Mississippi Corn Promotion Board
2025 Progress Report

Project Title: Going LIVE (Large-plot Implementation Validation Experiment): Utilization of precision agricultural technology to optimize planting and fertility applications while improving corn productivity and profitability at the field scale.

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Project Summary (Issue/Response)

Mississippi corn growers continue to experience the effects of rising seed and fertilizer prices as they prepare for the 2026 growing season. With input costs at record levels, maximizing efficiency in seed, nitrogen, and fertilizer use has become essential to maintaining profitability. These inputs represent some of the largest expenses in corn production, emphasizing the need for strategies that maximize productivity on every acre. As variable-rate technology is becoming more accessible, a clearer understanding of how to effectively implement these technologies is needed. Growers often have the mechanical ability to vary rates of seed, nitrogen, and other fertilizers; however, they are uncertain of the profitability and effectiveness of these practices due to limited data. This project aims to compare production practices, fertility regimens, and yield responses to determine which conditions and combinations are most likely to generate a profitable response. Results from the project will be shared with cooperating producers as soon as they are available and will include guidance on expected responses in specific environments when utilizing variable-rate technology and machine learning tools. Through these on-farm, large-scale replicated studies, this project will provide Mississippi corn growers reliable data to support precision agriculture technology decisions.

Project Results/Outcomes

In the 2022-2025 growing seasons, thirty-three experiments altering seeding and nitrogen rates were implemented at various locations in Delta and non-Delta regions of Mississippi. These fields included both producer and MAFES experiment station fields where irrigation practices included furrow and pivot irrigation practices as well as dryland environments. Up to five nitrogen rates were coupled with multiple different seeding rates to answer the objective(s).

Objective(s):

Determine the effects of nitrogen and seeding rate on corn productivity and profitability as a function of CEC.

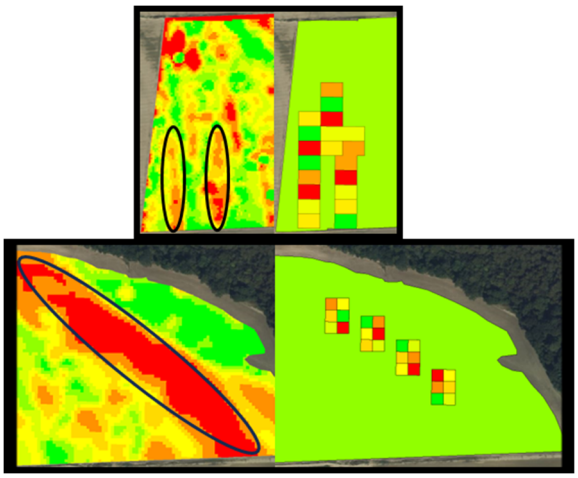
-Determine if nitrogen rates should be altered when seeding rates are varied across differing CECs.

-Begin to establish an economic threshold of nitrogen rates per seeding rate.

In 2025 plots with lower CEC (< 25), the combination of 36,000 s/ac and 270 lbs N/ac returned ~$16/acre. By reducing the rates to 32,000 s/ac and 240 lbs N/ac, profits were increased an additional $10/ac. Similarly, decreasing rates from 36,000 to 32,000 s/ac and applying the grower standard 270 lbs N/ac increased profit +$2/ac. However, reducing N rate from 270 to 240 lbs/ac and maintaining seeding rate of 36,000 s/ac resulted in a loss of $48/ac. Profitability was not improved when increasing nitrogen rates from 240 to 300 lbs/ac. Higher CEC soils (≥25) in 2025 had no profitable treatments, although a seeding rate of 36,000 s/ac reduced losses when compared to 34,000 and 32,000 s/ac. Unfortunately, an equipment malfunction at the time of application resulted in all nitrogen being applied at the grower standard of 270 lbs/ac. In the 2023 high clay content (30+ CEC) dryland environments, there was no benefit to reducing nitrogen rates when seeding rates were lowered. Plots planted at 30,000 s/ac coupled with 280 lbs/ac of nitrogen were +$20/ac more profitable than plots planted at 30,000 s/ac coupled with 160 lbs/ac of nitrogen. In years 2022 and 2024, no treatments were profitable.

Project Results

In irrigated environments with high clay content (CEC ≥30), decreasing seeding rate often resulted in higher nitrogen rates increasing yield but not profit; when planted at 30,000 s/ac, profitability was highest when nitrogen rates ranged from 212 to 272 lbs/ac. In irrigated environments with lighter textured soils (CEC <25), decreasing seeding rate favored lower nitrogen rates, and at 30,000 s/ac, reducing nitrogen from 302 to 212 lbs/ac increased profit by ~$35/ac. Results from 2025 irrigated environments further support these trends, as reducing nitrogen from 300 to 240 lbs/ac reduced economic losses by more than $40/ac in several low-CEC soils. In higher CEC soils during 2025, decreasing seeding rate from the grower standard of 36,000 s/ac increased losses by approximately $45–60/ac, although the grower standard treatment still resulted in a net loss of approximately $16/ac. Additional experiments conducted in historically underperforming areas showed that failure to utilize variable-rate planting and nitrogen management could increase losses by up to $160/ac in affected zones and more than $50/ac when averaged across entire fields. When data from 2022–2024 were pooled across all irrigated locations, a seeding rate of 36,000 s/ac coupled with 242 lbs/ac of nitrogen produced the highest average return ($232/ac) with a yield of 211 bu/ac. Although 36,000 s/ac coupled with 302 lbs/ac of nitrogen resulted in the highest yield (217 bu/ac), net returns were $6/ac lower.



Images above depict varying seed and nitrogen rates in historically underperforming areas.

Project Impacts/Benefits

Results from this project will provide growers with agronomic, precision ag, and economic benefits. Data from this project suggest that utilizing variable rate technology is profitable depending on the environment and agronomic practices. Many growers are purchasing equipment with variable rate technology, but are not taking full advantage of what they have purchased. These data suggest that if a grower decreases seeding rate due to CEC or other factors, the nitrogen rate could also be adjusted to increase profitability. All growers can benefit from this type of information regardless of how much variable rate technology they utilize. This type of knowledge is beneficial for growers due to changing seeding rates based on soil texture, hybrid characteristics, yield potential etc. With input prices continuing to increase, especially nitrogen, the results from this project could significantly alter management practices and increase profit.

Project Deliverables

Deliverables from this project include:
-Discussed goal and plot design at grower meeting in Hamilton, MS; summer 2022
-One-on-one discussions with participating growers in Delta and non-Delta regions of MS
-Presented data at:
-Cotton and Rice Conference January 2023
-Winter Grower Meeting December 2023
-Cotton and Rice Conference January 2024
- County meetings in 2025 (Monroe and Noxubee, February 2025)
- Extension agent training (Columbus, MS, February 2025)
-Cotton and Rice Conference (January 2025)

Additional Questions

1. What value does this research give the grower? Describe any financial decision-making tools your project provides.

This research helps growers understand where nitrogen and seeding rate adjustments are likely to pay and where they increase economic risk, particularly across different soil CECs. The results from this research show that in areas with a lower CEC, reducing nitrogen rates can limit losses by $40–80/ac, while in higher-CEC soils, seeding rate decisions can change returns by $45–60/ac even when no treatments are profitable. Comparisons to grower-standard practices show that small changes in input rates can shift net returns by tens of dollars per acre. The data also show that not adjusting inputs in historically underperforming areas can increase losses by more than $100/ac in some zones and over $50/ac when averaged across entire fields. These results give growers practical information to decide where variable-rate planting and nitrogen management make sense and where more decreased input levels may help reduce losses. Overall, the project helps growers make input decisions based on return potential rather than yield alone.

3. List other sources of funding you have acquired over the past 2 calendar years.

The MSPB funded a similar project investigating site-specific seed, P, and K prescriptions in soybean in 2025.

Additionally, these concepts were used to develop an EPA-funded project in which we are currently investigating how altering inputs and application strategies at the field or basin scale affects off-site nutrient transport and farm-scale productivity.