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HOW TO INCREASE SOIL HEALTH PROPERTIES

At the Paul Hay retirement ceremony in Gage County last week I pulled out some old slides in the early 80's or the birth of no-till farming in the Tobias area in Saline County. At the time Gage County had about 170,000 acres of conventional tillage milo and Saline County around 80,000 acres. We didn't have Roundup back then but with diverse rotations with wheat, milo, soybeans and alfalfa, we made it work with multiple modes of actions with the herbicides at the time. We knew no-till farming saved fuel, labor and saved a significant amount of precious topsoil. Milo responded very positively in dry years even in short-term no-till fields with seven bushels more yield with each tillage pass we eliminated. What we didn't understand at the time was the long-term crop yield gains possible with soil carbon and soil health.

Last week I had a report on a fifteen year continuous no-till, irrigated soybean field in Friend area that attained 84 bushels per acre whole field average, a point of pride for the farmer involved. Plant breeders would like to take all the credit and varieties are better than in the 80's but this could not have been achieved on this particular soil type and field without excellent soil health properties. The producer is using swine manure and starting to implement cover crops. In the early 90's we understood chemical properties in soils really well and fertility issues but hardly anyone was talking about physical characteristics of the soil and soil microbiology changes when no-till over long-term is implemented. Manure or compost sources can be a valuable source of nutrients but how much does it contribute to overall soil health?

Research conducted by Charles Wortmann and Charles Shapiro at UNL in Northeast Nebraska demonstrated soil aggregate stability increased with manure and compost applications. Soil aggregates are groups of soil particles that bind to each other more strongly than to adjacent particles. The space between the aggregates provide pore space for retention and exchange of air and water. Soil aggregates breakdown when we do tillage but when you combine manure application with no-till farming there is a very positive reaction that happens. It "turbo charges" your soil.

In the study, manure and compost applications replicated plots had an increase of over 200% in water stable, large macro aggregates within 15 days after application. These large aggregates were 200% higher in Bray-P1 phosphorus levels compared to the check plots. Aggregation was highest with composted manure compared to raw manure or swine slurry. Less phosphorous runoff from the field was predicted.

Manure creates a new habitat for soil microbes to explore and colonize and persist. The organic matter from manure creates an environment for increased biological activity. The activity produces a substance called polysaccharides or what I call "soil glues". The glue is what is needed to make water stable soil aggregates. With more soil aggregates, soil water infiltration gets better and less farm runoff. You also provide food for earthworms and arthropods in the soil. Liquid manure has good properties for the soil but are shorter lived compared to soil manure applications.



Fungal mycelial growth binds soil particles together more effectively than smaller organisms, such as bacteria. No-till farming continuously fosters more fungal growth in soil versus oxygenated bacterial action. Aggregate stability declines rapidly in soil planted to a tilled crop. It increases while the soil is in sod and crops, such as alfalfa. When the soil is wet, dig into sod with a tile spade in a field edge or waterway then dig in a tilled field and a long-term no-till field and you will feel and see the difference.

After the big rain this week we will see combines in the long-term no-till fields sooner than tilled fields and the reason is soil water stable aggregates.

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