UF UNIVERSITY of FLORIDA
IFAS Extension

SL273

# Soils & Fertilizers for Master Gardeners: Soil Organic Matter and Organic Amendments [1]

Gurpal S. Toor and Amy L. Shober[2]

This article is part of a series entitled *Soils and Fertilizers for Master Gardeners*. The rest of the series can be found at http://edis.ifas.ufl.edu/topic_series_soils_and_fertilizers_for_master_gardeners. A glossary can also be found at http://edis.ifas.ufl.edu/MG457.

## Introduction and Purpose

Organic matter normally occupies the smallest portion of the soil physical makeup (approximately 5% of total soil volume, and is usually 1 to 3% for Florida's sandy soils) but is the most dynamic soil component (Figure 1). The primary sources of soil organic matter are plant and animal residues. Soil organic matter is important for maintaining good soil structure, which enhances the movement of air and water in soil. Organic matter also plays an important role in nutrient cycling. This publication is designed to educate homeowners about the importance of soil organic matter and provide suggestions about how to build the organic matter in garden and landscape soils.

## What is the Composition of Soil Organic matter?

Soil organic matter contains (i) living biomass: plant, animal tissues, and microorganisms; (ii) dead tissues: partly decomposed materials; and (iii) non-living materials: stable portion formed from decomposed materials, also known as humus. Soil organic matter typically contains about 50% carbon. The remainder of soil organic matter consists of about 40% oxygen, 5% hydrogen, 4% nitrogen, and 1% sulfur.

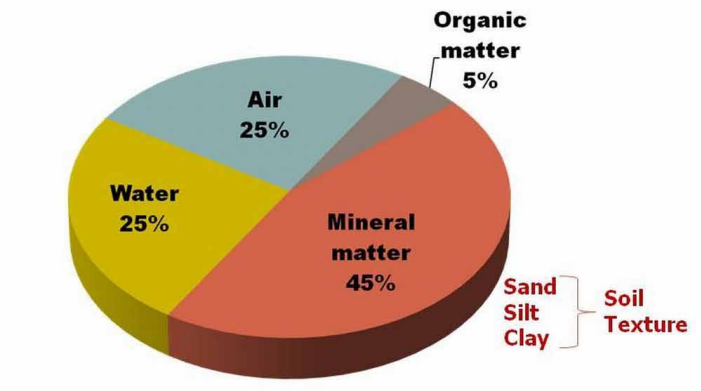


Figure 1. Typical Components of Soil.
Credits: Gurpal Toor

The amount of organic matter in soils varies widely, from 1 to 10% (total dry weight) in most soils to more than 90% in organic (muck) soils. The amount of organic matter depends upon the inputs of plant residues, animal manure, composts, and other organic materials. Biological processes, including plant growth and microbial decomposition of organic matter, help determine whether the level of soil organic matter will increase, decrease, or remain the same. In addition, disturbance of the soil by human activities can

1. This document is SL273, one of a series of the Soil and Water Science Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Original publication date October 2008. Revised January 2009. Reviewed February 2012. Visit the EDIS website at http://edis.ifas.ufl.edu.

2. Gurpal S. Toor, assistant professor; Amy L. Shober, assistant professor; Center for Landscape Conservation & Ecology, Soil and Water Science Department, Gulf Coast Research and Education Center, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL 32611.

also impact the amount of organic matter present in the soil.

## Why is Soil Organic Matter Important?

Organic matter in soils provides a variety of benefits. These benefits include improvement in physical, chemical, and biological properties of the soil. The main benefits are:

1. **Maintenance of stable soil pH:** Soil organic matter moderates the major changes in the soil pH by binding or releasing cations. This helps to keep soil pH in the neutral range (pH: 7-8), which is optimum for most garden and landscape plants.

2. **Regular supply of plant nutrients and maintenance of soil fertility:** Plants obtain essential nutrients (nitrogen, phosphorus, potassium) from decomposing organic matter. While the non-living part of organic matter (humus) does not directly provide nutrients, humus improves soil fertility by holding plant nutrients so they remain available for growing plants and do not leach from the soil.

3. **Maintenance of adequate soil structure:** Presence of adequate amounts of soil organic matter in soils can help to coat the soil particles (sand, silt, clay). Coating of soil particles facilitates aggregation, which provide pores and channels in the soil that allow rainfall or irrigation water to pass through the soil. Aggregation also reduces the runoff of water and nutrients, and soil erosion. Soil aggregates also protect the soil from compaction so it is easier for plants to grow.

4. **Supply of energy to soil microorganisms:** Organic matter is the main source of food for several microorganisms (bacteria, fungi, actinomycetes). When fresh organic matter (e.g., plant tissues, organic wastes) is added to the soil, these microorganisms start the decomposition process. During this process, nutrients are released, soil aggregates are formed, and humus is created. Organic matter also acts as an energy source to specialized soil bacteria so that they can convert nitrogen gas in the atmosphere to plant available nitrogen.

5. **Removal of harmful pollutants:** Soil organic matter binds selected harmful pollutants like residual pesticides and trace elements so that these constituents cannot escape from the soil and pollute our water bodies.

## How to Build Organic Matter in Soils?

The amount of organic matter in soil is the result of two processes: the addition of organic materials (roots, surface residue, compost, etc.), and the loss through decomposition. Soil organic matter is continuously produced and broken down by living soil microorganisms, insects, and worms as they consume it for food. Microbial activity and decomposition rates of organic matter are enhanced in warm, wet conditions, which are common in Florida.

Regular additions of organic residues are needed to maintain a consistent amount of organic matter in soils. In a natural ecosystem, this addition is achieved by the constant recycling of organic matter as plants and animals leave residues or die. In an urban landscape, this cycle is often disrupted when plant trimmings and residues are removed and sent to the landfill.

For a homeowner, the most common and rapid way to build soil organic matter is to add plant or animal residues back to the soil. Grass clippings and leaves contribute nutrients and organic matter if these organic sources are directly returned to the soil. Alternatively, these materials can be composted (along with plant clippings and some food waste) and then returned to the soil. Another option is to purchase organic amendments (e.g., composted manures, biosolids or yard waste) from a lawn and garden store or a local composting facility. Regardless of the source, the organic amendments should contain no recognizable bits of organic matter (e.g., whole leaves, sticks, or other large chunks) and have a near neutral pH (approximately 7.0). Animal manures are also an excellent source of nutrients and organic matter and can be successfully added to soils once manures have been well composted. Avoid adding raw manures to the soil in your landscape as these uncomposted materials may burn plants and may also have an offensive odor.

Building soil organic matter is a slow and gradual process. Plus, Florida's warm, wet climate makes it that much harder to stay ahead of the game. First, the amount of residue and organic matter need to be increased. This extra amount will increase the species and diversity of macro– and micro–organisms in the soil. These organisms then will actively decompose organic matter. It may take a decade or more for organic matter levels to significantly increase. Fortunately, the beneficial effects of the changes in organic matter can be seen after few additions of organic residues/compost.

## Summary

Careful planning and management can help homeowners to gradually build soil organic matter to sufficient levels. Adding new organic matter to soil every year (by spreading a thin layer of compost on top of grass) is perhaps the most effective way to improve and build soil organic matter in established lawns. Once the soil organic matter reaches sufficient levels, it would maintain steady supply of nutrients for plant growth and promote infiltration of water. This nutrient supply from the organic matter will save homeowners the cost and hassle of buying and applying frequent applications of fertilizers. Lawns with good availability of nutrients will have well-established root systems, which would require less amounts of irrigation water to keep the lawns healthy. At the same time, there will be less runoff of water and nutrients from lawns and reduced potential of water quality degradation.

## References

Brady, N.C. and R.R. Weil. 2002. *The Nature and Properties of Soils.* Prentice Hall, Upper Saddle River, NJ. 13th Edition.

Magdoff, F. and H. van Es. 2000. *Building Soils for Better Crops*. Sustainable Agriculture Network. U.S. Department of Agriculture, 2nd edition. p. 3-55. Available online at http://www.sare.org/publications/bsbc/bsbc.pdf (accessed November 21 2008).