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Transitioning to Improved Soil Health

Farmers in a conventional tilled corn-soybean rotation often ask how they can improve soil health. It is not easy but also not impossible. Improving soil health starts with evaluating your soil and then fixing those problems. Fall is an excellent time to evaluate your current soil health and to start making management changes for next year.

First, evaluate your soil structure. Take a shovel and look for hard pans and soil that does not crumble easily. Dig down at least 12-15 inches. Often at least 2-3 layers of hard dense soil may be visible. Between 6-8 inches, the old plow layer is almost always found; either visually, by probing the soil with a steel rod, or by breaking soil apart. Tillage tools often smear wet soil and create these dense soil layers which restrict roots, water movement, gas exchange, and mineral nutrition.

Second, evaluate your drainage, both surface and subsurface. On the surface, look for areas that had or has ponding water, surface crusting, and a lack of surface residue. Before crops are harvested, look at crop height, stalk strength, and plant populations; then evaluate yields in different parts of a field. Too much standing water may mean no or few crops and little yield. In a dry year, these areas tend to produce well. On hills, the lack of soil organic matter can cause problems during dry weather or a drought. The goal with good soil health is to get high yielding crops every year on the whole field, regardless of soil type. Generally, higher levels of soil organic matter (SOM) buffers extremes in temperature, moisture, and increases plant available nutrients.

Good SOM levels also improve soil structure and improve tile (subsurface) drainage. If you have no tile (subsurface drainage), tiling is usually a first good step. If you have tile, but the soil does not drain adequately, then start by improving your soil structure. Plant both deep rooted cover crops with tap roots to get water into the soil along with fibrous rooted grasses to move the water laterally to the tile lines. Farmers can save money investing in cover crops by making their existing tile lines work better, rather than spitting or investing in more tile.

Generally, the next step is addressing soil fertility. About 85-90% of current fertilizer nutrition centers on three macro-nutrients: nitrogen (N), phosphorus (P), and potassium (K). However, the other elements are just important! When taking soil tests and tissue tests, test as many macro and micro-nutrients as possible and always write down the time of year and the general weather

conditions. Environmental factors like weather, moisture, temperature, and pH affects microbial activity and nutrient availability. Do not forget to test for SOM. Poor soil structure, soil compaction, and low SOM tends to reduce microbial activity and reduces plant nutrient availability. Try to take future soil tests and tissue tests at the same time of year so results can be compared and tracked from year-to-year.

Calcium and sulfur plant deficiencies are becoming more common. Certain herbicides like glyphosate (Round Up) are known to chelate or tie up micro-nutrients like manganese (Mn), zinc (Zn), copper (Cu) and even iron (Fe) which are all positively charged. Micro-nutrient anions (negative charged elements) like boron (B), molybdenum (Mo) are also critical micronutrients. Even nickel (Ni), cobalt (Co) and selenium (Se) may be needed in very small amounts by soil microbes and plants to activate certain enzymes. Soil and tissue testing are critical tools to improving soil health.

Planting oats as a cover crop tends to reverse the effect of applying glyphosate on micro-nutrient availability. Planting fall cover crops tends to out compete weeds and may reduce herbicide usage and other pests over time. Adding poultry, swine, cattle manure or compost can be a great way to supercharge the soil biology when applied in reasonable amounts. Increase your SOM by planting cover crops to increase root turnover. Higher SOM creates a healthy soil environment for improved microbial activity and nutrient turnover. Healthy soils tend to have adequate levels of macro- and micro-nutrients to activate enzymes for biological functions that increase yields and improve grain quality through higher nutrient density.

Farmers should try to add wheat into the crop rotation to break up pest cycles and have the opportunity to plant summer cover crops. Timely cover crops planting is extremely important, so try planting early maturing corn and soybean varieties (without sacrificing yields) to improve soil health. Keeping live plants on soil year-round feeds soil microbes and keeps soil protected leading to better soil health.

