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# Linking Soils and Water

I recently received a phone call from an old friend now working as a journalist in South Dakota. After exchanging pleasantries, he explained that he was writing a story on the effect of drought on agriculture in his region and was interested in learning more about general topics in soil. Undoubtedly tickled, I launched into a diatribe about the role of soil texture, microorganisms, temperature, root growth, management, and a myriad of other topics that affect the degree of water stress in plants. This brought us to an interesting point in the conversation as I realized that all of these aforementioned factors influence and are influenced by soil organic matter.

Soil organic matter is a foundational component of soil systems. In fact, it is difficult to overstate the importance of soil organic matter in defining chemical, biological, and physical processes. In a previous FNP article, I wrote about the concept of soil health. Though in this article, I'd like to get a bit more granular about this key metric of soil health: organic matter.

Though the term sounds like it is related to the USDA organic certification, it more so refers to the chemical composition of the material, specifically the carbon-to-carbon or carbon-to-hydrogen bonds. Less scientifically, soil organic matter is an umbrella term that encompasses the materials that are or were once living organisms. For example, by-products from decomposing plant roots are considered soil organic matter. Actually, this breakdown process is vital in creating chemically active pools of organic matter needed to sustain soil-life and subsequent plant growth.

Without getting too deep, there are subcategories, or "pools" of organic matter. Some are held tightly and remain in the soil for long periods of time while other pools are "cycled" or used rapidly by soil microorganisms. The protected fraction is termed humus ("hugh-mus", not the Mediterranean food), which in high concentrations gives soil a characteristic dark color. It may help to think of this in a monetary context, wherein the humus may serve as the bank while the active pool is the cash that we spend. Much like our finances, it is important to have a sizable reserve but we must also recognize the value that spending or cycling some of the active pool brings. From an agricultural perspective, having soil microorganisms spend some of that active soil organic matter provides a majority of valuable plant-available nutrients for crops.

Back to the timely drought topic: soil organic matter plays a critical role in soil water dynamics. Soil organic matter directly holds more water than its soil mineral counterparts. Water molecules enter the miniscule spaces between the complex structures of soil organic matter where it is protected from loss. Indirectly, soil organic matter improves soil structure–the arrangement of soil particles–as some organic compounds act like a glue to form "soil aggregates", particles held close together. This effectively opens the soil, increasing the pore space thus allowing water to move through the soil finding nooks and crannies where it can hide

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from evaporation or other mechanisms of loss. No less, soil organic matter improves water infiltration; water that hits soil enters more rapidly where it could be used or held rather than being lost to evaporation or run-off.

So, for my South Dakota counterpart, soil management practices guided by the Six Principles of Soil Health (reference to Soil Health FNP Article) generates soil organic matter, creating more drought-resistant and healthier crops.

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