Fall Tillage: Benefit or Detriment to the Soil? Lafayette County Agriculture Educator: Josh Kamps

As the 2021 fall harvest nears completion in many regions of the state, farmers' focus is likely turning to 2022 decision making. Preparing the soil for next year's crop is an important area of crop production. Fall tillage is a commonly chosen practice to prepare soil for the upcoming year by burying crop residue, incorporating applied nutrients, or loosening compacted soils. Simply stated, tillage is the mechanical modification of soil in preparation of crop production. Depending on the type of soil and the type of tillage, soil health is at risk with routine tillage. Soil health is a measure of the ability of soil to function properly. Healthy soil has an even balance of physical, chemical and biological characteristics. Examples of proper soil function include equal balance of water to air, symbiotic plant to soil microbe relationships, and adequate levels of available crop nutrients.

The results of a three-year field and laboratory study at Iowa State University show no significant difference for the rate of Bt corn residue breakdown between tillage or no-till. Burying the residue, processing the residue into smaller pieces or applying decomposition agents did not show an increased rate of decomposition. In healthy soils with adequate soil microbial activity, the maximum residue decomposition rate occurs when soil moisture is at field capacity and soil temperatures are above 50 degrees F. Putting corn residue in close contact with healthy soil begins this process on the soil surface. Fall tillage as a residue management tool does not address the main driver of decomposition, which is soil biological health and proper soil conditions.

The importance of incorporating soil-applied nutrients is specific for each nutrient. Nitrogen losses resulting from surface application due to volatilization are common during certain weather conditions. Nitrogen sources in the ammonium form of N are at risk of converting to ammonia and volatilizing. Other nutrients like phosphorus, potassium, sulfur, calcium and boron remain on the soil surface with low losses during most weather conditions. Healthy soils with established cover crops and microbe activity assist with nutrient movement from the surface to the plant-rooting zone through earthworm and root channels and adequate water infiltration. Cover crop research completed at University of Minnesota showed a significant reduction in soil nitrate level with a rye cover crop and manure application compared to no rye cover crop. Incorporating crop nutrients through banded placement can promote crop production efficiency. Certain tillage options and planter set-ups are available to accomplish this process.

Soil compaction is a result of applied pressure to the soil surface during times the soil is at or near field capacity. Compacted soil has reduced soil aggregation, which leads to lower water infiltration, limited soil biological activity and limited plant root penetration. Excessive soil compaction limits a soils ability to function properly and limits crop production. As soil moisture decreases, air pockets form between soil aggregates, which increases the soils' load carrying capacity. A soil penetrometer or a soil spade are both tools capable of identifying the presence and depth of soil compaction. If consistent compaction across a field is not present, a tillage pass may actually increase the risk of soil compaction in the field. Refer to UW-A4158, "Managing Soil Compaction at Planting and Harvest" for additional details on preventing and reducing soil compaction.

Healthy soils balanced for physical, chemical and biological characteristics are equipped to resist erosion. Strong soil aggregates, living roots, and increased soil microbe activity comes with less tillage. Healthy soils infiltrate and store water and capture and store carbon, which increases soil organic matter levels. To encourage healthy functioning soils, determine the purpose for the tillage pass before the tractor heads to the field this fall.

<u>References</u>

1) "Corn Residue Breakdown as Affected by Tillage and N Application" –Mahdi Al-Kaisi
--ISU, Integrated Crop Management News
2) "Managing Manure Nitrogen with a Cover Crop" –Les Everett, Randy Pepin, Jeffrey Coulter, and Melissa Wilson – UMN, Minnesota Crop News
3) "Managing Soil Compaction at Planting and Harvest" –Francisco Arriaga, Geoffrey Siemering, and Brian Luck
--A4158, UW Division of Extension