



# Mississippi Corn Promotion Board 2023 Progress Report

## Project

Title: Going LIVE (Large-plot Implementation Validation Experiment): Altering seeding and nitrogen rates as a function of CEC to optimize corn productivity and profitability at the farm scale

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## Project Summary (Issue/Response)

Mississippi corn growers are feeling the effects of budgetary constraints from fertilizer prices while preparing for the 2024 growing season. With fertilizer and other inputs reaching record-high prices, it is imperative for growers to be most efficient with their resources. Seed and nitrogen are among the leading costs of corn production. As variable-rate technology is becoming more available to growers, a clear understanding on how to utilize these technologies is needed. Many growers have seen positive returns from varying seeding rates with new planters. Growers also have the mechanical ability to make variable-rate nitrogen applications, but limited information is available on the profitability of this precision agricultural practice. The objective of this LIVE plot project is to determine the effects of nitrogen and seeding rate on corn productivity and profitability as a function of CEC. This LIVE plot program will inform producers with precision application technologies how to adjust seeding and nitrogen fertility rates as function of CEC to optimize corn grain yield and on-farm profitability. On-farm, large-scale replicated studies like this LIVE plot program will give Mississippi corn growers confidence in the adoption of novel, precision agricultural technologies.



## Project Results/Outcomes

In the 2022 & 2023 growing seasons, fifteen experiments altering seeding and nitrogen rates were implemented at various locations in Delta and non-Delta regions of Mississippi on producer fields along with experiment stations. These experiments were subject to furrow and pivot irrigation along with dryland. Five nitrogen rates were imbedded within two 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 dryland environments (2023 only) with a high clay content (30+ CEC), 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 irrigated environments (2022 & 2023) with a high clay content (30+ CEC), when seeding rates were decreased, a higher nitrogen rate was needed to maximize profitability. When rates of 30,000 s/ac were planted, up to \$45/ac were lost by applying less than 302 lbs/ac of nitrogen. In irrigated environments

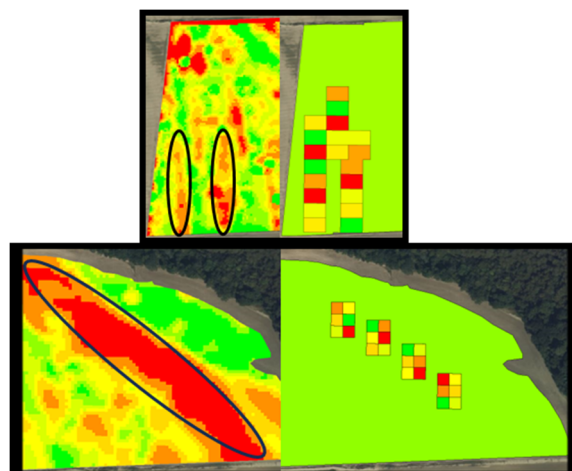
## Project Results

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(2022 & 2023) with lighter textured soils (<25 CEC), when seeding rates were decreased, it was most profitable to decrease the nitrogen rate. When rates of 30,000 s/ac were planted, profit was increased +\$35/ac by reducing nitrogen rates from 302 to 212 lbs/ac.

When data were pooled across all irrigated locations in 2022 and 2023, seeding rate of 36,000 s/ac coupled with 242 lbs/ac of nitrogen was most profitable with an average return of \$276/ac and yield of 210 bu/ac. While 36,000 s/ac coupled with 302 lbs/ac of nitrogen had the highest yield at 215 bu/ac, net returns were \$10/ac lower.

Additional experiments were implemented on historically “underperforming” areas which are circled in image to the right. These experiments contained the same treatments that were implemented on acres with more “adequate” yields. When compared to a grower standard, not utilizing variable rate planting and fertilizing technologies could cost a grower +\$250/ac in affected zones and \$70-\$100/ac when averaged across the entire farm/field acreage. These data suggest there is an economic threshold lbs/ac of nitrogen within seeding rates that may differ due to CEC in combination with yield potential.



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

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## 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.

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## 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
- Presented data at:
  - Cotton and Rice Conference January 2023
  - Winter Grower Meeting December 2023
  - Will present at Cotton and Rice Conference January 2024



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