Equipment Considerations for No-till Soybean Seeding *(Sumner)*

No-till planters and drills must be able to cut and handle residue, penetrate the soil to the proper seeding depth, and establish good seed-to-soil contact. Many different soil conditions can be present at the time of planting. Moist soils covered with residue, which may also be wet, can dominate during late fall and early spring and occasionally in the summer. Although this provides for an ideal seed germination environment, such conditions can make it difficult to cut through residue. In contrast, hard and dry conditions may also prevail. This is especially common when no-tilling soybean into wheat stubble during the hot, dry months of June and July. Although cutting residue is easier during dry conditions, it is more difficult to penetrate the hard, dry soils. Proper timing, equipment selection and adjustments, and management can overcome these difficult issues.

Condition of the Field and Residue

Two of the keys for success with no-till equipment are proper handling of the previous crop residue and weed control. If these issues are not considered, then the ability of the planter or drill to perform its functions is greatly limited. The residue has to be uniformly spread behind the combine if the opening devices are going to cut through the material and plant at a uniform depth. Ensure that the combine is equipped with a straw chopper and chaff spreader to distribute residue and chaff over the entire cut area.

The other key is weed control. If standing weeds exist, you are asking the planter/drill to cut and move this extra material through the system, plus the crop has lost valuable resources of nutrients and water.

Coulters and Seed Furrow Openers

Probably the primary difference between conventional planter/drill systems and those designed for conservation tillage systems is weight. Since the openers and soil engaging devices must penetrate much firmer soils and cut the residue, the conservation planter/drill systems are built heavier and have the ability to carry much more weight than conventional systems. For adequate coulter penetration, weight may have to be added to the carrier. Some planter/drills use a weight transfer linkage to transfer some of the tractor weight to the coulters to ensure penetration. Because coulters are usually mounted several feet in front of the seed opening/placement device (in the case of coulter caddies even further), many use wide-fluted coulters, a pivoting hitch or a steering mechanism to keep the seed openers tracking in the coulter slots.

Wide-fluted coulters (2-3 inches wide) perform the most tillage and open a wide slot in the residue. They allow faster soil warm-up (which may be a disadvantage in some double-cropping situations) and prepare an area for good soil-to-seed contact. However, because of the close spacing, fluted coulters require more weight for penetration, disturb more soil surface, and bury more residue. In wet soil conditions, fluted coulters may loosen too much soil, which could prohibit good seed-to-soil contact. The loose, wet soil may stick to the seed openers and press wheels resulting in non-uniform depth control and clogging.

Narrow-fluted coulters (1/2 to 1 inch wide, see Figure 1) or narrow bubble coulters, ripple coulters and turborippled coulters do not require as much weight for penetration and do not throw as much soil out of the seed furrow as the wide-fluted coulters. Turbo-ripple coulters have more cutting action over the ripped coulters of the same width. Ripple coulters with a smooth edge or smooth coulters are preferred for residue cutting. They can be sharpened to maintain the cutting surface. Operate all coulters close to seeding depth (Figure 2) to avoid excessive soil throwing at high operating speeds and to limit the formation of air pockets below the seeding depth. Use the largest diameter coulters available. When operated properly, they have the best angle for cutting residue and require less weight for penetration.

Most no-till planters/drills are equipped with independent seeding units that should allow at least 6 inches of vertical movement. This will allow smooth transit over non-uniform surface and adjust for root stubs and other obstacles. These units are sometimes staggered which helps with the unit function (more side-to-side space) as well as more space for the residue to flow through the system. These units should be equipped with heavy down-pressure springs and sufficient weight to ensure penetration of both the coulters and seed furrow openers into untilled soil. Usually these springs are adjustable and multiple springs can be added until sufficient pressure is achieved.

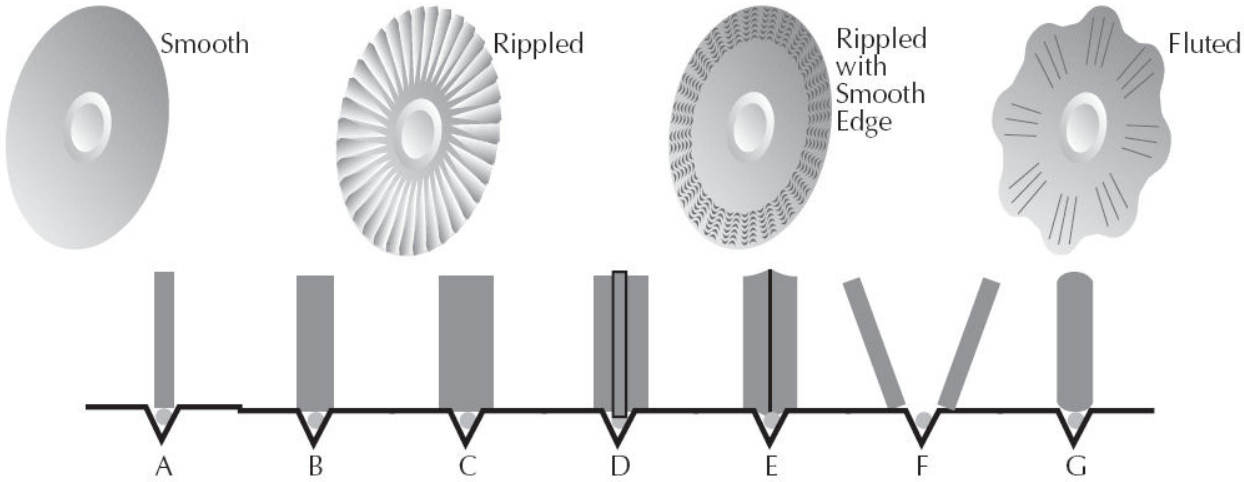

Figure 1. Top figure shows common coulter styles and the bottom figure shows various types of press wheels. Press wheels (bottom figure) are defined as: A) 1- inch wide wheel presses directly on the seed in the bottom of the seed furrow, B) 2-inch wide wheel presses on the seed and gauges planting depth by riding on the sides of the seed furrow, C) wide press wheel gauges planting depth but does not press directly on the seed, D) wide press wheel with two ribs applies pressure on the side of the seed furrow to press soil on the seed while gauging the depth, E) wide press wheel with one center rib applies pressure on the seed furrow to press while gauging the depth, F) a pair of angled press wheels gauge depth while closing the seed furrow and establishing seed-to-soil contact, G) narrow steel press wheel applies pressure directly on the seed but does not flex to “shed” soil in sticky conditions.

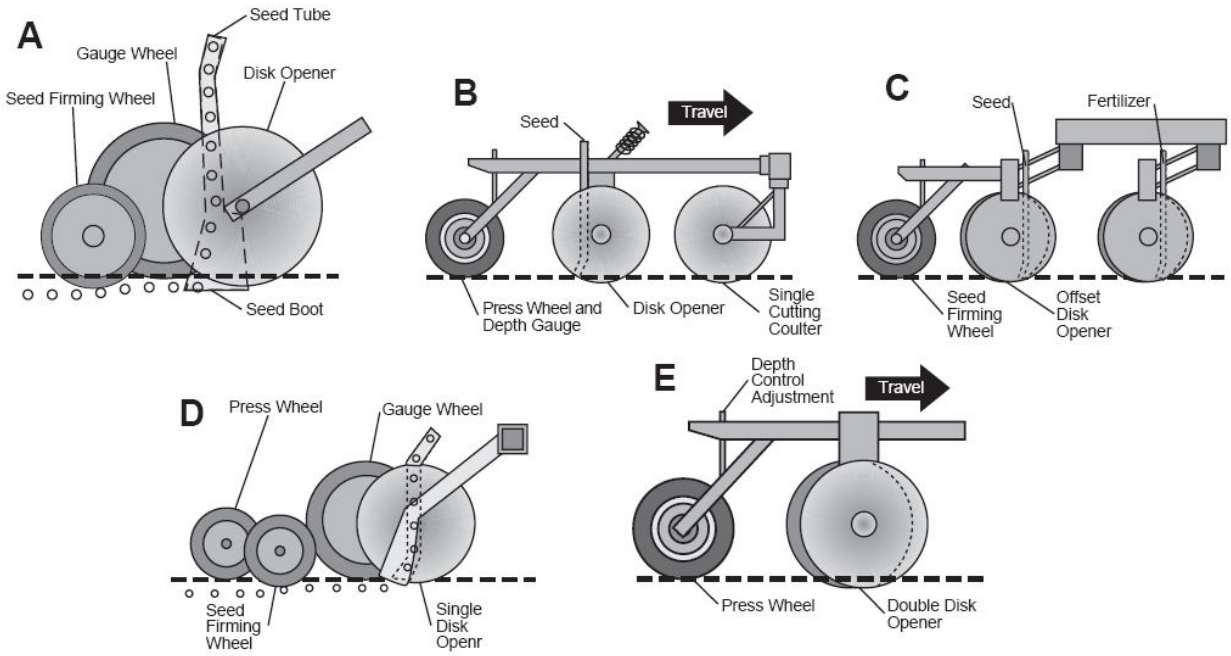

Figure 2. Diagram of typical seeding mechanisms: A) Single disk opener, B) single disk opener with add-on coulter unit, C) offset double disk openers with fertilizer opener mounted midway between seed openers, D) depth control is maintained by mounting the gauge wheel beside the seed opener disk, E) depth control is maintained by mounting the press wheel on the furrow opener frame member.

Some no-till planters/drills are not equipped with coulters (Figures 2-A and D). These planters/drills use the seed furrow openers to cut and place the seed. Several planter/drill systems have a staggered double disk seed furrow opener without a coulter (Figures 2-C and E). The leading disk (usually 1/2 to 1 inch in front) cuts the residue and the second aids in opening the seed furrow. Some manufacturers use a single, large disk set at a slight angle. These units require less weight for penetration and provide minimal soil disturbance.

Some no-till drills use offset double-disk openers (Figure 2. C & E) and the leading edge of the double disks is subject to significant wear. Single disk openers are also subject to similar wear. Essentially, the leading edge of one disk takes the abrasion and wear of cutting straw or stalks and penetration into the soil. The leading and trailing disk are typically two different parts and cannot be interchanged. As the double disk openers wear, check the gap between them. If a gap opens between the double disks they will push residue into the furrow and have less ability to cut the residue. Adjustment washers are found in the double disk opener assembly, which allow some adjustment to compensate for wear.

Summary

Successful planting/drilling with no-till equipment depends on specially designed systems that can uniformly place seed through heavy residue and into firm, moist soil. No-till equipment is available to achieve these results for good yields.