

Appendix 5

Using no-till technology to establish nwsg

There have been many changes in agriculture during the last 50 years. One of the most significant changes has been the use of no-till planting methods. When no-till planting is mentioned, most people usually think of crops such as corn, soybeans and cotton. Though often overlooked, no-till technology is also well-suited to establish forage crops, including nwsg, for wildlife or livestock. Soil erosion in conventional row-crop production has been decreased significantly by using herbicides to kill a cover crop and planting without tillage. This same benefit is also realized when no-till planting nwsg.

Why use no-till?

Many fields in Tennessee have been planted to permanent pasture because they were too steep to conventionally plant corn or soybeans. The potential for soil erosion was so great that a perennial cover had to be used to prevent excessive soil erosion, which was inevitable on many slopes. The main advantage to no-till planting is to conserve soil and decrease erosion.

No-till planting has several other advantages. Planting is able to occur soon after rain using no-till, while the soil must be allowed to dry before disking when conventional planting is used. After planting, the soil retains moisture longer when using no-till technology because the soil is not directly exposed to the sun. This is a real consideration when planting nwsg, especially when planting later in the season (June).

Characteristics needed in no-till drills

To be successful, no-till drills must place seed at the right depth, at the right rate and in firm contact with soil. They need to do this across a wide range of soil-moisture gradients, soil types, slopes and residue cover. Listed below are some characteristics to consider when choosing or using a no-till drill.

Weight

A no-till drill needs enough weight to let coulters and seed openers penetrate firm soil, allow press wheels to close the seed furrow and keep drive wheels or coulters in good contact with the ground. Depending on soil moisture, depth of planting and the setup of the drill, this may require 300 to 600 pounds per foot of width.

Coulters

Many drills use coulters to cut through residue in front of seed-furrow openers. In general, narrow coulters less than 1 inch wide disturb less residue, require less weight and work better across a wider range of conditions than wide-fluted coulters. Either narrow-ripple or smooth-edge ripple (bubble) coulters work well. Coulters should be as close to seed furrow openers as possible for better tracking on hills. Generally, coulters should be run at the depth of seeding or slightly deeper. When planting nwsg, this is just below the ground surface. Some drills use offset double-disc openers or angled, single-disc openers instead of coulters. These drills require less weight to penetrate the soil and have fewer moving parts. Disc openers wear out quicker on these drills, and the coulter may be useful in heavy residue.

Seed furrow opener

Double- or single-disc openers give more consistent depth of seeding and handle heavy residue better than hoe or shovel openers. They are particularly better for shallow planting, such as nwsg, alfalfa and clovers.

Depth control

Seeding depth is usually controlled by the press wheels or by depth gauge wheels mounted by the seed openers. Some drills rely on coulter depth to set seeding depth, but this method will not give consistent results.

Press wheels

Press wheels cover the seed, firm the soil and control seeding depth on many planters. Generally, either single 2-inch press wheels or two angled, narrow press wheels in a V-shaped configuration work well on no-till drills. Single, narrow press wheels (1-inch wide) will not control depth well in soft soils and should be used only if depth is controlled by gauge wheels. Press wheels wider than 2 inches will not close the seed furrow unless they have ribs on either side of the furrow. The angled, V-shaped press wheels work well on hard ground, but may clog in heavy residue like corn stubble. Staggering the press wheel/seed opener units helps reduce clogging.

Seed metering

Most drills have internally fluted metering mechanisms that are easy to adjust and are suitable for a wide range of seeds (various species). However, special seed box attachments with an agitator or auger and picker wheels (or similar device) are necessary for bluestems and indiangrass seed that have not been de-bearded. Also, many drills have a small seed box for planting switchgrass, alfalfa or clovers.

Power requirements

Pull-type drills need five to seven horsepower per foot of width.

Tractor hydraulics

Many drills require that the tractor have external hydraulics, so two hydraulic hoses can be plugged in.

Tracking

Proper tracking, with the seed opener and press wheels following in line behind the coulter, is often a problem on hilly ground or in turns. Drills with coulters close to the openers have less problems with tracking. Wider coulters help by tilling a wider zone, but require more weight.

Maintenance and operation

Of course, it is important to follow the recommended maintenance practices for no-till drills and to be familiar with the operating procedures as described in the owner's manual. Drills should be inspected before planting and maintained as necessary. Many drills used to plant nwsg are

borrowed or rented from state wildlife agencies, Quail Unlimited chapters, or farm supply companies. The age, type and maintenance of these units vary greatly. It is critical to understand how to adjust the seeding rate, change the seeding depth, realize how the weight and ballasting system works, and know the horsepower and hydraulic requirements of the drill. Drills should be inspected before transport or use for worn, broken or missing parts. Fittings should be greased and hoses inspected for wear and to make sure they are not clogged. Before beginning to plant, coulter settings and seeding depth should be adjusted as necessary, and the drill must be calibrated. More tips on calibration are described below.

Calibrating the drill

Calibrating a drill is nothing more than determining how much seed is being released per acre at a given setting. There are several ways to calibrate a drill, depending upon make and model. Nonetheless, any drill can be calibrated using the following steps.

- 1) Set the seed flow rate for the drill according to the calibration chart guidelines.
- 2) Mark a 100-foot length to use for catching seed.
- 3) Detach the seed flow tubes from above the press wheels.
- 4) Load seed (when using bluestems and indiagrass that have not been de-bearded, use enough to seed to fill to the top of seed agitators) and pull the drill until seed begins to flow.
- 5) Tape or tie a bag onto each of the hoses and pull the drill over the 100-foot marked area.
- 6) Weigh the amount of seed released over the 100-foot area.
- 7) Seeding rate in pounds per acre can be determined by the following formula:

$$\text{Seeding rate (lb/acre)} = \frac{\text{seed released (lbs)} \times 43,560 \text{ sq ft per acre}}{100 \text{ ft} \times \text{drill width (feet)}}$$

Note: this equals the seeding rate in bulk pounds per acre, not Pure Live Seed (PLS).

When more than one seedbox is used, each one should be calibrated individually before seeding. For example, when planting nwsg for wildlife, the seedbox for nwsg must be calibrated, as well as the seedbox for small seeds if forbs are added separately from the grasses. Changing the calibration on one seedbox does not affect calibration of the other boxes.

Some drills provide instructions for calibration by raising the drive wheel with a jack and turning the drive wheel a certain number of rotations at the proper ground speed to approximate a usage distance. This is often easier than pulling the drill several times before getting the seeding rate adjusted properly.

Several factors may affect seeding rates. Humidity, seed density, purity, inert matter and debris in the seed bag, speed of travel, seedbed condition, slope, soil type and tire size may influence the seeding rate. This illustrates the importance of calibrating the drill on the site to be planted, with the seed being planted on the day planting is completed. Operator error also can affect the seeding rate significantly. Overlapping rows, leaving too wide a space between rows and not lifting the drill at row ends can impact grass density significantly.

Coulter adjustment

No-till drills vary in the method used to control coulter seeding depth. Coulter depth on some drills can be adjusted by adding or removing weights to the drill. Some drills have a hydraulic mechanism that can be raised or lowered to adjust coulter depth. A variety of mechanisms are used to adjust disc opener depth. When the drill is being calibrated for seeding rate, several furrows should be checked to determine the depth the coulter is cutting into the ground and the depth of seed placement. Generally, it is best to use only enough pressure, weight or coulter depth to ensure the coulters will turn. The final determination of seeding depth is made by checking the planting furrows when planting and measuring seed depth. If the seeds are not obvious, they are too deep or are not being planted!