Dealing with corn stalks Part 1

After heavy rains/flooding, a common complaint is the movement of corn stalks/residue off fields into surface ditches. The Soil & Water transects shows that about 67% of corn acres are planted to no-till soybeans and only 6-7% of soybean acres are planted to true no-till corn. The corn residue including corn leaves, corn stalks, and corn cobs and chaff may float off any field once it becomes saturated with water. The practice of no-tiling soybeans into corn stalks followed by conventional tilled corn is called rotational tillage.

Farmers have found that there are economic benefits to no-tilling soybeans into corn stalks. It takes less fuel for no-till, the corn residue conserves moisture in a dry summer, reduces weed growth, increases water infiltration, and improves drainage. Environmental benefits of no-till soybeans into corn residue include less soil erosion and sediment losses, less nutrient runoff, and improved soil productivity. Negative side-effects of rotational tillage include corn residue that is slow to decompose and may float away during heavy rainfall events. An understanding of soil ecology is needed to explain why corn stalks are slowly decomposing. Farmers have three tillage production systems to consider: conventional tillage, no-till, and no-till plus cover crops (Ecological or ECO Farming).

In conventional tillage, the soil is disturbed which changes how the soil functions and changes the soil ecology. Tillage is a destructive process that oxidizes the soil organic matter and releases nutrients to the soil. In the short-term, crops benefit from the increased nutrient availability, but long-term, soils lose their structure, get harder and denser and the environmental consequences may be severe. Advantages of tillage include about 0.5 to 1.0 inches of water removed from the soil profile. Soils in the spring tend to warm up faster because it takes 10 times more energy to warm up cold water than it does air. Disadvantage of tillage include decreased soil structure, increased soil compaction, decreased water infiltrate, decreased soil organic matter levels due to excess oxidation, and decreased soil-water storage. Ecologically, a tilled system is dominated by bacteria and the soil functions less efficiently than a healthy soil. Bacteria tend to decompose soluble nutrients and sugars but are not as efficient as fungus at decomposing corn stalks high in lignin.

In no-till systems, the soil is not disturbed; however; the soil is still left bare in the winter. Advantages of this system include increased water infiltration, some improvement in soil organic matter levels, some improvement in soil structure, and some increased soil-water storage capacity which increases yields under dry conditions. The soil is cooler in the summer and may be wetter due to increased surface crop residue. Disadvantages include colder soils in the spring because soils that hold more soil moisture also take more energy to warm up in the spring. In reality, there are very few long-term no-till fields. Most farmers practice rotational tillage where soybeans are no-tilled into corn stalks and then the soybean stubble is chiseled or turbo-tilled in the fall to create a stale seed bed for conventional corn the next year. Turbo-tilling increases soil warming in the spring and increases faster nutrient release. However it also creates a zone of surface compaction which limits water infiltration. To make no-till work efficiently, it takes 5-7 years to transition to long-term no-till and most farmers are not that patient. Ecologically, true

long-term no-till soils have a better balance of bacteria and fungus in the soil because fungal populations recover due to less tillage.

The third system is ecological farming or ECO Farming which includes both long-term no-till and cover crops. The advantage of this system is similar to no-till except that the improvements are more dramatic. Increased soil organic matter levels due to increased root turnover and improved soil structure result in decreased soil compaction, increased water infiltration and increased soil-water storage. These soil changes decrease surface water ponding and increase water storage in the soil profile which may decrease flooding potential. With the increased pore space, in the spring, soils tend to be warmer due to increased porosity and higher aeration and live roots keep the soil warmer. Ecologically, the soil is alive with healthy bacteria and fungus populations which decompose high lignin crop residues like corn stalks quicker.

Each system has an impact on how long it takes for corn stalks and corn residues to decompose. In the next article, potential solutions will be discussed to to reduce corn stalks in surface water.