No-Till, A Conservation Tillage Method

Conservation Tillage
Conservation tillage can refer to several reduced tillage/planting methods that retain the previous crop’s residue on the soil surface. Methods include no-till, strip-till, ridge-till, and mulch-till. Each method has its associated pros and cons. However, in the true essence of conservation tillage, no-till stands alone as the practice with zero tillage. Maintaining a no-till system requires the use of residue management, integrated pest management, crop rotation, nutrient management, proper equipment, and other agronomic disciplines.

Benefits of No-Till
- Reduction in soil erosion as residue helps hold soil in place.
- Residue helps build soil structure and health.
- Reduction in fuel use, labor cost, and equipment investment.
- Helps improve water infiltration.

Disadvantages of No-Till
- Soils are generally slower to warm for planting.
- Moisture retention may prevent timely planting.
- Potential increased dependence on chemicals (herbicides, insecticides, fungicides).
- Residue may be difficult to plant through.
- Perceived potential for yield drag.

Residue Management
Prior crop residue should be left in place for no-till systems. Stalks should not be shredded because planting equipment can function better in standing residue (Figure 1). Residue should be evenly spread during harvest. Intermittent light and heavy residue soil coverage can result in streaks of good and poor emergence. Soils with heavy residue mats may also harbor more insects than soils with light residue coverage. Increased moisture under heavy residue may increase the potential for seed and seedling disease development.

Properly adjusted equipment for no-till planting is necessary to adequately place seed in the planting furrow as desired. Residue row cleaners, coulters, stronger down pressure springs, and extra weight may need to be considered. Residue can be cut and soil loosened in advance of the planting unit by coulters. Coulters can be straight, wavy, or bubble in design. Depending on soil type and moisture, each of the different coulter designs may need to be considered. Rubber closing wheels are typically used in no-till; however, cast wheels can also be used in soils that are difficult to close, but should not be used when soils are wet.¹

¹ For additional agronomic information, please contact your Channel Seedsman.
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No-Till Economics

Perceived yield drag has been a common reason for not transitioning to no-till. Though yield potential may initially be reduced because of insects, disease, compaction, or other factors, it does not necessarily occur. Studies at Penn State University showed there was little chance for lost yield if the transition to no-till began with a soybean crop planted into corn residue and then rotated to corn. If the transition begins with no-till corn, the risk of a slight yield drag was greater. The use of a cover crop improved the opportunity for a positive effect on yield.

A long-term study at the University of Nebraska compared several tillage methods to no-till systems. Table 1 compares yield between results of a common chisel/disk system to no-till. No-till corn yields were higher than the chisel/disk system each year from 2008-2013. Soybean no-till yields were higher than chisel/disk yields for 5 out of the 6 years.

Trips across a field, regardless of function, cost money. Equipment, fuel, and labor are expensive and must be considered when analyzing planting systems. If there is a perceived yield drag with no-till, the financial loss through lost yield may well be offset by less expenditures on variable costs. University of Nebraska information shows that no-till systems use about 1.35 gallons/acre of diesel fuel compared to 3.34 gallons/acre for chisel plowing. In addition, assuming a 100 hp tractor and associated equipment, 0.45 of water/year can be saved through improved infiltration, less runoff, and reduced evaporation with no-till management.

Soil Structure and Biology

No-till helps develop, establish, and maintain a soil with good aggregation and structure. Pores from roots, earthworms, and other insects and animals allow water to seep deeper into the soil profile. University of Nebraska information indicates that 5 to 12 inches of water/year can be saved through improved infiltration, less runoff, and reduced evaporation with no-till management. Decaying roots help return organic matter to the profile and breakup compaction. Microorganisms hold soil particles together and are instrumental in the decomposition process, which helps recycle nutrients and carbon. Larger forms of animal life feed on the microorganisms creating more channels and additional nutrient and carbon recycling.

There is some recent debate on the amount of carbon sequestration that actually occurs with no-till practices. Sequestration is the process of transferring atmospheric CO₂ into the soil through plants, plant residues, and other organic solids that are stored or retained as part of the soil organic matter or humus. The process should increase soil organic carbon over time. Information from the University of Illinois suggests that manure and other outside products placed onto a no-till field should not be included in the sequestration equation because it does not remove atmospheric CO₂. In this trial, no-till has an advantage over conventional tillage when it comes to producing or retaining soil organic matter; however, it may not be sequestering atmospheric CO₂. The study also shows that the no-till subsurface or depth of rooting should be sampled and evaluated for soil organic carbon levels as this soil area could be losing more carbon than what is gained on the surface.

Additional studies showed that the use of cover crops, regardless of tillage system, increased the amount of soil organic carbon. The soil organic carbon increase was 30% with no-till, 10% with a chisel plow system, and 18% higher for moldboard-plowing.

Summary

No-till can be beneficial for reducing erosion, helping to rebuild soils, and helping with water conservation. It is a production tool that should be considered for its advantages.

Sources:
2. Roweih, J. Have a game plan when converting to no-till. No-till. Penn State Extension. extension.psu.edu/plants/crops/soil-management/no-till

Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible. ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. Leaf Design® is a registered trademark of Monsanto Company. Channel® and the Arrow Design® and Seedsmanship At Work® are trademarks of Channel Bio, LLC. All other trademarks are the property of their respective owners. ©2014 Monsanto Company. 140915164543 121614LGM

Table 1. 2008-2013 Average Yield Results at University of Nebraska Rogers Memorial Farm for Chisel Plow/Disk compared to No-Till (bu/acre)

<table>
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<th>Tillage System</th>
<th>Crop</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
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<tr>
<td>Chisel/disk</td>
<td>Corn</td>
<td>222.8</td>
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