

Can No-till Work with Residue Conservation in a Corn-on-corn Rotation?

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If you drive around the countryside you will notice a lot more black ground this year than in the past. Are producers adopting residue conservation but not able to make it work with conservation tillage? Those that are plowing down their fields in the fall after corn must feel that no-till or spring cultivation is not enough to get high yielding crops the next year. This article will explore the issues surrounding no-till and residue conservation in a continuous corn rotation more thoroughly including:

- 1) Heavy soils that won't dry out in the spring which delays planting,
- 2) Allelopathic effects,
- 3) Yield reductions.

The main concern for a producer in the fall is if the soil is going to be dry in the spring and accessible for early planting. One method used to speed soil drying in spring is to plow in the fall. Tillage of this nature will fluff the soil and leaves more surface area available for evaporation of water. This is especially true on heavy soils such as clays. On a sandier soil, fall tillage may not be as necessary because sandy textured soils will dry out faster in the spring regardless of tillage type. A drier soil in the spring means shorter time to wait for planting. In many cases, getting into a field earlier allows a producer to capture as many heat units as possible which in most cases translates into timely harvest in the fall and better yields.

In conjunction with desirable soil moisture is the need for a good seed bed for planting. Temperature and the soil itself are also important for seed establishment. A warm seedbed is preferred and tillage will help air movement through the top layers of the soil and warm the temperature in the spring. Also, tillage can help break up clods of soil or residue that would physically impede the seedling from breaking through the soil crust. Some researchers have noted seedling emergence issues with stover, however there is no agreement among in the research as each situation is different (soil type, hybrid, soil moisture, climate etc.) (Figure 1) (Mann et al., 2002).

Figure 1: Corn seedlings growing in last year's stover



Growing corn after corn can provide an opportunity for both good and bad soil microbes to flourish. Researchers have determined that corn-after-corn rotation provides a breeding ground for yield reducing microbes and these reductions are not completely due to N fixation (Brady and Weil, 2002; Turco et al., 1990). Autotoxic substances and the resultant diseases that excel in residue can be a problem in soils that experience a continuous corn rotation. Turco et al. (1990) fumigated the soil in a corn field and determined that in just 2 weeks, the corn roots were healthier which produced higher yields. The fumigation suppressed biological activity of deleterious microbes such as *Pseudomonas* (Turco et al., 1990). Those corn plants in the plots with no fumigation were more prone to root disease which resulted in reduced yields in a continuous corn rotation. It is critical that roots are healthy during the first weeks of growth. Plowing down residue, in addition to crop rotation, would help reduce disease issues and yield reductions.

Many researchers have noted a clear yield advantage for the moldboard plow over no-till in a corn-on-corn rotation. Research conducted in Wellington County and Halton Region has illustrated a significant yield boost from moldboard plowing corn stalks in the fall compared to no-till. There was a 14 bu/ac and a 17 bu/ac yield difference at the Halton and Wellington sites respectively (Vyn et al.). These studies were conducted on clay loam and silt loam soils. It can be speculated that moldboard yielded better because it allowed for better soil drying in the spring on the heavier soils and a more desirable seed bed. Similar results were found by extension staff in Minnesota. They conducted several years worth of corn-on-corn yield trials and determined that at all sites the moldboard plow yielded higher than no-till (Randall et al. 1996). In some cases substantially higher yields (30+ bu/ac) were measured on the soil loams and moderately well-drained clay loams. The yield reductions on the no-till were partially due to wet soils during years of high rainfall. The researchers also indicated that after several years of no-till there is a consolidating effect on the soil which slows root growth and delays overall plant growth, maturity, and consequently yields.

With the aforementioned issues in mind, there is an argument for using conventional tillage if your rotation is corn-on-corn. Drier soils in the spring, especially on heavy ground, earlier planting, soil and root disease suppression, and higher yields are all reasons that no-till or conservation tillage are less likely to be favored and conventional tillage is often used in corn-on-corn rotations.

Notes:

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