LSU AgCenter

H. Rouse Caffey Rice Research Station

NEWSLETTER

Volume 21 Issue 2 | May 1, 2024

Upcoming Events

- **International Temperate Rice Conference –** New Orleans Marriott – June 5 - 8
- **Climate Smart Rice Field Day** – Wyatt Hardee Farm, Kaplan – June 11
- **Acadia Parish/South Farm Field Day –** June 12
- **H. Rouse Caffey Rice Research Station Field Day –** June 25

Upcoming Station Visitors

- **Oklahoma Farm Bureau Tour –** May 7
- **LSU AgCenter Southwest Region Parish Chair Meeting –** May 22
- **LSU AgCenter Nutrition and Community Health New Agent Training –** May 29 - 30

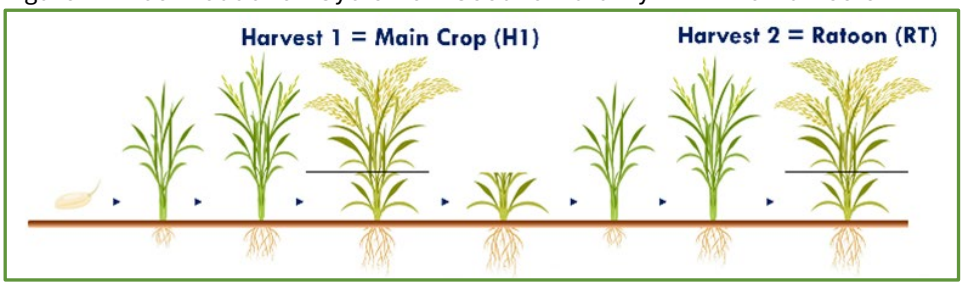
New Station Personnel

- **Bruno Borges** (Graduate Assistant – Quantitative Genetics)
- **Kashish Grover** (Graduate Assistant – Quantitative Genetics)
- **Jomar Punzalan** (Post-Doctorate Researcher- Breeding)
- **Jardel Souza** (Visiting Scholar – Quantitative Genetics)

Rice Breeding & Genetics: Breeding for Rice Ratoon Performance

Rice ratooning, a sustainable and efficient farming practice, involves cultivating a second rice crop from the remaining stubble after harvesting the main crop (Figure 1). This practice is crucial for farmers in Louisiana, aiming to maximize the profitability of rice cultivation. The goal of the LSU Rice Breeding Program is to develop high-performing rice varieties tailored to the needs of the Louisiana farming community. However, developing new varieties that perform well in ratoon is a challenging task.

Figure 1. Rice Production Cycle from Seed to Maturity with Two Harvests.



The main reason is that ratoon performance has typically been considered only in the later breeding stages when genetic variability is limited, and there is no correlation between grain production and the two harvests. In other words, and as depicted in Figure 2, one variety that performs better in the first crop will not necessarily yield well in the second. In the traditional breeding pipeline, selections are made based on what breeders can measure (e.g., grain yield) and observe in the field, known as phenotyping, choosing the top-performing plants for crossing to generate the next breeding cycle.

Recently, Genomic Selection (GS) has emerged as a valuable tool to accelerate breeding. It uses DNA markers to select plants based on genomic information and historical data from relatives, eliminating the need to wait for plants to grow to perform the selections. Of course, it is useful in the early stages. Later, all potential new varieties are tested and retested in field conditions to confirm their potential.

In this context, we have worked to select varieties with improved grain yield for both harvest seasons: the main crop (H1) and the ratoon (RT). For that, we have compared three approaches to test the ability to perform selection simultaneously for H1 and RT: 1) plant response indices, 2) traditional indirect selection, and 3) genomic selection. Also, we have historical data from the rice breeding program to compare and determine how feasible it is to select for ratoon in the early stages.

In summary, our findings demonstrate that both plant response indices and traditional indirect selection provide little to no value in simultaneously selecting for grain yield in both the main and ratoon crop. Results do show, however, that GS does provide significant promise. Table 1 compares the accuracy of GS in selecting a high performing variety in both the main and ratoon harvests to that of using phenotypic data, with the higher the accuracy value, the higher the probability that the variety selected will have the desired performance in both the main and ratoon crops. It is universally understood and accepted that using phenotypic data provides the maximum level of accuracy in variety selection. However, grain yield data can only be collected and used at the end of the variety development process once considerable time and effort has been expended in planting and harvesting the variety. And while accuracies associated with GS are not as high as using phenotypic data, they do come close and offer the opportunity to make nearly as reliable variety selections much earlier in the process, thus reducing the time, effort, and costs associated with variety selection. This underscores the importance of integrating ratooning as a target trait in the breeding process from the outset, empowering farmers to cultivate varieties optimized for both main crop and ratoon harvests, thus boosting their profitability.

Figure 2. Variety Rankings, Main Crop (H1) versus Ratoon Crop (RT)

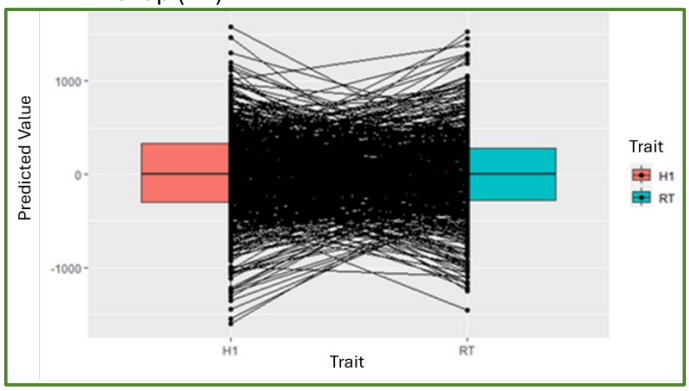


Table 1. Accuracies of Genomic Selection (GS)

Trait	CV [A]	Pheno [B]	GS [C]
Harvest 1	0.55	0.65	0.49
Ratoon	0.36	0.50	0.40

[A] Cross-validation (CV): assesses predictive model performance dividing data into subsets for training and testing GS.
[B] Phenotpic data (Pheno): grain yield measured over the years
[C] Genomic Selection (GS): predicts individual performance based on genetic markers, enabling identification of markers linked to desirable traits in plants.

Article By Dr. Karina Lima Borges (Post Doc Researcher), Dr. Roberto Fritsche-Neto (Quantitative Geneticist), & Dr Adam Famoso (Resident Coordinator & Rice Breeder)

Agronomy Project: Evaluating Nitrogen Uptake and Use Efficiency

Nitrogen (N) is required at higher levels than other nutrients for optimal rice production. Given the high dependence of rice yields on nitrogen fertilizer and given the recent sharp increases in the costs of fertilizer, there continues to be a need to examine ways to increase the efficiency of nitrogen utilization by the crop and the resulting optimal yields. Urea fertilizer is a major source of N utilized by the rice industry. However, previous research has shown it is less effective when applied in a flooded environment. However, the most prevailing nitrogen management

strategy in a drill-seeded, delayed flood production system has been a 2-way split application where two-thirds of the seasonal N needs is applied pre-flood with the remainder applied at mid-season. To examine the effectiveness of alternative management strategies, the Agronomy project conducted research trials from 2017 to 2020 with the objective of evaluating post-flood N applications on rice production in comparison to pre-flood applications. A single pre-flood application was compared to a single post-flood application and different split applications with various timings and levels. The timings were 1 day pre-flood, 1-day post-flood, 3 days post-flood, 5 days post-flood, and 10 days post-flood. The application rates were to apply all of the N needs at one time or two split it. The split applications were applying two-thirds in the first application and one-third in the second application, applying half in the first and the remaining half in the second, and applying one-third in the first application and two-thirds in the second.

Results over the four years of the project showed similar results for total N uptake, Nitrogen Use Efficiency (NUE), and rice yields. For each, results showed the highest performance from a single pre-flood application in which all of the N needs for the season were applied. Nitrogen Use Efficiency (NUE) was more than Results indicated that a single pre-flood application in which the total N needs are provided outperforms any other strategy in terms of total N uptake, Nitrogen Use Efficiency (NUE), and grain yields.

Nitrogen Use Efficiency values were over 60 percent in the single pre-flood applications while it dropped to below 10 percent in all scenarios in which fertilizer was applied post-flood, regardless of the application timing or application rates. This higher NUE resulted in significantly higher grain yields. Yields per acre for the single pre-flood application approached 10,000 pounds while yields for all other scenarios were below 5,000 pounds per acre. This represents nearly a 50 percent reduction in grain yields. Results from the trial clearly showed that post-flood nitrogen application methods were significantly less effective than the pre-flood nitrogen applications, regardless of application timing or rate of nitrogen. Results indicate that post-flood application using urea as the fertilizer source should be avoided.

Figure 1. Nitrogen Use Efficiency (%) at the 50% Heading Production Stage at Different Urea Application Timings and Rates

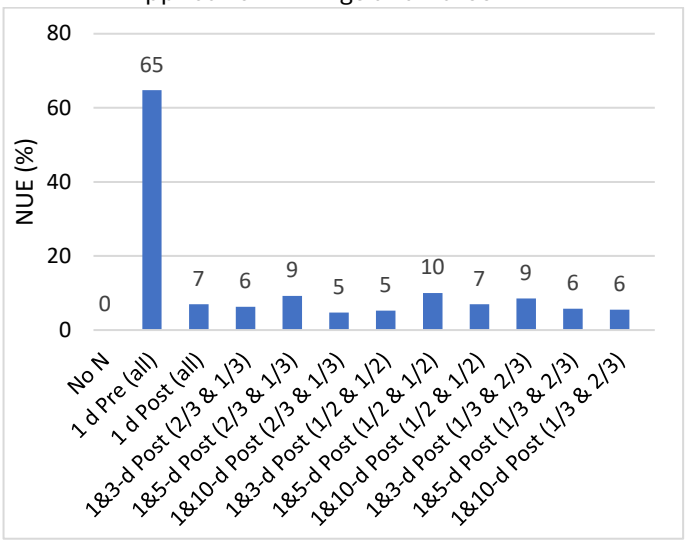
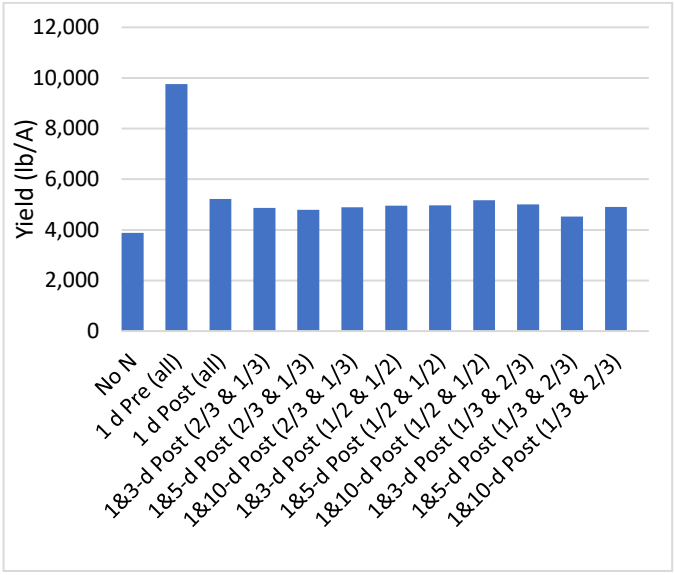


Figure 2. Grain Yields at 12% Moisture (lbs./acre) at Different Urea Application Timings and Rates



Article by Dr. Monach Kongchum (Rice Agronomist)

Weed Science Project: Weed Management Challenges in 2024

In southwest Louisiana there have been two main planting windows this year, one of which took place during the last week of February and the other during the first week of April. Towards the end of February, planting conditions were ideal with warm dry weather and field preparations completed in the fall months. Some producers who I have talked to finished planting in February and others held off to diversify their planting dates. During the first half of March frequent rains and high temperatures in the upper 70s and lows in the 60s promoted rice emergence and growth; however, by mid-March cooler temperatures occurred which stalled the growth of the rice. Nighttime temperatures as low as 41 F occurred in some areas.

By the end of March, the early plantings of Provisia and MaxAce rice were ready for their first application of Provisia or Highcard, respectively. After the injury that was observed during the 2023 season with adverse growing conditions, many producers proceeded with caution and waited to spray during the first week of April when growing conditions improved. During the first week of April, southwest Louisiana did experience a brief cold front that reduced nighttime temperatures down into the upper 40s; however, bright sunshine played a role in reducing crop

Figure 1. PVL03 After a 15.5 fl oz per acre Application of Provisia

Figure 2. PVL03 After a 31 fl oz per acre Application of Provisia

injury. Many producers were aiming to spray during the second half of that week to get past the cold front; however, applicators were getting booked up, forcing producers to go ahead and spray. Overall, the injury that has been observed this year has been a typical “yellow flash” that is normally observed with these technologies (Figure 1) and does not translate into yield losses. In 2023, higher levels of injury were observed in the Provisia and MaxAce

systems with much of the injury progressing past the “yellow flashing” to necrosis (dying) of the plant tissue (Figure 2), especially where an application overlap occurred.

In 2023, the injury observed with Provisia and MaxAce rice prompted the Weed Management Program to evaluate environmental conditions that potentially could be playing a role in crop response with these technologies. Studies focused on overcast growing conditions, simulated by employing different percentages of shade clothes placed over the top of PVL03 planted in mid-May to target warm growing conditions. As of now, we know cold and cloudy conditions play a major role in crop response to Provisia and Highcard, and many questions in 2023 concerned the timing of herbicide applications in relation to adverse growing conditions. To address this concern, research trials evaluated simulated overcast growing conditions for a period of 7 days before a Provisia application and for a period of 7 days after a Provisia application. Crop response was observed for both windows of overcast growing conditions, but the general trend was that slightly higher levels of crop response were observed when overcast growing conditions were simulated after a Provisia application (Figures 1 and 2). The results from this Rice Research Board funded study played a significant role in the recommendations that have been made in 2024 regarding the timing of Provisia and Highcard applications.

Figure 1. Rice Injury Related to Overcast Growing Conditions for a Period of 7 Days PRIOR to Provisia Application

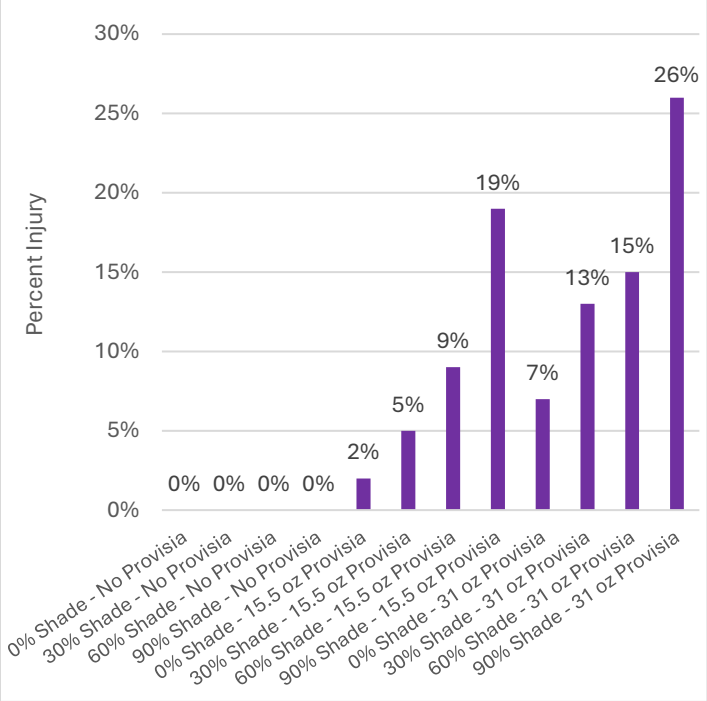
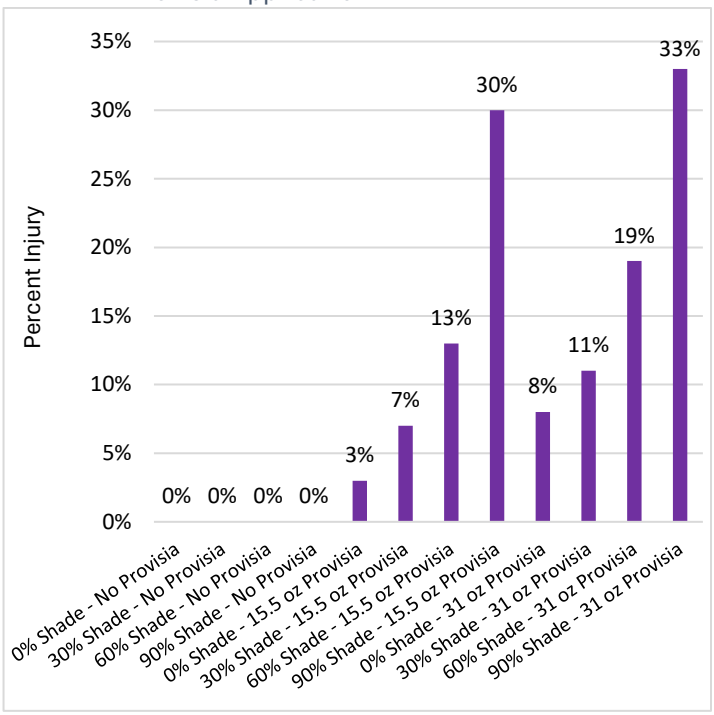


Figure 2. Rice Injury Related to Overcast Growing Conditions for a Period of 7 Days AFTER Provisia Application



Article by Dr. Connor Webster (Weed Scientist)

LSU AgCenter and Horizon Ag Enter New Breeding Partnership

An announcement was recently made introducing a new partnership between Horizon Ag and the Rice Station’s Breeding Project. The LSU AgCenter’s Communication department outlined this new endeavor in the following article.

The LSU AgCenter is partnering with Horizon Ag, a seed marketing and variety development company, to initiate a new rice breeding program focused on varieties for southern rice-producing areas, which include Louisiana,

Arkansas, Mississippi, Missouri, and Texas. This partnership will give Horizon Ag access to the AgCenter's elite rice breeding germplasm and result in collaborative breeding efforts. LSU AgCenter rice breeder and director of the AgCenter H. Rouse Caffey Rice Research Station Adam Famoso said the partnership offers tangible benefits to the two partners—the rice industry and rice producers.

"The contract research activities will be leveraged to support our existing and future station research and breeding efforts, and will enable expanded testing within the LSU breeding program," Famoso said. "The AgCenter will provide contract research services such as field testing and evaluation of Horizon's breeding materials." The initial agreement is set for five years, beginning this year. Horizon Ag will hire a rice breeder and support staff who will be housed in an independent lab at the Rice Research Station. New varieties released by Horizon will be in addition to the AgCenter's breeding activities.

Horizon Ag's CEO Tim Walker said the company saw decreasing financial support for rice breeding programs in the southern rice-growing region and sees this partnership as a way to invest in the LSU AgCenter's breeding program while working alongside it for the betterment of the rice industry. "We see this as an opportunity, a need and a mutual benefit," Walker said. "The industry will be better having more breeders working towards a common goal of improving grain yields and quality, both of which are very important to southern USA rice farmers."

The AgCenter will receive royalties from varieties released by Horizon Ag, helping sustain the size and scale of its rice research efforts. The AgCenter's rice breeding program also will have the opportunity to test its experimental lines in wider geographies and environments through additional testing networks that Horizon Ag will establish. "We are excited for this groundbreaking public-private partnership with Horizon Ag. This collaboration is a first-of-its-kind initiative designed to enhance the sustainability and competitiveness of the Louisiana rice industry, bringing substantial benefits to our rural communities," said Matt Lee, LSU vice president for agriculture. "It is designed to bolster economic development through employment and the local procurement of materials and supplies. Together, we are poised to lead in agricultural innovation and research, establishing new benchmarks for success and sustainability in the rice industry."

While this partnership is unique, Horizon Ag has worked with the AgCenter before. "We worked closely with LSU and our partners when we really revolutionized the industry with Clearfield rice. Then we did the same thing launching the important Provisia technology, and they were both launched as LSU varieties," Walker said. "This is the evolution of that relationship and a unique and innovative step for the rice industry." The LSU AgCenter has long been a leader in rice breeding, releasing 63 varieties through its program at the Crowley station, the world's oldest rice research station. Groundbreaking technologies developed at the station have been pivotal in combating weedy rice, enhancing crop yields and sustainability.

John Denison, chair of the Louisiana Rice Research Board, offered his support of the agreement. "As the costs of research continue to rise, I am excited to see additional investment into the rice breeding program," Denison said, "Louisiana's breeding program and our Rice Research Station have been world-renowned for decades, in large part because of the investment from our Louisiana growers through our checkoff. We hope this partnership complements the breeding program overall and continues to yield advancements and new varieties in the market that help keep Louisiana rice farmers successful and sustainable."

Project Highlight – Farm Crew and Foundation Seed Production

An effective and efficient support structure is critical to creating an environment that allows our scientists to focus on designing impactful research that addresses the need of the rice industry. A component of that support structure here at the H. Rouse Caffey Rice Research Station is the Farm Crew and Foundation Seed Production. Under the direction and coordination of our Farm Manager, Mr. Brent Theunissen, this group takes on the responsibility of maintaining the condition and appearance of the rice station as well as working with every research project to make necessary land preparations to provide optimal conditions for successful research trials. On any given day, this

group will be busy mowing grass, cutting trees, maintaining station roads, managing irrigation systems, tilling land, and a host of other activities needed to keep the station looking and functioning at a high standard. In addition, under the direction of the station's Foundation Seed Production manager, Mr. Rick Zaunbrecher, this group plants and manages several acres of different rice varieties each year, to be used as foundation seed. The Foundation Seed Program produces foundation seed of new and existing rice varieties, providing the final linkage between variety development research and commercial rice production.

Pictured from left to right: Mr. Rick Zaunbrecher (Foundation Seed Manager), Mr. Jimmy Pelerin (Research Farm Specialist), Mr. Brent Thenuessin (Farm Manager), Mr. Thomas Reed (Research Farm Specialist), Mr. Paul Miller (Research Farm Specialist), Mr. Jason Hartman (Research Farm Specialist), and Mr. Brandon Frey (Research Farm Specialist)

Faculty, Staff, and Student News

The faculty, staff, and students of the H. Rouse Caffey Rice Research Station are actively involved in outreach, professional and industry events. The following is a list of the activities and events people from the Rice Station participated in over the last 6 months:

- Dr. Connor Webster (Weed Scientist) attended the 27th annual Cotton and Rice Conference in Jonesboro, Arkansas on January 29 – 30, 2024. Dr. Webster served on three panel discussions: one discussing stewardship of the Provisia Rice System, one discussing the implementation of a new active ingredient, ttflupryolimet, in rice production, and a final one discussing experience with and recommendations for the herbicide, Rogue.

- Dr. Kurt Guidry (Assistant Resident Coordinator) provided market condition and outlook presentations at the Tri-Parish Crop Forum held in New Roads, LA on February 5, 2024.
- Mr. Todd Fontenot (Crawfish Production Specialist) presented a talk entitled "Drought and Salinity Effects on Crawfish Production" at the Gulf Coast Soil and Water Conservation District's Annual Meeting held in Lake Charles, LA on February 8, 2024 and to the Crowley Rotary Club on April 9, 2024.
- Mr. Todd Fontenot (Crawfish Production Specialist) provided a crawfish production update to the Louisiana Crawfish Promotion and Research Board during their quarterly meeting held in Lafayette, LA on February 20, 2024.
- Dr. Herry Utomo (Rice Breeder) traveled to Lima, Peru from February 26, 2024 to March 5, 2024 as part of a research product entitled "Effects of Long-Term Consumption of Low Glycemic, Non-GMO Rice on Insulin Sensitivity, Inflammation and Risk of Diabetes in the Upper Amazon: A Household-Based, Community Study". This project is a collaborative effort with faculty from the University of Kansas.
- Maria Montiel, PhD student of Dr. Adam Famoso (Resident Coordinator & Rice Breeder), successfully defended her PhD thesis on March 18th.
- Dr. Kurt Guidry (Assistant Resident Coordinator) attended the Annual Meeting of the Southern Association of Experiment Station Directors held in Louisville, Kentucky on March 25 – 28, 2024.
- Dr Felipe Dalla Lana (Rice Pathologist) presented an online seminar at Cornell University on March 29, 2024 entitled, "Development of Management Strategies for Rice Diseases in the Southern United States".
- Dr. Felipe Dalla Lana (Rice Pathologist) participated in the 13th International Epidemiology Workshop in Foz do Iquacu, Brazil from April 9 – 12, 2024. During the meeting, Dr. Felipe presented a poster entitled "Disease Reaction Classification Considering Trial Accuracy and Phenotype Stability: A Case Study with Rice".
- Dr. Kurt Guidry (Assistant Resident Coordinator) provided a guest lecture on April 23, 2024 for the Forage Ecology and Management course. The lecture focused on the economics of forage production.
- Dr. Kurt Guidry (Assistant Resident Coordinator) provided a market update and outlook presentation at the Northwest Region Beef and Forage Field Day at the Red River Research Station on April 25, 2024.
- Mr. Todd Fontenot (Crawfish Production Specialist) presented information on crawfish production at the Acadia Parish 4-H Achievement Day held in Midland, LA on April 29, 2024.
- Dr. Adam Famoso (Resident Coordinator & Rice Breeder) was part of a team that received a US. Agency for International Development (USAID) grant entitled "Feed the Future Climate Resilient Cereals Innovational Lab (CRCIL)". The grant is led by Kansas State University and includes multiple US and international partners aimed to advance breeding of four major world crops – sorghum, millet, wheat, and rice.

Station Events

The Rice Station hosts a variety of events each year. These events range from agricultural education for youth to training for LSU AgCenter personnel. During the last quarter, the following is a list of the events hosted by the Rice Station:

- February 12, 2024 – Dr. Kurt Guidry (Assistant Resident Coordinator), Dr. Ron Levy (Rice Production Specialist) and Mr. Mark Shirley (Crawfish Production Specialist) hosted a group consisting of research scientists, agricultural producers, and agricultural industry personnel from the US, Canada, and Australia. The group was associated with the Nuffield International Farming Scholars program. Discussions focused on the research activities of the station and rice and crawfish production in Louisiana. The group was also able to participate in crawfish harvesting at the station's crawfish production ponds on the South Farm.
- March 18 – 19, 2024 – The station hosted the quarterly meeting of the Louisiana Sea Grant's Marine Extension Program.
- March 21, 2024 – Dr. Kurt Guidry (Assistant Resident Coordinator) and Dr. Ron Levy (Rice Production Specialist) hosted participants of the USA Rice Federation Leadership Program. Discussions focused on research activities at the station along with rice production in Louisiana. The group also toured the station's Molecular Marker Lab at which Dr. Steve Linscombe (Retired Resident Coordinator) discussed how this technology was being used to elevate variety development efforts.
- March 28, 2024 – The station hosted a session of the LSU AgCenter's Management Development Institute (MDI) which offers leadership training to LSU AgCenter faculty.
- April 11, 2024 – Dr. Kurt Guidry (Assistant Resident Coordinator) and Dr. Ron Levy (Rice Production Specialist) hosted Bishop Ernest Obodo and Father Francis Chiawa from Nigeria to discuss research at the rice station along with rice and crawfish production. Bishop Obodo and Father Chiawa are interested in developing an exchange program in which producers and others from Nigeria would come to the US to stay and work with rice producers to gain skills and knowledge related to agricultural production.
- April 16, 2024 – Ms. Lanette Hebert (Regional 4-H Coordinator) coordinated and hosted an awards trip for the First Baptist 4-H Club from Lafayette. As part of the field trip, Mr. Todd Fontenot (Crawfish Production Specialist) discussed crawfish production and led them in a tour of the crawfish production ponds at the Station's South Farm. The group was able to learn about rice, crawfish, and general agricultural production.
- April 19, 2024 – Dr. Adam Famoso (Resident Coordinator) and Ms. Lanette Hebert (Regional 4-H Coordinator) coordinated and hosted a field day for 1st graders at Mrytle Place Elementary, a French Immersion school in Lafayette. The group was able to see and experience various aspects of rice and food production and nutrition.

New Employee Highlight

Dylan Trahan joined the Pathology Project at the Rice Research Station as a Research Associate in January 2023. Dylan is a native of Klondike, Louisiana and still resides there today. He received his bachelor's degree from McNeese in Natural Resource Conservation and Management in 2016. His interest in wildlife and agriculture came early in his life having grown up around agriculture with his farther having a rice and crawfish operation. He remains involved with production agriculture with his brothers and dad along with his wife.

Prior to coming to the Rice Station, Dylan worked for the Gulf Coast Soil and Water Conservation District in Lake Charles and with the Louisiana Department of Wildlife and Fisheries at their White Lake Wetlands Management Area (WMA) in Gueydan, Louisiana. Through those experiences, Dylan assisted in planning and implementing vegetation plantings and implementing management plans for different marsh impoundments.

Here at the Rice Station, Dylan is responsible for handling the in-field operations of the Pathology project. This includes spraying, fertilizing, inoculation of fields, and other management of the rice crop from planting to harvest. He also assists with data collection and management. Dylan said that he enjoys working at the station because it keeps him involved in production agriculture. Understanding the struggles farmers face makes it rewarding to know that the work he does is helping farmers become more efficient and profitable. That, along with being able to work with a team that share the same goals, makes the Rice Station an exciting and satisfying place to work. Dylan says he has learned a lot in his time with the station from learning how to identify and effectively treat diseases to learning about the existing and new pesticides that can be used to manage disease and other issues. The thing that has surprised Dylan the most about his position is the level of technology and information that is used and available to address farmers' issues. in his time with the station from learning how to identify and effectively treat diseases to learning about the existing and new pesticides that can be used to manage disease and other issues. The thing that has surprised Dylan the most about his position is the level of technology and information that is used and available to address farmers' issues.

Dylan Trahan, Research Associate, Pathology Project

In his spare time, Dylan enjoys hunting, working with his horses, and spending time with family and friends. He and his wife, Savanah, both compete with their horses and are building a small herd of registered Santa Gertrudis cattle to continue their involvement in agriculture and to hopefully spark an interest in agriculture for their daughter.

For more information, contact us at the H. Rouse Caffey Rice Research Station
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For more information, visit our website at:

H. Rouse Caffey Rice Research Station (lsuagcenter.com)

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