Mississippi Corn Promotion Board
2024 Progress Report

Project
Title: Increasing corn planting speed using off-the-shelf precision planting technology

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Department: PSS

Project Summary (Issue/Response)

In this box, type 300-400 word project summary. Timely planting within favorable weather windows is a prerequisite for increased corn yield. Commonly used mechanical planters are limited to 4-6 mph, beyond which singulation and stand establishment are compromised. Planter speed limitations and narrow planting windows restrict the actual planted area, which is usually lower than intended acreage. However, opportunities to increase planter speed now exists with off-the-shelf precision planting technology that claims to improve singulation, emergence, and stand establishment. Preliminary testing of precision planting technology across 4 site-years in Mississippi revealed that increased planting speeds reduced plant stand without impacting yield. Poor stands likely resulted from increased row unit vibration caused by increased speeds and rough field conditions. We hypothesize that increased downforce on row units could help minimize these vibrations.

Project Results/Outcomes

We ran two separate trials in 2024. For trial one we quantified corn response to planting speed with a precision planter. In the second trial we assess the impact of planting speed and downforce on corn seeding.

Result from trial one was consistent with the 2023 trial, and no differences in plant stand or yield were found regardless of planter and speed (***Figures 1 and 2***). In the precision planter, increased planting speed numerically reduced plant population. Compared to the seed placement uniformity in the mechanical check, the precision planter performed better even at the highest planting speed (result not shown). The result suggests that planting speed can be increased without detrimentally affecting corn plant population, plant spacing, and yield in MS.

Preliminary results from the second trial showed no significant interactions between speed, downforce mode, and settings (***Table 1***). Increased planting speed increased row unit vibration and spacing while reducing plant stand. At Brooksville, increased downforce reduced row unit vibration. Neither speed nor downforce affected yield across locations. Preliminary results indicate that increasing downforce cannot mitigate plant stand reduction caused by higher planting speeds. However, these findings are preliminary and require validation through an additional year of experimentation.

Project Results

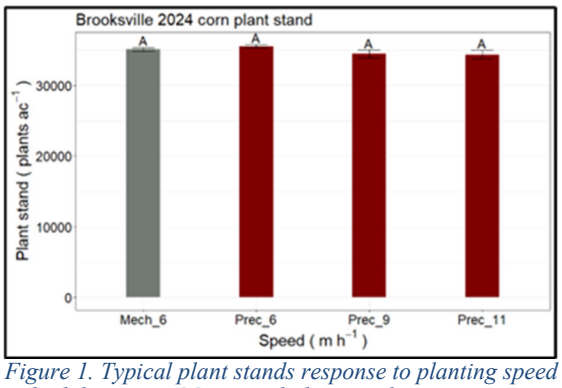

Figure 1. Typical plant stands response to planting speed in both locations. Means with the same letters are not significantly different.

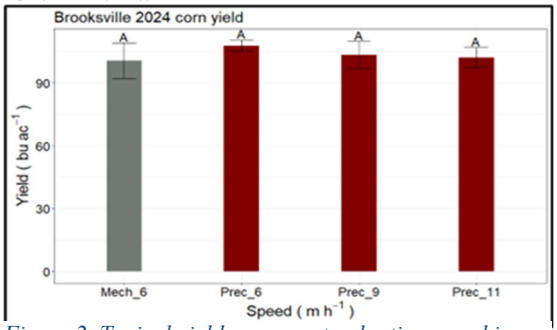

Figure 2. Typical yield response to planting speed in both locations. Means with the same letters are not significantly different.

Table 1. ANOVA of row unit vibration, corn plant stand, plant spacing and yield response to planting speed and downforce in 2024 in Mississippi.

Brooksville	Vibration	Plant stand	Plant spacing	Yield
Speed (S)	<0.0001	0.002	0.006	0.19
Downforce mode	0.51	0.56	0.64	0.65
Downforce settings	0.04	0.84	0.82	0.17
S * DM	0.95	0.17	0.11	0.22
S * DS	0.08	0.51	0.45	0.07
DM * DS	0.88	0.57	0.66	0.45
S * DM * DS	0.74	0.93	0.63	0.95
Stoneville				
Speed (S)	<0.001	0.005	0.005	0.48
Downforce mode	0.13	0.39	0.34	0.98
Downforce settings	0.91	0.61	0.65	0.36
S * DM	0.61	0.85	0.83	0.96
S * DS	0.38	0.65	0.51	0.25
DM * DS	0.24	0.17	0.11	0.06
S * DM * DS	0.055	0.26	0.27	0.14

Project Impacts/Benefits

Our preliminary evaluation at speeds up to 11 mph indicates that higher planting speeds generally lead to reduced plant stands and increased plant spacing variability without compromising yield. We hypothesize that the nonuniformity in seed distribution may be due to the relationship between increased ground speed and surface roughness, which causes planter components to vibrate and compromises the seed meters' ability to singulate effectively. Increasing downforce on row units could minimize vibration, but the application of downforce can be challenging. Hence, there is a need to understand downforce settings' effects on row-unit vibration and seed placement uniformity when planting at high speeds.

Project Deliverables

- Olomitutu, O. E., Dhillon, J., Mulvaney, M. J., Lowe, W. J., Bryant, C. J., Larson, E. J., Zhang, J., Wallace, J., Meadows, J., Shavers, G. M., Hilyer, T., & Oyedele, O. (2024) Impact of Planting Speed and Downforce on Corn Seeding [Abstract]. ASA, CSSA, SSSA International Annual Meeting, San Antonio, TX. https://scisoc.confex.com/scisoc/2024am/meetingapp.cgi/Paper/158406
- Olomitutu, O. E., Dhillon, J., Mulvaney, M. J., Lowe, W. J., Bryant, C. J., Wallace, J., Harper, N., & Shavers, G. M. (2023) Corn Response to Planting Speed in Mississippi [Abstract]. ASA, CSSA, SSSA International Annual Meeting, St. Louis, MO. https://scisoc.confex.com/scisoc/2023am/meetingapp.cgi/Paper/149245.
- Oluwaseyi E. Olomitutu, Jagman Dhillon, Michael J. Mulvaney, J. Wes Lowe, Corey J. Bryant, John Wallace, Noah Harper, Grant Shavers, Tucker Hilyer. Corn Response to Planting Speed in Mississippi. Southern Branch American Society of Agronomy Annual Meeting, Atlanta, Georgia, Feb. 2-6, 2024.
- Oluwaseyi E. Olomitutu, J. Dhillon, M.J. Mulvaney, J.W. Lowe, C.J. Bryant, J. Wallace, N. Harper, G. Shavers, T. Hilyer. Corn Response to Planting Speed in Mississippi. 2024 Spring Mississippi State Graduate Research Symposium. Feb 24, 2024.

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