2020 Corn Downforce Study

Corn was planted on April 21st at 34,000 plants/acre with three different downforce rates applied to show how downforce affects emergence, planting depth, ear height and ear size, plant health, and overall yield. The three downforce rates applied were 50 pounds active margin, 180 pounds active margin, and 400 pounds set point. We anticipated planting depth to be uneven and possibly some seeds on the ground in the 50 pounds active margin, 180 pounds active margin to be the sweet spot, and compaction in the 400 pounds set point with slow and uneven emergence and ear development problems. We used a 16R31 ExactEmerge planter and planted 16 rows per treatment. Fifteen gallons of 32% N and 10-34-0 were used as the starter fertilizer, 50/50 blend (7.5 gallons of each fertilizer). Corn was sidedressed with 55 gallons 32% N per acre.

The 2020 site was planted when it was warm, bone dry and the ground was extremely hard. Then, it turned off cool and started receiving weekly rainfall within a few days after planting. In addition to needing more downforce than we had planned due to ground conditions; we also had difficulties at first adjusting the planter and maintaining even planting depth due to half the planter having 2x2x2 and the other half 2x2. The 2x2x2 Bandits required more downforce to get the planter unit into the ground. We ended up having to remove the no-till coulters from the entire planter to reduce weight and help get the planter into the ground and maintain planting depth.

We noted emergence differences by population counts every 12 hours for the first five days then daily differences for days six-nine. We had several late emergers that emerged after we had stopped daily notes, so we took a final population count on 5/28 (three weeks after initial emergence) and noted the number of late emergers. All population counts were taken from the center two rows of each treatment and the average was recorded.

Downforce Applied	Average Population at 24hr emergence (5/5 AM -5/6 AM)	Average Population at 48hr emergence (5/5 AM – 5/7 AM)	Average Population at 22 days (5/13)	Late Emergers 3+ weeks (5/28)	Final Population at 37 days (5/28)
50# active margin	10	19.5	30	2	32
180# active margin	11.5	16.5	26.5	2.5	29
400# setpoint	3	10.5	26.5	3.5	30

Table 1. Corn downforce study population counts. Multiply population listed x 1000.

The 400 pounds setpoint emergence was delayed due to maxing out downforce at planting. There were more late emergers in the 400 pounds setpoint as well and they were all buggy whipped. Buggy whipped plants usually do not unroll their leaves enough to develop properly. Several of the buggy whipped plants we observed ended up dying or not producing an ear. We set the planter for 2” planting depth. The actual planting depth for each treatment is listed in table 2 below.

Downforce Applied	Planting Depth Measured in Field
50# active margin	1.5-2.0”
180# active margin	1.75”, but there was a lot more variability
400# setpoint	1.25”, variability

Table 2. Corn downforce planting depth measured behind the planter.

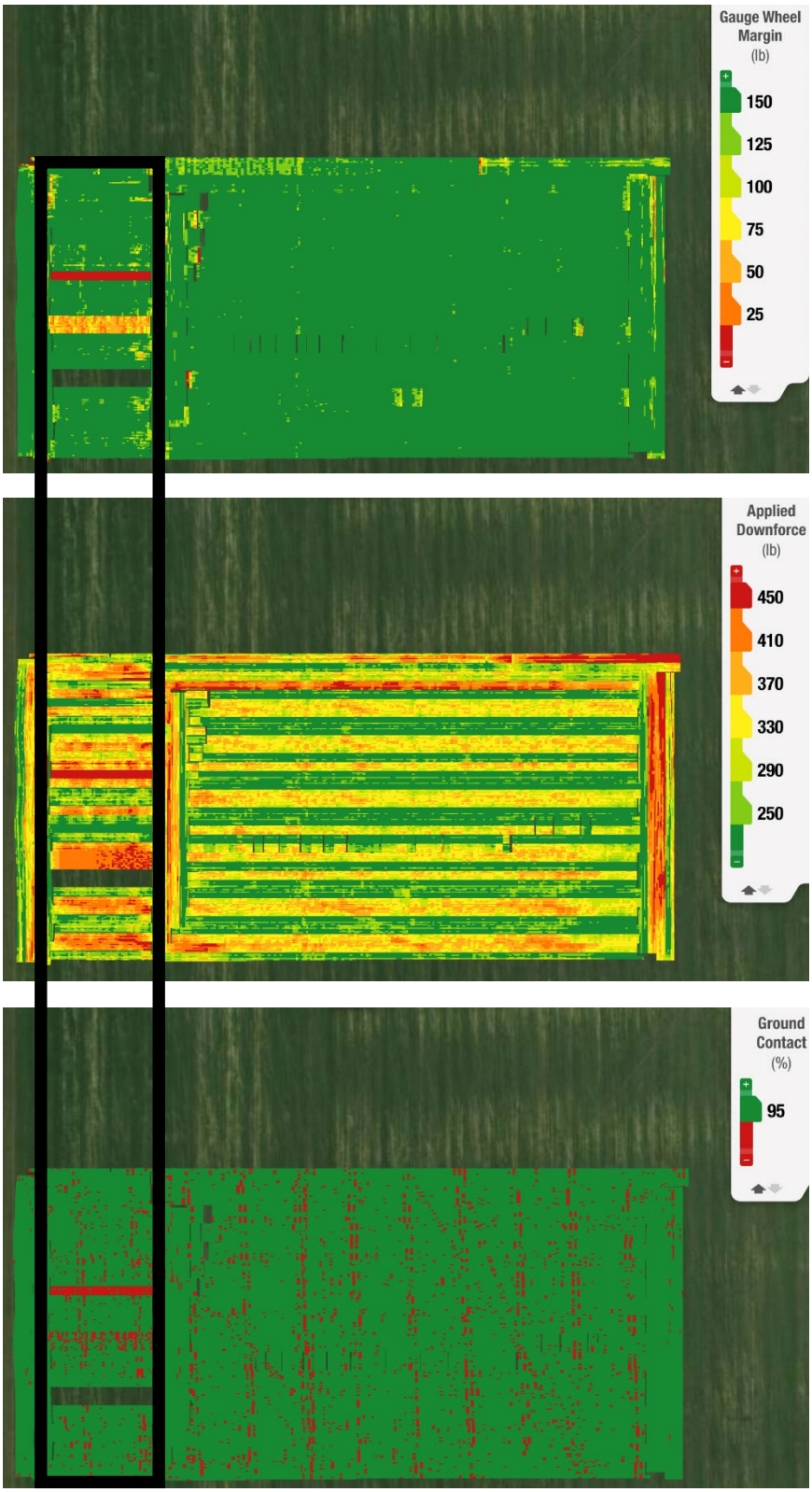

Figure 1. Connect Mobile planting maps. Small plot trials were conducted in the area marked on the west side of the field.

The red pass in the gauge wheel margin figure highlights the 3.5” planting depth (depth trial study) and the same trend shows up in the applied downforce and ground contact. Even at 450+ pounds of

downforce we could not maintain gauge wheel margin or ground contact. When you are trying to achieve such a deep planting depth and pushing the disc openers further into the ground, it takes even more resistance to get the planter into the ground and maintain contact. This explains why we were not able to maintain the planting depth we wanted, and it was inconsistent across the trial as our planting depth got deeper (see table 2). Inversely, the 1" planting depth (depth trial study) used less than 250 pounds of downforce and had plenty of gauge wheel margin to spare (full green pass just above the 3.5" planting depth red colored pass).

The 16R31 ExactEmerge planter we used had IRHD (individual row hydraulic downforce) and you can see in the applied downforce map in figure 1 how much the downforce changed per pass. In the 400 pound setpoint downforce pass, we maxed out the downforce on the planter and on average only had 50 pounds of active margin. We also had a hard time maintaining ground contact and the planter lost contact about 50% of the time, as indicated in figure 1.

Downforce Applied	Moisture	Dry Yield (bu/ac)
50# active margin	20.4%	211.6
180# active margin	20.0%	208.8
400# setpoint	19.3%	201.6

Table 2. Corn downforce study yield data.

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**This study was for demonstrative purposes only and was non-replicated.