

# Tillage shows very little impact on carbon sequestration

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Reducing or eliminating tillage is one of the farming practices most frequently touted to improve carbon sequestration in soil. A new study by INRA and Arvalis-Institut du Végétal turns this paradigm on its head. This study, the result of a rigorous experiment conducted in the Ile-de-France region, shows that after a period of 41 years, three tillage methods led to similar carbon sequestration outcomes. However, variations were apparent over time based on climate conditions.

At a time when [climate change](#) and increased CO<sub>2</sub> emissions due to human activities are major concerns, [tillage](#) was thought to hold the key to increasing [carbon sequestration](#) in cultivated soil. Numerous studies confirmed that reducing or even eliminating tillage could improve sequestration. This recommendation, supported by the Intergovernmental Panel on Climate Change (IPCC1), was made based on a number of results obtained mainly in North America. However, recent reviews of scientific literature<sup>2</sup> have highlighted methodological weaknesses regarding much of the research, challenging the importance of tillage on possible carbon sequestration.

INRA researchers analysed the results of experiments carried out in France by Arvalis-Institut du Végétal over a period of 20 to 41 years in Boigneville (Ile-de-France region) using an original approach that included calculating carbon stores over a greater depth (0–60cm) and monitoring carbon stores over time. They were able to demonstrate that carbon sequestration in the soil for three tillage methods (annual tillage, minimum tillage and no-tillage) were identical after 41 years of these

practices being continually implemented. Minimum tillage did indeed increase carbon sequestration at the surface (0–10 cm), but reduced it at greater depths (10–30 cm).

By analysing changes in carbon stores over time, the researchers showed that reduced tillage leads to phases of carbon capture and release that depend on [climate conditions](#). Dry years promote carbon sequestration in conjunction with minimal tillage, while years with significant rainfall lead to carbon being released when compared to tilled soil.

Carbon sequestration rates were not constant but rather positive or negative. Over the long term, the effectiveness of tillage methods depends on climate conditions, especially rainfall. Reduced tillage can impact ecosystem services other than climate regulation, but does not appear to be effective for carbon sequestration in humid temperate climates.

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Provided by INRA

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