

## The Challenge of Maintaining Soil Organic Matter

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Before we discuss how to improve Soil Organic Matter (SOM) levels in the soil let's first talk about what it is and what it does. The organic fraction of a mineral soil is fairly small, but can make all the difference between a healthy productive soil and one which is not. Typical SOM content will be between 1 and 6%, and can be split into two groups: the living and the dead. The living includes the worms, insects, fungi, bacteria, and many more organisms. A healthy soil can contain millions of organisms within a single tea spoon of soil. This living portion only makes up 3-4% of the SOM, but it is responsible for the decomposition of plant residues and other dead organisms. The plant residues continue to be decomposed until it becomes the most stable fraction of the SOM – Humus.



*Soil color is an indicator of Soil Organic Matter. Soils with darker brown colors generally have higher levels of SOM.*

The humus in the soil acts as a sponge for water and nutrients. Humus can hold as much as 6 times its weight in water and is a good source of nutrients as it is decayed by microbes. It also glues soil particles together to help form strong soil which help soils to resist wind and water erosion. The level of SOM is often used to define a healthy soil. Plants growing on a healthy soil with a good amount of SOM will be more resistant to drought, disease, and other natural events.

With all the positives for managing for SOM – Why do we continue to see SOM levels declining? In the tropics the maintenance and improvement of SOM is a huge challenge. Warm and moist soils are ideal for the rapid decomposition of SOM and when tillage is added into the equation the entire process is accelerated. To help illustrate the challenge of maintaining and increasing SOM let's look at the numbers. Assume an acre of soil weighs 2,000,000 lbs, contains 3% organic matter, and has an SOM decomposition rate of 5%. In this scenario an acre would contain 60,000 lbs of SOM and with decomposition rate of 5% the farmer is losing 3,000 lbs of SOM per year. This may not seem significant, but consider it takes approximately 10 lbs of plant residue to replace 1 lb of humus. As a result 30,000 lbs of plant residue will need to be added to the soil per acre annually to maintain this SOM at 3%. Below are the calculations discussed above.

- ▶  $(2,000,000 \text{ lbs soil}) \times (0.03 \text{ organic fraction}) = 60,000 \text{ lbs OM}$

- ▶  $(60,000 \text{ lbs OM}) \times (0.05 \text{ decomposition rate}) = 3,000 \text{ lbs OM loss}$
- ▶  $(3,000 \text{ lbs OM loss}) \times (10 \text{ lbs residue needed/lb humus}) = 30,000 \text{ lbs residue needed}$

The addition of 30,000 lbs of plant residue may seem impossible, and for some farms it may be. However, with changes in farming management farmers have seen SOM levels increase. Two management changes a farmer can implement to improve SOM would be the incorporation of cover cropping and reduced tillage. There are many purposes for planting a cover crop, but if the only reason was to improve the SOM it would be worth it. Cover crops are designed to produce large volumes of biomass and rather than be harvested they are tilled into the soil. This practice, in addition to the normal biomass production added to the soil from the actual cash crop, can go along ways toward maintaining SOM.

Also when there are cover crops in the field there is no tillage occurring. Every time a field is tilled, cultivated, or the soil stirred in any way the decomposition of SOM is accelerated. This is because the tillage aerates the soil which stimulates the aerobic soil organisms which are responsible for SOM decomposition. The adoption of these two management practices should also lead to reduction of soil erosion which is also critical for maintaining SOM.

## Resources

If you would like to learn more about SOM and other soil quality / soil health indicators visit <http://soils.usda.gov/sqi/index.html>

Spotlights: Conservation Conversations for Healthy Soil  
[http://soils.usda.gov/sqi/soil\\_health\\_videos.html](http://soils.usda.gov/sqi/soil_health_videos.html)

Soil Quality/Soil Health: <http://soils.usda.gov/sqi/index.html>

Soil Quality/Soil Health Assessment - Soil Quality Indicator Information Sheets  
<http://soils.usda.gov/sqi/assessment/assessment.html>

Web Soil Survey: This link allows you to locate an area of interest and identify soil type and associated soil data. <http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm>

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