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# Soil organic carbon storage over 17 years of organic and conventional farming in central India

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**Abstract**

Intensified agricultural production increases the strain on soil fertility, especially in regions with high population growth such as India. Organic farming is advocated to sustain soil fertility and increase carbon storage in soils. However, there is limited understanding about the rate and factors driving soil organic carbon (SOC) storage in clay-rich soils under organic farming, specifically in a sub-tropical climate. Here, we analysed SOC storage over 17 years comparing organic and conventional agricultural systems in Central India in a long-term experiment of the Research Institute of Organic Agriculture (FiBL). We additionally evaluated to which extent particulate and mineral-associated soil organic matter (SOM) pools in the farming systems are related with the dynamics of physicochemical soil properties over time to better understand how these may hamper or enhance the build-up of SOC. Lastly, we related the change of SOC storage over time with the cotton yield as SOC can directly impact crop yield. The soil organic carbon storage was evaluated by size fractionation distinguishing particulate organic matter (OM) >20 $\mu$m and mineral-associated OM <20 $\mu$m. The development of soil organic carbon fractions is interrelated with physicochemical soil properties (such as clay content, pH, electrical conductivity, and exchangeable cations) as well as cotton yield. Preliminary analysis shows that it took more than 10 years to obtain a higher SOC in the organic (approx. 8 mg $g^{-1}$) compared to conventional farming systems (approx. 4 mg $g^{-1}$). We expect organic farming systems to have higher organic carbon storage in particulate OM, greater total nitrogen, and increased cation exchange capacity. In this contribution, we aim to discuss the main driving factors of soil organic carbon storage in subtropical agriculture and how it may increase soil fertility as a basis for sustainable agroecosystems.

**Keywords:** Organic and conventional farming, organic carbon storage, organic matter pools, subtropical Vertisols

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