Conservation Tillage

Adjustment and operation of planters in systems with high levels of surface crop residue

Many Iowa crop producers are evaluating planters for operation in undisturbed soil conditions. The potential for lowering crop production costs with fewer trips over the field and for protecting soil by limiting erosion can make such a system attractive.

Producers often find that their existing planter, if manufactured since the late 1970s, is capable of planting in undisturbed soil. It may be necessary to modify or adjust equipment for successful operation, however, when moving into a system with high surface residue. Decisions on potential modifications or adjustments in planter operation are easier once you have defined objectives for planting (such as whether or not to clear residue away from the row zone over the seed). If you need new equipment, evaluate it for availability and ease of adjustment. Machine adjustment should be easy enough that the operator will invest the time to do it. If adjustments are difficult or nonexistent, successful operation of the machine is often compromised.

Major objectives of successful planter operation in high residue conditions are the same as in any tillage system: (1) good seed-to-soil contact, (2) uniform seed placement at a desired depth, and (3) uniform seed spacing at a desired population. An additional objective may be creation of a residue-free band in the row directly over the seed if soil can still be adequately protected from erosion. In a three-year experiment, researchers at the U.S. Department of Agriculture Soil Tilth Laboratory and Iowa State University found continuous corn yields increased with the width of a residue-free band over the row. They suggested leaving a six-inch band of bare soil over the corn row if erosion objectives could still be met. Other research in Iowa found some yield differences among tillage systems in continuous corn but similar yields among tillage systems for both corn and soybeans when planted in a two-year rotation. In a continuing experiment in northeast Iowa, yields have been monitored from continuous corn in no-till and chisel plow systems planted with a planter equipped either with or without row cleaners in both systems. Yields in a no-till system with the addition of row cleaners on the planter were statistically similar to yields in a chisel plow system using a planter either with or without row cleaners.

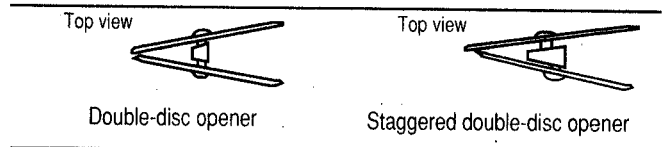

Figure 1. Double-disc seed openers.

Soil that has not been tilled previously is often more difficult to penetrate with seed openers and other soil-engaging tools. In order to place seeds at desired planting depth in soil difficult to penetrate, add ballast to individual planter units or transfer additional weight from the planter frame with downpressure springs on the parallel links attaching planter units to the frame. Do not transfer any more weight from the frame than is necessary to maintain seed placement at desired depth. Excess weight on the planter may overly compact soil in the seed zone. If you must transfer large amounts of weight from the planter frame to maintain seed depth, extra frame ballast may be required to maintain good soil contact with frame transport wheels that drive seed metering mechanisms.

The selection of possible planter attachments depends somewhat on the style of seed opener on the planter. Many newer planters use double-disc type seed openers (fig. 1). One exception is a stub-runner opener using a lead coulter to cut residue and a variation of a runner opener that slides under the residue.

Double-disc openers have a pair of sharpened, opposed disc blades. Traditional double-disc openers have leading edges evenly matched so that neither one leads the other. Blade edges wear and should be kept pinched together at the soil entry point to prevent soil and residue from plugging the opener. When residue is uniformly distributed on the surface and/or easily cut or fragile (*e.g.*, soybean residue), double-disc openers often cut through residue and place seed in an acceptable manner without a leading coulter.

At other times, a single leading coulter is useful to cut residue ahead of the seed opener. If a coulter is required to cut through residue, additional weight may be needed for penetration. Engineers with the USDA Soil Tilth Lab found the vertical force to keep a single coulter in the soil was 100 to 200 pounds, but could be

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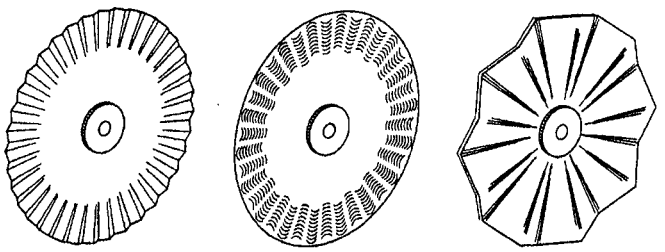

Figure 2. Types of coulters.

up to 400 to 600 pounds in difficult conditions. Operating the coulter only deep enough to cut residue minimizes the weight requirement and helps to ensure seed contact with firm soil. The engineers found no differences among different coulter shapes in the ability to cut residue, but did observe increased cutting ability when the coulter was sharp (fig. 2).

Some growers prefer to use a fluted coulter to disturb a wider band of soil in the row area. There is a tendency, however, for soil loosened by fluted coulters to be thrown out of the row by the coulter or seed opener when planter operating speeds are greater than 5 miles per hour. This usually occurs when soil sticks between wider fluted undulations at the edge of the coulter. Other coulter styles such as rippled or bubble (a rippled coulter with straight edge that can be sharpened) avoid this problem.

Staggered double-disc openers have one coulter placed about 1/4- to 1/2-inch ahead of the other coulter. A leading single coulter to cut residue is usually not necessary for the staggered or offset seed opener.

If an objective of planting is to leave a residue-free band over the row, a row-cleaning device is required. Row cleaner types include vertical-discs, horizontal-disc, and wide sweep (fig. 3). Vertical-discs are two discs operating at angles to the travel direction, with leading edges either even or staggered. Discs vary in size and shape of the blade and edge. Edges may be smooth or notched or may fingers or even brushes. Row cleaners are mounted by various arrangements to the frame, parallel linkage, or planter unit.

Row cleaners should remove a uniform amount of residue in the row area. Adjustment and maintenance of operating depth of the row cleaners is important. In most cases, adjust row cleaners to skim the soil surface, removing mostly residue and little additional soil. An exception may be in ridges where additional soil is removed to displace weeds and surface weed seed in the row.

Possible modifications and adjustments to a row crop planter for satisfactory performance in high residue depend on the producer's equipment type and objectives. Endless variations exist. For example, a producer may desire some type of tillage in the row ahead of the planter and attach fluted coulters or other soil-engaging tools on the planter frame ahead of the seed opener. A decision on the possible application or use of a planter attachment is easier when the operator has planting objectives and knows how a particular attachment may or may not further such objectives. Consultation with experienced farmers and equipment dealers and a check of the planter operator's manual are beneficial. In the field, producers should stay flexible and be willing to experiment and adjust for changing soil and residue situations. For example, seed placement and seed-to-soil contact may be improved by removing a leading coulter if wet soil or residue causes residue to constantly "hairpin" under the coulter or causes soil to stick to soil-engaging components.

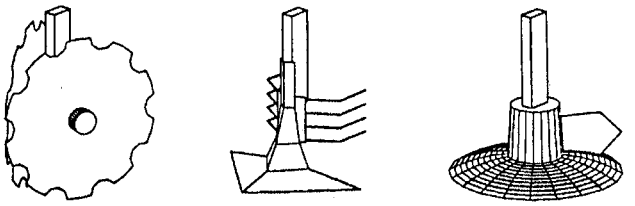

Figure 3. Types of row cleaning devices.

References

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For more information, ask for Conservation Tillage fact sheets, available at your county extension office:

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