



Know Your Soil

Soil Organic Matter

Bulletin #2288

Organic matter makes up only a small part of the soil. Most soils in Maine contain two to 10 percent organic matter. Even in small amounts, organic matter is very important. This fact sheet answers some basic questions about soil organic matter.

What Is Organic Matter?

Soil organic matter has several parts:

- The living microbes in the soil (like bacteria and fungi), which break down very rapidly when they die.
- Partially decayed plant material and microbes, for instance, plant material you mix in or manure.
- The stable material formed from decomposed plants and microbes. This material is called humus, and is broken down very slowly.

What Does It Do?

Organic matter affects both chemical and physical properties of the soil.

Chemical Effects: Organic matter releases many plant nutrients as it is broken down in the soil, including nitrogen (N), phosphorus (P) and sulfur (S). It is also one of two sources of cation exchange capacity (CEC) in the soil. (Clay is the other major source.)

CEC represents the sites in the soil that can hold positively charged nutrients like calcium (Ca⁺⁺), magnesium (Mg⁺) and potassium (K⁺). If CEC is increased, the soil can hold more nutrients and release them for plant growth. To increase CEC, you have to increase organic matter.

Physical Effects: Organic matter loosens the soil, which increases the amount of pore space. This has several important effects. The density of the soil goes down (it becomes less compacted) and the soil structure improves. This means that the sand, silt and clay particles in the soil stick together, forming aggregates or crumbs.

Because there is more pore space, the soil is able to hold more water and more air. Plants grown on healthy soils won't be as stressed by drought or excess water. Water also flows into the soil from the surface more quickly. With less compaction, it is also easier for plant roots to grow through the soil.

How Do Farming Practices Affect Organic Matter?

Farming practices can decrease organic matter, increase organic matter or maintain organic matter in the soil.

Practices That Reduce Organic Matter: Tillage is one practice that reduces the organic matter in the soil. Each time you till the soil, oxygen is stirred into it. This oxygen stimulates or speeds up the action of soil microbes, which feed on organic matter. The more the soil is tilled, the more organic matter is burned off.

Plant residue is an important source of organic material. Crops that return little residue to the soil also lead to lower organic matter levels.

Many modern cropping systems combine frequent tillage with small amounts of residue; the result is declining organic matter content of



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many soils. Historically, manure was present on most farms, and used to keep up organic matter levels. Many farms no longer have livestock, so this source of organic material is not available. The loss of organic matter through erosion can also be great.

Practices That Boost Organic Matter: There are many ways to add organic matter to soils. The method you choose may depend on the current organic matter level. Cover crops, green manure crops and perennial forage crops will add organic matter. It will take time to improve a poor soil using these practices, because the amount of material is small.

For example, red clover green manure may add 6,000 pounds of material, and much of this is rapidly broken down. It takes about 20,000 pounds of actual soil organic matter to raise the level from four to five percent in the soil.

Compost, manure or sewage sludge may add larger amounts of organic matter. Compost

is very similar in composition to soil organic matter. It breaks down slowly in the soil and is very good at improving the physical condition of the soil. Manure and sludge may break down fairly quickly, releasing nutrients for plant growth, but it may take longer to improve the soil using these materials.

Conservation practices that protect the soil from erosion are important to keep organic matter in place, although they will not add much organic matter to the soil.

Building up or reducing organic matter in soils takes time—years, even decades. Even so, you should set a goal to keep up or increase the soil organic matter when you design a cropping system, just like fertilization or weed control.

For more information on the practices discussed in this fact sheet, contact your county Extension office.

Prepared by Tim Griffin, Extension sustainable agriculture specialist.



County Offices

Androscoggin and Sagadahoc Counties

24 Main St.
Lisbon Falls, ME 04252-1507
1-800-287-1458 (in Maine) or
(207) 353-5550

Aroostook County

22 Hall St., Suite 101
Fort Kent, ME 04743-7131
1-800-287-1421 (in Maine) or
(207) 843-3905

PO Box 727, Houlton Rd.
Presque Isle, ME 04769-0727
1-800-287-1462 (in Maine) or
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Houlton, ME 04730-0008
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Hancock County

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1-800-287-1478 (in Maine) or
(207) 667-8212

Kennebec County

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Augusta, ME 04330-5692
1-800-287-1481 (in Maine) or
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Knox and Lincoln Counties

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Waldoboro, ME 04572
1-800-244-2104 (in Maine) or
(207) 832-0343

Oxford County

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South Paris, ME 04281-6402
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Bangor, ME 04401-4331
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Piscataquis County

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Dover-Foxcroft, ME 04426-1396
1-800-287-1491 (in Maine) or
(207) 564-3301

Somerset County

7 County Drive
Skowhegan, ME 04976-4209
1-800-287-1495 (in Maine) or
(207) 474-9622

Waldo County

992 Waterville Rd.
Waldo, ME 04915-3117
1-800-287-1426 (in Maine) or
(207) 342-5971

Washington County

2 Washington Street
Whitneyville, ME 04654
1-800-287-1542 (in Maine) or
(207) 255-3345 or 255-8640

York County

41 Shaw's Ridge Road
Sanford, ME 04073-9502
1-800-287-1535 (in Maine) or
(207) 324-2814

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