**Row Crop Irrigation Science Extension and Research (RISER) Program, 13-2024**

**Annual (April 1, 2024 – March 31, 2025)**

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**Rationale/Justification for Research:**

Declining aquifer levels, coupled with impending well monitoring, serve as a catalyst to improve water use efficiency. The RISER program has identified several technologies and management practices that have the potential to eliminate the 300,000 ac-ft/yr overdraft on the Mississippi Alluvial Aquifer while ensuring that producers stay within permitted irrigation limits. However, the adoption of Best Management Practices (BMPs) by producers in the Mississippi Delta is minimal. The RISER (Row Crop Irrigation Science Extension and Research) Program can serve as the primary means to facilitate widespread adoption of the latest irrigation management research findings across the Mississippi Delta. The goal of the project is to evaluate, demonstrate, and transfer innovative and proven technologies that can result in water conservation by conducting coordinated extension activities throughout the Mississippi Delta.

**Report of Progress/Activity:**

**Objective 1: Identify, evaluate, and demonstrate new irrigation technologies in furrow irrigation.**

***Evaluating Various Irrigation Scheduling Methods on Soybean Production in a Sharkey Clay Soil:***

The objective of this study was to evaluate several different types of irrigation scheduling methods on soybeans grown in a Sharkey Clay soil. The irrigation scheduling methods evaluated in this study are: Watermark 200SS soil moisture sensors triggered at a weighted average of -75 kPa, Simplot’s SmartFarm Irrigation service, Goanna Ag’s irrigation scheduling service, an NCAAR-developed Sentek relative depletion rate method, an NCAAR-developed soil water balance model, a soil water balance model app (SI Crop Fit) developed by the University of Georgia and Florida, a weekly calendar schedule, and a no irrigation control. Irrigation methods will be compared upon water use, water use efficiency (WUE), and yield data.

Table 1. shows soybean yield (bu ac-1), total water use, irrigation water use efficiency (IWUE), number of irrigations, and average number of days between irrigations for each irrigation treatment used for this study in 2024. In 2024, Goanna Ag treatments produced the highest yield numerically at 92.9 bu ac-1 but was not different from the weekly calendar schedule (88.4 bu ac-1), the NCAAR Sentek relative rate of depletion method (85.6 bu ac-1), and the NCAAR soil water balance method (85.6 bu ac-1). Although the weekly calendar schedule had similar yields, this method utilized the most water (17.3 ac-in), had the highest # of irrigations, and had the fewest # of days between irrigations (8.4). When looking at the sensor-based methods, nearly all the methods utilized the same amount of water (~15 ac-in), had the same # of irrigations (~6), and had the same # of days between irrigations (~12). The only exception to this was Simplot SmartFarm treatments utilizing only 11.9 ac-in of water. The Smart Irrigation Crop Fit app utilized the least amount of water (9.7 ac-in) and produced the lowest irrigated yield at 69.1 bu ac-1, which can be attributed to the longest interval between irrigations which was 22.5 days. Irrigated treatments represented at least an 87% increase in soybean yield over the no-irrigation control. Overall, the 2024 growing season emphasized the need for irrigation water management with only 2.6 inches of effective rainfall. While method selection can have an impact on yield, water use, and irrigation frequency. No differences were observed for IWUE in 2024.

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| **Table 1. Soybean Yield, Total Water Use, Irrigation Water Use Efficiency (IWUE), # of Irrigations, and Ave. # of Days Between Irrigations as affected by irrigation treatments in 2024** |
| Irrigation Treatment | Yield @ 13% Moisture | Total Water Use | IWUE | # of Irrigations |
|   | bu ac-1 | ac in | Irr. Yield - Dry Yield/Irrigation Water Applied |   |
| Watermark -75 kPa | 81.2 b | 15.0 a | 3.0 | 6.0 b |
| Simplot SmartFarm Irrigation | 79.5 b | 11.9 b | 3.6 | 4.3 cd |
| Calendar Schedule (Weekly) | 88.4 ab | 17.3 a | 3.0 | 8.0 a |
| NCAAR Soil Water Balance | 85.6 ab | 15.9 a | 3.1 | 6.0 b |
| Goanna Ag | 92.9 a | 15.8 a | 3.6 | 6.2 b |
| NCAAR Sentek Relative Rate of Depletion | 85.6 ab | 15.0 a | 3.3 | 5.7 bc |
| Smart Irrigation CropFit App | 69.1 c | 9.7 b | 3.3 | 3.0 d |
| No Irrigation Control | 36.9 d | 0.0 | 0.0 | 0.0 |
| Within a column, means followed by the same letter are not statistically different (P ≤ 0.05). |   |

***Irrigation Automation Evaluation***

Collaborating producers on three on-farm research sites agreed to participate in the 2024 RISER program to evaluate irrigation automation. Research sites were located in Bolivar, Coahoma, and Sunflower counties. Each site is equipped with soil moisture sensors, pump controls, pump automation, and automated actuator valves for each well and associated fields. Evaluations for each well system are being conducted on functionality, reliability, flexibility, sustainability and efficiency and will be compared to yield, water use efficiency, and economic analysis.

**Table 1. Total yield (bu ac-1) and water use (acre-in) for MSU and producer research sites in 2024.**

|  |  |  |  |
| --- | --- | --- | --- |
| **MSU Yield****bu ac-1** | **Producer Yield****bu ac-1** | **MSU Water Use****acre inches** | **Producer Water Use****acre inches** |
| 73 | 68.7 | 12.82 | 8.82 |

**Table 2. Combined average yield (bu ac-1) and water use (acre-in) across all 4 years (2021 - 2024).**

|  |  |  |  |
| --- | --- | --- | --- |
| **MSU Yield****bu ac-1** | **Producer Yield****bu ac-1** | **MSU Water Use****acre inches** | **Producer Water Use****acre inches** |
| 78.82 | 79.91 | 8.97 | 10.16 |

**Objective 2: Conduct hands-on training and learning opportunities with producers that have yet to adopt proven irrigation water management practices and continue to assist producers who already utilize IWM practices.**

***Sensor Training and Demonstration:***

To empower farmers to take the big step of adopting sensors, we launched an agent-led and multi-year on-farm education program. Agents recruit farmer-participants from their respective counties and provide critical hands-on training in the field to give the producer the best user experience. Irrometer Watermark 200SS sensors are utilized in this program.

Year one participants receive focused hands-on instructions from the agents. The goal for participants in years two and three is to gradually use the soil moisture sensors more independently. In 2024, 32 farmers across Mississippi agreed to participate. **Three ANR Extension Agent training courses discussing the following topics were held during this reporting period; 1) Irrigation Termination (7/31/2024), 2) Sensor Graph Building (11/15/2024), and 3) On Farm Preparation (3/28/2025).**

Figure 1. 2024 soil moisture sensor sites in this statewide Extension program

***Farmer assistance in computerized hole selection:***

Pipe Planner programs were designed for over **14,330 acres** during this reporting period. Flow rates and elevations were taken by the MSU irrigation team to develop the computerized hole selection plans. The irrigation team and county extension agents are currently working with growers to prepare fields, collect elevations, and flowrates to prepare for the 2025 growing season.

***Master Irrigator:***

[***https://www.ncaar.msstate.edu/outreach/master/index.php***](https://www.ncaar.msstate.edu/outreach/master/index.php)The Master Irrigation course took place in February of 2025. The program consisted of 24 hours of online modules, classroom training, peer-to-peer exchange among participants and instructors, and field demonstrations. In 2024, 60 individuals participated in the program, which provided them with knowledge of irrigation water management practices, soil health, agronomics, irrigation systems, and equipment maintenance.

***Presentations:***

1. MAIC Row Crop Certified Crop Advisors Program. Strategies to Improve Irrigation and Water Management. Orange Beach, AL 07/24/2024.
2. Leadership Washington County-Washington County Economic Alliance. Irrigation Research Overview. Stoneville, MS 09/03/24.
3. Mississippi Agricultural Consultants Association. Irrigation Update. Stoneville, MS 9/27/2024.
4. Gholson, D.M. NRCS State Technical Committee Meeting. NCAAR Update. Jackson, MS 11/14/24.
5. Gholson, D.M. 2024 MSU Row Crop Short Course. Advanced Irrigation Water Management Strategies for Furrow Irrigation. Starkville, MS 12/09/24.
6. Gholson, D.M. Oklahoma State University Winter Crop School. Using Soil Moisture Sensors to Schedule Irrigation*.* Stillwater, OK 12/17/24.
7. Simpson, A., Simpson, Z. P., Lo, T. H., Spencer, D., **Gholson, D. M.** (2024) Soil Conservation Practices in the U.S. Mid-South Improve Soil Quality. ASA, CSSA, SSSA International Annual Meeting, San Antonio, TX. <https://scisoc.confex.com/scisoc/2024am/meetingapp.cgi/Paper/162317>
8. Russell, D. A. and **D.M. Gholson** (2024) Evaluating Various Irrigation Scheduling Methods and Telemetry Services on Soybean Production in the Mid-Southern USA. ASA, CSSA, SSSA International Annual Meeting, San Antonio, TX. <https://scisoc.confex.com/scisoc/2024am/meetingapp.cgi/Paper/161953>
9. Russell, D.A. and **D.M. Gholson** (2024) Mississippi Master Irrigator: First-Year Successes and What's Next. ASA, CSSA, SSSA International Annual Meeting, San Antonio, TX. <https://scisoc.confex.com/scisoc/2024am/meetingapp.cgi/Paper/161893>
10. Lo, T. H., Freeland III, T. B., **Gholson, D. M.,** Larson, E. J., Czarnecki, J. M. P., Singh, G., Kaur, G., Irby, J. T., Quintana-Ashwell, N. E., Simpson, A., Russell, D. A., & Deason, J. A. (2024) Wide-Skip Furrow Irrigation: A Promising Practice for Managing Vertisols in Humid Climates. ASA, CSSA, SSSA International Annual Meeting, San Antonio, TX. <https://scisoc.confex.com/scisoc/2024am/meetingapp.cgi/Paper/156335>
11. Lo, T. H., **Gholson, D. M.**, Pringle, H. C. III, Rix, J. P., Russell, D. A., & Deason, J. A. (2024) Scheduling Furrow Irrigation Using Multi-Sensor Capacitance Probes: Recent Experiences in the Yazoo-Mississippi Delta. ASA, CSSA, SSSA International Annual Meeting, San Antonio, TX. <https://scisoc.confex.com/scisoc/2024am/meetingapp.cgi/Paper/156334>
12. Locke, M. A., Witthaus, L., Johnson, F. E. II, Moore, M. T., Steinriede, W., **Gholson, D.M.**, Wells, R. R., & Heintzman, L. J. (2024) Soil Assessments in the Lower Mississippi River Basin Long-Term Agroecosystem Research (LTAR) Common Experiment. ASA, CSSA, SSSA International Annual Meeting, San Antonio, TX. <https://scisoc.confex.com/scisoc/2024am/meetingapp.cgi/Paper/159570>
13. **Gholson, D.M.** (2025) Mississippi Master Irrigator: Enhancing Producer Knowledge and Adoption of Irrigation Water Management Practices Through Education. 28th Annual National Conservation Systems Conference. Memphis, TN 01/27 & 28/2025.
14. 51st Annual Mississippi Agricultural Consultants Association. Irrigation Management in Mississippi Row Crops. Starkville, MS 02/04/25.
15. LTAR Grower-Stakeholder Meeting. Stoneville, MS 02/27/25.

***Field Days:***

1. Daugherty Water for Food Global Institute. Agriculture Irrigation in the Deep South. Various locations in the Mississippi Delta. 04/03/24.
2. 2024 National Black Growers Council Model Farm Field Day Series. Row crop production practices and relevant research updates/activities at MSU and DREC. Greenville, MS 06/28/24.

***Podcasts:***

1. Mississippi Crop Situation Podcast. 4/2/24. Spring Preparation for Irrigation. <https://extension.msstate.edu/content/spring-preparation-for-irrigation>.
2. Mississippi Crop Situation Podcast. 06/11/24. Irrigation Triggers for Corn, Soybean, and Cotton. <https://mscropdocs.podbean.com/e/irrigation-triggers-for-corn-soybean-and-cotton/>.
3. Mississippi Crop Situation Podcast. 08/13/24. What to Look at for Irrigation Termination. <https://mscropdocs.podbean.com/e/what-to-look-at-for-irrigation-termination/>

***YouTube:***

1. Farmweek – MSU Extension. 4/25/2024.

 <https://www.youtube.com/watch?v=KnubPYEbeO4>.

1. The Crop Science Podcast Show. Groundwater Management and Irrigation.

09/10/24. <https://www.youtube.com/watch?v=SZ0tRAmhleY>.

***Website:***

1. Soil Moisture Sensor Showcase: <https://www.ncaar.msstate.edu/outreach/general.php>.
2. 2024 NCAAR Irrigation Web Tools: <https://www.ncaar.msstate.edu/outreach#webtools>

Provides an opportunity for the Mississippi agricultural community to learn more about the soil moisture sensors and accompanying telemetry services currently on the market.

***Blog Post:***

1. Gholson, D. and T. Irby. Soybean Irrigation Termination-5. 08/07/24. <https://www.mississippi-crops.com/2024/08/07/soybean-irrigation-termination-5/>.

***Popular Press Articles:***

1. MSU Researches Efficient Crop Irrigation Strategies. Extension Matters. April 2024. <http://extension.msstate.edu/news/feature-story/2024/msu-researches-efficient-crop-irrigation-strategies>.
2. MSU Master Irrigator Program Equips Growers. Extension Matters. May 2024. <http://extension.msstate.edu/news/feature-story/2024/msu-master-irrigator-program-equips-growers>.
3. MSU Master Irrigation Program Equips Growers. The Leland Progress. May 15, 2024. Volume 127 Number 20. Pgs. 1-2.
4. MSU Extension Master Irrigator Program Equips Growers with both Online and In-Person Training. Delta Business Journal. June 2024. Volume 26. Number 12. Page 104.
5. Delta Farm Press. January 21, 2025. Trouble irritating cracking clay? Try wide row ships. [Trouble irrigating cracking clay? Try wide row skips](https://www.farmprogress.com/crops/trouble-irrigating-cracking-clay-try-wide-row-skips?utm_rid=CPG02000002451991&utm_campaign=93108&utm_medium=email&elq2=f9777ce109ed4e238918acd5b33a3e03&sp_eh=484f57c87348b15da03c345d08e80cd58be806f97de53dfcef78dbecda05b991).
6. MSU Irrigation Research Urges Moisture Sensor Use. Extension Matters. February 26, 2025. [MSU irrigation research urges moisture sensor use | Mississippi State University Extension Service](https://extension.msstate.edu/news/feature-story/2025/msu-irrigation-research-urges-moisture-sensor-use).

***Producer Meetings***

1. Leflore County Grower Meeting. Greenwood, MS 02/13/25
2. Humphreys County Grower Meeting. Belzoni, MS 02/11/25
3. Grenada County Grower Meeting. Grenada, MS 02/10/25
4. Tunica County Grower Meeting. Tunica, MS 02/10/25

***Technical Publication:***

1. NCAAR 2023 Annual Report. MAFES & USDA. 2024.

<https://www.ncaar.msstate.edu/docs/2023NCAARAnnualReport_HighRes.pdf>

***Extension Publications***

1. Russell, D., **D. Gholson**, N. Quintana, A. Deason, H. Lo. 2024. *Mississippi Irrigation Manual*. Mississippi State University Extension Service Publication 3951. <https://extension.msstate.edu/sites/default/files/publications/publications/P3951_web.pdf>