



THE LOUISIANA
Soybean & Grain
RESEARCH & PROMOTION BOARD

2023 REPORT

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Bones, beans and building first-of-its-kind quality-assessment machine

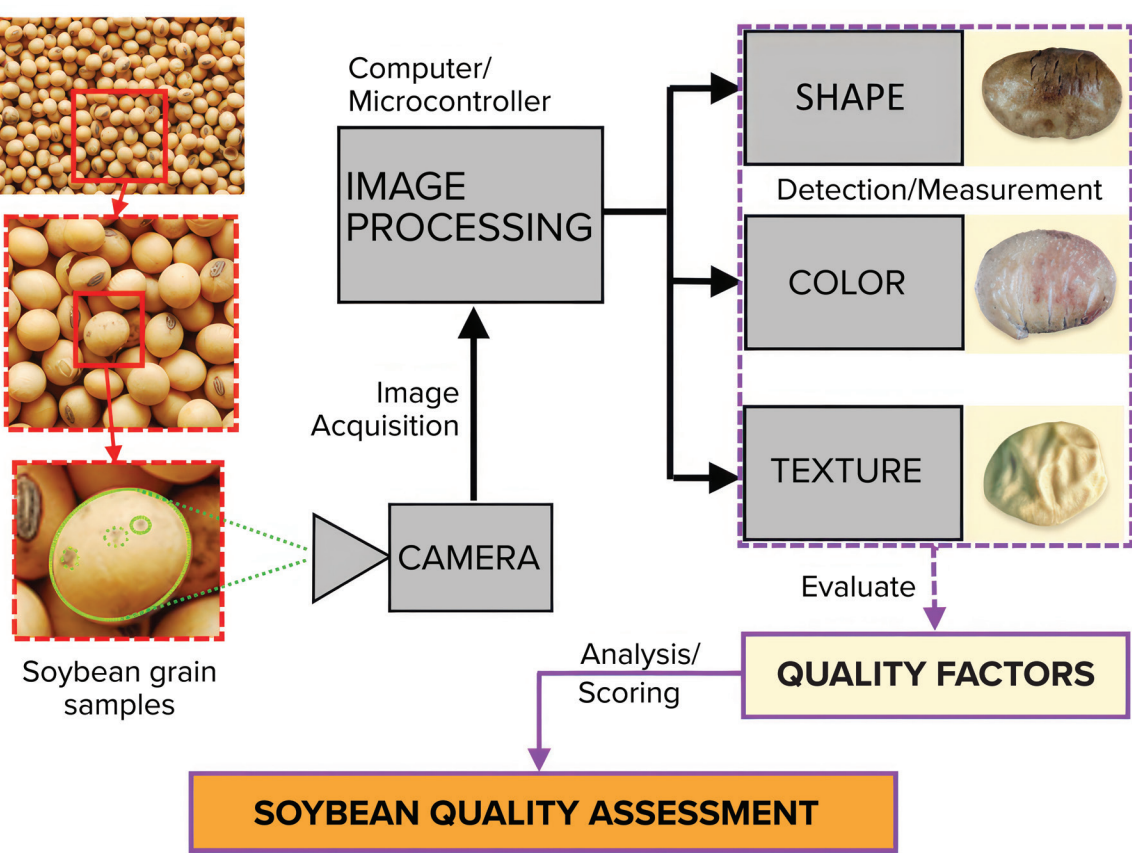
What do bones and soybeans have in common? They both have defining traits that can be analyzed through imaging, and just as LSU AgCenter engineer Kevin Hoffseth has digitally imaged and analyzed bone quality for many years, he's relied on that specialized expertise to invent a technological system for improved evaluation of soybean quality.

"What I do in both of these areas is connected by trying to say something about how good something is," said Hoffseth. "We're putting together a machine to distinguish and assess soybeans in a way that hasn't been done before, as far as I know."

Soybean producers have been concerned with undue variation of inspection and grading — whether the process was accurately reflecting the quality and grade of their beans. Hoffseth, in 2020, began research targeting an automated image-based system to develop more consistent, accurate assessments of quality.

"The warehouse inspector is put under the continual stress of analyzing large numbers of truckloads at harvest time," said Hoffseth. "Inspection is a manual process where a person judges visual factors that indicate quality, and that rating affects the money that farmers can make."

Inspections assess bean quality based upon color, texture, shape and any notable damage, such as visible mold or shriveling. Inspectors use U.S. Department of Agriculture standards to rate a batch of soybeans as one of five different grades.



From the
Louisiana Soybean and Grain
Research and Promotion Board

What do you do when you have a potential record crop, but lose much of it in two weeks’ time when a system of rain sets in? You buckle down and farm forward in hopes of doing it again.

The 2022 harvest brought a host of challenges to our soybean and grain farmers in Louisiana. All of the research we support as a board seemed to come together to support a lot of great farms looking at a very bountiful crop. That all changed rapidly as rain set in across our state.

Now in the 2023 crop, Mother Nature is giving us the opposite challenge — not enough rain. We also faced challenges in the wheat crop and early corn crop with a late freeze. However, our years of study and practice through our research and extension partners have once again given us the opportunity to look forward to a harvest and bringing in our crops with success.

The Louisiana Soybean and Grain Research and Promotion Board serves as Louisiana’s wheat and corn checkoff and facilitates the national checkoffs for soybeans and grain sorghum in Louisiana. As a collective representation of farmers from across the state and across these represented crops, we strive to collectively administer funds for research specific to the needs of Louisiana while contributing to larger market promotion and advancement of these important crops.

However, this checkoff system is once again in question with members of Congress. But for those of us who have worked in it and contributed to it for so long, we know how valuable it can be. One priority for your Louisiana Soybean and Grain Research and Promotion Board in the coming year is to determine how we can better share this good work and research results with you. Our efforts are only useful if those who contribute are receiving the return on their investment through the information they receive.

With a host of new members on our board last year, we began to examine why many of them weren’t aware of the great projects the board was funding until they were on the board. So, for 2023 and into 2024, we hope you will look beyond just this annual report and continue to further engage with our contracted partners who carry out the work that benefits soybean, corn, wheat and milo farmers throughout the state. Your checkoff board wants to get your information out to you!

One specific project the board has been funding is getting more attention because of the challenges we faced with grain quality during harvest. Louisiana State Sen. Glen Womack created the Task Force on Louisiana Automated Grain Grading through the Senate Concurrent Resolution No. 31 in the 2023 legislative session. Our board should be a great resource for this group, as we have been funding a project for three years to create grading technologies that will benefit the farmer.

Beyond grading, our board continues to focus your dollars on applied research that generates better yields and returns back to you. The checkoff is a very fruitful investment if you will just dedicate a little time, along with your pennies, to absorb the knowledge and education your money is generating.

So, get involved, share your thoughts and questions, and let’s make this a great year for research and promotion of soybeans, corn, wheat and grain sorghum. We have a lot of excitement occurring with our partners at the LSU AgCenter. We have attention and interest from our legislators. And we have a board of farmers that are volunteering their time to collectively achieve a better opportunity for Louisiana farmers. With those pieces, I believe we can once again produce results that each of you can be proud of. Thank you for your support, and thank you for your contributions to our checkoff. Sincerely,

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



Soybean and Grain Research and Promotion Board members front row from left: Joey Olivier, Charles Cannatella, Joey Boudreaux and Garrett Marsh; and back row from left, Kellon Lee, Kody Beavers, Luke Sayes, Wil Miller and Burch Pierce.

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DeWitt joins AgCenter
as wheat breeder

Noah DeWitt joins the LSU AgCenter wheat breeding program. DeWitt is originally from North Florida and earned a Bachelor of Science in plant genetics from the University of Florida. He said his motivation in pursuing plant genetics came after watching Florida’s citrus industry struggle with major diseases. He received his doctorate in crop science and genetics at North Carolina State University working on understanding the relationship between wheat development and yield variation.



DeWitt

After earning his doctorate, he ran a U.S. Department of Agriculture wheat breeding program in Raleigh, North Carolina, focused on grain quality and rust resistance, along with coordinating regional wheat nursery trials.

He now helps run the wheat breeding and research program at the LSU AgCenter with Stephen Harrison. His work focuses on using genomic tools to understand genotype by environmental interactions and accelerating the rate of genetic gain for yield in wheat while improving plant disease resistance. As part of this program, he works on optimally incorporating DNA marker information on major disease-resistance genes into selection decisions, testing new models for environment-specific yield predictions, and coordinating with other members of SunGrains, the southern wheat breeding cooperative, to run trials for yield and disease resistance.

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The first couple years of the project were spent researching and developing image processing algorithms and programming implementation. Hoffseth and his graduate students also worked on acquiring and building hardware, such as specialized camera stations, to build visual-based setups for quality assessment that should assist the grading process.

“The programming needs to be set up to see the same thing each time and that saves a lot of work, saves a lot of problems and makes it the quickest,” said Hoffseth.

Most recently, Hoffseth’s team has been creating prototype machinery to, among other things, address:

- Analyzing texture.
- Developing mechanisms to move grain past the cameras.
- Establishing greater speeds for imaging.
- Establishing ideal resolution of images.
- Determining the best image compression for saving useful information.
- Controlling lighting for consistent results.
- Creating an optimized image storage system.

“We’ve been working to develop new and improved algorithmic approaches for image processing analysis methods to look at these soybeans and give quantitative values,” said Hoffseth. “We’re looking forward to getting these prototypes finished so that we can do some initial experiments at farms.”

Hoffseth and the LSU AgCenter Office of Intellectual Property have applied for a provisional patent for the technologies they’ve already developed. A crucial part of the project’s future success, however, will be the creation of a large database of soybean images used alongside big-data applications, said Hoffseth.

“That becomes super valuable because there’s this immediate need of building a database of our locally grown varieties in Louisiana and understanding the trends,” said Hoffseth. When they have these stored images, they can run analyses on them, keep them for future reference and then run them on future applications.

Soybean producers have also approached Hoffseth about assessing oil and protein content in their beans. That could be done with various types of infrared technologies.

“That’s a wonderful thing that can come as an outgrowth of this work,” said Hoffseth. “As of now, that’s (inspecting oil) not part of the inspection and grading process, but farmers, when their beans are damaged, want to know whether they could still have value because of good oil content.”

Hoffseth said these technologies are not meant to replace the inspector, but to offer tools for helping quickly come up with consistent and accurate results. Louisiana harvested nearly 1 million acres of soybeans in 2020, so this new customized technology could be very useful to many farmers in the state, and even to farmers nationwide. The invention also holds potential for use with other similarly sized grain crops, according to Hoffseth.

“If we can quantify and take out a lot of variability and subjectivity in how those soybeans are graded,” Hoffseth said, “it can be a huge factor in making everyone’s life easier.” **Randy LaBauve**

Economist creates helpful budgeting tools for soybean, grain producers

After “tremendous” rises in costs for chemicals, fertilizer and fuel over the past two years, LSU AgCenter economist Michael Deliberto expects to see a slowdown in the rate of increase for inputs in 2023.

However, profit margins will be tight as market prices are not expected to be as high as last year.

“Margins are going to continue to be stressed in 2023 simply because as quickly as commodity prices fall, input prices are slow to fall,” Deliberto said.

Because almost every decision matters to a farmer’s bottom line, Deliberto has worked to create free budgeting and economic tools to assist Louisiana producers in planning their crops.

These tools, which are customizable spreadsheets available at [LSUAgCenter.com](https://www.lsuagcenter.com), help producers develop custom estimates using various scenarios for prices and yields. The spreadsheets allow farmers to compare the cost of production with other years and track their historical production costs. Grants from the Louisiana Soybean and Grain Promotion Board have helped fund these tools.

“By allowing our tools to be distributed in a spreadsheet form, it provides the growers the opportunity to really look at site-specific factors,” Deliberto said.

The tools also help producers estimate how changes — such as buying or renting tracts of land, hiring labor, irrigating more or using a more robust herbicide regimen — will affect their profits.

“We try to get as specific as we can while working within the limitation that every situation is different,” Deliberto said. “We’re providing tools to the growers that they can use to tailor these things to be more reflective of their particular production situation.”

Another aspect of Deliberto’s work funded by the Louisiana Soybean and Grain Promotion Board is providing tutorials to growers about new crop protection offerings.

As the federal Farm Bill has emphasized crop protection as a risk management tool, Deliberto said, the U.S. Department of Agriculture has developed new crop insurance products designed to work with traditional revenue or yield protection policies. He also provides Farm Bill support program analyses for the USDA Agriculture Risk Coverage (ARC) and Price Loss Coverage (PLC) programs.



Soybeans are transferred into a terminal before being loaded onto a barge for transport to New Orleans, where they will be shipped overseas. Photo by Lance Cheung/U.S. Department of Agriculture

“There are a lot of ‘what if’ analyses, a lot of scenarios,” he said. “This allows us to illustrate the effectiveness of these risk management tools but also defines the types of risks that they’re designed to mitigate, whether that is price or yield risk.”

To help keep producers apprised of important economic news, Deliberto produces monthly market reports and quarterly policy reports. Both are available at [LSUAgCenter.com](https://www.lsuagcenter.com).

Soybean budgeting tools are available at <https://www.lsuagcenter.com/topics/crops/soybeans/budgets>. Corn budgeting tools are available at <https://www.lsuagcenter.com/topics/crops/corn/budget>. **Kyle Peveto**

AgCenter economist educates producers on conservation funding sources

AgCenter economist Naveen Adusumilli is finding ways to reach out to agricultural producers and educate them on the federal and state programs that pay subsidies for on-farm water and soil conservation methods such as cover crops or reduced tillage.

Adusumilli and his team search news reports and government websites and bulletins to find U.S. Department of Agriculture program updates, funding allocations and new conservation initiatives which they disseminate via a monthly newsletter and the Louisiana Agriculture Policy account on X, formerly known as Twitter (@LA_AgPolicy).

Following the various programs that assist producers takes a great deal of work, Adusumilli said.

“Few farmers are so proactive that they would constantly keep checking these programs so that they can take advantage of those funds that are available,” he said.

Agencies that pay subsidies, such as the Louisiana Department of Agriculture and Forestry — which works through 44 local soil and water conservation districts in the state — and the federal Natural Resources Conservation Service (NRCS), are often understaffed. While they do take calls and answer questions from producers, the producers need to know what programs exist and how they can access them.

The NRCS pays subsidies through the well-known Environmental Quality Incentives Program (EQIP) and Conservation Stewardship Program as well as other programs, including the Mississippi River Basin Healthy Watersheds Initiative and National Water Quality Initiative.

“If farmers can understand how to navigate their conservation adoption, they can dip into these little pots of money that are available, and they can improve conservation practices on the ground,” Adusumilli said.

Adusumilli and three students help find these opportunities and create the monthly, two-page Louisiana Commodities and Conservation Newsletter, which is sent to NRCS office staff and to AgCenter Extension agents, who then send it to interested producers.

Adusumilli also worked on an agricultural subcommittee for Gov. John Bel Edwards’ task force that developed the Louisiana Climate Action Plan (Tasks 14, 15 and 16). Over a year and a half, Adusumilli and the other subcommittee members discussed what kind of funding the state should support for agricultural producers and how it should reach them.

One topic they discussed is how to work with the NRCS to develop a program where funds are routed through federal climate action initiatives to the state to expand conservation activities for 10-year periods.

“When there are funds within programs available for a longer number of years, there will be more interest from farmers to continue that activity,” he said.

Adusumilli also leads economics graduate students in evaluating how the conservation programs are implemented, developing data on how the initiatives are adopted in Louisiana.

Some states have more programs and bigger budgets to support conservation.

“We are aware,” Adusumilli said, “and we are trying to find ways to fill in those gaps.” **Kyle Peveto**



Above: LSU AgCenter plant pathologist Trey Price looks for signs of root disease as part of his disease management study at the Macon Ridge Research Station in Winnsboro.
Below: LSU AgCenter plant pathologist Boyd Padgett checks wheat for disease pressure at the Dean Lee Research Station in Alexandria. Photos by Johnny Morgan

Disease management in grains is goal of statewide research

Plant scientists agree that one of the greatest limits to yield in row crops in Louisiana is disease pressure.

LSU AgCenter plant pathologists Boyd Padgett and Trey Price have begun a three-year study to develop disease management programs for grain crops in central and south Louisiana.

Padgett said the climate in central and south Louisiana is conducive for the development of many diseases impacting soybean.

“From 2015 to 2019, diseases reduced yield an estimated 10%-20%,” he said. “Aerial blight, Cercospora leaf blight, frogeye leaf spot and target spot are just some diseases that can negatively impact yield and quality if not managed.”

In some instances, successful disease management must employ multiple practices. Therefore, management programs using multiple strategies need to be developed.

An effective disease management program begins with genetic resistance. Disease resistant varieties usually are no more expensive than susceptible varieties and could eliminate or reduce the need for a fungicide.

Padgett said his goal is to evaluate varieties entered in the LSU AgCenter Soybean Official Variety Trials not treated for disease resistance. He will then compare the results (disease and yields) of the official variety trials treated with fungicides to those not treated with fungicides.

“We also will evaluate the impact of disease development in varieties planted at various planting dates,” Padgett said.

In soybeans, genetic resistance is particularly important for managing Cercospora leaf blight and frogeye leaf spot, since strobilurin and thiophanate methyl fungicides are no longer effective due to pathogen resistance, he said.

To identify high-yielding disease resistant varieties LSU AgCenter scientists evaluate commercial and experimental varieties every year in official variety trials.

Trials are conducted on seven experiment stations. Trials in central and south Louisiana are normally treated with a fungicide to minimize the impact of disease.

Therefore, varieties in these trials at these locations cannot be evaluated for resistance to naturally occurring diseases. Additional official variety trials not treated with a fungicide are needed to evaluate disease resistance at some of these locations.

To evaluate varieties for resistance to naturally occurring diseases, an additional official variety trial (side by side if possible) will be planted on the Dean Lee Research and Extension Center and Doyle Chambers Central Research Station.

At each location one official variety trial will be treated with a fungicide, and one will not receive an application. To assess genetic resistance and the benefit



of a fungicide, varieties will be monitored for disease development in each trial. To determine the impact of fungicide and genetic resistance on yield, trials will be harvested. This provides stakeholders the opportunity to evaluate the performance of each variety with and without a fungicide and identify disease resistant varieties.

Corn hybrids, grain sorghum hybrids, and small grain varieties entered in LSU AgCenter official variety trials conducted at the H. Rouse Caffey Rice Research Station, Doyle Chambers Central Research Station, Dean Lee Research and Extension Center and Iberia Research Station will be evaluated for disease resistance.

Price, who is also working on the project, said he is also looking at diseases in soybeans, corn, sorghum and wheat. At present, one of the main diseases in soybean that he’s working on is taproot decline. “One problem that we encounter with soybeans is the pathogens that remain on the residue in the field after harvest,” Price said.

“We are currently looking for fungicide options to slow the disease in soybeans,” he said. “In addition, we have a specialized variety trial that is inoculated with the pathogen to screen varieties in the field as well as yield impact trials.”

Corn producers may encounter many different foliar diseases throughout the state including common rust, southern rust and northern corn leaf blight.

“Other less common foliar diseases such as Curvularia leaf spot, gray leaf spot, anthracnose and southern corn leaf blight may occasionally significantly affect corn as well,” he said.

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Fall armyworm and corn earworm Bt protein resistance presents growing problem

LSU AgCenter entomologist Fangneng Huang has spent the last few years trying to get to the bottom of what is causing Cry1A and Cry2A toxin resistance in the fall armyworm and corn earworm. Progress is being made, but there is still a way to go.

“The fall armyworm and the corn earworm are the two most damaging pests being studied, but they’re not as dangerous to corn as they are to other crops,” Huang said. “Both can damage many different crops in Louisiana and other southern states.”

Huang says that this is becoming a bigger problem now than it was five years ago due to the resistance to the Cry proteins, which have been used for pest control for more than two decades in some cases.

Vip3A, an insecticidal protein produced during the vegetative stages of *Bacillus thuringiensis*, or Bt, has shown promise as the only fully active toxin expressed in transgenic crops to control the corn earworm in the United States.

Huang says multiple field trials in three years demonstrated that natural corn earworm populations in Louisiana were highly resistant to maize expressing Cry toxins only, but susceptible to all tested hybrids containing Cry and Vip3A genes combined.

Like the corn earworm, the fall armyworm, *Spodoptera frugiperda*, is a polyphagous pest, meaning it feeds on a variety of plants. In the Americas it is targeted by transgenic corn and cotton expressing Bt proteins. In 2021, the species, which typically shows up in the fall, arrived in Louisiana earlier than expected and has been a problem ever since for rice, soybean and sugarcane farmers.

During 2021 and 2022, a total of 23 fall armyworm populations were collected from seven U.S. southern states, including nine populations from the southeastern coastal region.

A previous study during the 2011-2013 period demonstrated practical fall armyworm resistance that caused field control problems of corn producing the Cry1F Bt protein in the southeastern seaboard of the U.S. The main objective of this study was to investigate the current susceptibility status to four Bt proteins commonly expressed in Bt corn plants, including Cry1F, Cry1A.105, Cry2Ab2 and Vip3A, in fall armyworm populations from the U.S. southern region.

Overall, the current study does not provide evidence of practical resistance in the fall armyworm to any of the four tested Bt proteins. The detected Cry1F susceptibility in the fall armyworm represents the first case of documented practical resistance to a Bt crop and has important implications for insect resistance management.

“We are collaborating with industry and other universities, so we will keep an eye out and monitor progress year by year,” Huang said. **V. Todd Miller**



Vip3A has shown promise as the only fully active toxin expressed in transgenic crops to control the corn earworm (seen here) in the United States. Photo by Fangneng Huang



The detected Cry1F susceptibility in the fall armyworm (seen here) represents the first case of documented practical resistance to a Bt crop. Photo by Blake Wilson

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Curvularia leaf spot is an emerging issue in Louisiana and can be mistaken for eyespot. This disease is often seen after periods of extensive rainfall and appears to vary in severity among hybrids.

“We need to know if Curvularia leaf spot causes yield losses,” Price said. “Because if it does not, there is no need to manage the disease. So far, we have seen mixed results in our Curvularia yield loss studies.”

Wheat in Louisiana may be affected by a number of foliar diseases, such as leaf rust, stripe rust, stem rust and Septoria leaf blotch, he said.

Leaf rust, stripe rust, and Fusarium head blight are the major foliar diseases affecting wheat produced in Louisiana.

Stem rust and bacterial leaf streak have been sporadic problems in the state. Leaf and glume blotch and barley yellow dwarf are diseases that occur less frequently, but also may impact yields.

The occurrence of disease each year depends on which pathogens are present, environmental conditions, varieties, cultural practices and total acreage.

“It is imperative to continually develop management strategies for all potential diseases,” Price said. “The most efficient way to manage wheat diseases is to avoid them by planting resistant varieties.”

Fungicide application types, rates and timings for commercial and experimental fungicides are evaluated for efficacy against naturally occurring diseases in wheat.

Treatments are evaluated for their impact on disease development, grain yield and test weights at multiple locations.

One of the most common and destructive grain sorghum diseases in Louisiana is anthracnose, which may affect all parts of the sorghum plant.

The foliar phase of anthracnose is most observed and may cause losses up to 50% under optimal environmental conditions of cloudy, warm and humid weather.

“Hybrid selection is the best management option for anthracnose,” Price said. However, genetic resistance may not last long because the pathogen can develop cultivar-specific virulence.

Over the past several years in fungicide trials, researchers have observed different reactions to fungicide applications depending on the hybrid.

“For example, we will conduct the same test with the same application timing and fungicide treatments on two or more different hybrids,” he said. “When the data is analyzed, a given fungicide may perform very well on one hybrid and not the other.”

According to Price, continuing annual integrated disease management research must be done to keep up with changing environments, farming practices, fungicides, cultivars and economics. **Johnny Morgan**

2023 Soybean and Grain Research and Promotion Board-funded projects

Agricultural Economics and Agribusiness.....\$31,000

Outreach and Education on Water and Soil Policy Reforms for Profitable On-Farm Soil and Water Management, *Naveen Adusumilli*

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

Biological and Agricultural Engineering.....\$53,000

Lignin-based Nanoparticles to Protect Photolabile Pesticides for Soybean Treatment, *Cristina Sabliov*

Analyzing Soybean Quality with Automated Image Processing, *Kevin Hoffseth*

Communications.....\$6,500

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

Dean Lee Research Station.....\$347,431

Evaluation of Weed Management Practices in Louisiana Soybeans, *Daniel Stephenson*

Investigation of Weed Management Programs in Louisiana Feed Grains, *Daniel Stephenson*

Soybean On-Farm Demonstration Program, *David Moseley*

Evaluation of Mature Seed Damage Resistance, Fertilizer Inputs, and Planting Practices to Increase Soybean Yield and Profits in Louisiana, *David Moseley*

Evaluating Agronomic Strategies to Improve Soybean Growth and Yield, *Andre Reis*

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

Enhancing Soybean Insect Pest Management Strategies for Central and South Louisiana, *James Villegas*

Enhancing Field Corn Insect Pest Management Strategies for Central Louisiana, *James Villegas*

Enhancing Grain Sorghum Insect Pest Management Strategies for Central Louisiana, *James Villegas*

Developing Soybean Disease Management Programs in Central and South Louisiana, *Boyd Padgett*

Developing Soybean Disease Management Strategies for Corn, Grain Sorghum, and Small Grains in Central and South Louisiana, *Boyd Padgett*

Determining the Critical Period of Weed Control in Soybean, *Daniel Stephenson*

Entomology.....\$105,600

Sustainable IPM Solutions for Louisiana Soybean, *Jeff Davis*

Investigation of Susceptibility/Resistance of Field Populations of Corn Earworm and Fall Armyworm in Louisiana to Common Insecticides, *Fangneng Huang*

Bob R. Jones-Idlewild Research Station.....\$40,000

Environmental Testing of Toxicant to Control Feral Swine in Soybean Fields, *Glen Gentry*

Macon Ridge Research Station.....\$359,182

Corn On-Farm Demonstration Program – 2023, *Matt Foster*

Evaluation of Phosphorus and Potassium Applications to Commercial Corn Fields in Northeast Louisiana, *Matt Foster*

Spatial and Temporal Variation of Soil Sampling Affect Phosphorus and Potassium Recommendations for Corn and Soybean, *Rasel Parvej*

Cultivar Evaluation, Fungicide Efficacy, Emerging Diseases, and Novel Fungicide Application Methods in Corn and Wheat, *Trey Price*

Identifying and Refining Varietal, Cultural, and Chemical Management Strategies for Important Biotic and Abiotic Soybean Diseases, *Trey Price*

Reaction of Selected Grain Sorghum Hybrids to Fungicide Application, *Trey Price*

Determining Early and Late Season Impacts of Stink Bugs in Soybean, *Tyler Towles*

Reevaluation of Sampling Methodology and Host Shift Patterns for the Redbanded Stink Bug in Louisiana Soybean, *Tyler Towles*

Improving Soil Fertility and Nutrient Management Recommendations for Corn and Soybean and Reevaluation of Sulfur Recommendations for Soybean in Louisiana, *Rasel Parvej*

Enhancing Soybean Insect Pest Management Strategies for Northeast Louisiana, *Tyler Towles*

Northeast Research Station.....\$92,518

Evaluation of 30-inch Production Systems on 60-inch Beds in Corn and Soybean Production Systems, *Dennis Burns*

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

Plant Pathology and Crop Physiology.....\$296,167

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

Direct Double Stranded RNA Application for Managing Cercospora Leaf Blight and Rust, *Zhi-Yuan Chen*

Characterizing the Production and Spread of Inoculum and Infection Strategies for Cercospora Leaf Blight and Purple Seed Stain Pathogens, *Vinson Doyle*

Tools for the Management of Taproot Decline, *Vinson Doyle*

Development of Seed-Priming Agents that Augment Soybean Growth and Broad Spectrum Disease Resistance, *Jong Ham*

Evaluation of Fungicide Application Timing and Cultivar Resistance for Management of Cercospora Leaf Blight on Soybean, *Sara Thomas-Sharma*

Host Status of Resistant Soybean Varieties to Geographically Diverse Root-Knot Nematode Populations in Louisiana, *Tristan Watson*

A Genetic and Effector-Based Approach to Manage Fungal Diseases of Soybean, *Jonathan Richards*

Influence of Winter Cover Crops on Nematode Population Development and Soil Health in a Soybean/Corn Rotation and Evaluation of Nematode Susceptibility in LSU AgCenter Core-Block Soybean Varieties, *Tristan Watson*

Red River Research Station \$114,430

Effect of Tillage System on Crop Irrigation and Evaluation of New Methods to Determine Irrigation Initiation Timing, *Syam Dodla*

Evaluation of Micronutrient Fertility to Increase Corn Yields in Louisiana, *Syam Dodla*

Fertility Loss via Soil Erosion and Runoff Water Quality from Rainfed and Irrigated Croplands, *Changyoon Jeong*

Spatial Variability of Soil Properties in Agricultural Fields: What Does This Means for Soil Water and Nutrient Management and Crop Production in Louisiana?, *Xi Zhang*

School of Plant, Environmental and Soil Sciences\$254,600

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

Characterizing Soil Health and Yield Under Conservation Practices in Soybean and Grain Production Systems, *Lisa Fultz*

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

Harnessing UAV and Machine Learning Technologies to Promote Resilient Soybean and Corn Production, *Tri Setiyono*

Soybean Improvement through Identification and Introgression of Salt Tolerance Genes, *Prasanta Subudhi*

Foliar Treatment of Micronutrient Deficiency: Addressing Yield Gap and Disease Pressure in Field Crops Production in Louisiana, *Brenda Tubaña*

Sulfur Fertilization Updates: Application Rate, Sources, and Potential of Biostimulant, *Brenda Tubaña*

Total Funding for 2023: \$1,700,428

Can bacteria help plants resist stress?

An LSU AgCenter plant pathologist is investigating whether good bacteria can help a plant resist stress in the environment.

Jong Ham and his research group are continuing their study on biostimulants and how beneficial bacteria added to soybean seeds can enhance soybean plant growth and yields. Ham has been investigating the use of biostimulants on soybean plants and rice for about five years. Last year he looked at the growth of the plants with seed treatments. His latest project focuses on helping plants survive abiotic stress such as floods or drought.

“We’re not just looking at disease resistance,” Ham said. “Nowadays a major issue is the damage from environmental effects and the effects of stress.”

Ham is looking at biological and chemical compounds that show increased defense to disease and abiotic stress. He is conducting experiments at two locations to test under different conditions. He has plants in the field and in a greenhouse at the LSU AgCenter Doyle Chambers Central Research Station in Baton Rouge and in fields at the Red River Research Station near Shreveport.

“We test the chemical by itself, the beneficial bacteria by itself, and then we are planning in the next

year to test the chemicals and biological compounds together,” he said.

Ham imposes flooding or drought conditions on plants grown from treated and untreated seeds and checks them at four days after the stressor and again after seven days to see how the plants are faring. He said his data so far is encouraging.

He also is comparing his treatments to those commercially available and said it appears his treatments worked better than commercial products.

Ham’s treatments include a mixture of up to 10 different bacterial agents. He said it has been a challenge to manage the mixture to keep the bacteria active and shelf stable.

“The first obstacle is to make a formulation for a long shelf life,” he said. Additional tests include seeing how long the treatment will be effective on the seed.

Ham also is working to identify and isolate more bacteria that target stress resistance. He said after he collects data from this year, his next step would be to test the materials in additional locations across the state to see how the treatments perform. **Tobie Blanchard**



Soybean plants exposed to a seven-day drought condition show various root development. At left is a plant without seed treatment. The middle and right are plants with seed treatment with two different bacterial mixtures, respectively. Photo by Jong Ham’s graduate student Sandeep Gouli, who is helping conduct the research.



Top: AgCenter nematologist Tristan Watson examines a research plot at the Northeast Research Station near St. Joseph. He is looking for signs that nematodes are feeding on the plants, which leads to a stunting of the plants. **Bottom:** Watson examines soybean roots for damage. Photos by Craig Gautreaux

Potential solutions for nematode problem interest soybean growers

Come rain or shine or blistering heat,Tristan Watson is hard at work finding answers for questions regarding controlling nematodes.

Watson, a native of Canada, has been busy for three years adapting strategies to combat nematodes in soybean production, much like a Canadian must adapt to Louisiana summers.

To see exactly what a nematode looks like, one would need a microscope, but for many Louisiana farmers, the damage caused by these organisms can be seen in their fields quite easily.

“The reniform and Southern root-knot nematodes feed on the roots of plants. They are reducing the ability of the roots to access water and nutrients,” Watson said.“The symptoms will look a lot like nutrient deficiencies.”

These two nematodes are the most common in Louisiana agricultural fields. They often target cotton and sweet potatoes, but they will also feed on soybeans. A survey of fields found root-knot nematodes in 20% of the fields examined and reniform nematodes inhabiting more than 60% of the fields.

To farmers, the number of nematodes present can mean a big difference in their bottom line because higher numbers will lead to yield loss.

“Yield loss is going to depend on the site, obviously, and the level of nematode infestation,” Watson said.“In severe root-knot infestations, we can get up to 50% yield loss.”

Damage caused by the root-knot nematode is easier to diagnose.

“It causes galls on the root system,” Watson said.“If you think you have a problem with this nematode, go out in your field and uproot a plant, probably midseason to late season. Look for the symptoms, but don’t confuse them for nodules associated with nitrogen fixing bacteria.”

Diagnosing a reniform nematode problem is a bit more complex.

“To diagnose that one, you’re probably going to have to pull soil samples and send them to the LSU AgCenter Nematode Advisory Service,” he said.“There we can take the soil, extract the nematodes, quantify how many of the reniform nematodes you have and let you know how likely you’ll have yield loss at that population level.”

Watson has been tasked to help develop tactics for reducing nematode pressure in soybean fields, and he has seen some promise with soybean lines that have shown resistance, particularly for the reniform nematode. Much of his research is being conducted at the Northeast Research Station in St. Joseph and the Macon Ridge Research Station in Winnsboro.

Watson’s early research looked at the most common soybean varieties grown in Louisiana.All of these varieties supported reniform nematode population development. So, he looked north, not to Canada but Missouri. Some varieties developed there claimed resistance to this pest, and Watson added them to his research trials.

“These lines seemed to not support any nematode reproduction.The population levels just plummeted,” Watson said.“And we also outyielded some of the commercial lines that are currently grown here. I think we are onto something.”



Like a good scientist,Watson is replicating the study again in 2023 to see if the results hold true before making a recommendation to growers. If the results are the same, what’s next?

“Where I’d like this project to go next is commercialization,” he said.“I hope that some of our commercial seed producers, developers, see the utility of these traits and the benefit we can have for our growers and start incorporating that into newer varieties.”

The chemical nematicide Velum was recently granted approval for use in soybeans for nematodes. It has been used in cotton and sweet potato production, and it has shown good efficacy at controlling root-knot and reniform nematodes, according to Watson.

Just because a pesticide has gained approval for being applied to a new crop, it doesn’t necessarily mean it is a cure-all for that crop.Watson is examining it both for its effectiveness and any potential problems.

“We actually saw a little bit of plant toxicity in our preliminary greenhouse trials, but when we put the compound out in the real-world setting, we didn’t see that,” Watson said.“So that is quite promising.”

Watson sees two potential barriers for using Velum in soybean production. He said it is a more expensive product in comparison to other products currently used for nematode control. Another issue is application. Growers would need to make a liquid in-furrow application while the seeds are being planted, which is not something growers typically do during planting. **Craig Gautreaux**

Row, bed adjustments positively impact soybean, corn yield

LSU AgCenter researchers have shown that adjustments to the width and depth of rows can contribute to boosts in yield for soybean and corn. Their project, based at the AgCenter Northeast Research Station near St. Joseph, has demonstrated a consistent increase in productivity over the past two years.

The standard row width for corn and soybeans in north Louisiana is a single 38-inch row on a 38-inch bed. An increase in yield came after changing the size to two 30-inch rows on top of a widened 60-inch bed, with drainage furrows between.

“We’ve seen about a 12-bushel increase for corn and about an 8-bushel increase for soybeans,” said Dennis Burns, coordinator of the LSU AgCenter Northeast Research Station. “It’s been consistent, and while we haven’t harvested yet this year, we anticipate similar results.”

Burns said there are a number of reasons why the 30-inch row, 60-inch bed production system may be working better than the standard way:

- Seeds are planted with greater spacing than for 38-inch rows.
- There is better light reception for the young plants.
- The plants canopy faster which helps with weed control.
- A shallower bed depth of 6-7 inches allows water to wick sideways into the plants, making absorption easier than in deeper beds (a couple feet) for 38-inch rows.
- There is less erosion of the wider beds.
- It is a more stable platform for planting seeds.

Growers realized 38-inch beds were more stable and easier to plant than 30-inch beds. So, Burns and other growers began to experiment with wider, 60-inch beds, similar to sugarcane fields.



Plantings using 30-inch rows of corn, at left, have shown less weed growth than 38-inch rows. Research on 30-inch beds for corn and soybean is being conducted at the LSU AgCenter Northeast Research Station near St. Joseph, Louisiana. Photos by Dennis Burns

The wider beds created a more stable platform that was more efficient for planting.

“I think that has influenced our yield as much as anything,” Burns said. “We also get a better stand that’s much more uniform — increases yield uniformity.”

Another cost-saving aspect of this system involves soil conservation. The wider bed is very flat and stable, which reduces erosion and complements minimum-till or no-till soils. It won’t wash away, so producers don’t have to add soil the following year.

“If you don’t have to rebuild your beds, that saves money,” Burns said. “At the research station we’ve had some of the same soil for three to four



years, even though we have to reopen the furrows every other year.”

Burns also works with cover crops to improve soil health. Because the wider beds are more stable and don’t easily erode, this helps improve soil quality by making it more mellow — that is, finer and more crumbly, not clumpy.

While there are some initial costs to convert tractor equipment, Burns says this production system is well worth it.

“We’ve seen this work consistently, and if you’re going to be a corn or soybean farmer, then you almost need to be planting 30-inch rows if you want to see those increases in yield.” **Randy LaBauve**

Soybean core block trials examining several issues of growers’ concern

David Moseley, LSU AgCenter soybean specialist, sees a great deal of Louisiana through his core block variety trials. These trials are found at 17 locations in 14 parishes and are in virtually every corner of the state.

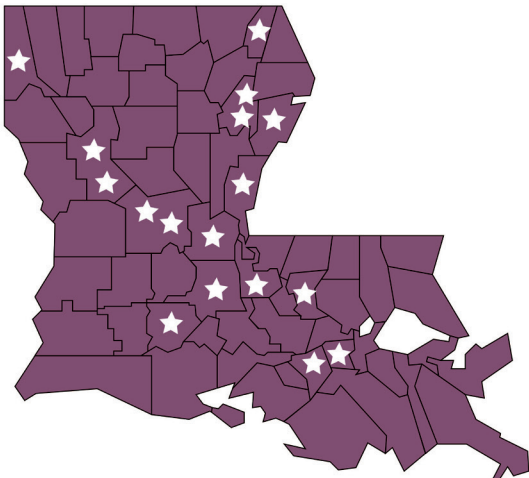
“Yield is always the most important aspect we look at in these trials,” Moseley said. “But we are also focusing on some situational issues that could help growers across the state experiencing similar issues.”

Core block trials are conducted on commercial growers’ farms and on research stations. Moseley is looking at varieties that are commonly grown in the state. He is looking at 25 different varieties across maturity groups III, IV and V.

“We want the research to be representative of the state,” Moseley said. “About half the locations are irrigated, which is about what we find in Louisiana soybean production.”

Moseley has expanded upon the core block trials and is looking at specific issues hampering specific farms with the hopes that solving these problems could be applicable to other producers.

One area under study is soil fertility issues. In northeast Louisiana, a manganese study is underway on 160 acres in Catahoula Parish. Soybeans on this farm showed symptoms of manganese deficiency, which were exacerbated when glyphosate was applied.



Soybean core block locations

Acadia, Assumption, Avoyelles, Caddo, Concordia, East Baton Rouge, Franklin, Natchitoches, Pointe Coupee, Rapides, St. James, St. Landry, Tensas, West Carroll

“Some research indicates that glyphosate can tie up manganese, and it can cause manganese deficiency,” Moseley said. “So we’ll be able to see the same treatments with and without glyphosate to see if that is causing a problem here.”

Moseley is also studying potassium issues related to a farm in southwest Louisiana. The treatments

included recommended rates, split applications and in-season foliar potassium applications. This is the second year of study for this location.

Additionally, Moseley is studying varieties resistance to nematodes using strip trials at three research stations in north Louisiana. He is examining seven varieties at the Northeast, Macon Ridge and Red River research stations.

Moseley already has plans to expand his work in 2024.

“Next year, I plan on studying deer repellents,” he said. “There’s not a lot of research in this area, and we hear a lot of complaints about deer damaging crops.”

Moseley also plans to continue to study fertility issues regarding micro and macronutrients. Next year, he plans to examine phosphorus and sulfur issues in soybean production with on-farm demonstrations.

Soybeans are Louisiana’s largest row crop in terms of acreage with an estimated 1.12 million acres grown in 2023. They are also grown throughout the state on many different soil types, so research is beneficial to farmers statewide.

Moseley also wanted to thank all of the farmers, seed company representatives, consultants, extension agents and researchers who have provided invaluable assistance and participation in these studies. **Craig Gautreaux**

Determining the right timing, fertilizer rates key to corn research

When agricultural producers mention fertilizer, the big three normally come to mind — nitrogen, phosphorus and potassium. But there are other nutrients and considerations that are important to improve crop yields.

LSU AgCenter researchers across the state are looking at the various nutrients needed to produce a healthy crop. The studies are being conducted in Winnsboro, Bossier City, St. Joseph and Alexandria.

At the Macon Ridge Research Station in Winnsboro, AgCenter soil fertility specialist Rasel Parvej leads the project that is looking at the importance of timely soil sampling to determine optimum fertilizer rate for maximum yield and profit.

“Nowadays, crop consultants or farm-service reps prefer to collect soil samples mostly within a few weeks after summer crop harvest due to the chances of rain in the early to late winter months,” he said.

Soil sampling immediately after crop harvest may not account for all of the nutrients that are going to be available during the next summer crop because crop residue of high biomass producing crops such as corn, rice, etc. contains significant amounts of phosphorus and potassium that are eventually added to the soils once the residue breaks down with rainfall and soil management such as tillage.

The corn biomass after harvest is loaded with nutrients, but taking a soil sample before the biomass breaks down will give a false reading as the nutrients have not been released in the soil yet. This can take at least two to three months, depending on rainfall amount and soil tillage.

“After harvest, we suggest producers to wait about two months before soil sampling,” Parvej said. This way the soil test values will be higher, especially for potassium, considering the nutrients released from crop residue. This will reduce fertilizer rates for the next summer crop production.

Parvej said his study is being conducted in Winnsboro and St. Joseph. He starts taking soil samples every 15 days immediately after harvest until the next summer crop planting. The results of this project will help model the variation of soil test nutrient values across the winter months and find the optimum time to collect soil samples for maximum soil test nutrient values that will result in reducing fertilizer rates.

From the same project, researchers are also evaluating the nutrient release rate from the crop residue after harvest by collecting crop residue in every 20 days starting immediately after harvest until the next summer crop planting. At the end of this project, they will be able to pinpoint how much nutrient each crop residue contains at harvest and how fast it is released back to the soil.

On the LSU main campus, AgCenter soil scientist Brenda Tubaña is looking at sulfur application rates and the potential use of biostimulants.

“Plants require 14 essential mineral nutrients that are absorbed by the roots,” she said. “Sulfur is one of these nutrients with a unique role in facilitating the assimilation of inorganic nitrogen into organic forms.”

Studies have shown that the Clean Air Act changes made in the 1980s caused a decrease in sulfur dioxide in the atmosphere, which is also causing sulfur deficiencies in the soil.

“So, we have cleaner air to breathe, but we no longer have this source of free sulfur for our plants,” she said.

In addition to decreases in the concentration of sulfate in rainfall, sulfur deficiency can be further exacerbated by the practice of burning residue, such as corn, which also leads to sulfur losses to the atmosphere.

This insufficient supply of sulfur can reduce nitrogen use efficiency of a crop, she said.

There has been an increasing interest in the use of biostimulants, which include diverse formulations of substances and microorganisms.

“We identified a silicate solubilizing bacteria that is capable of dissolving phosphates and produces plant growth promoting compounds,” she said. “The bacteria are known as Win-54, because it was discovered at Winnsboro.”

At the Red River Research Station near Bossier City, AgCenter soil scientist Syam Dodla is looking at the micronutrients needed to improve corn grain production.

Dodla said the micronutrients are only required in small quantities but are important as major nutrients to increase the grain yields. At present, these nutrients are not given enough importance as part of soil fertility improvement.

“There are six micronutrients that we wanted to evaluate and test their potential to improve the grain yields,” Dodla said. “These micronutrients are copper, manganese, iron, boron, zinc and molybdenum.”

The pH level plays a key role in the availability of nutrients, Parvej said.

“If the soil pH is slightly acidic to neutral (pH 6.5 to 7.0), there may be no need to apply micronutrients except molybdenum (Mo) because there will already be enough micronutrients available to the plants, and plants need a small quantity of micronutrients,” Parvej said.

Dodla said the soil loses a certain amount of nutrients anytime the crop biomass is removed from the field. Over time, these nutrients will have to be replaced.

“What we already know is that the alkaline soils tend to have more micronutrient deficiencies,” he said. “But there is not enough research to develop recommendations for the micronutrients.”

Correcting the soil pH to between 6 and 7 is important to eliminate many nutrient deficiencies or toxicities. Lime or calcium carbonate can be used to increase the pH of acidic soils and elemental sulfur can be used to decrease the pH in alkaline soil, he said. **Johnny Morgan**

LSU graduate student Diego Mayorga applies granular sulfur fertilizer to corn as part of a fertilizer study headed by LSU AgCenter soil scientist Brenda Tubaña at the Central Research Station in Baton Rouge. Photo provided by Brenda Tubaña



Vinson Doyle, a mycologist and associate professor in the LSU AgCenter Department of Plant Pathology and Crop Physiology, is pictured with soybean plants that are part of a project studying the effects of nitrogen on the incidence of the taproot decline disease. Photo by Olivia McClure

Unlocking the mystery of taproot decline

Taproot decline was once called a “mystery disease.” It wasn’t clear what caused it or how to go about controlling it.

LSU AgCenter plant pathologists Vinson Doyle and Trey Price have spent the past several years trying to demystify the disease, which impedes development of soybean roots and severely hampers yields. They now know that taproot decline is caused by a pathogen — a newly identified species called *Xylaria necrophora*. The pathogen is unique in that it’s the only member of the *Xylaria* genus that attacks an annual crop; all others are pathogens affecting woody shrubs and trees or saprophytes that feed on dead wood.

It probably was in Louisiana soils decades ago, long before soybeans were grown here. And because it triggers foliar symptoms similar to those produced by other diseases and abiotic stresses, it was likely misdiagnosed many times over the years.

No fungicides seem to stop taproot decline, which often kills plants before emergence but can affect soybeans in later stages of development, too. It can be found in Louisiana and a handful of other southern states.

So, what’s next in unraveling this mystery?

“What we’re trying to understand is how this pathogen causes disease. We’re looking at the secondary metabolites that this fungus produces,” Doyle said. “We’ve identified two compounds that are in relatively high concentrations that are known to be phytotoxic, and when the root cells are exposed to these compounds, the cells die. It inhibits root development.”

Pinpointing these two compounds marks an important turning point in learning about how taproot decline functions and how it may be controlled.

“These compounds are nitrogen-based compounds, and so we want to understand whether variation in soil nutrient availability, particularly available nitrogen, has an impact on disease severity,” Doyle said.

Soybeans typically don’t require nitrogen fertilizer. But many farmers grow soybeans in rotation with other crops that need additional nitrogen.

“If we can determine that nitrogen has an impact on disease severity,” Doyle said, “then we can start to talk to farmers about soil nutrient management.”

Scientists also are studying whether stressors such as high temperatures play a role in disease development.

“Secondary metabolite production is often a response to stress,” Doyle said.

When it comes to finding control solutions, he and his colleagues have made some useful findings — like the fact that populations of the pathogen responsible for taproot decline tend to show a low level of diversity.

“In a pathogen where there’s little diversity, the likelihood of them overcoming resistance or evolving resistance to fungicides is low,” Doyle said. “So that’s a good thing. We are trying to find cultivars that are resistant to taproot decline, and once we find them, they’re likely to be more stable.”

That work is taking place at the AgCenter Macon Ridge Research Station in Winnsboro, where Price is based.

“We have ‘copies’ of Arkansas, Louisiana and Mississippi official variety trials that are inoculated in the field to try and identify resistant varieties for farmers,” Price said.

The scientists also are searching for chemical control options, having installed seed treatment and in-furrow fungicide trials in six locations in Arkansas, Louisiana and Mississippi. In addition, they are working with field pathologists in those states to gather more data on yield losses caused by taproot decline.

As for what farmers can do in the meantime to reduce their chances of taproot decline-related problems, cultural practices are the answer.

“Past research has shown that tillage and crop rotation are effective in reducing taproot decline incidence,” Price said. “Anything that reduces the accumulation of debris reduces the inoculum load, thereby reducing taproot decline incidence. Altering seed placement from year to year also may reduce seed and seedling contact with infested debris.” **Olivia McClure**

LSU AgCenter researchers attack Cercospora on multiple fronts

Cercospora may translate to big yield losses for Louisiana soybean producers, but for AgCenter researchers the problem is a small one — in fact, you can say it is a microscopic one.

The cercosporin produced by the microscopic pathogen *Cercospora* cf. *flagellaris* causes oxidation of the plant’s leaf tissues, explained LSU plant pathologist and crop physiologist Zhi-Yuan Chen. He and his colleagues have been working to prevent Cercospora from ever reaching the farmers’ fields by attacking the fungal ailment with in-depth genetic research. His two main projects in this area include reducing the production of the cercosporin toxin that causes the fungal symptoms to be present in the first place.

“Whenever the pathogen produces this toxin, it gets more virulent on the host,” he said. “So, what we’re trying to do is to reduce the production of this cercosporin toxin.”

There are two ways Chen is using his research to reduce the damage or losses to soybean by the pathogen. The first method is to pinpoint the genes that aid in the production of the cercosporin. He explained that a technology similar to what was used to combat the COVID-19 pandemic has been used to combat Cercospora leaf blight (CLB) disease.

“If you are familiar with the Pfizer or Moderna COVID vaccines, they are using rRNA vaccines,” he said. “So, basically, we are using a similar idea. We are using rRNA produced in bacterial cells that are targeting the genes involved in cercosporin production. We then apply that to the leaf.”

Using this line of research stops the production of the cercosporin that affects soybeans. There were two fields planted to study this vaccine-style approach — one at the Ben Hur Research Station and another at the H. Rouse Caffey Rice Research Station. Unfortunately, the field at the Rice Research Station was planted later than the ideal time and was hit with a dry spell causing the seedlings to die, Chen explained. In the Ben Hur trials, Chen and his associates plan to inoculate some of the fields with the rRNA produced by bacteria while other fields will be allowed to develop the CLB naturally. From there the researchers will determine whether there are any symptom differences between the treated fields and the control fields.

The second method Chen explored used research from a previous study that involved a means of biocontrol. Chen said within soybean leaves there is a certain type of endophytic bacteria that proves inconducive to the proliferation of this Cercospora pathogen. Having identified and isolated these bacteria, researchers are able to apply them to stunt the growth or spread of the Cercospora.

“If you put these bacteria next to the Cercospora, the Cercospora will not grow,” Chen said. “This bacterium has an antagonistic effect on the Cercospora pathogen.”

He explained that this method includes applying the bacteria to the soil, then planting the soybeans and inoculating the plants with the Cercospora pathogen. Results using this biocontrol method have been promising, he said.

“Initial data is encouraging,” he said optimistically. “So far, we see there is much better growth in the ones that were treated with bacteria. The plants are much greener, much healthier and it seems to improve the iron uptake or other nutrient uptake.”

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Scientists study long-term effects of conservation methods and soil variability

Soil conservation practices such as no-till systems, cover cropping and different rotations benefit producers, but LSU AgCenter researchers are working to determine the return producers can expect on this long-term investment.

Lisa Fultz, an AgCenter soil microbiologist, is examining soil conservation trials that have been conducted over the last eight to 10 years to determine how conservation practices improve soybean and grain production.

“When producers implement these conservation practices, regardless of what they are, many times they will see a yield decline immediately afterward,” Fultz said. “But we often expect to see a rebound after — usually around three to five years.”

One trial Fultz is studying has been in place for 10 years. After five years, the research showed a 25% to 30% increase in soil organic matter. Fultz is now studying whether there are further increases after five more years.

The initial yield decrease followed by yield increases occurs “because the biological system is resetting itself,” Fultz said.

As producers start introducing more biomass from cover crops, no-till residue or other organic matter, there is an influx of organic material, she said, and the microbes from that influx can outcompete cash crop plants for nutrients, especially nitrogen.

“Once they have established themselves in those communities, that excess nitrogen starts becoming available again,” Fultz said.

In research trials, soybeans do not show the same fluctuations (decreases and increases) in the first few years.

“Unfortunately, we don’t necessarily see yield benefit,” Fultz said. “From a yield perspective, it’s maybe not as beneficial. But it also means that they’re not having as much yield loss or really any yield loss so far.”

Trials have shown that corn can receive a “nitrogen credit” for the use of legume cover crops, Fultz said.

“We are seeing some benefit from them. We’re seeing increased organic matter,” she said. “The nutrient cycling enzymes that we measure, they are basically looking at the turnover of specific nutrients. We see them higher in areas where we have cover crops or no-till practices.”

Another trial that has been ongoing for eight years compares tillage versus no-till systems as well as multiple cover crop termination dates and different rotations. Fultz’s team is collecting soil samples and analyzing them.

Fultz is also examining data from two model farms included in an AgCenter program that institutes best management practices, a project made possible by grant funding from the Patrick F. Taylor Foundation. These analyses will help researchers make cover crop recommendations to soybean and grain producers.

“Can we make adjustments to seeding rate recommendations? Right now, for cereals, they’re kind of on the high side,” Fultz said. “When we compare data for the whole southern region, it is very likely that we can reduce those recommended seeding rates.”

Another AgCenter soil scientist, Xi Zhang, is in the middle of a three-year study on spatial variability of soil. His research asks how variations in soil affect soil water and nutrient management.

“The reason I developed this project was to look at the spatial variability in agricultural fields and to look at how the changes in the soil texture or other soil properties are going to influence the water movement in the soil and how this can influence how the crop grows,” Zhang said.

Zhang conducts research at a 4-acre field at the Red River Research Station that features fine-, medium- and coarsely-textured soils. His research team took soil samples with grid-based sampling method at 65-foot intervals, sampling three different depths up to 24 inches and measuring the soil texture. They used geostatistical analyses to create a map of the spatial variability of soil clay content.



A soil moisture sensor installed in a field at the AgCenter Red River Research Station measures the status of fields used in Xi Zhang’s research. Photo by Xi Zhang

Based on the soil clay map, soil moisture sensors were installed in different zones at two depths — one zone zero to 8 inches deep and another between 8 and 24 inches. Compared with the high clay zone, the soil with a low clay content responded to water input more quickly, a result consistent with field observations. Water can easily permeate soils with a low clay content.

“Sometimes when we find an area of low yield, it is not caused by a nutrient deficiency,” Zhang said. “It is caused by water stress.”

This year, the second year of a three-year study, Zhang is installing soil water samplers to measure how the change of the water dynamic in the soil can influence the transportation of nutrients. He also wants to simulate different rainfall intensities or irrigation practices to study soil water dynamics and nutrient transportation under diverse scenarios.

In the third year of the study, Zhang wants to integrate soil and crop data to delineate management zones to convert research results directly into management decision support to help soybean and grain farmers to improve production.

“That is important, not just that the producer knows there is variability, but we want them to know how we are going to use that variability to improve management and yield,” Zhang said. **Kyle Peveto**

Continued from Page 10

Now in the second year working on this project, Chen said there are trials planned to analyze the efficacy of different application methods. The three application methods being tested are drenching the soil with the bacteria, spraying the bacteria onto the plants and applying the bacteria as a seed treatment.

Elsewhere, Cercospora management is taking a different approach. AgCenter plant pathologist Vinson Doyle is working on characterizing the production and spread of inoculum and infection strategies for Cercospora leaf blight.

AgCenter plant pathologist Trey Price said, “The most important thing farmers can do is to plant a tolerant variety that was tested in their area.”

Fungicide resistance has also been a large research component in Cercospora management, Price said. He and his associates have identified fungicide resistance in the majority of that pathogen population, but there are still fungicidal treatments that do show efficacy.

“Some of the newer SDHI [fungicide] materials — the triazoles — are effective on Cercospora blight,” Price said. “So, fortunately, we do have some fungicides that have been working for us over the last several years.”

As part of research into individual fungal isolates, researchers have unlocked a new challenging discovery. Price said there have been at least three species of Cercospora that are involved with fungicidal resistance. He said the multiple species confounds management.

“We’re not sure if different species cause different symptoms,” Price said. “There are a lot of different symptoms attributed to this disease.”

Despite these new challenges, Price said, AgCenter pathologists will continue to work closely with plant breeders to identify varieties that are resistant to Cercospora. He said one such collaboration includes the University of Missouri.

LSU AgCenter plant pathologist Vinson Doyle is also working on characterizing the production and spread of inoculum and infection strategies for Cercospora. **Derek Albert**

Entomologists battle pests in soybeans

LSU AgCenter entomologists are focusing on several fronts to protect soybean plants from insect pests.

Jeff Davis has multiple projects that approach control of stink bugs and lepidopteron defoliators in different ways.

One ongoing project is testing new and improved insecticides and their applications. Davis said lately that means testing more natural products that use biological control methods and can go through testing by the Environmental Protection Agency more quickly than synthetic insecticides.

“We do efficacy trials. We are trying to get ahead of the game so when they do make it to the growers, we have some good information,” Davis said.

Davis also is keeping a close eye on the brown marmorated stink bug. This insect first showed up in Louisiana in 2021, and it hasn’t moved much from Iberville Parish where it was first detected.

Unlike the redbanded stink bug, which feeds primarily on soybeans, the brown marmorated stink bug will infest soybeans, corn, cotton, fruits and vegetables and can be found in people’s homes and in gardens.

“Anything you may have in your garden will also be building those populations,” Davis said. “We’re putting out traps around the state to see if it moves.”

Methods used to control the redbanded stink bugs will also control the brown marmorated.

Soybean growers asked Davis to investigate whether stink bugs feeding on soybean pods is leading to seed decay seen in some fields. Davis said over the past five years whenever hurricane or heavy rain occurs near harvest, growers see a lot of seed decay.

“Any feeding can cause a wound on the pod and that creates an opening for disease to come in, just like if you have an opening in a screen on your house you might have mosquitoes and termites come in,” he said. “So, we are looking at does stink bug feeding, probing on those pods, cause more seed decay and can we prevent it.”

Davis is working to determine if timely insecticide applications or insecticides with a fungicide can decrease seed decay. He also is seeing if applying harvest aids near a rain fall leads to seed decay.

The fourth area of focus for Davis is to determine how areas in conservation stewardship programs adjoining cropland may harbor pests.

“Growers came to me and asked questions about if they participate in these conservation stewardship programs does that affect insect populations,” Davis said.

Davis is using a mark and capture technique to detect insect movement from the conservation areas into fields. Davis sprayed the conservation areas near fields

Insect management strategies applied to corn and grain sorghum

The cold spring slowed the emergence of corn leading to a heavy population of soil-borne insects according to LSU AgCenter field crops entomologist James Villegas.

Part of Villegas’ research focus is controlling pests in corn and grain sorghum. He said wireworm has his attention this year.

“I’ve talked to consultants up north, and some producers ditched their fields, 200-acre fields of corn because of wireworm problems and just planted beans,” Villegas said.

Wireworms can live in the soil for a long time. He said certain species can stay as larvae for up to three or four years, making them hard to control and predict.

Low acreage of grain sorghum has made it difficult to conduct research on that crop, but Villegas is looking at the sugarcane aphid and head worm complex and how those pests are affecting sorghum.

“We only have two foliar products available on the market that are effective for sugarcane aphid control and that would be Transform and Sivanto,” he said. “In terms of head worms, Vantacor and diamide products are still pretty good towards it.”

with egg whites, which act as a natural biomarker on insects. He then came back and did insects sweeps at different lengths starting with the conservation areas and moving into the fields. Analyzing the captured insects, he could see the amount of movement.

“I’m not saying we aren’t seeing any movement, but it’s not as much as I thought, and they are not providing that much of a detriment to our growers,” he said.

AgCenter field crops entomologist James Villegas is also helping growers battle insect pests in their fields.

Farmers and insect scouts started seeing redbanded stink bugs early this year in their fields. Villegas said they had hoped the late cold snap would have decreased the population, but it seemed to have little effect.

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Researchers work to expand potential of precision agriculture

From drones to sensors, many farmers already use precision agriculture technologies to help them make management decisions for their crops.

But the large amount of data these tools gather has even greater potential, and LSU AgCenter scientists are studying the best ways to use it.

Tri Setiyono, an assistant professor with the AgCenter focusing on precision agriculture, wants to see whether these technologies can help mitigate challenges related to changing weather patterns.

“The weather is becoming less favorable for growers,” he said. “The timing of rain often does not come when they want it to, and the rainfall is getting more intense.”

Rain can affect when farmers apply nitrogen fertilizer, an expensive but crucial investment for a successful crop, particularly with corn.

Farmers often have to take advantage of dry spells to put out fertilizer, even if a heavy rain is forecast for the next day. Ill-timed or excessive rainfall can wash away fertilizer, and it also can contribute to uneven crop emergence, which leads to lower yields.

Setiyono is conducting studies simulating flooding, which can stress plants and limit yield potential, in corn and soybeans. Using drones and remote sensing, he wants to find out if these technologies can shed light on the crops’ response to excessive rainfall and help inform decisions about whether to reapply lost fertilizer.

“We equip drones with sensors to map the fields,” he said. “We scan the crops and assess whether the stand is uniform. We are implementing some algorithms, including artificial intelligence, to see if we can convert those images into plant stand counts.”

He hopes to use the data to help farmers be more resilient to climate challenges.

“Traditionally when making our nitrogen fertilization recommendations, we look at the yields at the end and work backwards and say, ‘the optimum N rate is this much.’ In this study, we will do that, but also, can we scan it soon after fertilization or after flooding to see indication of potential yield reduction,” he said.

By catching deficiencies early, it’s possible to correct those problems and recover yields. Sensors can pick up on certain leaf characteristics and other indicators of stress.



Tri Setiyono, far left, an assistant professor with the LSU AgCenter focusing on precision agriculture, works with his graduate students in a test plot of corn at the AgCenter Central Research Station with a few tools of their trade, including drones and sensors. Students, from left, include Dulis Duron, Rejina Adhikari, Bhawana Acharya and Farmer Rontani. Photo by Olivia McClure

“Remote sensing can detect what our eyes cannot see,” Setiyono said. “It can see if a plant is experiencing stress, like not having enough nutrients, and from that respect, the idea is that if we can capture this early enough, we can develop correlations for how much nitrogen we need to put back.”

Whether adding that extra fertilizer is worthwhile must be considered on a case-by-case basis.

“The question in the end is economics,” Setiyono said. “Is it still profitable to put the fertilizer back in? We are actually going to include that in our analysis — how much of a yield boost will we get and does that offset the cost?” **Olivia McClure**



Top: A pack of feral hogs runs through a field at the LSU AgCenter Bob R. Jones-Idlewild Research Station in Clinton on June 6, 2023. **Inset:** LSU AgCenter scientists are working on a sodium nitrite-based bait to kill feral hogs. The bait has a texture similar to a gummy bear and is shaped into balls. Newer versions include a fluorescent substance that glows under a black light — as seen in this photo — which helps the researchers see whether the bait breaks apart while hogs eat it. So far, the bait seems to stick together well, leaving no crumbs behind. Photos by Olivia McClure



Finding humane solutions with bait targeting feral hogs

Several years ago, some unwelcome visitors began making their presence known across rural Louisiana. They left uprooted crop fields, trampled tree seedlings and destroyed wildlife food plots in their wake.

The culprit? Packs of hungry, havoc-wreaking feral hogs. And the problem has only gotten worse, with Louisiana’s hog population doubling in the past decade to reach about 1 million today. It’s now estimated they cause \$91 million in damage every year in the state.

Hunting and trapping can’t get rid of enough hogs to keep up with their fast reproductive rate. A sow can have two litters a year, with an average of six piglets per litter.

After eight years of work, LSU AgCenter animal scientist Glen Gentry and his team closed in on a more efficient solution: a sodium nitrite-based bait that kills hogs but has minimal impact on the environment and nontarget species. It’s even safe for hunters to consume meat from hogs that have eaten the bait. The team recently reached a major milestone, with a patent being issued for the bait in August. The journey, however, has taken many twists and turns.

Early on, scientists took interest in sodium nitrite as a toxicant because of its effectiveness and relative safety.

“It’s got a very marginal, if any, effect on the landscape because it converts so quickly to

compounds that don’t cause lethal issues,” said Gentry, director of the AgCenter Bob R. Jones-Idlewild Research Station in Clinton.

The rapid breakdown of sodium nitrite, however, proved to be a double-edged sword. Gentry tried to find ways to stop it from converting to those harmless compounds too quickly — before hogs could eat it — before contacting LSU chemistry professor John Pojman for help.

Pojman and his graduate students found that adjusting the pH of the bait matrix to a slightly alkaline level would keep the sodium nitrite stable and lethal to hogs.

Another key question was how to get hogs to eat the bait. After several tries, the team found the magic ingredient to entice hogs: dehydrated fish.

The bait they’ve landed on is a golf ball-sized sphere with a texture similar to a gummy bear. It doesn’t break apart when bitten into, which is important to protecting nontargets that may be tempted by remnants.

Newer iterations of the bait matrix include a fluorescent ingredient that glows beneath a black light, making it easy to see whether any pieces get left behind. So far, Gentry hasn’t found any scraps of the bait on the ground.

“Pigs like our bait,” Gentry said, adding that he has seen the animals gobble down three, four and even five of the bait balls at a time. Just one sphere contains enough sodium nitrite to kill a 100-pound pig.

After consuming a lethal dose — which for feral swine is 188 milligrams per kilogram — they become sleepy and die within three hours.

“It’s a very humane death for these pigs,” Gentry said.

Gentry and research associate Ariel Bourgoyne are now focusing on developing a feeder to deliver the bait and expanding from pen trials to larger-scale hybrid field trials.

“It is definitely a light at the end of the tunnel situation,” Bourgoyne said. “I see the progress we’ve been making and it’s gratifying. It’s been baby steps, but if you look back over the eight years, we’ve overcome a lot of obstacles.”

He noted that the majority of funding for the bait work has come from stakeholder groups, including the Louisiana Soybean and Grain Research and Promotion Board.

“It’s the people that are directly affected by the pigs that have provided the funds for us to move forward with the research,” he said. “And for that, we’re greatly appreciative.” **Olivia McClure**

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He is conducting research on insecticidal seed treatments for early season soybean pests. He said results on those studies haven’t been as consistent as he would like, but in good conditions, it appears that seed treatments are not needed.

“If we plant right after wheat or in a weedy field, then we get a lot more benefit from these seed treatments,” Villegas said.

Villegas also is collaborating with researchers at other universities in the Midsouth to look at different

combinations of insecticides and whether they are still working effectively against redbanded stink bugs.

“The other states really rely a lot on the data coming from the Midsouth group, especially the data coming from Louisiana because normally we have higher infestations than, for example, Mississippi or Arkansas,” he said.

New this year is Villegas’ work with sprayer drones. He is working with AgCenter engineer Randy Price to build drones that can carry insecticides and spray small research plots.

“I want to see what the role of sprayer drones could be, particularly in integrated pest management,” he said.

Villegas or research assistants often walk research plots with backpack sprayers. Sprayer drones would allow insecticides to be applied even when fields are too wet to traverse. He is hoping to create standards for sprayer drones and help answer questions that are starting to arise as consulting companies start to offer sprayer drone services. **Tobie Blanchard**

Wheat prices remain high but the Hessian fly is looming

In 2022, wheat prices rose due to drought and the war in Ukraine. This year, wheat prices remain high, and Louisiana producers are again taking an interest in planting the grain crop in 2023.

According to AgCenter statistics, producers planted about 45,000 acres of wheat in Louisiana during the past year, which is a substantial increase from the 14,000 acres of the previous season.

“There’s a significant amount of interest in wheat varieties right now because wheat prices are higher due to drought and the war in Ukraine,” LSU AgCenter small grains expert Stephen Harrison said.

Harrison is a 38-year veteran of harvest seasons at the AgCenter, where he works to improve wheat and oat varieties. He collaborates with breeders and research programs in several southern states through SunGrains, a seven-university wheat breeding cooperative he coordinates that shares genetic material, genomics knowledge, testing resources and royalties from seed sales.

“Proper variety selection determines whether farmers can capitalize on high wheat prices,” Harrison said. “This year, a big increase in wheat acres and a warm winter were associated with major Hessian fly damage across southern Louisiana, Texas, Mississippi, Alabama and Georgia.”

According to Harrison, Hessian flies haven’t been observed in Louisiana in the past for a number of years but may be a recurring problem for growers in the state going forward given the trend toward warmer winters.

Hessian flies lay eggs inside of young wheat between the stem and leaf sheathes, and the hatched larvae stunt tillers and create a patchy, dwarf look in fields. Longer periods of warmer temperatures in the late fall and winter allow the insects to complete multiple generations of reproduction and build up substantial numbers in fields. Yield of fields with heavy Hessian fly infestations were significantly reduced and some fields were abandoned as a result.

This year, Harrison said, the breeding team was able to collect good data on resistance of breeding lines in Baton Rouge, adding that variety resistance coupled with insecticidal seed treatment is the best way of preventing Hessian fly infestation. Major resistance genes characterized and incorporated by SunGrains breeders prevent infestation or limit its spread. SunGrains breeding lines from the seven collaborating universities will be screened for resistance this winter in a field that was managed over the summer to preserve viability of over-summering Hessian fly.

As far as variety resistance to the pest goes, Harrison said two years ago, AgSouth Genetics licensed AGS 3022, a wheat variety developed by



An example of Hessian fly pupae. Photo provided by Stephen Harrison

the LSU AgCenter breeding team using methods that can bring new wheat varieties to market more quickly. The variety has excellent test weight and very high yields, he said, and is resistant to the Hessian fly. It also has a strong resistance to stripe rust and to fusarium head blight, or scab.

“Scab continues to be our biggest nemesis and what we spend a large proportion of our resources on,” Harrison said.

In most cases, new wheat varieties take 10 years to develop from the time breeders first make a cross between existing lines to the day the seed becomes available for farmers. However, AGS 3022 was released in six years. Harrison and his team used a time-saving procedure, the double haploid methodology, which is a breeding shortcut used in some cases to speed up the process.

“It’s a very expensive process, so we can’t do that with our entire breeding program” Harrison said. “It would take an additional half a million dollars to do that on every cross we make, but we do choose a few high-priority crosses each year.”

A new wheat breeder, Noah DeWitt, has been hired by the LSU AgCenter and will help lead the breeding program going forward, taking over the wheat and oat breeding program when Harrison retires.

Under DeWitt’s guidance, a joint initiative will focus on introducing large-scale genetic and drone data into developing improved oat varieties for use as forage, and increased efforts will be placed on developing triticale varieties for cover cropping. **Kyle Peveto, V. Todd Miller**



An example of frogeye leaf spot lesions. LSU AgCenter file photo

Image analysis may help map frogeye leaf spot resistance genes

Over the course of the last few years, LSU AgCenter plant pathologist Jonathan Richards has been focusing his research on screening different soybean varieties for resistance to frogeye leaf spot, a disease that has the potential to adversely affect yield by reducing leaf area and causing defoliation.

Richards and his team have been screening a different collection of soybean varieties and have identified three or four varieties that seem to have a high level of resistance.

“We identified what’s likely the Rcs3 resistance gene, one that has been previously identified, that is considered a broad-spectrum resistance gene because it’s effective against all the races present in the United States,” he said. “The linked genetic markers we have identified will be useful in soybean breeding programs.”

However, according to Richards, novel races may arise that overcome that resistance gene, which highlights the need to continue doing the work to identify new sources of resistance.

Richards said that, preliminarily, he’s excited that his team may have found some new resistance genes towards frogeye leaf spot, which they will continue to research this year.

“One of my students is working on that project,” he said.

Richards says another big focus of the last few years has been to optimize and develop new ways to phenotype or screen soybean lines for resistance. One of those ways is through an image analysis workflow.

“It uses machine learning to detect differences between healthy tissue and diseased tissue,” he said. “So, we can use that workflow to take pictures of the diseased leaves and it will tell us how many lesions there are on the leaves, how big those lesions are and what percentage of the leaf is covered by disease.”

Richards said this can supply his team with the information to map these resistance genes more precisely in different soybean populations.

In the past, much of Richards’ team’s focus has been on conducting greenhouse or growth chamber experiments, but from 2020 to 2022, they’ve developed plots at the Macon Ridge and Dean Lee research stations to diversify their studies.

“The experiments we have in the field were primarily to confirm some of the findings that we were getting in the growth chamber and the greenhouse where we found a few lines that look to be highly resistant,” he said.

They found that, overall, there was a high correlation with the resistance that was effective in the greenhouse studies also being effective out in the field.

Host genetic resistance is important because if his team can use a soybean variety that’s resistant to different fungal diseases, that reduces the reliance on other management practices, such as fungicide applications, which can save producers time and money.

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LSU AgCenter wheat breeder Stephen Harrison discusses wheat variety trials with attendees of the 2023 wheat and oat field day at the LSU AgCenter Macon Ridge Research Station in Winnsboro. Photo by V. Todd Miller



LSU AgCenter soybean specialist David Moseley checks the health of soybeans at the Dean Lee Research and Extension Center in Alexandria. He is completing his third year of research to determine strategies to increase yield and minimize risk. Photo by Johnny Morgan

Scientist studies soybean best management practices using multiple strategies

Finding ways to improve soybean production requires multiple best management practices.

LSU AgCenter soybean specialist David Moseley is completing his third year of research to determine strategies to increase yield and minimize risk.

Moseley has focused his research on multiple areas that are crucial to a good soybean crop. Some of the categories that he has researched include planting date, fertilizer and soil amendments and soybean desiccant trials.

“We wanted to provide more information to growers about the best planting dates in order to produce the greatest yields,” he said.

In 2023, Moseley started planting on April 4 with six planting dates that continued through late June. He planted four varieties for each of three maturity group sections.

“We have several years of data to show that April 1 through April 20 will get your best yields from all maturity groups,” he said. “But there are still some growers who want to plant earlier.”

This year, some growers were planting on March 1, but this planting practice had mixed results because the freeze that came on March 20 destroyed some fields.

“We saw that the growth stage when the freeze hit seemed to make a difference in soybean survival,” he said. “Planting early comes with increased risk since the first planting date covered by crop insurance is April 15.”

Moseley said more research is needed on double-cropping soybeans, especially with sugarcane.

“Cane growers need to get their crop planted as early as possible in order to harvest in time to plant cane in late August and early September,” he said.

Historical soybean planting practices included planting maturity group 5-8 varieties beginning in mid-May to early June.

But that all changed around 2000, when Midsouth growers started using the Early Soybean Production System.

“With this system, they have focused more on growing mid-to-late maturity group 4 varieties beginning in April,” he said.

The second category of Moseley’s research looks at the importance of fertilizer and soil amendments to increase yields.

Moseley has found that adding phosphorus at planting has the potential to increase yields, especially with low phosphorus soil content in high pH areas.

A third area of study looks at the effect of desiccants, which are used to defoliate the crop before harvest.

Moseley is beginning soybean desiccant trials this year to look at the different effects of desiccants on soybeans yields and dry down time. He is also including fungicide applications to see the interactions of fungicide and desiccant applications.

Johnny Morgan

Continued from Page 14

“Especially for some of these pathogens like the one that causes frogeye leaf spot,” he said. “Some of these chemicals aren’t effective anymore, so we need to use other strategies, like genetic resistance to help control the disease.”

Richards said that although they haven’t had any results yet, the plan for the next year is to look at differences in gene expression between resistant and

susceptible soybean lines in an effort to understand what genes a resistant plant uses that a susceptible plant doesn’t.

“By understanding these different genes or different pathways that are involved, we can be more informed of how we can utilize host genetic resistance,” he said. **▼**

Todd Miller



Left: Ryegrass control four weeks prior to soybean planting in spring with a cereal rye cover crop treated over-the-top with Dual Magnum two weeks after emergence in the fall. **Right:** Ryegrass population four weeks before soybean planting with no treatment or cover crop used in the fall. Photos by Donnie Miller

Ryegrass: 'Most troublesome winter weed species to all crops' says AgCenter researcher

LSU AgCenter weed experts Daniel O. Stephenson and Donnie Miller have been working this past year to combat herbicide-resistance in johnsongrass and ryegrass, the latter of which has become a big problem — and not just for soybean farmers.

Stephenson said not much has changed from last year when he received complaints from producers in the Macon Ridge and Mississippi River parishes about glyphosate’s ineffectiveness on johnsongrass.

“Glyphosate resistance is similar to antibiotic resistance in bacteria,” he said. “Multiple sub-lethal doses of glyphosate year after year are the cause.”

He said it is the same scenario as many other weedy species that are currently resistant to a herbicide, asserting a weed management plan that has a holistic approach must be adopted to manage the problem or potentially avoid it.

In addition to johnsongrass, Stephenson said that glyphosate-resistant ryegrass has also “exploded.” He and Miller started a project last fall looking at different techniques to control ryegrass.

Miller, who works out of the Northeast Research Station in St. Joseph, said that ryegrass has become the most common and troublesome winter species to all crops — not just soybean.

According to Miller, this is because of increases in population, impacts on early season crop growth and dwindling effective over-the-top herbicide options, including glyphosate, clethodim, many ALS (acetolactate synthase) herbicides and, most recently, paraquat, due to developed resistance.

Miller said if growers can’t control the grass, it becomes a tremendous competitor with crops, especially those planted early, such as corn, which reduces yield for producers. The weed may also host insect populations, which is doubly problematic.

“It’s just one of those weeds that can slowly take over. It sits on the edge of the field for a couple of years then, all of a sudden, it’s 10 feet into the field edge,” Miller said. “Then, next year, it’s 30 feet in. And when the farmers conduct tillage operations, they can drag seed from plants on the outer field edges into their production fields.”

Often attention is not focused on later-emerging spring populations or earlier misses in control until it’s too late, Miller said. And the size of the ryegrass limits effective control in populations that aren’t resistant to over-the-top herbicides.

More →

Louisiana Soybean & Grain Research & Promotion Board Report



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Miller’s research was initiated in fall of 2022 regarding ryegrass management, either through cover crops and/or herbicides applied in the fall after harvest. Initial indications are that cereal rye and black oats can effectively compete with emerging ryegrass and limit populations.

“When coupled with Dual Magnum, a soil residual herbicide applied two weeks after cover crop emergence in fall, producers have an effective program for managing ryegrass during winter and spring months ahead of planting,” Miller said. “In addition to weed management, agronomic and soil benefits associated with cover crops are realized.”

Miller went on to say that this combination offers a one-two-punch approach to ryegrass management, allowing the soil herbicide to eliminate or limit emergence of ryegrass during late fall and early winter months while the cover crops limit spring emergence and competition due to prolific biomass production in spring. **V. Todd Miller**

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