SC Soybean Board Final Report

General Information

Principal Investigator(s) Name(s): Michael Plumblee, Ph.D.
Organization: Clemson University
Date: 1/19/2023
Quarter: Final

Proposal Information

Title: Evaluating Ultra-Late Soybean Planted Behind Corn in South Carolina
Amount Expended to Date: 20,000

Project Summary

Soybean farmers in South Carolina have historically taken advantage of double cropping soybean behind small grain, in addition to planting full-season soybean. In order for farmers to take advantage of the maximum profit generated per acre per year, double cropping is a desirable planting scenario, and it works well in our region. Over the last several years, when commodity prices have been considered high, some farmers in SC have taken advantage of double cropping soybean behind corn rather than leaving the field fallow. While this scenario associates quite a bit of risk with it, a considerable number of acres are planted annually in SC with this scenario. In this project, we evaluated this planting scenario from a whole system approach, including agronomic, pest, disease, fertility, and economic parameters associated with planting soybean behind corn in SC, in order to provide farmers with the best management practices for this scenario.

Four separate trials were conducted to help answer research questions associated with this production practice in the 2022 crop year.

Planting Date x Maturity Group

The first trial was a planting date by maturity group trial where two corn hybrids (113 and 120 RM) were planted on March 15th and April 13th and grown in accordance with Extension recommendations through maturity. Each hybrid was then harvested when it dried down to approximately 25, 20, and 15.5% moisture. Four soybean MG's (MG 4, 5, 6, & 7) were then planted immediately following corn harvest and grown out until harvest. From this trial, we aimed to determine the optimum corn planting date, harvest moisture, soybean planting date, and maturity group for double-crop soybean behind corn.

*From the results in **figures 1, 2, 3, 4, & 5** we conclude that corn planting date and corn harvest moisture are critical in determining soybean yield. From this year, it appears that corn needs to be planted in March and harvested at 25 or 20% moisture content OR corn needs to be planted in April and harvested at 25% in order to maximize soybean yield following the crop. Furthermore, the soybean maturity group did not have significant differences in soybean plant*

height or grain yield, but the variety and its characteristics appear to have more influence on grain yield and plant height.

Nematode

The second trial was evaluating the nematode impacts that could arise from a continuous cropping system with nematode-susceptible host plants (corn and soybean) rather than having a fallow period after corn harvest. Corn was planted in Mid-April and harvested in early August. A susceptible and resistant MG 5 soybean was planted immediately following the corn harvest on August 10th. Certain plots in both the corn and soybean were treated with in-furrow nematicides to provide a treatment structure that allowed corn followed by soybean with no nematicides or resistance to corn treated with nematicide followed by a resistant soybean with an in-furrow nematicide and all combinations in between. From this trial we aimed to determine if corn or soybean should be treated with an in-furrow nematicide, whether a Southern root-knot-resistant soybean variety should be utilized, combinations of all nematode control measures should be deployed in this system.

Based on the V3 nematode samples the best treatment occurred when Counter 20G plus AgLogic 15G plus a resistant soybean variety was planted. Harvest nematode samples were also collected and are currently being analyzed to determine if harvest nematode counts are above or below the threshold. No significant yield differences were observed among the treatments for corn or soybean. We anticipate planting these plots in their exact locations again in 2023 so the additive effect may become more apparent at the end of the 2023 cropping season. ***See figures 6 & 7.***

Row Spacing

The third trial was the evaluation of two different row spacings (15 and 30-inch row spacing) on double-crop soybean. Soybean was planted immediately following corn harvest on August 10th at a rate of 180,000 seeds per acre on both 30 and 15-inch row spacing. From this trial, we aimed to evaluate whether there would be any yield benefit from planting on narrow row spacing at this ultra-late planting date.

From these results in 2022 we did not see any significant differences in grain yield based on soybean row spacing with the standard variety for this practice Pioneer 95Y70. ***See figure 8.***

At-Plant Nitrogen

The fourth and final trial was the evaluation of at-plant nitrogen applications. From previous research, we know that applications of nitrogen on soybean are not profitable and rarely show a yield benefit. However, reports out of Georgia where this production system has been implemented have suggested using up to 30 lbs. of at-plant N to increase plant height for combine and harvest efficiency. In this trial, we applied 0, 15, 30, 60, and 90 lbs. of ammonium nitrate immediately following planting to soybean plots that were planted immediately following corn harvest.

From this research, we aimed to determine if plant height or soybean grain yield was impacted by the additions of at-plant nitrogen. Based on the results of this trial we did not impact plant height or grain yield across any of the nitrogen rates. ***See figures 9 and 10.***

Key Performance Indicators

This research will determine if a specific maturity group soybean is best for this planting scenario in addition evaluating to the use of a nematicide, at-plant nitrogen, and determining optimum row spacing. These results could alter how soybean farmers participate in planting ultra-late soybeans both from an agronomic and economic standpoint. The key performance indicator will be to define the most profitable scenario.

The KPIs that were measured in this project were plant height measurements, nematode soil and root counts, soil fertility samples, and grain yield. All of the KPIs were exceeded in year one. From the research, in year one several factors in this production system were evaluated and in year two will be improved on with regards to variety selection, residue management, tillage, soybean planting date, and corn harvest moisture. These results have been presented at local and national meetings. Graduate student, Bennett Harrelson, who is working on this project placed 3rd at the American Society of Agronomy meeting in Baltimore, Maryland in the Applied Soybean Research Community student competition.

Next Steps

The next steps of this project will be to implement these trials again in 2023 to further evaluate this production system to a point where economic analysis can be conducted and best management practices can be established for farmers in SC that wish to utilize this system.

Additional Information

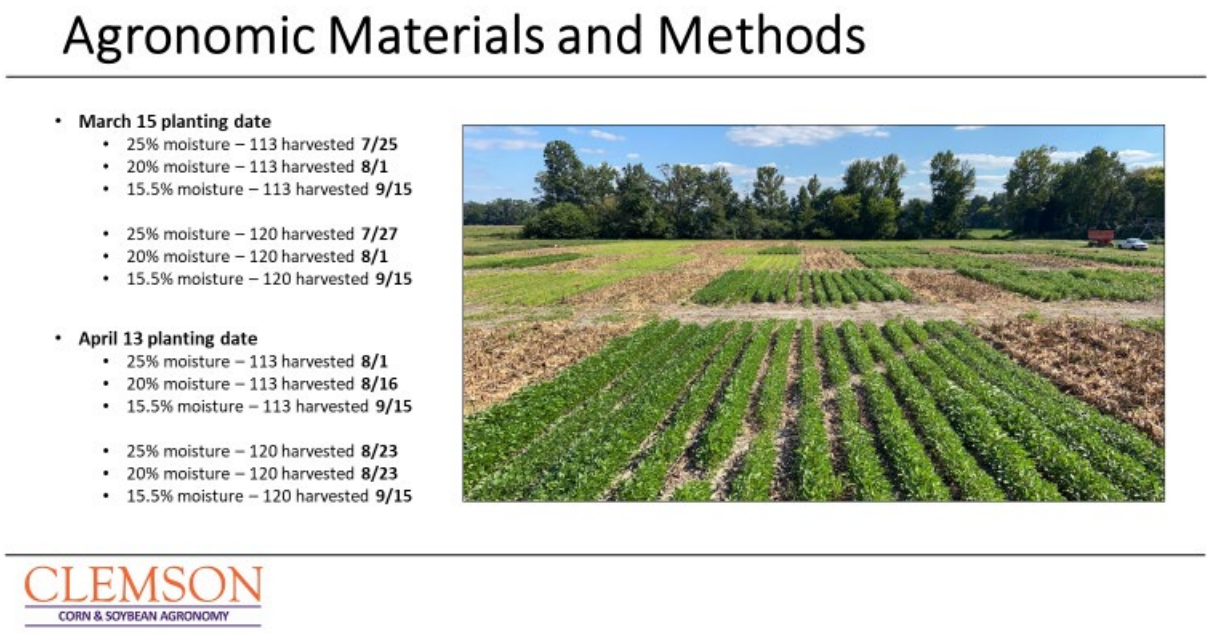

Figure 1. Corn planting dates, Relative Maturity, Harvest Moisture, and Soybean Planting Date.

Agronomic Results

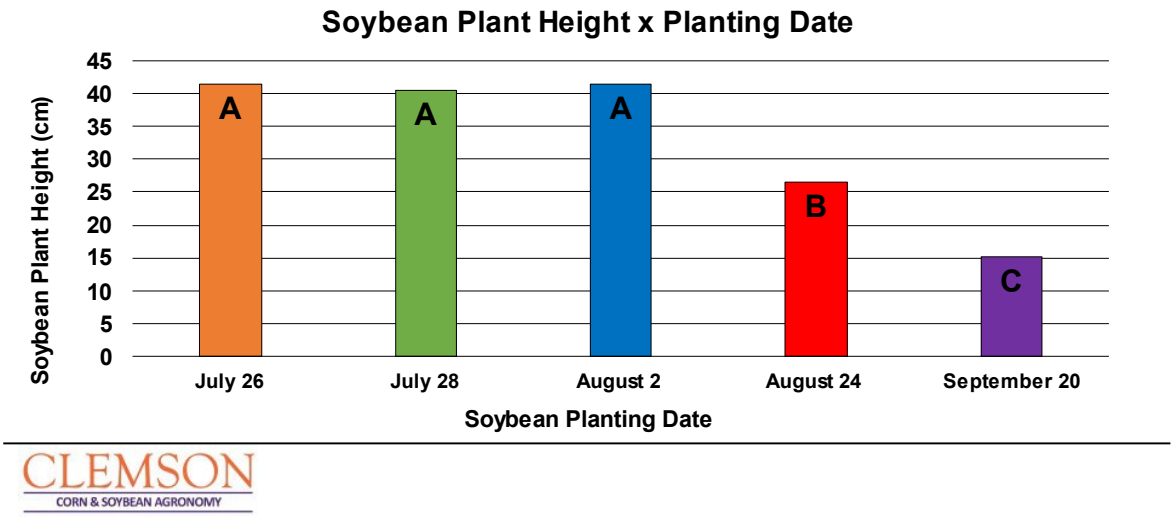

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Figure 2. Soybean Plant Height by Soybean Planting Date.

Agronomic Results

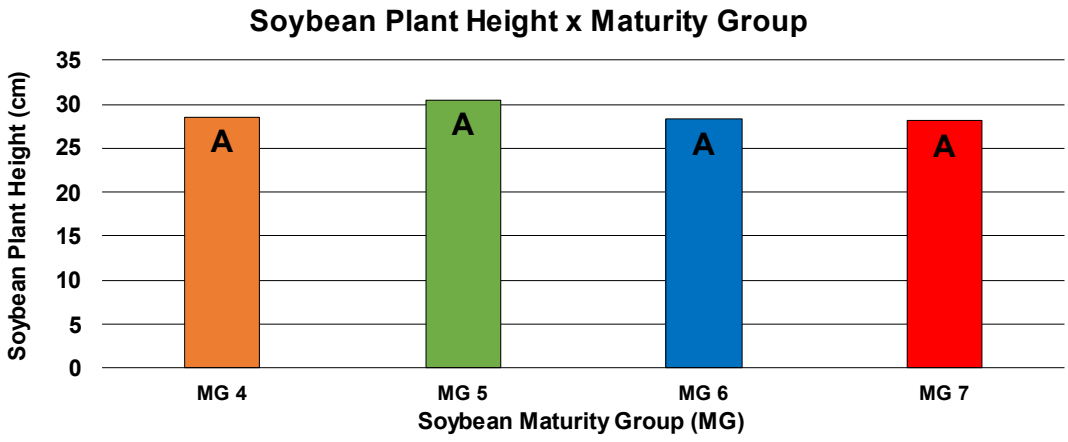

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Figure 3. Soybean Plant Height by Soybean Maturity Group.

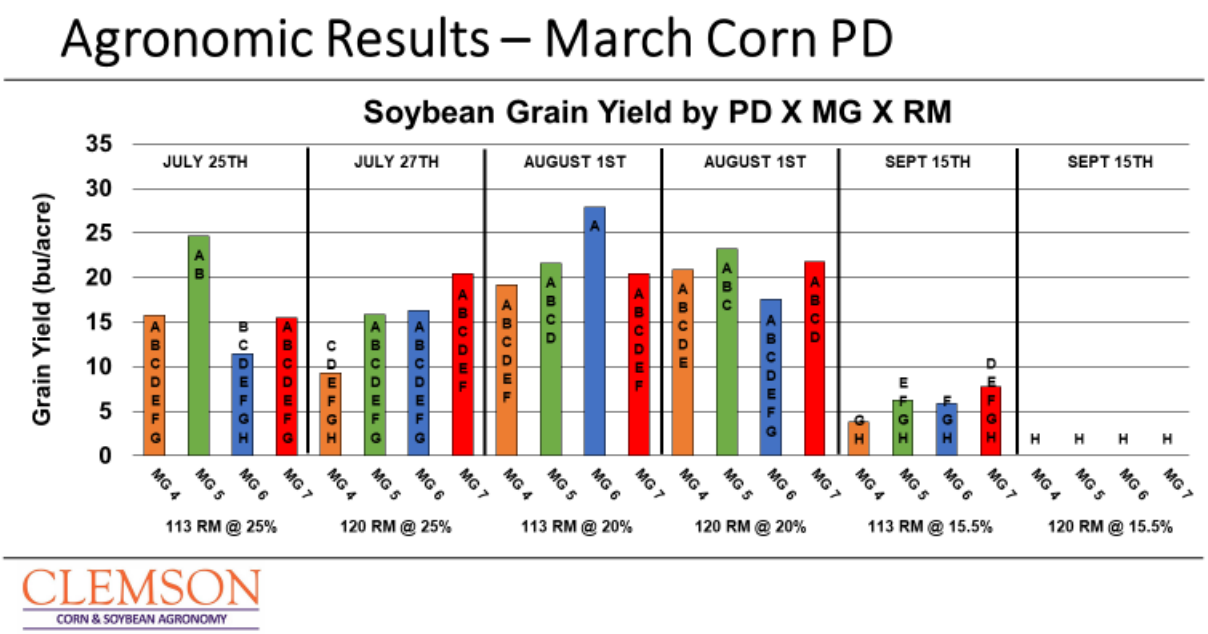

Figure 4. Soybean Yield by Soybean Maturity Group split by March Planted Corn, Relative Maturity, and Harvest Moisture.

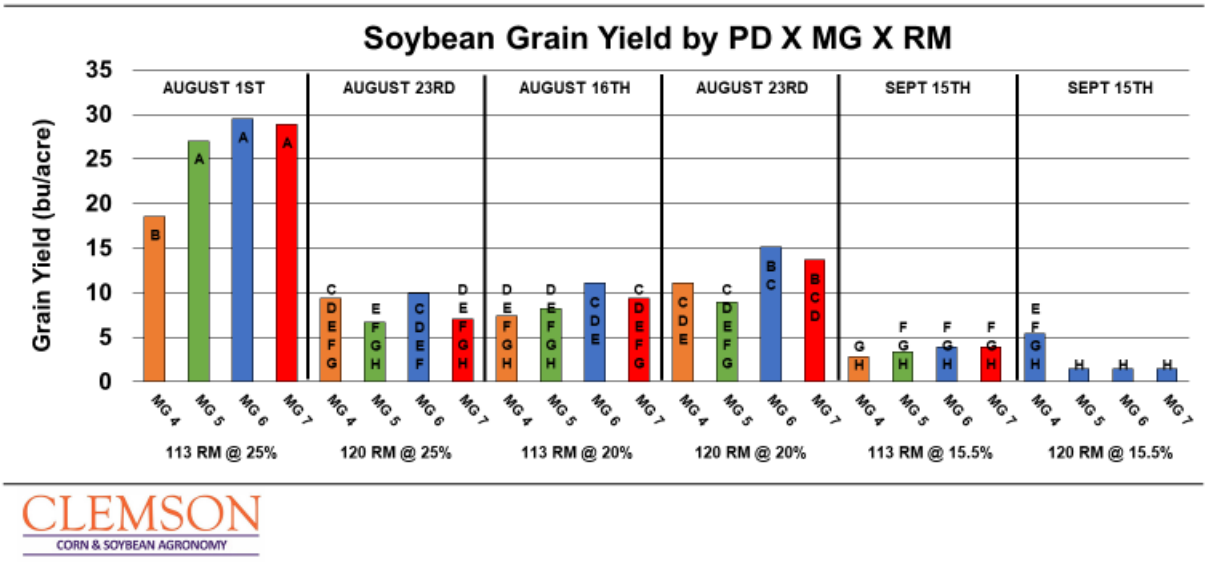

Figure 5. Soybean Yield by Soybean Maturity Group split by April Planted Corn, Relative Maturity, and Harvest Moisture.

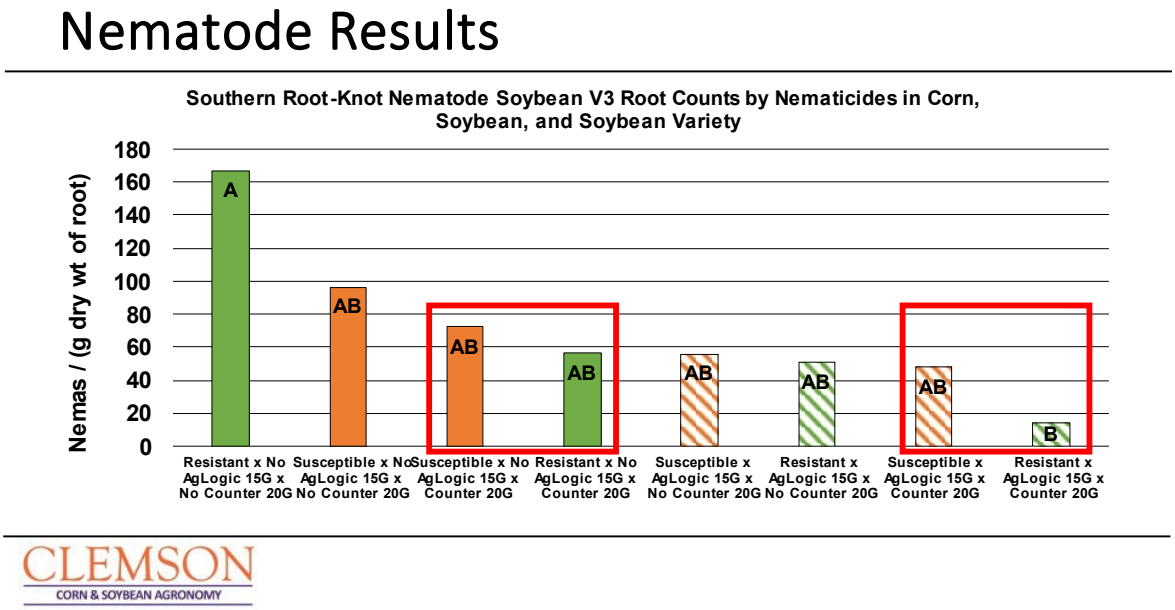

Figure 6. Southern Root-knot Root Counts in V3 Soybean Following Corn Comparing Counter 20G, AgLogic 15G, and Resistant or Susceptible Soybean Varieties.

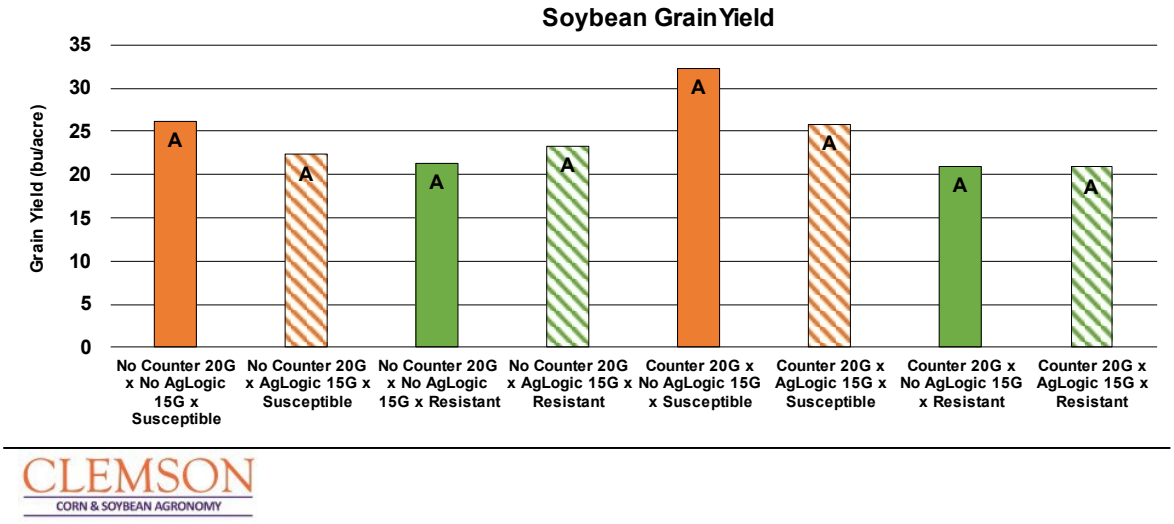

Figure 7. Soybean Grain Yield from the Double Crop Nematicide Trial.

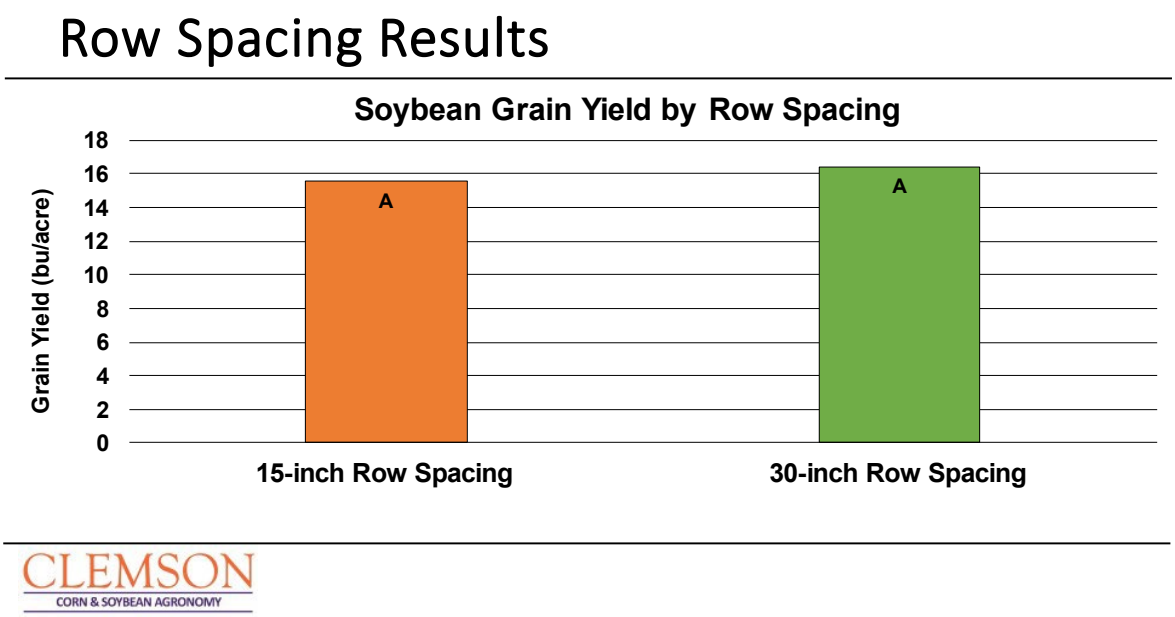

Figure 8. Soybean Grain yield from the Double Crop Row Spacing Trial.

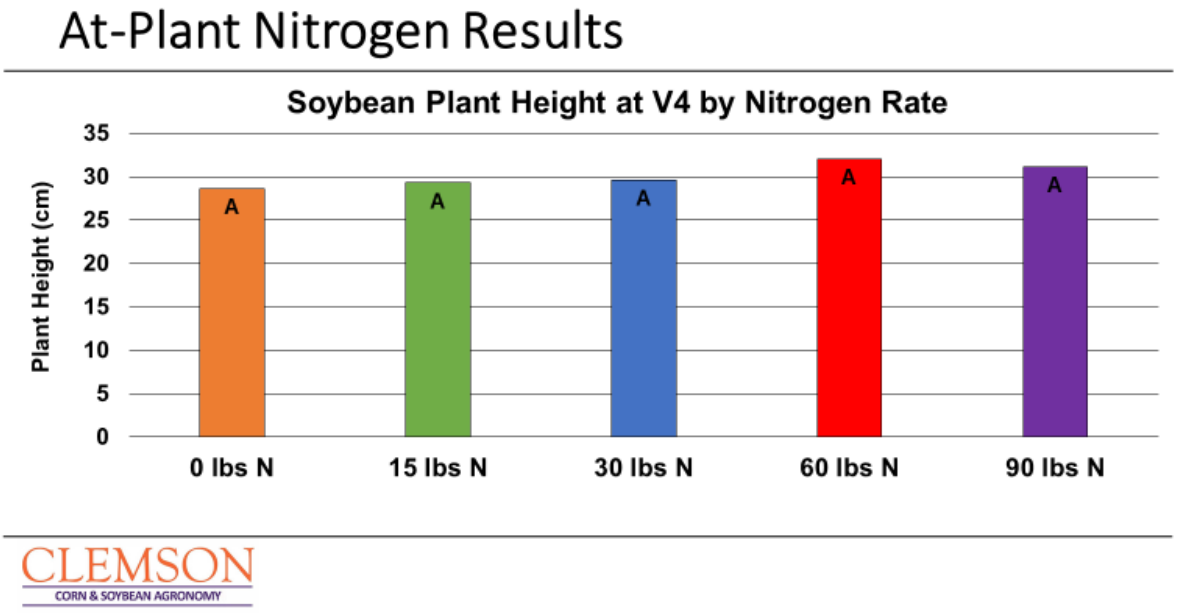

Figure 9. Soybean Plant Height at V4 Growth Stage by At-Plant Nitrogen Rate in Double Crop Soybean.

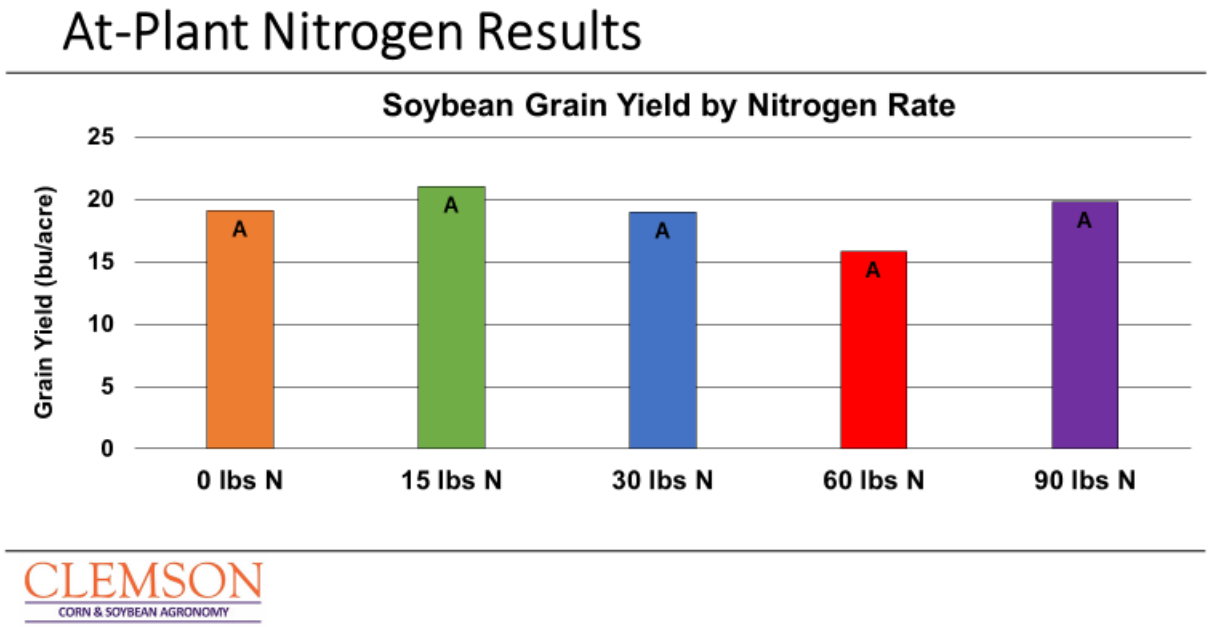

Figure 10. Soybean Grain Yield from the At-Plant Nitrogen Trial.

Prior to submission, reports should be saved as a pdf document using the following naming convention; 2023Date(MMDD)_(PI Last Name)_(Abbreviated Proposal Title)_Final.