



Mississippi Corn Promotion Board 2023 Progress Report

Project

Title: Providing Irrigation Vision, Optimization, and Training

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Project Summary (Issue/Response)



While significant research and Extension efforts in Mississippi have been devoted to furrow irrigation, there is little information available for overhead irrigation, the second most prevalent delivery system in the state. Optimum production practices, delivery techniques, and irrigation management strategies may vary between surface and overhead irrigation due to intrinsic differences between the two systems. The PIVOT program will provide Mississippi corn growers with research-driven recommendations to maximize the agronomic and economic benefit of overhead irrigation systems. The objectives of PIVOT are to 1) leverage big data from Mississippi irrigators to direct research and Extension efforts, 2) experimentally investigate and validate observations, and 3) educate overhead irrigators through demonstration and on-farm assistance. Analysis of large quantities of data from Mississippi overhead irrigators will be used to determine relationships between corn grain yield and various practices, techniques, or strategies. Concurrently, designed small-plot and on-farm experiments will be used to validate big data trends and investigate new technologies and strategies. Throughout all phases of the PIVOT program, the most up-to-date information will be transferred to Mississippi corn growers via traditional and innovative Extension methods. This project can quickly advance Mississippi corn producers that utilize overhead irrigation.



Project Results/Outcomes

In year two of this project, progress was made toward all objectives. In execution of objective 1, approximately 50,000 acres of yield data from pivot-irrigated land has been collected, cleaned, and is being analyzed. Based on this on-farm data, corn yield under pivots is an average of 40 bu/acre greater than outside the pivot. In fulfillment of objective 2, multiple experiments were conducted. The first experiment investigated the optimal timing and application volume of pivot irrigation events in the Prairie and in the Delta. After two years, the results suggest that regardless of production area, pivot irrigators should not allow the soil moisture threshold to exceed -40 cbar, a wetter soil moisture than is optimum for furrow-irrigated systems (-80 cbar). Additionally, pivot irrigators should increase application volumes over the typical 0.6 – 0.75 inches. The second experiment demonstrated that converting from 38-inch rows to narrow or ultra-narrow row spacings can improve yield in pivot-irrigated environments 13% and 27%, respectively. Conversely, row spacing did not affect corn grain yield in dryland systems. A third experiment conducted in 2023 suggested that elevation/position in a field affected corn grain yield, while planting flat or on beds did not. Finally, in execution of objective 3, overhead irrigators have been supported through on-farm site visits, producer presentations, field days, and phone calls.

Project Results

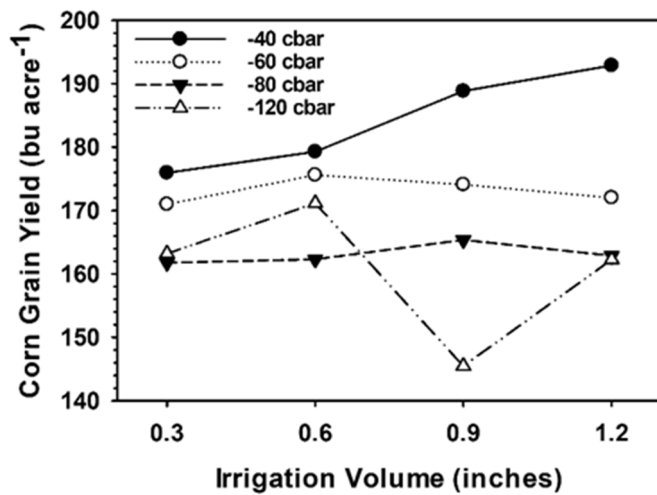


Figure 1. Pivot irrigations should be initiated at a wetter soil moisture content (-40 cbar) than is recommended for furrow irrigation (-80 cbar). Additionally, pivot irrigators should apply more water per irrigation to meet crop demand.

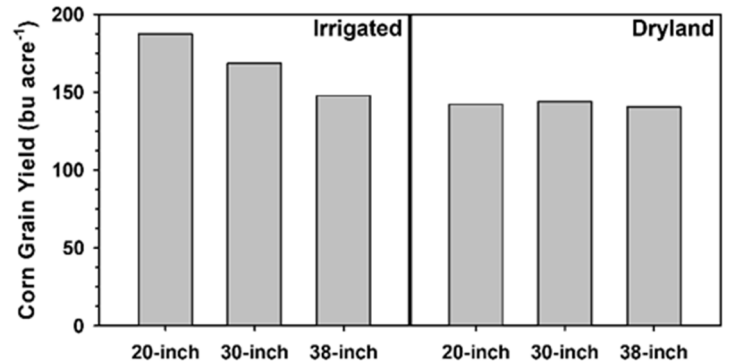


Figure 2. In irrigated environments, altering row spacing to maximize sunlight capture may increase yield, suggesting that solar radiation may be an overlooked “limiting nutrient” in Mississippi corn production.

Project Impacts/Benefits

Multiple implications have emerged after the second year of this project. First, pivot irrigators should use a much more conservative irrigation threshold than furrow irrigators, regardless of location in the state. This suggests that the optimum soil moisture condition for corn growth is near field capacity. Furrow irrigating at a drier soil moisture threshold may reduce the amount of time the field is saturated. There is less chance of prolonged saturation with pivots. Therefore, irrigating corn with a pivot should be approached differently than with furrow irrigation, and information is needed to optimize irrigation initiation, termination, and soil moisture thresholds by growth stage. A second implication is that sunlight capture may be overlooked as a “most limiting factor”. If water and fertility are sufficient, corn grain yield can be improved by moving to narrower rows to capture more sunlight. Finally, additional research is needed to investigate the cost/risk-mitigation balance of raised seedbeds in the Prairie.

Project Deliverables

Deliverables for the PIVOT program in 2023 included almost 100 individual direct contacts through in-person meetings, phone calls, emails, texts, or small-group gatherings. Additionally, information was shared to another 400 people through state and regional meetings including the National Conservation Systems Cotton and Rice Conference, the Mississippi Agriculture Industry Council Annual Meeting, field days, and the MSU Short Course. Contributions were also made to irrigation articles in the Delta Farm Press.