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"Bridging the gap between increasing knowledge and decreasing resources"

Cocoa in Full-sun Monocultures vs. Shaded Agroforestry Systems under Conventional and Organic Management in Bolivia

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Abstract

Cocoa is a crucial export commodity for many developing countries and provides income for millions of smallholders. However, cocoa cultivation has resulted in habitat destruction, biodiversity loss and soil degradation. While much of the world's cocoa is produced in arguably unsustainable full-sun monoculture systems, shaded agroforestry systems may be an alternative for sustainable cocoa production. However, data-based information on advantages and limitations of different cocoa production systems are limited and pairwise comparisons on the long-term performance of cocoa monocultures and agroforestry systems under conventional and organic management are literally inexistent.

The Research Institute of Organic Agriculture (FiBL) is pioneering to fill this knowledge gap with a unique long-term field trial in tropical Bolivia. The trial was established in 2008 and consists of six systems: two monocultures (MONO CONV/ORG) and two agroforestry systems (AF CONV/ORG) under conventional and organic management, one successional agroforestry system (SAFS, organic only) with dynamic shade management, and a fallow system of the same age serving as a reference for biodiversity and soil fertility studies. The systems aim to represent current smallholder cocoa farmers' practices. Parameters such as the tree development, yield of cocoa and by-crops, incidences of pests and diseases, soil fertility, carbon stocks, nutrient balances, economic data and biodiversity are regularly assessed.

Five years after planting, results showed significantly shorter tree circumference (18 % and 33 %) in AF systems and SAFS, respectively, compared to MONO systems. Tree circumference correlated strongly with cocoa dry bean yield which was, as expected, highest in MONO CONV (603 kg ha^{-1}). By-crops such as plantain, cassava, pineapple, etc. were harvested in AF systems and SAFS, which may compensate for lower cocoa yields in the first years.

Future research will investigate cocoa performance after the establishment phase and thus provide indications on the long-term sustainability of the different systems.

Keywords: Agroforestry, Bolivia, cocoa, long-term experiment, organic agriculture, smallholder farmer, systems comparison

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