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No-Till Drills

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Most drills are built to plant small grain but some can be equipped with options to plant small, dense seeds such as clover and alfalfa and/or light, fluffy, irregular seeds such as warm-season grasses.

The usual range of available opener spacings is from 6 to 8 inches, which is the conventional spacing for wheat. Some farmers double-drill forages in two directions for a closer effective spacing. A few drills are available with spacing down to 4 inches for high-yield wheat. This is a desirable spacing for forage, but presents problems in spacing no-till coulters. To get close spacing with planters and drills, the openers usually must be staggered by mounting on two or more parallel bars. Staggering ground-engaging components helps to negotiate trash (residue) without acting like a rake, in addition to allowing physical space for components. Components are staggered as much as 4 feet on one make of drill (the John Deere All-Till drill).

Note
Reference to brand names is not meant to imply endorsement by the author or by MU but is used for purposes of illustration.

Most drills used in the more humid eastern United States have double-disk openers. Drills with hoe, shovel or knife-type openers penetrate hard soil well, but tend to operate at varying depths and to rake trash. Most makes of no-till drills have a coulter ahead of each disk opener to cut the residue and to do a bit of tillage (to loosen the soil ahead of the opener).

A few drills have the double-disk openers offset; the front disk acts like a coulter to cut the residue and start to open the seed furrow. The opposing disk may be set back an inch or so and completes opening the furrow. Operating without a no-till coulter to cut residue and open the hard ground may cause disks to wear down sooner and make bearing life shorter. There are, of course, fewer components to buy or replace.

Things to look for

Weight

A no-till drill requires considerable weight when operating in hard ground. Many drills have weight brackets to add cast-iron weights when needed. Others have tanks to add water for ballast. Water weighs about 62.5 pounds per cubic foot; iron weighs about 490 pounds per cubic foot.

About 400 to 500 pounds may be needed to force a no-till coulter or double-disk opener into hard ground. A drill with 10 openers may require a gross weight of 4,000 to 5,000 pounds for deep penetration into hard ground. Less weight is needed for no-till seeding of forages than for seeding wheat or soybeans, since forages should be planted only 1/4 to 1/2 inch deep. Drills should be weighted to provide proper penetration and operation when the seed boxes are nearly empty.

No-till coulters

No-till coulters vary from flat disks to wide, fluted disks up to about 2.5 inches wide. The narrow ripple or bubble coulters are common on no-till drills. In general, the deeper the openers operate, the wider the tilled strip should be. Thus a flat coulter may be adequate for shallow-seeded forages, especially if the coulter and the opener are mounted on the same linkage for constant alignment. A flat coulter can be sharpened.

If the coulters are mounted well ahead of the openers (e.g., on a caddy), there is an advantage in using a wide coulter to ensure that the opener runs in loosened soil. Coulters should be at least 14 inches in diameter to work well in heavy trash. Eighteen-inch coulters seem to work well in a variety of conditions. Large coulters can operate deeper without pushing residue ahead instead of cutting through. The coulters usually are operated at about the same depth or slightly deeper than the seed openers. Seed placement depth may be more consistent if the coulter is operated at the same depth or slightly shallower than the coulter, and the seed may be placed in firm soil.

Wide coulters usually require slower travel speed to prevent throwing chunks of soil beyond the range of the seed-covering device, especially in wet or hard, fine-textured soils.

Openers

Openers are usually double-disk units with disks from 14 to 18 inches in diameter. Double-disk openers are well suited to shallow planting since they can be fitted with depth bands. Small disks require less downward force for penetration. Large disks operate better in trash.

Offset disk openers usually open a narrower seed furrow, requiring less downward pressure for penetration and less soil moved back to cover the seed. Offset-disk openers may eliminate the necessity for no-till coulters ahead of the openers. Single disk openers may be mounted two to a linkage to balance the side-thrust.

Depth control

The most common depth control device is the combination gauge and press wheel operating behind the openers and attached to the same linkage. A press wheel narrower than the seed furrow is relatively ineffective as a depth control device.

A few drills are available with gauge wheels alongside the opener, resulting in more accurate depth control under most conditions. Depth bands probably give the most precise depth control. Disadvantages of depth bands include high cost, difficulty in changing depth and poor operating in wet, sticky soil.

Look for quick-change depth control with some easy means of setting all units to the same depth (e.g., a hand wheel with a marked scale for the depth setting). On some drills, operating depth varies to some extent with the weight on the drill. Some drills are too heavy to operate well in tilled soil. Drills frequently change depth as the soil changes from dry to moist or from clay to loam.

Press wheels and seed covering
The most common seed-covering device is the press wheel(s). Many sizes and configurations are available for most drills, from a narrow, single press wheel to two wheels in a Vee configuration. Materials range from zero-pressure rubber tires to hard rubber or steel.

The double-Vee configuration is popular for operation in a wide variety of tillage conditions. A wide press wheel that is effective in loose, tilled soil usually is not effective in no-till unless it has ribs about 2 inches apart to create down pressure near the seed furrow. Some farmers drag a flex-harrow or tineharrow behind the drill for better seed covering (and residue distribution), especially when using a coulter caddy and operating at high speed (7 to 10 mph).

Seed metering
A variety of seed metering devices are available, including:

- An externally fluted feed wheel, common for small seeds such as wheat and clover.
- An internally fluted feed wheel, popular for large, fragile seeds such as beans.
- Adjustable orifice with agitator wheel; seeding rate tends to decrease as forward travel speed increases.
- A picker wheel is used on fluffy, feather-like seeds (e.g., warm season grasses).

Component tracking
For operation on hillsides or curves, components such as press wheels, openers and coulters should be closely spaced (in the fore and aft direction).

For trash clearance, components should be spaced far apart (fore and aft as well as sideways). Pivots between components can improve tracking on curves. Pull-type drills will track better on curves than mounted drills, but mounted drills will track better on hillsides. Some no-till drills have the coulters on a caddy unit that places the coulters far ahead of the openers. Investigate tracking features if these units are to be used on hillsides or curves. Some caddies have a pivot to improve tracking on curves.

Power requirement
Pull-type no-till drills usually require about 5 to 7 horsepower per foot of drill capacity. Mounted drills require larger tractors, perhaps 10 to 15 horsepower per foot, to have sufficient front-end weight and hydraulic capacity to lift the drill. No-till drills pull slightly harder than conventional drills, but the rolling resistance of a tractor operating on firm soil is much less than on tilled soil.

Converting conventional drills

Several companies produce coulter caddy units to convert conventional 3-point hitch drills for no-till planting. There is considerable distance with some caddy units between the no-till coulters and the disk openers. Thus tracking may be a problem, especially on hillsides and curves.

Using wide, fluted coulters (at least 1 inch wide) will help ensure better tracking. The drilling depth is usually determined by the coulter operating depth, with a minimum of down pressure on the openers. Many operators travel in the 6- to 10-miles-per-hour range, resulting in considerable soil movement (tillage). A flex harrow, or tine harrow, behind the drill will rearrange the soil and residue. This results in better seed coverage and a

more uniform mulch, which may reduce crusting. High operating speed helps to prevent clogging problems with the drill and harrow. A narrow packer wheel, 1 inch or less wide, operating in the seed furrow to improve soil-seed contact, should be considered for this type of operation.

At least one company (Yetter Mfg. Co.) produces a coulter bar that mounts onto the 3-point hitch on a tractor to convert a pull-type drill to no-till operation. This unit has a hydraulically operated weight-transfer mechanism to transfer weight from the rear of the tractor to the coulter bar, producing coulter penetration without adding weights to the bar.

The John Deere All-Till grain drill

The John Deere All-Till grain drill incorporates some of the desirable features of the John Deere MaxEmerge planter. Each opener unit has one gauge wheel (vs. two on the planter) and one angled closing wheel (vs. two on the planter). It does have a seed packer wheel operating in the seed furrow ahead of the closing wheel.

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Related MU Extension publications

- G1650, Conservation Tillage and Residue Management to Reduce Soil Erosion
  http://extension.missouri.edu/publications/DisplayPub.aspx?P=G1650
- G355, No-Tillage and Conservation Tillage: Economic Considerations
  http://extension.missouri.edu/publications/DisplayPub.aspx?P=G355
- G4448, Controlling Vole Damage in No-Till Corn and Soybeans
  http://extension.missouri.edu/publications/DisplayPub.aspx?P=G4448
- G4673, Big Bluestem, Indiangrass and Switchgrass
  http://extension.missouri.edu/publications/DisplayPub.aspx?P=G4673
- M164, Missouri No-Till Planting Systems
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