**SCSB Final Report**

**General Information**

**Principal Investigator(s) Name(s):** Michael Plumblee
**Organization:** Clemson University – Edisto REC

**Date:** January 4, 2021

**Quarter:** Final

**Proposal Information**

**Title: Determining the Optimum Planter Downforce Settings in Soybean**

**Amount Expended to Date: $5,000 ~ 100%**

**Progress Assessment**

Tyler Soignier, the M.S. graduate student working intensively on this project and has started his final semester of his M.S. degree and is currently writing his thesis. We anticipate publishing the results of this research in Crop, Forage, and Turfgrass Management by the end of 2021 and an additional report will be submitted to the SC Soybean Board with results. Overall, based on these trials conducted in 2019 and 2020 we can conclude that varying downforce rate, gauge wheel selection, or tillage type by respected location did not provide a “best” treatment or recommendation. With that being said, SC soybean growers may have some flexibility with planter setup and downforce rate when planting soybean in similar scenarios as this research. Furthermore, this research supports the hypothesis that uniform seeding depth and uniform emergence in soybean does not appear to contribute to additional yield like it may in corn.

Small-Plot – Edisto REC: Barnwell County, SC

Soybean plots were harvested on November 3, 2020. The results from the static downforce trial at Edisto REC resulted in no difference in yield based on tillage type (strip-till vs conventional till), gauge wheel type (narrow or normal), or static downforce rate (0 to 300 lbs). These results are similar to what was observed in 2019. Tillage type at Edisto did influence soil compaction at the 4-inch depth where conventional tillage had more compaction than strip till. Again, these results mirror what we observed in 2019, thus we hypothesize that where we performed conventional tillage the soil was “fluffier” and therefore allowed the planter to compact the soil compared to strip-till plots. There was no significant difference in soil compaction between planter downforce rates, however, there is a visual trend where downforce rate increased compaction appears to increase. There was no significant difference in soybean emergence between 4 days after emerging in 2020 at Edisto regardless of tillage type, gauge wheel, or downforce rate. Soybean emergence was influenced 2 days after emerge depending on gauge wheel or downforce rate where a narrow-gauge wheel had significantly more plants emerged than a normal wheel and downforce rates under 100 lbs of downforce had better emergence compared to rates over 100 lbs of downforce. Seeding depth by downforce rate was investigated again in 2020, though no differences in seeding depth occurred in 2020 regardless of downforce rate. We did note that in 2019, soil was dryer when planting than when we planted in 2020, therefore we hypothesize that possibly dryer soil may allow for the planter to push seed deeper as downforce rates increased at Edisto.

Small-Plot – Simpson REC: Anderson County, SC

Soybean plots were harvested on November 17, 2020. Due to the severe deer damage that resulted at this location we are confident that yield treatment effects are not accurate, though yield data was collected. Tillage type impacted emergence counts at 2 and 4 days after emergence where conventional tillage had significantly more plants emerged than no-till plots. We suspect that this had to do with soil moisture at planting and the fact that we planted into wheat stubble in no-till plots. Soybean emergence counts were affected 2 days after emergence with varying downforce rates. Downforce rates of 150 to 250 lbs had better emergence than 0 lbs of downforce. Furthermore, 250 lbs of downforce also had better emergence than 50 lbs of downforce. This trend is similar to 2019, where greater downforce at Simpson had increased plant emergence, especially early after the first plants began emerging. Gauge wheel did not impact yield, compaction, or soybean emergence at Simpson, this is likely due to the soil texture difference compared to Edisto and that the Piedmont soils are more stable and less likely to be influenced by the planter moving across the field. A significant difference in soil compaction was observed between conventional and no-till plots at Simpson in 2020, a very different story compared to 2019. This is probably due to having adequate soil moisture at planting in 2020 compared the dry conditions in 2019. We suspect that the tillage in front of the planted wheat that we planted soybeans behind may have contributed to reduced compaction in our no-till plots as well.

Large-Plot – Coastal Plain and Piedmont – Active Downforce:

These plots were harvested the same day as the static downforce trial at Edisto. No significant differences in yield or soybean emergence were observed between active downforce rates applied (50-200 lbs) at Edisto or Simpson RECs. These results somewhat differ from 2019 where at Edisto differences between active downforce rates with regard to soybean emergence, plant height, and soil compaction were observed.

**Key Performance Indicators**

*The KPIs used in this research were to evaluate whether or not soybean benefited from planter downforce technology, as well as, to evaluate whether downforce technology affected soybean emergence, thus contributing to uniform emergence and improved yield. These KPIs were measured through grain yield, plant measurements, emergence counts, soil compaction readings, and seed depth measurements. All KPIs were met through the data collection of this project. The varying environmental locations (coastal plain vs Upstate) compounded with the treatment structure used, allowed for many aspects of planter downforce to be evaluated in soybean. Ultimately, in the Upstate location, deer feeding damage likely hindered treatment effects, therefore additional site-years would be beneficial. Further research to continue evaluating planter downforce technology in soybean would be beneficial to SC Soybean growers in determining overall benefit and return on investment across varying crop residues at the time of planting.*

**Next Steps**

*The next steps for this research would be to present the findings at local, regional, and national meetings, field days, and through other news outlets. Upon complete analysis of data this research in should develop planter downforce recommendations for SC Soybean growers. Furthermore, this research will be published in an academic journal to further support planter research in soybean production in SC.*

**Additional Information**

*The following slides are graphical forms of the data that were mentioned in the text above.*

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