SDSU Extension

iGrow Soybean

BEST MANAGEMENT PRACTICES

Chapter 11:
Seedbed and Planter Preparation

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Obtaining a excellent soybean stand is a necessary step to successful soybean production. Preparing your land and planter for seeding is one of first steps required to optimize soybean yields (Fig. 11.1). Prior to seeding the field, planter maintenance should be completed and during planting the planter and seed placement should be routinely checked.

We recommend that soybeans be planted at a depth of from 1 to 1.5 inches. In South Dakota soybean production, the soil temperature is critical and in South Dakota in the early spring, deeper is colder. Soybeans require a warmer soil (54°F) to germinate than corn (50°F). Colder means slower growth and less nutrient uptake. Soybeans are more sensitive to seeding depth than is corn. Studies in Northern climates have consistently shown that seeding soybeans below 2 to 2.5 inches typically results in a seedling population reduction of 20% or more from the number of seeds planted.

The goal of this chapter is to provide guidance on seedbed and planter preparation. Seedbed and planter preparation requires planning and should be conducted at various times during the year.

Figure 11.1. A John Deere DB120 Crop Planter.
(Source: http://photo.machinestogo.net/main.php/v/user/equipment/john-deere-db120-crop-planter.jpg.html)

Chilling injury

Germination of soybean and corn seeds can be reduced by chilling injury. Chilling injury results from the seed uptaking cold water during germination. If the water is cold, from melting snow, it can cause the cell membranes to become rigid and rupture. A typical symptom is a swollen seed that has not germinated. This problem can be avoided by seeding soybean when the temperatures are optimum. Soybeans require a warmer soil (54°F) to germinate than corn (50°F). Soybean seeds germinate best when the temperatures are between 60 to 70°F. Many problems can occur if soybeans are seeded into cool soil. The surface (0-2 inches) soil temperature is the average of two measurements (early morning and late afternoon).

Residue management

The goal of seedbed preparation is optimize germination by improving soil to seed contact. This process starts with residue management. It is important to note that when preparing a seedbed, the prior crops residue should be considered. A long-term sustainability objective should include adopting tillage practices that leave as much residue on the soil surface as possible. This residue helps prevent surface sealing and reduces wind and water erosion. Tips for optimizing residue for soybean seedbed preparation include:

- Spreading the previous crops residues uniformly over the soil surface.
- Minimizing tillage in wet soil.
- Decreasing tillage.
- Using straight points or sweeps instead of twisted points.
- Driving more slowly.

Reduced-till systems require optimization of planting and the planter residue management system. A common misconception is that the planter residue manager can compensate for non-uniform residue distribution. Residue management begins at harvest, leaving as much residue in place as possible. Using stripper headers for harvesting wheat and other suitable crops allows straw to remain upright and attached, preventing residue from being moved by wind or water. In corn, this is accomplished by adjusting the strippers and rolls to keep the stalk intact and upright. Uniformly chaff spreading is particularly difficult when using large headers. Straw and plant stems that are chopped into small pieces, are difficult to distribute uniformly, and have a tendency to be moved into piles by wind or water.

Planter residue managers work best in situations where residue is uniform. When residue is not uniform, it is almost impossible to properly adjust residue managers. Moving residue is easier if it is cut before moving it. Single-disc fertilizer openers placed at the same depth and two to three inches to the side of the seed opener path can serve a dual purpose, cutting residue and placing the side-band fertilizer. When compared to conservation tillage, no-till soils generally remain cooler in the spring. Cooler soil temperatures can slow nitrogen (N) and sulfur (S) mineralization. Placing nutrients like N and S as a side-band improves early season plant vigor.

Planter

The planter is one the most valuable piece of machinery on the farm. Achieving optimal value depends on how well it performs in the field: placing seed at the correct depth, evenly spaced, at the correct population, and insuring optimal seed-to-soil contact. Evolving technology has improved all aspects of the planter's ability to maximize seed emergence. Technology has even addressed human error using guidance systems where guess rows are no longer a guess. Guidance systems have reduced operator fatigue, reducing accidents and allowing planting to continue after sundown with significantly less error. However, the ability for the planter to achieve optimal seeding has always been and still remains dependent on skilled operation and regular maintenance. Since your planter can be responsible for a yield difference of 5 or more bu/acre of soybeans, how much time, effort, and money is warranted?

There are so many differences between makes, models, singulation mechanisms, and other components of planters. A thorough knowledge of a planter operational manual is the first place to start. In addition,

knowledge of aftermarket components is also a must. Wear tolerances and instructions for replacement are usually provided. Maintenance, operation, and adjustment questions are best answered by factory-trained technicians.

Information on planter maintenance is available at https://www.pioneer.com/home/site/ca/template.CONTENT/guid.03EDD6D3-84B2-4E5F-A6C6-005380C343F0/.

If you do not already have one, consider the purchase and installation of an electronic seed-metering monitor. There are a number of aftermarket systems that have been reported to be very accurate.

Table 11.1. Planter performance checklist.

1. **Review your planting needs.**
   Is your current planter big enough to ensure timely seeding at a reasonable speed (<5mph)? Increased profit from reduced yield loss because of late planting may pay for a planter with more row units.
2. **Review the planter performance from last year.**
   Did the planter seed at the correct population and were the plants spaced evenly apart? Did you have high apparent emergence rates?
3. **Review maintenance records for the planter.**
   Which components need replacing?
4. **Inspect, clean, and replace singulation meter mechanisms as suggested by the operator's manual.**
   Perform a calibration of the singulation meters. Consider aftermarket alternatives that may offer more accurate singulation.
5. **Check the tires for wear.**
6. **Check all linkage between the tractor and openers.**
   Are linkages are tight throughout? Replace bushings at any and every point that appear to be loose.
7. **Insure that planting units are operating parallel to the soil surface and that the planter is level side to side.**
8. **Check all singulation chains and sprockets.**
   The slightest amount of wear can result in an inch or two of increased standard deviation in plant spacing, which could cost significantly more than the repairs.
9. **Perform an operator's manual step-by-step inspection of singulation mechanisms.**
   Insure that all parts are clean and meet manufactures specifications. Replace worn parts.
10. **Check down pressure to ensure that gauge wheels and openers are creating a viable seed trench.**
11. **Check the amount of wear on disc openers and coulters.**
    Insure that they are properly aligned and adjusted. Check the owner's manual for wear specifications. If wear is excessive, replace worn parts.
12. **Be certain that closing wheels are aligned with disk openers.**
    If they are out of alignment, check for wear on the closing wheel supports. Replace bushings as needed.
13. **Insure that row cleaners are properly set.**
    Row cleaners should move residue from the row and not soil.
14. **Be sure the seed firming mounting mechanisms do not alter the configuration of the seed delivery tubes.**
    The use of seed firmers during periods of normal conditions has been shown to give positive results. Firmers may need to be removed for wetter planting conditions.
15. **Inspect seed tubes to insure unobstructed movement of seed from the singulation meters to the discharge foot.**
    Replace any worn components.

Planter performance review and inspection

When the snow is still on the ground, time spent is critical in reviewing field scouting records that relate to planter performance and inspection of equipment (Table 11.1).

Seedbed management

Once the seed has accurately been discharged from the planter, seedbed management becomes critical. A seed's germination is improved when it is covered with loose material and firmly held from the sides at the right depth in warm, moist soil. The original corn planters were designed for use in well-tilled seedbeds. Consequently, with less intense tillage practices, modifications are needed to assure optimal seed placement and seed to soil contact.

Almost all row-crop planters have openers that utilize two discs to open the seed slot. The seed opener discs are often arranged so that the blades touch evenly at the front and have discs of equal size. Some manufacturers offset these discs so that one disc leads the other. Wiper/depth wheels can limit the problem of mud being brought to the surface and interfering with seed opener depth wheels. South American openers use offset double-disc openers with discs of different sizes; this design results in a differing angular momentum between the blades that is thought to improve the slicing action.

All disc openers require sharp blades; if they are not sharp, the residue can be pushed (hair-pinned) into the trench, resulting in crop residue contact rather than soil contact, which often results in uneven germination, uneven emergence, and uneven growth. Hair-pinning most often occurs when residue is cut into short lengths and soil structure is poor. Conventional tillage and continuous long-term, no-till systems have less of a problem with this issue. A correct combination of openers, gauge wheels, and appropriate down pressure, should leave a well-formed V trench into which seed will be dropped.

Once the seed is placed in the trench, it needs to be pressed into the soil. The best way to accomplish this is to separate the firming (seed pressing) and covering operations. Several companies make seed-firming devices designed to press or lock the seed into the bottom of the trench. This speeds the rate at which the seed imbibes water and anchors it to the bottom of the trench. The lack of root penetration is often blamed on "sidewall" compaction, which can be traced to a poorly anchored seed.

There are also several companies that make aftermarket devices designed to press the seed into the bottom of the trench. In general, vertical wheels work better in most conditions; however, they are more expensive and harder to mount than those that use a sliding piece of plastic.

Once the seed is firmly pressed into the bottom of the trench, it needs to be covered. Standard closing systems on corn planters are designed to work in tilled seedbeds by packing the area under and around the seed, while leaving loose material above the seed. Standard rubber or cast-iron closing systems normally do not function well in less tillage-intense till systems because they have difficulty in properly closing the trench in well-structured or wet soils.

If the soil over the seed is packed too firmly, the corn plant may set its growing point too shallow. This makes it prone to damage from herbicides and late frosts. If the soil covering the seed is too loose, the seed trench may dry too fast, leading to stand loss. Many companies (Martin, May-Wes, Exapta, Yetter) make attachments designed to loosen the soil in the seed trench and place it over the seed.

One reason that strip-till may appear superior to no-till is that seed is planted into loose soil created by the strip tillage operation, thus allowing for optimal operation of standard closing wheels.

Fertilizer openers and residue management

Other attachments needed are fertilizer openers and residue managers. It is our opinion that the best fertilizer opener designs are single-disc openers with a depth-gauging and/or wiping wheel. These openers cut the residue and place fertilizer two to three inches to the side of the seed. In fine-textured soils, most of the N and P can be band-applied using this approach. However, in irrigated or sandy fields, limit N applied to one-third to one-half of the seasonal N requirement.

Using residue managers that cut residue before it is moved and replacing wide depth-wheels with narrow depth-wheels reduces the likelihood of planter plugging in heavy residue. Using a residue manager with a backswept design helps keep residue from wrapping. Cutting the residue allows the residue managers to split the mat of residue without tearing it apart, which is especially important under damp conditions. Cutting residue reduces soil disturbance because residue managers do not have to engage the soil, therefore reducing problems with surface sealing or crusting, weed growth, and erosion.

There are many designs of residue managers. Test the ease of adjustment prior to selecting a residue manager. The bottom line with minimum till, ridge till, strip till, and no-till seeding equipment is that while it does not have to be complex, it needs to work effectively. Additional information is available at http://www.sdnotill.com and at http://www.dakotalakes.com.

References and additional information

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Acknowledgements

Funding for developing this chapter was provided by USDA-NRCS, South Dakota Soybean Research and Promotion Council, USDA-AFRI, and South Dakota 2010 research program.

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