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"Towards multi-functional agro-ecosystems
promoting climate resilient futures"

Biodiversity transitions in coffee and cacao toward climate-resilient agroecosystems in mexico, Guatemala and dominican republic

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Abstract

Coffee and cacao are tropical crops of major economic, social, and environmental importance worldwide, supporting millions of farming families in Latin America, Africa, and Asia. However, these production systems face growing threats from climate change, including rising temperatures, altered rainfall patterns, increased incidence of pests and diseases, and loss of ecosystem functions. Because coffee and cacao are often grown within or near tropical forest landscapes, biodiversity can play a key role in strengthening the resilience and sustainability of these agroecosystems. In addition to the ecosystem services that agroecological systems can get from biodiversity.

In this context, the BioFinCas project assesses the current state of biodiversity on coffee and cacao farms in Mexico, Guatemala, and the Dominican Republic, with the aim of identifying transition pathways toward more climate-resilient production systems. Field assessments were conducted on 60 coffee farms in Mexico, 16 coffee farms and 24 cacao farms in Guatemala, and 16 coffee farms and 24 cacao farms in the Dominican Republic.

A standardised protocol was applied across all farms to evaluate shade tree diversity, pollinators, ground cover, bromeliads, and biomass of cultivated and associated trees. These indicators help explain how biodiversity contributes to ecosystem services such as microclimate regulation, soil protection, pollination, and overall system stability under changing climatic conditions.

The comparative analysis identifies how coffee and cacao systems can transition toward more multifunctional and biodiverse agroecosystems. The results provide valuable inputs for producers, researchers, and decision-makers in designing adaptation strategies that strengthen productivity, conserve biodiversity, and improve rural livelihoods in tropical regions exposed to climate uncertainty.

Keywords: Agroecosystems, biodiversity, cacao, climate resilience, coffee

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