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Farmers’ and academia’s views”

Carbon sequestration in aboveground biomass within a diversity gradient of different cocoa agroforestry systems

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Abstract

Quantifying carbon (C) sequestration rates is essential for carbon offsetting programs with cocoa agroforestry systems (AFS). However, they can vary substantially between AFS and depend on several factors, such as stand age, stand density, species diversity and management (organic and conventional). Few scientific long-term-studies exist on C sequestration rates within a diversity gradient of AFS. Within the framework of FiBL's long-term Farming Systems Comparison (SysCom), the objective of this study was to quantify above-ground C in different AFS at age 14. The AFS under investigation were under conventional (AFS CONV) and organic (AFS ORG) management as well as a highly diversified organic successional agroforestry system (SAFS) without external input use. Additionally, the aboveground C of two full-sun cocoa monocultures with organic (MONO ORG) and conventional (MONO CONV) management were measured to contrast C in full-sun cocoa systems and AFS. A total of 292 shade trees and 720 cocoa trees were measured non-destructively for aboveground C. Other measured C components were litter, dead wood banana/plantain biomass and herbaceous biomass. SAFS had the highest aboveground C storage with 48.91 t ha⁻¹ followed by AFS ORG with 44.19 t ha⁻¹, and AFS CONV with 42.78 t ha⁻¹. C storage of MONO ORG and MONO CONV was 21.63 t ha⁻¹ and 20.29 t ha⁻¹ respectively. The long-term experiment shows that the different management regimes had an impact on total aboveground C. After 14 years, the highly diversified successional AFS without input use accumulated the highest aboveground C in comparison to conventional and organic AFS management treatments.

Note: Since this is an ongoing investigation not all results are available at this point in time.

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