

## DETERMINING DOWN FORCE TO SET A PLANTER

Correct down force management for the soil conditions during planting is important for consistent placement of seeds at the required depth in the soil. Excessive down force can cause soil compaction zones and lower actual seeding depth. If too little down force is applied, planting depth can be shallow and seed-to-soil contact may not be adequate for consistent germination and emergence. For a more consistent and dependable management, an automated down force system should be considered to help adjust for field variability.

### Planter Seeding Depth

Planting is the last opportunity to prepare the soil conditions for optimal seed germination and early growth. This is especially critical in no-till situations since it represents the only time the soil will be modified to provide these desired conditions. For optimal germination conditions, seeds should be placed at a uniform depth, with good seed-to-soil contact, and uniform seed spacing.<sup>1</sup>

Each crop has an optimum seeding depth that helps foster uniform germination, optimum growth, and maximum yields. The recommended planting depth for corn seed is 1.5 to 2 inches while 1 to 1.5 inches is recommended for soybean seed.<sup>2,3</sup> Shallow planted seed is subject to feeding by animals and birds and can result in lodging and rootless corn syndrome. Planting too deep extends time to emergence which can predispose seeds and seedlings to pests and diseases. Consistent seed depth at planting is essential to achieve uniform seedling emergence. 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.

### Effects of Improper Down Force

Firm soil conditions limit the penetration by the seed opener, which may make it difficult for the depth wheels to make solid contact with the ground surface. This situation may result in a shallow planting depth. Excessive down force can cause compaction zones and lower actual seeding depth as well as cause problems later in the growing season as roots attempt to grow into additional compacted soil areas.<sup>4</sup>

When planting in moist conditions, the amount of down force applied can become problematic. Similar to planting in firm soils, if too much pressure is applied when planting in wet soils, compaction problems may arise that can adversely impact root structure. It is essential to find the right balance of pressure to provide adequate seed-to-soil contact, but without causing over-compaction.<sup>5</sup> If too little down force is applied, planting depth can be too shallow and seed-to-soil contact may not be adequate.

### Determining Optimum Down Force

Finding the optimum down force to help provide the right soil conditions for seeds can be a challenge. Planting conditions are typically less than ideal across a field, which makes it more difficult to provide ideal conditions for seeds. Practices and technology that provide better soil conditions for the seed can serve to increase agronomic efficiency and yield potential.

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Down force can be manually set with each planting situation, or an automatic down force system can be used. Testing in both corn and soybeans found that manual down forces of 125 lbs. or less, or the automated system averaged the highest yields.<sup>6,7</sup> Testing confirmed that too much down force can negatively affect yield, with a yield penalty in both corn and soybean for pressures over 125 lbs. For the most consistent and dependable management, an automated down force system should be considered as this can better adjust for field variability.

## Considerations for Setting Down Force

- Using appropriate amounts of down force at planting can improve yields compared to excessive down force.
- Determining the ideal down force for a field can be challenging due to varying soil types, tillage conditions, and soil moisture.
- The benefits of automatic down force systems would likely be more evident in fields where greater variability in soil physical properties are encountered at planting.
- Automated down force mode automatically provides the appropriate pressure for each seed throughout the entire field. It can be especially convenient because once in the cab, down force is one thing the operator has the least amount of control over.
- Consider re-evaluating down force settings after each planting rainout because the level of soil moisture may change what is the best setting for a field. It is unlikely that one setting would be the best for all conditions.

## Sources

<sup>1</sup> Karayel, D. and Sarauskis, E. 2011. Effect of downforce on the performance of no-till disc furrow openers for clay-loam and loamy soils. Agricultural Engineering Research Papers, Vol. 43, No. 3:16-24. ISSN 1392-1134.

<sup>2</sup> Nielsen, R. 2000. Corn growth and development. What goes on from planting to harvest? Purdue University. AGRY-97-07. [www.agry.purdue.edu](http://www.agry.purdue.edu).

<sup>3</sup> Licht, M. 2014. Soybean planting depth considerations for Iowa. Iowa State University Integrated Crop Management News.

<sup>4</sup> Gratton, J., Chen, Y., and Tessier, S. 2003. Design of a spring-loaded downforce system for a no-till seed opener. Canadian Biosystems Engineering Vol. 45:229-235. <http://www.csbe-scgab.ca>.

<sup>5</sup> Hanna, H. 2009. Planter setup and adjustments for accurate seeding of corn and soybean. Proceedings 2009 Indiana CCA Conference. <https://www.agry.purdue.edu>.

<sup>6</sup> Effect of planter down force at planting on yield. 2015. Bayer Learning Center Summary, Gothenburg, NE. Technology Development & Agronomy. <https://www.dekalbasgrowdeltapine.com/en-us/agronomy/down-force-management-effects-corn-soybean-establishment-yield.html>

<sup>7</sup> Down force management and its effects on corn and soybean establishment and yield. <https://www.dekalbasgrowdeltapine.com/en-us/agronomy/down-force-management-effects-corn-soybean-establishment-yield.html>

2015. Bayer Learning Center Summary, Huxley, IA. Technology Development & Agronomy.

## Legal Statements

Performance may vary, from location to location and from year to year, as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible and should consider the impacts of these conditions on the grower's fields.

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