



Mississippi Corn Promotion Board 2022 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

PI: Dr. Zach Reynolds

Department: Mississippi Water Resources Research Institute

Project Summary (Issue/Response)

Mississippi corn growers are feeling the effects of budgetary constraints from fertilizer prices while preparing for the 2023 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 growing season, six experiments altering seeding and nitrogen rates were implemented at various locations in Delta and non-Delta regions of Mississippi. These experiments were in the following counties: Washington (2), Clay (2), and Noxubee (2). All Washington and Clay locations were large-scale experiments implemented on producer fields while Noxubee locations were performed on the Blackbelt Experiment Station in Brooksville. Both Washington locations, one Clay location, and one Noxubee location were subject to pivot irrigation while the remaining two were dryland. Stand counts, soil samples along with texture, tissue samples, and yield were recorded from each plot at all locations.

Objective: 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

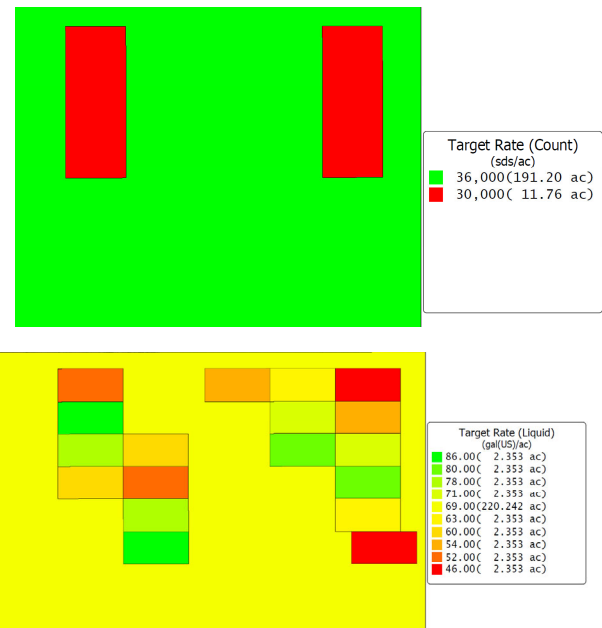
-Begin to establish an economic threshold of nitrogen rates per seeding rate

To meet the objective, two different seeding rates accompanied by five different nitrogen rates were implemented across varying CEC levels. Locations were determined by CEC and technology utilized by the producer. CECs ranged from 9.4 to 42.7 in Washington and Clay, respectively. Variable rate technology was utilized to plant and apply nitrogen. Treatment layout involved planting large “blocks” of 30,000 and 36,000 seeds per acre. The five nitrogen rates were then superimposed on these large blocks of varying seeding rates. The rates were selected to represent realistic nitrogen use across irrigated and dryland seeding rates. The nitrogen rates used in lbs N/ac are as follows: 182, 212, 242, 272, 302 for irrigated locations; 160, 190, 220, 250, 280 for dryland locations. Prelimi-



Project Results

nary data reveals that based on inputs from growers and Mississippi State University Budgets, none of the dry-land plots were profitable. This is likely due to the high nitrogen costs coupled with extreme environmental factors in 2022. Data suggests that in irrigated environments, nitrogen rate of 272 lbs/ac coupled with 36,000 s/ac was most profitable even with high input costs. Results revealed that on average, when seeding rates were decreased, it was most profitable to decrease the nitrogen rate also. When rates of 30,000 s/ac were planted, profit was increased by \$200+ per acre when nitrogen rates were cut from 302 to 182 lbs/ac because of increased yield along with reduced input prices. Plots planted at 30,000 s/ac in heavier soils (30+ CEC) accompanied by nitrogen rate of 182 lbs/ac were more profitable than 36,000 s/ac rate paired with 182, 212, and 302 lbs/ac of nitrogen. This same pattern did not hold true on lighter soils. These preliminary data from one year suggest that there is an economic threshold of lbs/ac of nitrogen within seeding rate that may differ due to CEC.



Top image is planting prescription and bottom image is corresponding nitrogen prescription used at a location.

Project Impacts/Benefits

Results from this project will provide growers with agronomic, precision ag, and economic benefits. Preliminary 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 should also be decreased to maximize profitability. 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
- Will present data at Cotton and Rice Conference in January 2023