Row Crop Irrigation Science Extension and Research (RISER) Program
13-2023
Annual Report (April 1, 2023 – March 31, 2024)

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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 sensor-based automation technologies.
For 2023, eight collaborating producers agreed to participate in on-farm research sites. Sites were located in Sharkey, Coahoma, Washington, and Sunflower counties. Evaluations for each well system were conducted on functionality, reliability, flexibility, sustainability, and efficiency and compared to yield, water use efficiency, and economic analysis.

The evaluation included the actuated valves' functionality and monitoring and recording failures of the actuated valves throughout the season. The review of this new automated system is early in the stages of hardware systems. Additional programming and testing are needed for automation to become an easy and adaptable practice. System failures were still present this growing season and caused some overwatering issues when not caught quickly. We are working with programmers to see how the issues can be fixed.

Total water use and yield was obtained from the automated sites and the “control” non-automated, farmer irrigated sites. These results show the average for the on-farm sites. Results are:

Table 1. Seasonal irrigation, soybean yield, and irrigation water use efficiency (IWUE) for fourteen sites in soybean from 2020 to 2023.

	Yield (bu/ac)	**Water Use (acre-inches)**	**Water use efficiency (yield/irrigation applied)**
Automated Fields	78.82	8.64	11.58
Non-automated Fields	79.91	10.27	9.90

Objective 2: Conduct hands-on training and other learning opportunities with producers that have yet to adopt proven irrigation water management practices.

Through the MSPB-funded RISER program, it was determined that the use of soil moisture sensors, computerized hole selection, and surge irrigation water use can be reduced by 21% and water use efficiency improved by 36%, increasing producer profitability by $13 per acre. In 2023, the RISER program installed moisture sensors and trained producers one-on-one to promote the adoption of these practices that cover over 35,000 acres potentially resulting in over $455,000 in increased profitability and saving of 7,000 acre-feet or 2.2 billion gallons of water.

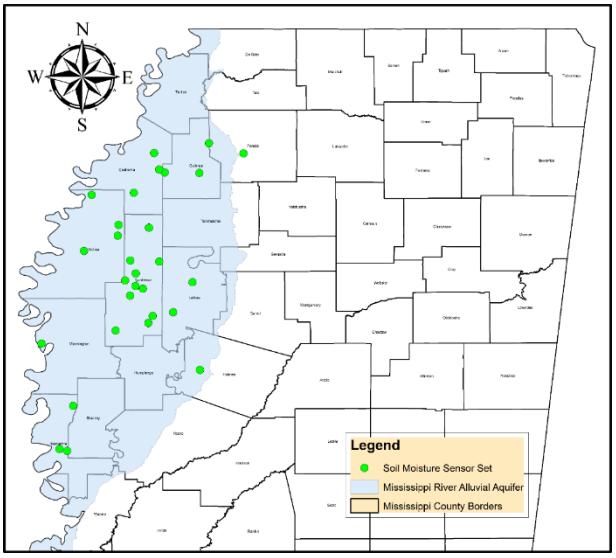

Figure 1. 2023 soil moisture sensor sites in this statewide Extension program.

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.
Two Extension agent training sessions were held at the DREC and one on-farm in a participating grower's field. Individual meetings were conducted throughout the growing season with 27 producers enrolled in the soil moisture sensors on-farm demonstration program. The final meeting was a year-end review including season-long soil moisture graphs, rainfall, and irrigation events. The review aided in discussions on how well the farmer did in irrigation scheduling, where they felt they could get better, and how we can help build knowledge about the sensors and understanding the moisture readings. We went over available resources. In addition, the growers completed a questionnaire about their experience with the program. At the conclusion of our first three-year program, 7 producers successfully completed their sensor training.

Soil Moisture Demo evaluation results:
100% were extremely satisfied with the program.
100% increase in knowledge when asked:

- How to read the soil moisture sensors.
- Confidence in soil moisture sensors to reflect accurate soil moisture readings.
- Where to get information for guidance on soil moisture sensors.

Farmer assistance in computerized hole selection:
43 soybean producers received assistance with computerized hole selection on a total of 11,393 acres. Flow rates and elevations were taken by the MSU irrigation team to develop the computerized hole selection plans.

Presentations:

1. **Gholson, D.** (2023) Panel Discussion: Addressing Groundwater Depletion across Regions and Aquifers. 2023 UCOWR/NIWR Annual Conference. Fort Collins, CO

2. Russell, D. and **D.M. Gholson**. (2023) Enhancing Knowledge and Facilitating Adoption of Irrigation Water Management Practices through Education. 2023 UCOWR/NIWR Annual Conference. Fort Collins, CO
3. Russell, D. and **D.M. Gholson**. (2023) Enhancing Knowledge and Facilitating Adoption of Irrigation Water Management Practices through Education. 2023 Mississippi Water Resources Conference. Starkville, MS https://www.wrri.msstate.edu/abstract.php?q=1906
4. **D.M. Gholson**. Applied Innovation in Irrigation for Decision Making. University and Industry Consortium. Sioux Falls, SD 04-19-23
5. Summer Research Experience in High Performance Computing and Agriculture Program. Development of Best Management Practices and Technologies to Optimize Water Use in the Lower Mississippi River Basin. Stoneville, MS 07-14-23
6. MSU-USDA ARS Research Day. Development of Best Management Practices and Technologies to Optimize Water Use in the Lower Mississippi River Basin (**Drew Gholson**/Chris Delhom) Stoneville, MS 06-28-23
7. 2023 UCOWR/NIWR Annual Water Resources Conference. Special Session – New Strategies for Managing Irrigation Water Depletion 2: Panel Discussion – Addressing Groundwater Depletion across Regions and Aquifers. Fort Collins, CO 06-14-23
8. 2023 MSU Row Crop Short Course. Enhancing Irrigation in Cracking Clay Soils and Unraveling Water Pathways. Starkville, MS 12-04-23

9. 2023 MSU Row Crop Short Course. Moderator - Grower's Perspective of Implementing Conservation Practices. Starkville, MS 12-04-23

10. Keynote speaker for Agricultural Irrigation Workshop hosted by Texas A&M AgriLife Extension Service and Post Oak Savannah Groundwater Conservation District. Maximizing Water-Use Efficiency and Crop Profitability. Caldwell, TX 11-10-23

11. Mississippi Agricultural Consultants Association Research and Education Committee Meeting. Roundtable discussion of research/Extension projects. Stoneville, MS 10-05-23

12. **Gholson, D. M.** (2023) Irrigation Automation - Evaluating On-Farm Irrigation Automation. ASA, CSSA, SSSA International Annual Meeting, St. Louis, MO. 10-2023 https://scisoc.confex.com/scisoc/2023am/meetingapp.cgi/Paper/152577

13. Vargas, A.*, **Gholson, D. M.,** Lo, T. H., Krutz, L. J., Spencer, D., & Singh, G. (2023) Irrigation Systems and Row Spacing Effects on Soybean Water Use and Productivity on a Sharky Soil. ASA, CSSA, SSSA International Annual Meeting, St. Louis, MO. 10-2023 https://scisoc.confex.com/scisoc/2023am/meetingapp.cgi/Paper/148525

14. Russell, D. & **Gholson, D. M.** (2023) Mississippi Master Irrigator: Innovative Approach to Expand Knowledge and Adoption of Irrigation Water Management Practices. ASA, CSSA, SSSA International Annual Meeting, St. Louis, MO. 10-2023 https://scisoc.confex.com/scisoc/2023am/meetingapp.cgi/Paper/148526

15. Lo, T. H., **Gholson, D. M.,** Rix, J. P., Venishetty, V., & Yanes, R. F. (2023) Investigations of Soil Water Sensor Variability in the Yazoo-Mississippi Delta. ASA, CSSA, SSSA International Annual Meeting, St. Louis, MO. 10-2023 https://scisoc.confex.com/scisoc/2023am/meetingapp.cgi/Paper/150654

In-Service Training:

1. ANR Extension Agent Training: flowmeters, elevations, Pipe Planner, soil moisture sensors, On Farm SMS Demonstration Program. Sunflower County Extension Office. Indianola, MS 03-25-24
2. ANR Extension Agent Irrigation Termination Training. Stoneville, MS 08-11-23

Producer Meetings:

1. 2024 North Alabama Irrigation Workshop. Use of Soil Sensors for Irrigation Scheduling. Decatur, AL 02/14/24
2. Central Delta Regional Producer Meeting. Greenwood, MS 02/12/24

Online Videos:

1. How to Install WaterMark Soil Moisture Sensors - Mississippi Master Irrigator. February 2024. https://www.youtube.com/watch?v=t5FlcNmX1f

Podcasts:

1. Mississippi Crop Situation Podcast. 06-03-23. When to begin irrigation in soybean. https://www.mississippi-crops.com/2023/06/03/when-to-begin-irrigation-in-soybean/
2. Mississippi Crop Situation Podcast. 08-09-23. When Do We Stop Irrigating Soybean? https://www.dropbox.com/scl/fi/c92n5mjcqvxckvn5mipn4/Irby_Gholson_08-07-23_Edited.mp3?rlkey=0hiajl2lu8czi7bt2idrq0d9v&dl=0
3. Mississippi Crop Situation Podcast. 11-07-23. Mississippi Master Irrigator Certification Program. http://extension.msstate.edu/agriculture/crops/master-irrigator https://mscropdocs.podbean.com/e/mississippi-master-irrigator-certification-program/

Popular Press Articles:

1. Improving Furrow Irrigation Efficiency. Soybean Research & Information Network (SRIN) website. May 15, 2023. https://soybeanresearchinfo.com/research-highlight/improving-furrow-irrigation-efficiency/
2. Mississippi Succeeding in Irrigation Efficiency Efforts. Mid America Farmer Grower. May 10, 2023. Vol.42 No. 19 https://www.flipsnack.com/mafgnet/issue-19-may-12-2023-mafg/full-view.html
3. NCAAR's Tools Promote Smart Irrigation for Growers. The Leland Progress. August 2, 2023. Volume 126 Number 30.
4. Water Conservation: Delta Producers are Taking Proactive Steps for Efficiency. Delta Ag Journal. Pgs. 38-40. Volume 6 Number 2. July 2023. Irrigation Efficiency – MSU Educates to Conserve Water Resources. Mississippi Landmarks. Volume 19 Number 2. Pgs. 10-12. November 2023. https://www.dafvm.msstate.edu/sites/default/files/2023-11/Landmarks_v19n2_web.pdf

Extension Publications:

1. Lo, H., **D. Gholson**, N. Quintana, A. Deason. 2023. Flow Measurement Series: Flow Meter Calculator. Mississippi State University Extension Service Publication 3905. http://extension.msstate.edu/publications/flow-measurement-series-flow-meter-calculator http://extension.msstate.edu/sites/default/files/publications/publications/P3905_web.pdf

2. Lo, H., J. Rix, **D. Gholson**. 2023. Sentek Drill & Drop Series: Data Interpretation. Mississippi State University Extension Service Publication 3898. http://extension.msstate.edu/publications/sentek-drill-drop-series-data-interpretation http://extension.msstate.edu/sites/default/files/publications/publications/P3898_web.pdf
3. *Roberts, C., **D. Gholson**, N. Quintana, H. Lo. 2023. How to Calculate Irrigation Pumping Costs with MITOOL. Mississippi State University Extension Service Publication P3889. http://extension.msstate.edu/sites/default/files/publications/publications/P3889_web.pdf
4. Russell, D., D. Gholson, N. Quintana, A. Deason, H. Lo. 2024. *Mississippi Irrigation Manual*. Mississippi State University Extension Service Publication 3951.

Blog Articles:

1. **Gholson, D.** Where should I install my soil moisture sensors? 05-24-23. https://www.mississippi-crops.com/2023/05/24/where-should-i-install-my-soil-moisture-sensors/
2. Irby, T. and **D. Gholson**. When to Begin Irrigation in Soybean. 06-3-2023. https://www.mississippi-crops.com/2023/06/03/when-to-begin-irrigation-in-soybean/
3. Gholson, D. New Master Irrigator Program Registration Now Open. 09-22-23. https://www.mississippi-crops.com/2023/09/22/new-master-irrigator-program-registration-now-open/

Field Days:

1. Virginia Tech Student Tour. Agriculture in the Deep South. Stoneville, MS 05-15-23
2. MAFES Bus Tour. Irrigation Research in the Delta. Stoneville, MS 05-02-23
3. Implementation of Conservation Practices. Stoneville, MS 04-25-23
4. Farm Bureau Board of Directors Field Tour. Stoneville, MS 08-23-23
5. Innovative Irrigation and Cover Crop Integration Field Day. Various locations in the Mississippi Delta. 07-19-23
6. Soil Health Institute Field Day. Sunflower County. Irrigation Management. 02-05-2024

Online Web Tools and Apps:

1. Flow Measurement Series: Flow Meter Calculator. The Flow Meter Calculator can be accessed at https://www.ncaar.msstate.edu/outreach/fmcalc.php.
2. How to Calculate Irrigation Pumping Costs with MITOOL. The online tool can be accessed at https://www.ncaar.msstate.edu/outreach/mitool.php.

Mississippi Master Irrigator:

- Developed and implemented a 24-hour online and in-person training course directed at Irrigation Water Management practices.
- Mississippi Master Irrigator Course. Inaugural Course February 2024. Delta Research and Extension Center. Stoneville, MS.
- Created the online course using Canvast to produce 8+ hours of instructional video content
- Implemented a two-day Master Irrigator in-person session with 38 participants completing the online and in-person requirements of the program.

Websites:

1. MSU Extension Master Irrigator Program:

   http://extension.msstate.edu/agriculture/crops/master-irrigator

2. 2023 Soil Moisture Sensor Showcase:
   Provides an opportunity for the Mississippi agricultural community to learn more about the soil moisture sensors and accompanying telemetry services currently on the market.
   https://www.ncaar.msstate.edu/outreach/general.php