



Communication is key for rebuilding agricultural soil carbon

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Soil organic carbon can have many positive effects on erosion resistance, soil aeration, water availability, and fertility of natural and agricultural lands. Soil-based initiatives to mitigate climate change and restore soil fertility therefore rely on rebuilding soil organic carbon. In this paper, we argue there is scientific consensus on the need to rebuild soil carbon for sustainable stewardship, and suggest that controversy about the role soils might play in climate change mitigation is eroding scientific credibility in the related but distinct effort to protect and restore soils more generally by rebuilding soil carbon.

There are agreed-upon foundations in soil science that support intentions to protect and rebuild soil carbon. Foundational knowledge includes the following: All soils are vulnerable to soil carbon losses and fertility decline. In agricultural landscapes globally, soil carbon losses have been substantial. Losses vary by type and duration of land use, as well as environmental and soil conditions like climate and soil

texture. And, importantly, adopting regenerative approaches like conservation agriculture and agroforestry can protect soil carbon and recoup some of the losses. Therefore, most soil scientists agree with the basis for soil health initiatives.

Clouding this agreement are debates on whether enough carbon can be rebuilt and retained in soils at a rate that is meaningful to help mitigate climate change. This important debate - which stems from measurement challenges, paucity of large-scale verifiable observations of management effects, advances in our understanding of soil carbon storage mechanisms, and feasibility of widespread producer adoption - is causing confusion in the public sphere around the plausibility and importance of soil health initiatives that similarly rely on rebuilding soil carbon.

We propose that rebuilding soil carbon in agricultural soils should be treated as a distinct objective that is well supported by soil scientific knowledge. Scientists should communicate

that we have enough knowledge to recommend principles to rebuild soil organic carbon and to set expectations for achievable and realistic accrual rates for different climates and management systems. Contextualizing active debates on rebuilding soil carbon will help to support a set of effective, well-informed management and policy actions to protect and restore soils globally.

Main Points

Soil-based initiatives to mitigate climate change and restore soil fertility rely on rebuilding soil organic carbon.

Controversy about the role soils might play in climate change mitigation is undermining actions to restore soils for improved agricultural and environmental outcomes.

Appropriately communicating what we know and contextualizing active debates around stewardship of soil organic carbon will help to support well-informed policy and management actions to protect and restore soils.

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