AGRONOMIC Spotlight

Technology Development by MONSANTO

Soil Management for High-Residue Fields this Spring

Planting conditions influence seedling emergence and corn growth throughout the season. Soil moisture, temperature, and structure, as well as residue cover are factors to be weighed against planting date. Last year's compaction and dense layers created within the soil cannot be corrected when soils are wet, and tillage implements and planters should be operated on dry ground to avoid compounding such problems. The way heavy residue is managed in high-yielding, corn on corn systems depends on soil conditions and available equipment. Several different systems will be discussed here. The intent is to identify multiple practices so growers can determine which system best fits soils, management practices, and equipment on their operation.

Conventional-Tillage

In some areas the standard for continuous corn production has been a traditional two-pass system of a deep fall chisel or ripper followed by a shallow secondary spring pass with a field cultivator or soil finisher. Deep primary tillage in the spring could be an option for areas with dry, high organic matter soils that do not generally develop hard clods. The burial of residue and creation of a warmer and drier soil surface creates a seedbed that is more favorable to rapid and consistent corn emergence. When used on wet soils in the spring, however, chisel plows or disk rippers may create clods that cannot break down via freeze and thawing action (Figure 1). If conditions allow for primary tillage, shallow shanks and narrow points are preferred over twisted or parabolic shanks.

Spring One-Pass System

A soil finisher is an implement with a row of disc gangs in the front to size and slice residue, followed by up to six rows of field cultivator shanks, followed by a finishing attachment option such as a harrow or harrow with rolling basket. Soils that have the potential to produce clods during tillage (clay and silt loams) would benefit most from the erosion protection of residue derived from this tillage system. This system buries more residue and loosens more soil than strip-till or vertical tillage systems while still leaving a lot of residue on the soil surface. This option can move enough soil to fill in moderate ruts and tracks left from a wet harvest. Generally, a good seedbed can be prepared; however, in wet soils a dense layer can develop in the soil just below the depth of tillage. This can compound soil compaction problems and may result in yield robbing root restrictions.

Figure 1. Tilling wet soils can result in cloddy seedbed conditions. Corn emergence, in-row spacing, and root development are often negatively influenced by such conditions.

Vertical Tillage

Implements are made by many manufacturers. They commonly have a set of straight blades, aligned vertically, and look similar to coulters. Fields with compaction problems and hard, clay soils can benefit from this type of tillage implement. These tools are designed to size residue and break up the soil surface to allow for drying and warming of the seedbed. These tools do have the ability to correct tire tracks from last fall. Residue is left on the surface which reduces erosion and is mixed in the top few inches of soil which aids decomposition. Soil is loosened vertically to promote root growth and water infiltration.

Some may believe these tools are a good way to dry soils out in the spring without creating a shallow root restricting layer common to disks, field cultivators and soil finishers. However, vertical tillage implements are heavy and require significant horsepower to pull. The large tractors required to pull the implement at intended speeds can result in serious compaction if soils are too wet.

Strip-Till

In some areas where traditional no-till has been less consistent at producing top yields, strip-till has become the preferred way of combining the best aspects of vertical tillage and no-till. Typically, strips 4- to 5-inches wide are cleared of residue and berms approximately 4-inches tall are built in the fall while fertilizer is applied below the surface. This tillage setup may be beneficial for heavy soils that are slow to warm, and soils with poor soil structure that would be damaged by full-width tillage. If strips were prepared last fall, the soil should warm and dry faster than residue covered areas for earlier planting. There can be some benefit to creating strips with a properly equipped strip-till bar

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if soils are dry this spring. A rolling basket can be added to the strip-till unit to crumble clods and firm the seedbed for planting. Placing fertilizer with the seed may be risky due to increased chances for seedling injury or death. In many cases if soils are dry enough to strip-till in the spring then true no-till may be a good option.

No-Till

By definition, tillage is not conducted with the exception of knives or shanks to apply some forms of fertilizer. Not unlike planting into a tilled seedbed, successful no-till planting involves waiting for proper soil conditions such as temperature and moisture levels. Often times, if a field is dry enough in the spring for tillage, it is also suitable for planting. In this case, cost savings can be realized in less fuel consumption due to reduced passes across the field. This also reduces the potential for further soil compaction and soil erosion. Well-drained soils may be best suited for first-year no-till, as most soils in long-term no-till have improved microbe populations and soil structure which aid in management of residue and moisture. No-till soils are at less risk for fertilizer loss associated with water erosion. Crop residue conserves moisture for improved crop growth in dry spring and summer conditions. Soil temperature often remains cool under residue cover which can delay emergence. Row cleaners can be used ahead of the disk openers to help clear residue from the furrow and warm soils. Residue may affect planter performance and seed placement. A coulter could be helpful for cutting moist residue. Farmers that are considering no-till for the first time should understand that no-till comes with both a learning curve of what practices work best and a transition period for yields to reach optimum levels.

Planter considerations

The most important decision this spring can be the decision to wait for proper field conditions. Compaction created during planting is not always evident early on, and may result from several components of the planter. Planters will need frequent adjustments this spring due to variable soil conditions to ensure uniform seeding depth good seed to soil contact. Adequate but not excessive down pressure and uniform planter frame height are two overriding considerations. Down pressure may require adjustment between fields to minimize the variability in seeding depth. Pinch-rows between duals on planter tractors, sidewall compaction from excessive planter down force, and side wall smearing from disk openers are the most common sources of compaction.

Row Cleaners

Row cleaners are necessary to push residue to the side to clear a path for disk openers, to create a true 'V' seed trench, and to avoid hair pinning (bending and pushing straw stalks into soil). Hair pinned residue can wick moisture away from seed in the furrow and prevent good seed to soil contact. Optimal adjustment of row cleaners should remove surface residue with minimal soil disturbance. Row cleaners are not a substitute for suitable planting conditions. Row cleaners expose wet soil which may stick to depth gauge wheels resulting in uneven seed depth. A coulter can be combined with row cleaners for additional soil disturbance and residue cutting. Down pressure should be adjusted frequently to maintain uniform planting depth without creating excessive down force that results in sidewall compaction. One or two spiked closing wheels can be used to help break up sidewall compaction. Drag chains should be added when using spiked closing wheels. If furrows are prevented from closing because they are too shallow due to compaction or wet conditions, germinating seed may die from exposure to wind and sun.

Deep-Rutted Fields

There is no ideal way to correct soil structure damage in a rutted field. If conditions are dry, deep tillage can be used to break up rutted areas and level the soil. Most likely, shallow tillage to fill in ruts will be preferred compared to aggressive tillage which may further damage soil structure in wet soils. Yield may not recover in these areas this year, but attempts should be made to prevent additional damage. This fall may be the next time to consider corrective deep tillage for compacted soils. No-till fields should be properly dry to prevent compaction, and a fall cover crop seeding may be used to alleviate compaction without tillage.

Corn is most affected by proper planting operations and soil conditions. Care should be taken to avoid damaging soil structure caused by wet tillage and planting. Uniform seeding depth, which leads to a strong root base and uniform emergence is affected by soil conditions, residue management, and planter settings.

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