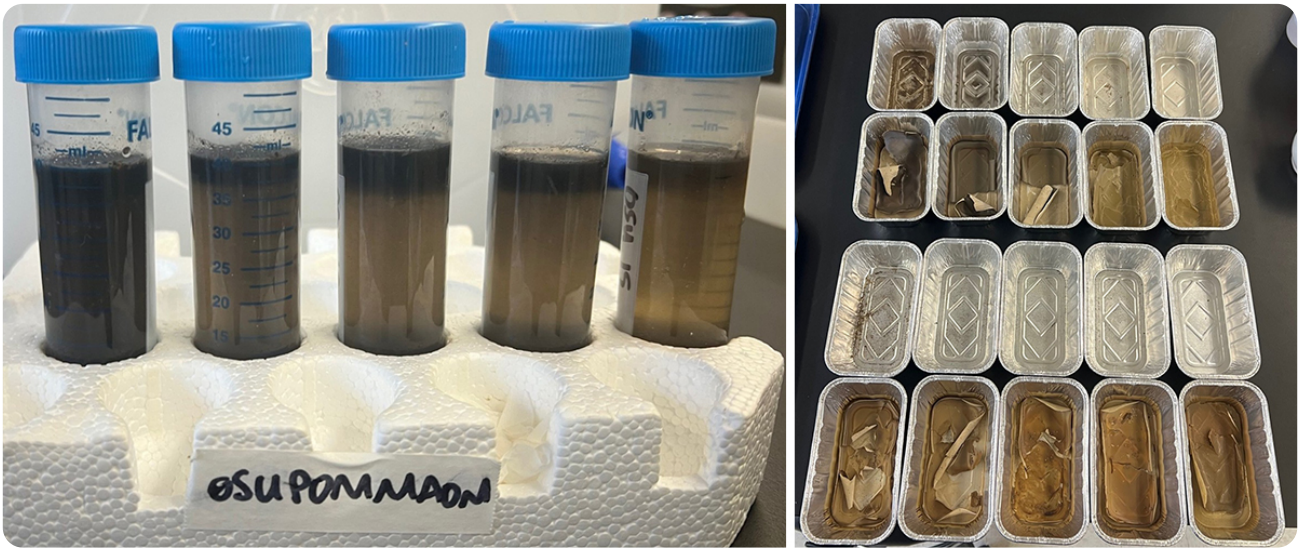
Science Societies

Regenerative agricultural practices affect soil organic carbon storage differently across carbon fractions and soil depths

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Particulate and mineral-associated organic matter fractionation. Photo courtesy of Dr. Katherine Naasko, first author on the study.

Does reducing tillage help build soil carbon and improve soil health? Research from one of the longest-running experiments in the United States shows that the answer depends on soil depth and the carbon fractions measured.

Researchers assessed soil organic carbon (SOC) storage in soil cores collected to a 1-m depth at The Ohio State University's Triplett-Van Doren Experiment after more than 60 years of contrasting tillage and crop rotation management. They measured two important carbon fractions: Particulate organic carbon (POC), a faster-cycling pool derived largely from partially decomposed plant residues, and mineral-associated organic carbon (MAOC), a slower-cycling pool containing compounds stabilized through interactions with soil minerals.

They found that SOC responses were more closely mirrored in MAOC than POC. Compared with moldboard plowing, no-till increased SOC and MAOC in the top 10 cm but decreased stocks at 30–50 cm. These results demonstrate that tillage influences carbon distribution throughout the soil profile and that carbon fractions contribute differently to overall storage.

For farmers and researchers evaluating soil health and carbon storage, these findings highlight the importance of digging deeper than the topsoil and focusing on the mechanisms of carbon stabilization and redistribution to better understand how reducing tillage shapes long-term soil organic matter accrual.

Dig deeper

Naasko, K., de Camargo Santos, A., Sprunger, C. D., & Deiss, L. (2026). Trade-offs between soil organic carbon surface gains and subsurface losses following 60

years of contrasting tillage and crop rotations. *Soil Science Society of America Journal*, *90*, e70267. https://doi.org/10.1002/saj2.70267

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