



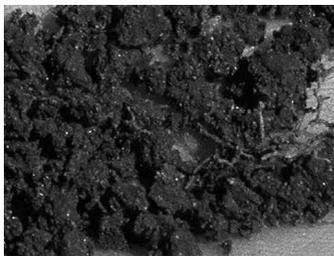
Building Healthy Soils

By Adam Hayes, CCA-ON

We expect a lot from our soils. Some take them for granted and others take the time to nurture them. Year after year seeds are planted into the soil and despite how the soil has been treated or what curves Mother Nature has thrown us, we expect to harvest a good crop. The soil can be resilient and can produce a crop after years of abuse but it will not produce to its potential.

Soil organic matter is an important part of a healthy soil. It plays a role in nutrient cycling, soil structure, moisture holding capacity, water movement through the soil and helps the soil resist erosion, crusting and compaction. To have a healthy soil it is important to manage the soil carefully to maintain or increase soil organic matter.

Organic Matter Basics



An ideal topsoil structure.

The first thing to understand is organic matter is constantly cycling. There are three components of organic matter that are sometimes referred to as the living, the dead and the very dead. The living portion is made up of earthworms, bacteria, nematodes (good and bad), fungi, plant roots, insects, etc. making up about 15% of the total soil organic matter. The dead consists of plant and animal residues and the material that has recently decomposed. The very dead is humus or well decomposed organic matter some of it could be thousands of years old.

The second thing to understand is that as it cycles there are gains and losses. Our soils had fairly high levels of organic matter when

they were cleared, as much as 10% or above. On many soils these levels have decreased significantly over time. Some soils have reached equilibrium, some continue to decline and others are rebounding.

Structurally Sound

The organisms in the living part of organic matter exude substances that help to bind soil particles together in to clumps or aggregates. Aggregates are the building blocks of soil structure. Good soil structure provides the channels and pores in soil that can improve water, air and root movement through the soil. The



Build soil organic matter levels with crop rotation, no-till and cover crops.

activity of organisms in the soil, such as earthworms, also helps to create channels in the soil. Substances released in decomposition also bind soil particles together. Some research suggests target levels of organic matter based on trying to achieve a maximum level of aggregate stability. In a sand and sandy loam soil the level is 3%, silt loam and loam 4%, clay loam 7% and clay 9%.

Organic matter plays a different role depending on the soil type. In clay soils, it helps form good soil structure that assists in water movement through the soil and holds water that is more readily available than water held by clay. In sandy soils, organic matter plays a significant role in water holding and nutrient cycling. For example, a 0.5% increase in OM can increase nutrient holding

ability by 15% and water holding capacity by 12%. This translates into about a week less moisture stress on the crop.

Building Organic Matter Levels

Organic matter levels can be increased by adding more to the pool than is lost. Minimizing the losses and increasing the additions are the keys to maintaining or building organic matter. Minimizing the losses means reducing soil erosion and reducing or eliminating tillage. Increasing organic matter additions involves growing crops with good root systems, crops that return more

residues, including cover crops, and applying organic materials such as manure and biosolids.

Dr. Fred Magdoff, University of Vermont, looked at what it would take to maintain organic matter levels on a clay soil that was moldboard plowed and in continuous corn silage over an 11 year period. It took 20 tons/acre/year of manure to maintain soil organic matter levels. An extreme situation maybe, but it shows that significant organic material additions can counteract organic matter losses.

And, finally, there is a lot of talk about biofuels these days and using those “waste residues” for fuel. As you can see, we will have to proceed carefully down this road and be prepared to limit removal or return an equivalent amount of organic material to balance the removal.



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There are over 500 Certified Crop Advisers (CCA) in Ontario. Each CCA has demonstrated their knowledge about Ontario crop production by passing the required exams. In addition, they have the crop advisory experience, the education, the commitment to continuing education and have signed a comprehensive code of ethics, which places the grower's interests first.

This industry driven program helps ensure that Ontario crop producers are well served by those providing their crop production advice. This article was written by one of those CCA's.