Science Societies

Do cover crops accumulate carbon in the whole soil profile in the long term?

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Winter rye cover crop biomass production averaged across 10 years was lower in the rainfed system (left) than in the irrigated system (right). Cover crops were not irrigated in this study. Photo by H. Blanco.

The extent to which cover crops sequester carbon (C) in the whole soil profile is still unclear. Most studies are short term (less than five years) and measure soil C only for less than 30 cm depth. Cover crops often accumulate C near the soil surface, but the shallow C may be easily lost to the atmosphere. The subsoil has lower C saturation and

may potentially sequester more C than the topsoil.

Researchers from the University of Nebraska–Lincoln assessed winter rye cover crop termination at two timings—early (two weeks before crop planting) and late (at crop planting). Specifically, they looked at how it affects soil C stock down to a 60-cm soil depth in rainfed and irrigated no-till continuous corn systems in the western U.S. Corn Belt after 10 years. They found that late-terminated cover crops accumulated 0.207 ± 0.145 Mg C ha^{-1} yr^{-1} in the irrigated system in the 0-5 cm depth but not in the rainfed system, which had a week or two less cover crop growth time in the spring. Early terminated cover crops did not affect soil C stock. The results also suggested that cover crops may not accumulate soil C if they produce <2 Mg biomass ha^{-1}, especially in soils with high initial C and relatively high clay content.

These findings indicate winter rye cover crops can accumulate C only near the soil surface on a site-specific basis but minimally alter soil profile C in no-till continuous corn after 10 years.

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Blanco-Canqui, H., Jasa, P., Ferguson, R. B., & Slater, G. (2024). Cover crops and deep-soil C accumulation: What does research show after 10 years? *Soil Science Society of America Journal*, *88*, 2167–2180. https://doi.org/10.1002/saj2.20747

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