Mississippi Corn Promotion Board
2024 Progress Report

Project Title: Wide-Skip Furrow Irrigation in Clay Soils—A Farmer-Led Revolution

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Project Summary (Issue/Response)

Mississippi farmers know that excessive water can be very harmful to corn and other row crops. In the Delta, irrigating every furrow can saturate buckshot (i.e., cracking clay) soils for days, especially when followed shortly by heavy rain. Lack of soil oxygen hinders plant functioning and accelerates nitrogen losses. Ultimately, the consequences are lower yield and lower income.

To tackle this problem, some Delta farmers have been concentrating irrigation water into one furrow every 10 feet or wider on buckshot. With this practice of wide-skip furrow irrigation, irrigation water reaches the bottom end of the field more quickly. At the same time, irrigation water spreads underground to non-irrigated furrows through soil cracks while leaving the topsoil unsaturated and oxygenated. Harmful effects of unexpected rain after irrigation are thus lessened.

Preliminary investigation in the Delta has affirmed the benefits of this farmer-driven innovation on buckshot. Yet before wide-skip furrow irrigation becomes an endorsed practice, its behavior, variables, and limitations should be better understood. Its performance should also be confirmed through further testing. To address these needs, we launched an integrated research-Extension project with three objectives: 1) determine the yield, water, and profit impact of wide-skip furrow irrigation on corn in buckshot; 2) distribute knowledge and recommendations associated with wide-skip furrow irrigation; and 3) develop one young agricultural professional through a graduate research assistantship. This progress report summarizes the first year of our multi-year project.

Project Results/Outcomes

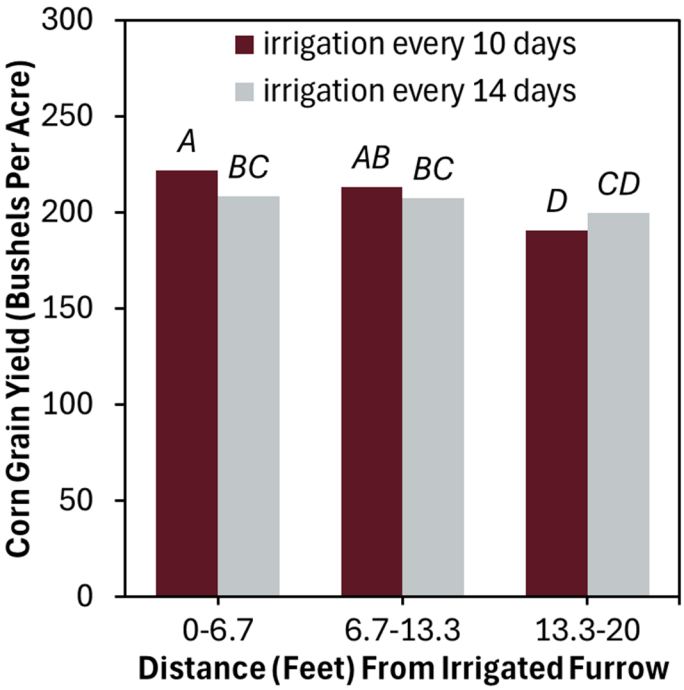
For the first objective, we launched new experiments on wide-skip furrow irrigation. Our on-station experiment focused on characterizing the influence of furrow inflow and irrigation frequency on the yield, water, and profit outcomes of wide-skip furrow irrigation. We conducted this experiment on Dowling clay soil at Delta Research and Extension Center. We planted corn in 40-inch twin rows on April 4th, 2024, and supplied 268 pounds of nitrogen per acre over three applications. We then implemented 40-foot wide -skip furrow irrigation (applying water to only every twelfth furrow) in all six treatments. These treatments were the combinations of two irrigation frequencies (every 10 days and every 14 days) and three furrow inflows (26, 58, and 113 gallons per minute). We irrigated the higher-frequency treatments four times and the lower-frequency treatments two times. On August 28th, 2024, we harvested separately the corn rows that were 0-6.7, 6.7-13.3, and 13.3-20 feet from the nearest irrigated furrow. Preliminary results suggest that, in the higher-frequency treatments but not in the lower-frequency treatments, corn grain yield was lower at 13.3-20 feet from the nearest irrigated furrow than at the two shorter distances (see figure on the next page). This pattern had not been observed in previous studies, where significant rain often occurred between irrigation applications. Our 2024 experiment, in contrast, received merely 0.75 inches of total rainfall during the month-long period between the first and the last irrigation applications. Without the compensating effect of rain, wide-skip furrow irrigation may not have replenished soil water sufficiently at long distances from the irrigated furrows. This invaluable discovery might not have been made if MCPB had not chosen to invest

Project Results

its funds into our project. In collaboration with four Delta farmers who had not yet tried wide-skip furrow irrigation, we also conducted on-farm comparisons of this innovative practice against these farmers' respective standard practices. All but one farmers ultimately chose to grow soybean exclusively in 2024 on the fields that they allocated for this comparison. At the only on-farm research site with corn, both the 20-foot wide-skip treatment and the farmer's standard treatment achieved an average grain yield of 221 bushels per acre according to preliminary results. We look forward to continuing our on-station experiment and including more on-farm research sites with corn in the coming years.

For the second objective, we delivered two oral presentations on wide-skip furrow irrigation (see Project Deliverables for details). Both of these presentations acknowledged the generous support of MCPB. We look forward to sharing new knowledge and new recommendations associated with wide-skip furrow irrigation as they are generated gradually from the experiments in our project.

For the third objective, we worked to recruit a graduate research assistant for our project. We advertised the position, screened applicants, interviewed finalists, and extended our offer to the top individual. This person has accepted the assistantship and will pursue a master's degree starting in January 2025. We look forward to mentoring this young professional and providing hands-on research experience through our project.



Preliminary results from the 2024 on-station experiment with 40-foot wide-skip furrow irrigation; treatments sharing a grouping letter are not significantly different at α = 0.05 according to Tukey's test.

Project Impacts/Benefits

Our project is discovering and disseminating how to best manage wide-skip furrow irrigation on buckshot. As compared with every-furrow irrigation, wide-skip furrow irrigation on buckshot is currently estimated to increase corn yield by 8 bushels per acre, to decrease corn irrigation by 2 inches, and to increase corn profit by 40 dollars per acre. All these immediate benefits to farmers and to their water resources do not involve adding costs or complexity. By alleviating waterlogging, wide-skip furrow irrigation will encourage more diverse and more flexible crop rotations on buckshot to support thriving and resilient Mississippi farms. Additionally, reductions in groundwater withdrawal as a consequence of adopting wide-skip furrow irrigation will contribute to slowing down the depletion of the Mississippi River Valley Alluvial Aquifer, supporting the future of the Mississippi corn industry and rural communities across the Delta.

Project Deliverables

Gholson, D. M. (2024). *Advanced Irrigation Water Management Strategies for Furrow Irrigation* [Oral presentation]. Row Crop Short Course, Mississippi State, MS, United States.

Freeland, T. B., III, Gholson, D. M., Lo, T., Larson, E. J., Prince Czarnecki, J. M., 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* [Oral presentation]. Soil Science Society of America International Annual Meeting, San Antonio, TX, United States.

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