Down Force Management and Its Effects on Corn and Soybean Establishment and Yield

Background

Every crop has its optimum seeding depth that helps foster uniform germination, optimum growth, and maximum yields. Seeds should be consistently planted at this depth into adequate moisture and with good seed-to-soil contact. Besides being subject to feeding by animals and birds, shallow planting can result in agronomic defects such as lodging and rootless corn syndrome.

Planting too deep extends time to emergence which can predispose seeds/seedlings to pests and diseases. The recommended planting depth for corn seed is 1.5 to 2 inches while 1 to 1.5 inches is recommended for soybean seed.\(^1,2\) Placing seeds at the required depth consistently, seed by seed, and row by row, requires proper down force management during planting. Due to the wide textural variability and different residue conditions in most fields, improper down force management may result in too much down force in some areas and not enough in others.

Too much weight on the gauge wheels can cause side-wall compaction in the seed trench which can cause hatchet-shaped roots. With too little weight, seeds are too close to the surface which may cause late or failed germination. Both defects affect yield. This study was developed to determine the effects of different down force options on corn and soybean establishment and yields.

Figure 1. Field layout of down force management treatments in corn trials. The Auto treatment is a variable down force setting at +/- 100 psi.
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Study Guidelines
A 111 Relative Maturity (RM) corn product was planted on April 30, 2015 into a field that was previously soybean. A 2.4 Maturity Group (MG) soybean product was planted on May 9, 2015 into a field that was previously corn. Weeds were controlled uniformly with a pre-emergence and post-emergence herbicide. DeltaForce® hydraulic cylinders provide row by row down force management. Down force settings were Auto (variable setting of +/- 100 psi), 0 psi, 125 psi, 250 psi, and 335 psi. The trials were conducted on 30-inch row spacing, 6 rows per treatment, and 200-ft long strips with 2 replications in corn and 3 replications in soybean. The seeding rates were 35,000(K) seeds/acre and 150K seeds/acre for corn and soybean, respectively. Corn plots were harvested on October 5, 2015, and yield was adjusted to 15% moisture content. Soybean plots were harvested on October 15, 2015, and yield was adjusted to 13% moisture content.

Results and Discussion
The down force maps (Figures 1 and 2) show how down force was adjusted to meet the requirements of each treatment. In corn (Figure 3), the average early stand count was nearly the same for Auto (variable down force of +/- 100 psi), Static 0 psi, and Static 125 psi but dropped as down force was increased above 125 psi. Average harvest

Figure 2. Field layout of down force management treatments in soybean trials. The Auto treatment is a variable down force setting at +/- 100 psi.
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population was nearly the same for both Auto and Static 0 psi at approximately 33K plants/acre but increased to 34K, 33.5K, and 34.5K plants/acre in Static 125 psi, Static 250 psi, and Static 335 psi, respectively. The fact that average harvest population was highest in Static 335 psi, even though it had a low early stand count, could indicate that there was a lot of late emergence (after V4) or that seedlings had a higher survival rate.

In soybean (Figure 4), average early stand count increased with increasing down force from 131K plants/acre in Static 0 psi to 145K plants/acre in Static 125 psi and then decreased with further increases in down force. Average harvest population; however, was highest with Static 250 psi and lowest with Auto. In corn, Auto mode had the highest average yield of 207 bu/acre, followed by an average yield of 206 bu/acre with Static 0 psi and Static 125 psi. Average corn yield was reduced to 200 and 202 bu/acre in Static 250 psi and Static 335 psi treatments, respectively (Figure 3). Average soybean yield increased with down force up to Static 125 psi, and declined with further increases in down force (Figure 4).

Takeaways

The trial revealed that the optimal down force for the research site is approximately 125 psi. There was a yield penalty in both corn and soybean for pressures over 125 psi. However, for more consistent and dependable management, Auto mode should be used as this will better adjust for field variability. Working with their trusted equipment dealer, growers can set the base pressure for Auto mode to fit their field conditions.

This trial was conducted on 200-ft long strips which does not completely capture the heterogeneity that exists in large fields. Even though the Static 0 psi produced comparable yields to the Auto and Static 125 psi in both corn and soybean, Figures 1 and 2...
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reveal how much ground contact was lost in the Static 0 psi treatment in both crops. In large fields, this defect could quickly add up and, if coupled with less than ideal growing conditions, negatively affect yields. The trial confirmed that too much down force negatively affects yield. Knowing what down force is ideal for a field could be challenging due to varying soil types, tillage conditions, soil moisture, and seed quantity in the boxes. Springs, air bags, air force, and DeltaForce® hydraulic cylinders are down force management platforms available for farmers. In this trial, the static treatments were set to simulate spring or air bag systems set for field-wide, planter pass, or planter sections scenarios.

The Auto mode feature takes the guess work out of down force management and automatically provides the appropriate pressure for each seed throughout the entire field. This is very important and convenient because once in the cab, down force is one thing the operator has the least amount of control over.

Sources

Legals
The information discussed in this report is from a multiple site, single year, non-replicated demonstration. This informational piece is designed to report the results of this demonstration and is not intended to infer any confirmed trends. Please use this information accordingly.

Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible.

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