Soil Organic Matter

This project's integrated research and outreach efforts have promoted understanding of soil organic matter formation, and management to diverse audiences, enhancing soil processes, soil conservation, and crop management.

Who cares and why?

New knowledge and practices that build soil resources provide the foundation of healthy farms, communities, and environments. The complex biological, geological, and chemical processes involved in soil organic matter formation and function require investigations by interdisciplinary and collaborative teams. The NCERA-59 committee investigates critical processes that influence soil carbon sequestration, biodiversity, and function of soils in agricultural systems. These processes include the genesis, composition, and reactivity of particulate and humic substances in soil organic matter formation. Research and extension activites related to these topics needs to be coordinated in order to support environmentally-friendly, sustainable, productive, and profitable farming practices.

The color, number of pores for air and water movement, and types of living organisms in a soil sample can tell scientists a lot about soil quality. Organic matter (from plants and other organisms that decompose in soil) improves soil quality and productivity as it builds up. By supporting highly productive fields, healthy soils can boost food production, sequester more carbon (helping to slow global warming), and improve environmental quality. Photo courtesy of USDA-NRCS South Dakota.

What has the project done so far?

NCERA-59 has brought together scientists from many disciplines to collaborate on research and outreach efforts that improve our understanding of organic matter formation, processes, function, and management. Collaboration has promoted the integration of research on soil organic matter chemistry with its function in agricultural and ecological processes. In particular, NCERA-59 committee members have initiated novel research on bioindicators (biological species or groups of species whose function, population, or status can be used to monitor the health and integrity of an environment). This research has addressed microbial community structure, lipid biomarkers, soil organic matter fractionation methodology, and soil function. Interdisciplinary linkages have also given the group the opportunity to work on pioneering initiatives such as the examination of environmental impacts of transgenic crops on soil biological process and the characterization of the economics of soil organic matter and quality. As part of a long-term outreach effort, the project has supported the initiation and maintenance of a wide range of outreach materials available through a website on soil quality *http://csltest.ait.iastate.edu/SoilQualityWebsite/home.htm*. In addition, the group has produced over 50 refereed publications, written chapters for *Soil Organic Matter Management, Advances in Agroecology,* and sponsored five symposia at professional societies, documenting the results of their efforts, sharing recommendations, and improving soil science education and training.

Impact Statements

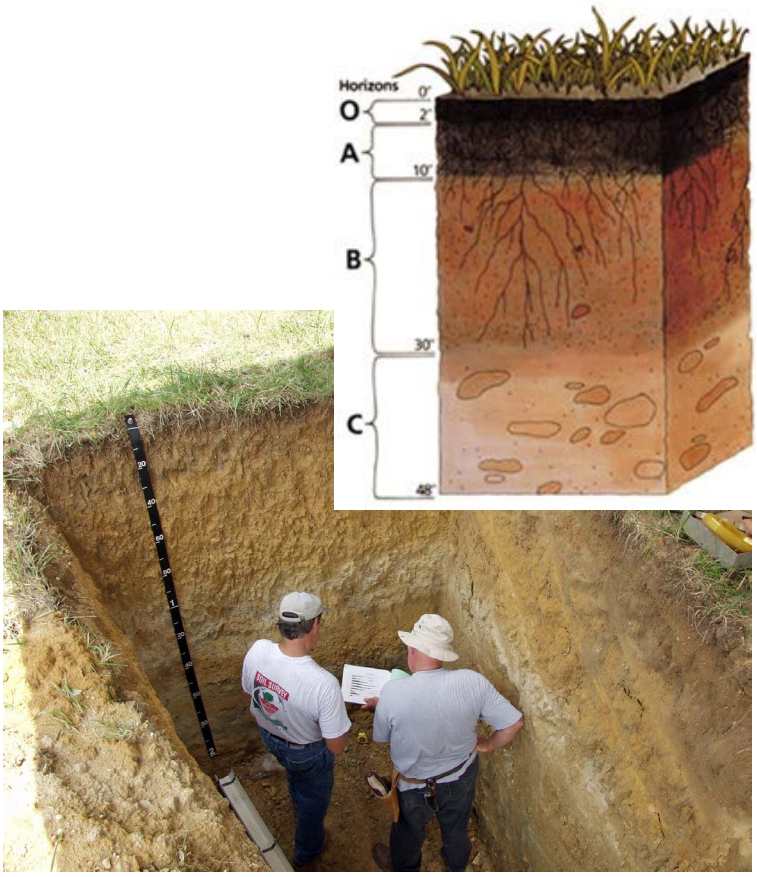
Brought together scientists from many disciplines, coordinating and improving soil research methodology across the U.S.

Enhanced soil functions in ecosystem services (e.g., regulating climate, providing food and habitat) by applying new knowledge of organic matter processes and improved management practices.

Supported widespread adoption of improved, integrated management of crops, manure, and fertilizer by shedding light on soil processes and how to best manage them. Among the crop systems surveyed, the percent using improved soil management practices has increased from 10% to 65%.

Exposed thousands of interested citizens, growers, crop advisors, environmentalists, industry representatitives, and other stakeholders to new knowledge of soil organic matter function and practical management options.

Informed 120 policymakers about soil organic matter processes and functions, influencing soil conservation recommendations and agronomic best management practices in Maryland and in Michigan.



Soil generally consists of visually and texturally distinct layers. The O horizon is a litter layer of plant residues in relatively undecomposed form. The A horizon, or topsoil, is the layer of soil with the most organic matter, such as leaves, humus (or well-decomposed organic matter), leaves, and soil life, such as earthworms, fungi, and bacteria. Soil organic matter adds nutrients to soil, helps soil retain water, and improves soil structure (e.g., clumping, porosity). NCERA-59 scientists are trying to get a clearer picture of the complex biological, geological, and chemical processes involved in soil organic matter formation and function so that they can develop strategies for enhancing these functions. Photo by John A. Kelley, USDA Natural Resources Conservation Service.

What research is needed?

Further research is needed to better understand soil ecological management practices that enhance formation of active organic matter, nutrient cycling efficiency, and system productivity. In addition, researchers still seek improved knowledge about bioindicators of soil organic matter formation and function. Researchers also want to investigate the processes of nitrogen and carbon mineralization and the biogeochemical factors that drive the synchronization of nutrient release and demand. This research will help scientists develop prediction tools for farmers as well as science-based policy recommendations about soil nutrient management.

Want to know more?

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This project was supported by the Multistate Research Fund (MRF) established in 1998 by the Agricultural Research, Extension, and Education Reform Act (an amendment to the Hatch Act of 1888) to encourage and enhance multistate, multidisciplinary research on critical issues that have a national or regional priority. For more information, visit *http://ncra.info/*.

Edited and designed by Sara Delheimer