said.

“Most of the crops we grow, like soybeans, don’t like to stay wet for too long,” Davis said. “It’s a delicate balance — understanding when it’s too wet and when that can affect your root growth.”

Sensors can show where roots are pulling water from, and farmers can use sensors to estimate root growth. They can also indicate soil compaction.

“They are basically your eyes under the soil surface,” she said.

Focused mainly above the soil surface, AgCenter agronomist Syam Dodla is studying the effects of different methods of irrigation and how to manage fertilizers with irrigation.

His research has found that skip-row irrigation, in which farmers only irrigate every other furrow in the field, doubles the area a farmer can irrigate at one time with a well and can help to minimize nutrient losses and soil runoff. The practice had no significant effect on soybean crop yields in clay soils, Dodla said. However, in very fine sandy loam soils, yields dropped from 6 to 46 percent, depending on the number of times the field was irrigated, the duration of dry spells and at which point in the crop growth stage the field was irrigated.

“It is also important to remember that our observations were from 40-inch-wide rows,” Dodla said. “The smaller row width could minimize the yield drop from skip-row irrigation in these light-textured soils.”

Dodla’s data show skip-row irrigation has no significant effect — and might have a small beneficial effect — on nutrient-use efficiency in clay soils. But sandy loam soils had a 10 to 12 percent drop in nutrient use efficiency.

“This result was because of lack of sufficient soil moisture in the non-irrigated furrow, which is essential for nutrient uptake by roots,” Dodla said. “The effect varies based on the length of time between irrigation events.”

In his research Dodla has found that overall soybean nutrient uptake is 22 percent better with irrigation.

“Many times lack of soil moisture leads to poor nutrient-use efficiency,” Dodla said. “This should be similar for any crop. Based on the duration of dry spells and the stage of the crop, the reported number could vary.”

Because irrigation is more common among soybean and feed grains farmers in Louisiana, producers also must adjust their fertilizer applications when irrigating fields, Dodla said.

“High vegetative growth and grain yields under good soil moisture availability necessitate higher nutrient needs,” he said. “Because of this, LSU AgCenter’s current fertilizer recommendations are higher for irrigated agriculture compared to non-irrigated.” **Kyle Peveto**



Water sprays from a pipe into the furrows of a field at Red River Research Station in Bossier City. Photo by Stacia Davis

Yield increases in wheat breeding program

The 2017-18 wheat crop was outstanding from a production and research standpoint, according to LSU AgCenter wheat breeder Steve Harrison.

Harrison said weather conditions made for a nearly perfect growing season.

“We had the highest yields and the highest quality ever,” Harrison said. “We also had the lowest acreage.”

AgCenter wheat specialist Boyd Padgett said disease pressure was the lightest he has seen.

In some variety trials and production fields, yields were over 100 bushels per acre — nearly double typical yields, Harrison said.

The excellent crop also helped Harrison make progress in his breeding program with good seed production and good data. The one downside, he said, was trying to decide which wheat breeding lines to advance and which to discard because they all looked good.

“We have a lot of good material to filter through,” he said.

The LSU AgCenter is part of the Sungrains collaborative wheat breeding program with five other universities. Harrison said he increased two breeding lines that were developed by Georgia Foundation Seed in Plains, Georgia, in cooperation with the University

of Georgia. AgCenter scientists are determining if those lines will be released.

Another critical component of wheat breeding is identifying molecular markers that link to desirable traits.

Through a graduate student research project that he co-advises with Harrison, AgCenter molecular biologist Niranjan Baisakh has identified about 15 genes — or markers — that control resistance to the herbicide Sencor.

“We’re trying to narrow it down to three or four that we can work with for routine screening of lines coming out of the breeding pipeline,” Baisakh said.

He also said he screened close to 600 LSU AgCenter wheat breeding lines for different makers linked to various traits — mostly Fusarium head blight.

Baisakh is using the high-throughput marker screening facility at the AgCenter H. Rouse Caffey Rice Research Station but hopes to have equipment on campus soon to expedite the process.

Harrison said these biotech tools greatly benefit conventional breeding methods.

Padgett evaluated the variety tests and incidences of diseases. He also completed a fungicide test in the southern part of the wheat-growing region.

“It was a quiet year; not a lot of scab,” Padgett said.

Harrison said the oat program also had a good year.

“We made a record number of oat crosses this year,” he said. **Tobie Blanchard**



A lush test plot of wheat is harvested at Winnsboro. LSU AgCenter wheat breeder Steve Harrison said the 2018 wheat harvest had the highest yields and quality for wheat during his 30 plus years of research. Photograph provided by Steve Harrison

Plant pathologists studying Cercospora leaf blight, the top soybean disease

Breakthroughs in research by LSU AgCenter scientists may soon lead to improved control of Cercospora leaf blight, the No. 1 soybean disease in Louisiana.

Since the discovery illustrating that more than one species of the Cercospora pathogen may be involved in the disease, research to isolate, screen and manage the disease has escalated.

Optimum management strategies for Cercospora leaf blight and purple seed stain

Vinson Doyle, LSU AgCenter assistant professor of plant pathology, is looking beyond soybean seed for potential inoculum sources of Cercospora disease presence in soybeans.

Surveys conducted in soybean fields across the state found *Cercospora flagellaris* to be the most prevalent species associated with foliar symptoms in Louisiana, while *Cercospora kikuchii*, long believed to be the primary culprit, was not found.

Cercospora kikuchii is generally thought to be host-specific, or at least show some preference for soybeans and their relatives. *Cercospora flagellaris* has a broad host range, which raises the question that other sources of the inoculum may exist, Doyle said.

Looking at seed, soils, alternative host species and plant debris, Doyle said the project recognizes the widespread nature of the *C. flagellaris* in order to determine the best management strategies.

Doyle and his students first optimized a protocol to eliminate all microbes from soybean seed, then planted, evaluated and compared disease pressure with plants from non-treated seeds.

After two years of seed treatment research, Doyle found no reduction in disease incidence and severity among plants grown from fungicide-treated seed, suggesting that seed may not be the most important source for the Cercospora pathogen.

“Here is one line of evidence that the disease is not principally seedborne,” he said.

Another component of the study compared different seed lots to characterize the diversity of Cercospora in seed before it is planted. Doyle collected blighted leaves from field plot trials to isolate and characterize the species by community predominance.

A follow-up study to isolate the species from seed collected in the trials is underway to characterize the pathogen community on that level, he said.

Molecular biology to control soybean diseases

AgCenter professor of plant biology Zhi-Yuan Chen is using a unique protocol to trigger an immune response in soybeans as a potential strategy for suppressing both soybean rust and Cercospora leaf blight.

Also known as host-induced gene silencing, the process affects only the cells of the pathogens rather than causing interference with plant cells, Chen said.

The technique involves isolating and producing specific RNA molecules of the Cercospora pathogen in the lab and inoculating them onto soybean plants to trigger an immune system response to reduce pathogen growth, he said.

Chen hopes to isolate target sequences in the pathogen that can control fungal growth and develop a management strategy that is both effective and affordable.

Microplot trials analyzing performance of the pathogen suppression protocol in the field will be conducted this year, he said, adding that more than 10 RNA sequences have been isolated and tested in the lab to narrow the targets that work best.

Iron formulations in managing for Cercospora leaf blight

Sara Thomas-Sharma, AgCenter field crop pathology assistant professor, assumed responsibilities in April for two studies begun by retired plant pathologist Ray Schneider.

In one study, researchers are applying foliar sprays and soil amendments to study how iron availability can affect Cercospora growth in soybeans.

By applying iron externally, or by controlling the iron nutrition in the plant, Thomas-Sharma said, symptoms can be reduced even if the fungal presence has not changed.

“Cercosporin toxins can bind to iron, so we think that by managing the iron nutrition in the plant, we can bind the toxin to reduce the symptoms and subsequent effect on yield,” she said.

Rapid lab protocol for screening for Cercospora leaf blight

Thomas-Sharma is also continuing research on the development of a rapid screening protocol designed to produce repeatable results that can effectively rate Cercospora susceptibility in soybeans in the lab.

“The lab provides greater control with decent reproducibility in showing a good range of resistance between varieties,” said Brian Ward, an AgCenter postdoctoral researcher working on Cercospora resistance testing.

The study uses leaf discs suspended in solubilized Cercosporin to study how carotenoid and chlorophyll levels in the plant are affected, then establishes standardized scores to rate different soybean varieties based on cell damage.

If lab results consistently compare favorably with resistance ratings from field trials, a reliable lab protocol for screening a large group of plants for resistance will be helpful for breeders, Thomas-Sharma said.

“We are doing some final testing to be sure it works well, is repeatable and will correlate with field data before we send it to the breeders,” Thomas-Sharma said.

Management strategies for soybean diseases

AgCenter plant pathologist Trey Price is hoping for a breakthrough in a breeder-driven project that is being conducted in 15 locations across six states in the Midsouth where Cercospora leaf blight is a problem.

Breeders and pathologists are using identical rating systems while looking for results that are consistent across locations, he said.

The project also aims to identify high-yielding plants resistant to Cercospora blight and other diseases, such as frogeye leaf spot, target spot, brown spot and aerial blight, and includes field trials of 500 plant introductions representing a wide range of soybean diversity.

“We have seen some promising plant introductions that seem to show resistance to these pathogens,” Price said.

Because no consistently effective fungicides are presently available against Cercospora blight, Price said foliar applications are not recommended unless significant disease pressure from other fungal pathogens are present.

Frequent rainfall events, moderate temperatures and very long dew periods last year provided a host-pathogen environment for Cercospora leaf blight that led to yield losses in soybeans estimated at \$80 million across the Midsouth, Price said.

“Many growers plant soybeans early to avoid yield-reducing symptoms from Cercospora blight, harvesting as early as August before disease pressure is highest,” he said, adding that the disease is most often found in varieties that mature later or are planted later.

Price said selecting resistant varieties should be based on ratings available from AgCenter experiment stations closest to the producer’s farm.

“Use ratings taken over multiple years and in multiple locations to get some consistency across locations,” he said.

Planting early to escape foliar disease symptoms and avoiding planting soybeans after soybeans is also recommended as a management strategy, Price said.

Karol Osborne



LSU graduate assistants Maria Izabel Costa De Novaes and Marija Zivanovic are conducting a study in the lab using different double-stranded RNA sequences to evaluate their effect on pathogen gene silencing and suppression on various diseases, including Cercospora leaf blight. Photo by Karol Osborne

Cover crop research improving yield, enhancing soil health

LSU AgCenter scientists are working to determine how winter cover crops grown in the offseason can be used to help farmers improve yields, reduce expenses and enhance soil health.

Changyoon Jeong, LSU AgCenter agronomist, is studying the potential for rapeseed to provide protection against nematodes in soybeans. Rapeseed puts glucosinolate into the soil, and that tends to suppress nematodes, he said.

Jeong is also working with a combination of rapeseed and hairy vetch to see how much carbon and nitrogen is added to the soil by the plants.

He said an evaluation will be done to see if hairy vetch and rapeseed increase crop yield. The project also examines whether the microbial community was affected by the two cover crops.

Lisa Fultz, an LSU AgCenter soil microbiologist, is wrapping up a four-year study on using legume cover crops to reduce the amount of nitrogen needed for corn.

Corn yields increased 10 to 20 bushels an acre on fields planted with crimson clover, hairy vetch and winter peas compared to fallow fields, she said, and it's likely the legume cover crops added nitrogen to the soil.

"It looks like we are making use of some of that nitrogen," she said.

But soybeans grown where cover crops were planted did not show a similar yield increase, she said. Her study also showed that following some cover crops, nitrogen could be reduced by half to 80 units, and the same corn yields would be obtained as plots fertilized with 160 units.

Benefits, in addition to any yield increases, are being evaluated. For example, she said plots planted to cover crops were weed-free for planting. Cover crops also reduce erosion and add organic material.

She said the Louisiana Soybean and Grain Research and Promotion Board funding for the cover crop study helped leverage federal money for a statewide cover crop study for cotton, sugarcane, soybeans and corn at 16 locations throughout the state.

Brenda Tubana, LSU AgCenter agronomist, is studying planting dates and optimum fertilization rates for effects on cover crops' biomass production and nutrient recovery.

She said the September and October plantings for hairy vetch, crimson clover and tillage radish had better plant stands and biomass production than the

November planting of these cover crops. Applications of 15-15-15 fertilizer showed enhanced growth of the three cover crops.

Josh Copes, LSU AgCenter agronomist and weed scientist, is studying various mixes of cover crops in rotations of corn-soybeans, corn-cotton and cotton-soybeans in both minimum tillage and conventional tillage systems.

"This is looking at what cover crops are doing not only to yield but also to the soil," Copes said.

Cover crops include hairy vetch, cereal rye and black oats, and mixtures of cereal rye plus hairy vetch and black oats plus hairy vetch. Cover crop mixtures are in a ratio of 70-30 or 30-70 ratio of cereal rye to legume cover, respectively.

Copes is also studying how cover crop termination dates affect crop yield, soil properties and nematode populations. This study is conducted in both minimum tillage and conventional tillage systems in rotations of corn-soybeans; corn-cotton; and cotton-soybeans.

Cover crops in all rotations are a mix of black oats and hairy vetch in ratios of 70-30 or 30-70 of black oats to hairy vetch, respectively, depending on what crop is being grown. Termination of dates of cover crops are six, four, and two weeks before planting corn (March 15), cotton (May 1) and soybeans (April 15).

Results from planting in later-terminated cover crops is showing soybeans in the early reproductive stages have spindly growth, he said, because of plants trying to grow above the crop canopy.

Syam Dodla, LSU AgCenter agronomist, said his research has shown that soil compaction associated with no-till systems is lessened by adoption of winter cover crops. Additionally, weed management is simpler under cover crops compared to fallow ground that minimizes weed issues during main crop, and incorporating legume cover crops also helps fix nitrogen in the soil.

A long-term fertilization study for the rotation of corn and soybeans is showing that corn removes more phosphorus than soybeans, but less potassium.

Results from 2017 showed corn removed 25 pounds of phosphorus per acre, compared to 15 pounds for soybeans. In the same year, corn removed 32 pounds per acre of potassium, compared to 40 pounds for soybeans. **Bruce Schultz**



Josh Copes, LSU AgCenter agronomist and weed scientist, inspects soybean plants at the LSU AgCenter Northeast Research Station. Photo by Bruce Schultz

Scientists developing nanoparticle technology to fight insects

Cristina Sabliov, LSU AgCenter biological engineer, is working with other scientists on a project using nanoparticles carrying insecticides to control insects.

Nanoparticles in the shape of tiny spheres are created by Carlos Astete, LSU AgCenter biological engineer, from a corn protein, zein. They are designed with a positive charge so they will attach themselves to plant tissue.

These minuscule particles are only 100 nanometers in diameter. For comparison, a human hair is 50,000 nanometers wide.

While the project is aimed at soybean loopers, it's possible that the nanoparticles could be used against other pests, or as delivery vehicles for fungicides and fertilizers, Sabliov said.

The scientists are studying whether nanoparticles improve insecticide efficacy while also attempting to determine what effects the nanoparticles have on plants and where the nanoparticles travel in the plant system.

“We want to make sure our particles stick to the plant and kill the loopers, but we don’t want the particles to be detrimental to the plant,” Sabliov said.

The plants are grown by LSU AgCenter biologist Sara Navarro. The nanoparticles can be introduced to the plants either hydroponically or with a foliar application.

Jeff Davis, LSU AgCenter entomologist, said the insecticide methoxyfenozide, which is sold under the trade name Intrepid, was used successfully with nanoparticles, and loopers were killed. But the loopers also were controlled with applications of nanoparticles that were not coated with the insecticide.

Loopers that were not killed showed weight loss, Davis said.

But Davis said more work is needed to determine why the untreated nanoparticles controlled the insect.

“We still want to know the why and how,” he said.

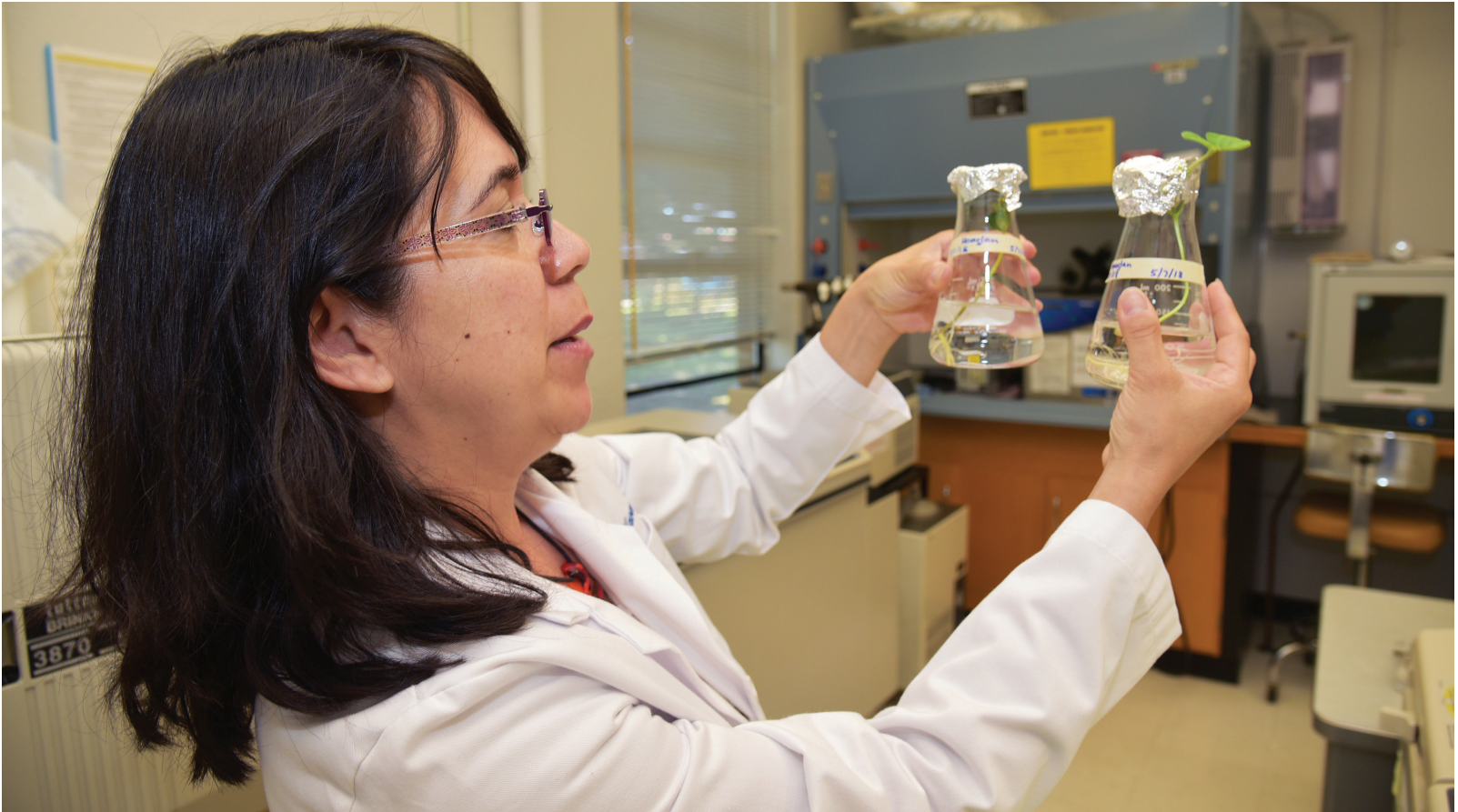
Sabliov said the board’s willingness to fund the project reflects a forward-thinking vision. She said several chemical companies have expressed interest in the concept, but it will take years of work to develop a project.

“This is not something you will see on the market next year,” she said.

Bruce Schultz



Carlos Astete, LSU AgCenter biological engineer, prepares a batch of nanoparticles to be used to carry insecticides to control soybean loopers. Astete makes the nanoparticles from a corn protein. Photo by Bruce Schultz



Sara Navarro, LSU AgCenter biologist, with soybean plants grown in the lab that will be used to test the effectiveness of nanoparticles coated with insecticides. Photo by Bruce Schultz

Agricultural economists explore tools, models to maximize irrigation efficiency

Water may not be as scarce in Louisiana as it is out west, but when it comes to irrigation, farmers in our state face challenges with changing governmental regulations, resource availability, environmental sustainability and profitability. A number of LSU AgCenter research projects are addressing these issues.

Over the last two years, AgCenter agricultural economist Naveen Adusumilli, with the help of research associates and field agents, has been analyzing changes in irrigation policy. A portion of the project includes sharing developmental updates with farmers throughout the state, at research station field days and various meetings, such as pesticide certification trainings.

“We wanted to look into these issues — what we call irrigation policy or water policy reforms—and then identify how that would have an impact on our grain and soybean farmers and their production as a whole,” said Adusumilli.

When the Louisiana Legislature passed a 2016 bill to increase taxes on equipment used for irrigation, like poly pipe and off-road diesel, Adusumilli tried to estimate what was the economic burden on farmers.

Armed with those research findings, the Legislature included waivers for farmers. The AgCenter held workshops to teach farmers about the waiver process and about irrigation tools that could help them improve their net returns.

As a result of that work with farmers and extension agents, AgCenter researchers have also developed an app for corn, cotton, soybeans and sorghum.

“This gives farmers the option to select certain efficiency practices,” said Adusumilli. “We put in all the production costs, all the economic incentives and the final number the farmer sees is the net return.”

Adusumilli said he received positive feedback from farmers.

The U.S. Department of Agriculture National Resources Conservation Service is a major contributor to cost-share programs for farmers, including certain irrigation efficiency practices, according to Adusumilli.

Some related AgCenter work also focuses on soil management and cover crops. After collecting information from NRCS, Adusumilli and his team have been working

with farmers to collect cover crop production costs and develop an app similar to the irrigation one.

AgCenter agricultural economist Krishna Paudel is attempting to identify the most efficient levels of irrigation for soybeans and other row crops.

Mississippi laws already require farmers in the Mississippi River Valley Alluvial Aquifer (MRVA) to measure and — in some cases — limit their use of water because of aquifer decline. Across the river, Louisiana has no such restrictions.

“If you extract more and more water, the water level could, at some point, become overdrawn,” said Paudel. “So the purpose of this research is really looking at when we need to irrigate, how much we need to irrigate and how’s that going to impact crop yield.”

There are more than 13,000 irrigation wells in Louisiana, according to Paudel. In addition to the potential for water being unnecessarily overdrawn, there are concerns of regulations that don’t take into account water levels necessary to grow a profitable crop.

“What if the day comes where government agencies see the aquifer water level has really gone down, and they come up with a groundwater extraction limit per acre of irrigated crop grown?” asked Paudel. “We have no information about how much water to apply for a profitable yield, and that’s what we’re trying to find out.”

The irrigation measurement project, centered primarily in the North Louisiana MRVA, attempts to gather information from soybean producers over the next two or three years and will then move to research other crops. When the most efficient levels are identified, this will give farmers an important model to help them optimize their profit level, according to Paudel.

“This is a serious problem because we need a balance for a long-term sustainable farming system while meeting environmental needs,” he said. “We want to continue extracting groundwater in the long run and sustain Louisiana agriculture.” **Randy LaBauve**

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Unmanned aerial vehicles: A set of eyes in the sky

LSU AgCenter agents are moving into the high-tech area when it comes to scouting soybean and corn fields in the state.

For the past three years, AgCenter agents Dennis Burns in Tensas Parish and R. L. Frazier in Madison Parish have used unmanned aerial vehicles, commonly known as drones, to take whole-field images to assess the health of plants.

Burns said there are companies that specialize in taking photos with the UAVs, but most will tell you they are not agronomists. They only take the pictures. They don't interpret them.

UAVs are not being used to diagnose insect problems or other issues in the field, but they give a snapshot of what the field looks like at any given moment during the growing season, Burns said.

"We are really looking for anomalies," Burns said. "We are able to look at comparisons to see changes that are taking place in the field."

For whole-field images, the UAVs are flown at 400 feet, he said.

"What we've learned from flying these routes is crop progress over time," he said. "It gives the grower an extra set of eyes."

Crop consultants are gradually getting more involved in using UAVs as part of their work, he said.

"It doesn't matter how the photos are taken, whether with a UAV, fixed-wing plane or with satellites, the field will still need to be walked to get a true picture of what's out there," Burns said.

If growers want to start flying their own drones, they can get up and running with an investment of about \$1,500.

Burns said the UAV photos should be taken about three times per year to provide general information on crops and conditions.

Much of Burns work is done in soybean fields, but growers of other crops are also taking advantage of the technology. AgCenter agricultural engineer Randy Price is using the technology to determine the proper amount of nitrogen to apply in corn fields.

His research separated the field into strips and nitrogen was applied at various rates to check how the plants responded.

"We are trying to collect high-frequency data using different cameras and taking images every week," Price said. "Turns out, all of them give similar data."

The images captured across the fields could be helpful to farmers who want to know what nutrients may be lacking in or being overused in his fields.

"My work with AgCenter corn specialist Dan Fromme involves looking at the optimum amount of nitrogen to use on corn with the help of the drone technology," Price said.

For now Price is only taking pictures, but some drones can actually carry a payload of chemicals or fertilizer. Price said he is not currently using the drones to make chemical applications, but the possibility is there if the need arises.

Johnny Morgan



LSU AgCenter engineer Randy Price holds a drone at the Northeast field day in June 2014. Photo by Olivia McClure

LSU AgCenter researcher looks at no-till systems

Syam Dodla, LSU AgCenter agronomist, is studying fertilization rates in no-till fields for corn and soybeans.

“Compared to conventionally tilled soils, soils in no-till fields have different structure and properties with varying amounts of nutrients found in layers of the soil profile,” he said.

No-till systems have higher soil organic matter content and microbial population.

Dodla said some studies have shown 20 percent more nitrogen is needed for optimum field corn production for the first few years of no-till production. Current LSU AgCenter fertilizer recommendations are based on many years of fertilizer trials in conventional tillage systems and lack nutrient recommendations for no-till systems.

Dodla is currently studying split applications of nitrogen for corn, comparing the results with a single application, in addition to comparing liquid and solid nitrogen fertilizers at two rates (200 pounds per acre versus 240 pounds per acre) for no-till systems.

Dodla is testing corn nitrogen fertilizer applications at three different timings: 100 percent at 2-leaf stage; 25 percent at 2-leaf stage, 75 percent at the 6-to-7-leaf stage; and 25 percent at 2-leaf stage, 50 percent at 6-to-7-leaf stage and 25 percent at tasseling. The same study is also replicated under conventional tillage system and in two soil types (clay and sandy loam soils) to develop optimum nitrogen management for corn in no-till systems with different soil types.

Another test involves planting soybeans after cotton, comparing no-till and conventional tillage.

Dodla said the no-till plots have been slower to develop, especially in clay soils, probably because of the relatively compacted topsoil compared to tilled soils.

He is looking at the phosphorus and potassium fertilization rates for no-till soybeans. The study evaluates use of granular fertilizer versus liquid fertilizers and application rates. In addition, Dodla wants to see if soybeans in a no-till field would benefit from a booster application of nitrogen at planting.

Dodla said soil compaction associated with no-till is reduced by including winter cover crops.

Weed management is simpler under cover crops compared to fallow ground that minimizes weed issues during main crop. Incorporating legume cover crops also helps add nitrogen to the soil, he said. **Bruce Schultz**



Syam Dodla, LSU AgCenter agronomist, at a corn plot at the Red River Research Station. He is studying split fertilizer applications on no-till corn. Photo by Bruce Schultz

Louisiana Soybean & Grain Research & Promotion Board Report



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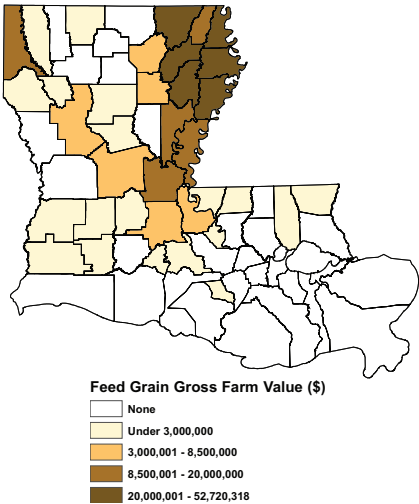
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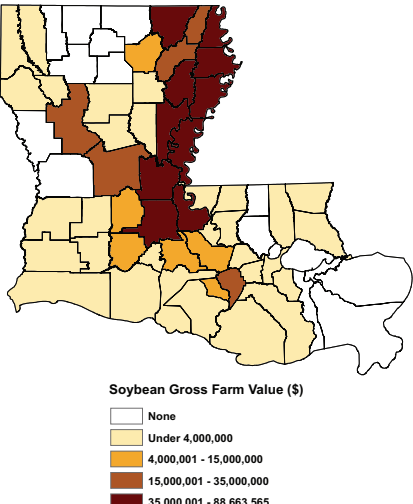
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Total value of Louisiana feed grain production in 2017: \$372.1 million



Total value of Louisiana soybean production in 2017: \$798.2 million



Total value of Louisiana wheat production in 2017: \$3.0 million

