MESSENGER-INQUIRER

Cooperative Extension Service

Farm Update

daviess.ca.uky.edu
AGRICULTURE & NATURAL RESOURCES EDUCATION
Clint Hardy
Daviess County Extension Office

3-30-24

No-Till

Many in the county rely on some form of tillage to prepare fields for planting. The justification includes weed control, soil warming, improved planter function, etc. Yet experience has proven that tillage is not required to control weeds, warm soil, or improve planter performance on our upland silt loam soils. Tillage certainly doesn't result in greater yields than planting into undisturbed soil. No-till farming practices have been on the decline, very unfortunate for soil management and conservation. Tillage will not improve soil and certainly increases the risk of erosion. Fortunately, the use of poultry litter and cover crop do offset some of the structure and carbon loss, but it will not replace the effect of leaving soil surface undisturbed and crop residues in place.

Drs. John Grove and Hanna Poffenbarger in the University of Kentucky Department of Plant and Soil Sciences have analyzed data from research field plots comparing long-term no-till and conventional till practices in Lexington and at Princeton. The data revealed no-till nearly always out yielded the adjacent conventional till plots across multiple years, rainfall totals, and nitrogen rates.

No-till was historically promoted as a soil moisture conservation tool, beneficial in dry periods of the growing season. The research at Lexington indicates that no-till corn out yields

conventional till, regardless of the growing season rainfall amounts. 2012 was the last very dry season. All yields were low but the no-till out-yielded the tilled fields by 12 bushels per acre. The five years from 2015 to 2019 were wetter at Lexington with growing season rainfall totals ranging from 32, relatively dry to 52, very wet. As you would expect, the average yield of both treatments increased as rainfall totals increased. But the data went on to indicate that no-till corn yield out-yielded conventional till each year by an average of 22 bushels per acre.

We know that leaving plant materials on the soil surface and roots beneath the surface undisturbed allows mineralization of nitrogen from those residues over a long period of time rather than rapid mineralization induced by tillage. Therefore, the researchers also examined the yield effect in the no-till and conventional-till plots of different nitrogen rates which range from 0 to 300 units of nitrogen. As with the rainfall, no-till corn yields were consistently higher, regardless of nitrogen rates. The response of both tillage practices indicated 150 units of N was not enough to maximize grain yield, especially in the heavier rainfall years. Both locations are well-drained soils and the nitrogen is applied soon after emergence. The 150 unit N yield data suggest a split application at planting and lay-by might have been beneficial by preventing some nitrogen loss in the wetter seasons.

Other measurements taken at Princeton indicate that no-till soils have greater porosity at the surface. This means that those large pores will easily retain and hold most of the water following a recent rain event. As the soil dries, either by evaporation or plant uptake, the pores still holding water become continuously smaller. When extremely dry, there is little difference between a no-till soil and the same soil after tillage. Water retention depends on the soil texture and the ratio of sand, silt, and clay particles; not soil structure. Tillage destroys soil structure,

especially the large pores, so less water is stored in the tilled soil following a rain event. Therefore, no-till corn has more plant-available water waiting for the next rain event. We used to think no-till conserved moisture by residue on the surface early in the season but shade provided by crop canopy would allow conventional fields to match no-till water retention later in the season. We've learned that the soil structure provides benefits to water retention well beyond canopy closure.

In addition to soil structure conservation, no-tilling these soils has led to increased "soil health" by the combined biological, chemical, and physical property interactaction without disturbance. Any tillage be it minimum, vertical, horizontal, mulch, or turning causes soil organic matter to be lost. No-tillage results in the organic matter retention for the greatest length of time for our soils and climate, resulting in increased water retention, nitrogen mineralization, and reduced erosion.