

United States Department of Agriculture • Natural Resources Conservation Service
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Soil Organic Matter

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Many soil properties impact soil quality, but organic matter deserves special attention. It affects several critical soil functions, can be manipulated by land management practices, and is important in most agricultural settings across the country.

Whether your soil is naturally high or low in organic matter, adding new organic matter every year is perhaps the most important way to improve and maintain soil quality. Regular additions of organic matter improve soil structure; enhance water and nutrient holding capacity; protect soil from erosion and compaction; support a healthy community of soil organisms; and can reduce the severity and costs of natural phenomena such as drought, flood, and disease. In addition, increasing soil organic matter levels can reduce atmospheric carbon dioxide (CO₂) levels that contribute to climate change.

Practices that increase organic matter include: leaving crop residues in the field, choosing crop rotations that include high residue plants, using optimal nutrient and water management practices to grow healthy plants with large amounts of roots and residue, growing cover crops, applying manure or compost, using low or no tillage systems, and mulching.

Reducing tillage minimizes the loss of organic matter and protects the soil surface with plant residue. Tillage is used to loosen surface soil, prepare the seedbed, and

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control weeds and pests. But tillage can also break up soil structure, speed the decomposition and loss of organic matter, increase the threat of erosion, destroy the habitat of helpful organisms, and cause compaction. New equipment allows crop production with minimal disturbance of the soil.

Out of concern for preserving agricultural productivity came the concept of tolerable soil loss and the creation of the “T” factor--the maximum annual soil loss that can occur on a particular soil while sustaining long-term agricultural productivity. Conservationists focused on reducing soil loss to T by applying practices such as terraces, contour strips, grassed waterways, and residue management.

By the end of the 20th century, concerns about air and water quality became as important as concerns about agricultural productivity. To address these environmental goals and maintain the land’s productive potential, we must now go beyond erosion control and manage for soil quality. How soil functions on every inch of a farm, not just in buffers or waterways, affects erosion rates, agricultural productivity, air quality, and water quality. The most practical way to enhance soil quality today is to promote better management of soil organic matter or carbon. In short, we should go beyond T and manage for “C” (carbon).

An important function of soil is to buffer and detoxify chemicals, but soil's capacity for detoxification is limited. Pesticides and chemical fertilizers have valuable benefits, but they also can harm non-targeted organisms and pollute water and air if they are mismanaged. Nutrients from organic sources also can pollute when misapplied or over-applied such as manure. Efficient pest and nutrient management means testing and monitoring soil and pests; applying only the necessary chemicals, at the right time and place to get the job done; and taking advantage of non-chemical approaches to pest and nutrient management such as crop rotations, cover crops, and manure management.

Managing soil organic matter is the key.

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For more information about increasing soil organic matter, please contact your local Natural Resources Conservation Service office or conservation district office located at your local county USDA Service Center. Also more information about soils is available at www.soils.usda.gov.

For more information about NRCS programs, visit the Kansas NRCS Web site at www.ks.nrcs.usda.gov.

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