ECO-CACAO: Ecological intensification and multifunctionality of genetically diverse cacao agroforestry in Peruvian landscapes

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Wider research context

Promoting the conservation of biodiversity and associated services while increasing ecological food production is a major challenge for a sustainable future. Ecological intensification of tropical agroforestry systems and their multi-functionality may be an important contribution to this goal, but remains poorly understood.

Research objectives

Our project will include field work in the Peruvian Amazon to investigate the ecological and commercial role of genetic diversity of cacao, including wild relatives, in its area of origin. Our main objectives address the highly complex interactions between local management (i.e. diversity of cacao varieties), site conditions (i.e. soil fertility) and landscape structure (i.e. forest distance) affecting pest suppression, pollination services, and crop yields. Specifically, we want to identify key ecosystem processes, relevant tradeoffs and synergies that are critical for the development of efficient and biodiversity-friendly land use practices.

Approach

To address key knowledge gaps, we designed an experimental study to quantify the relative role of local cacao genetic diversity and landscape context on multiple ecosystem services (of birds, bats, ants and further arthropods contributing to pollination and biological pest control) as well as their effect on crop yield. We will use pollination and biocontrol exclosure experiments on 24 field sites and quantify all stages of the cacao life-cycle to develop suggestions for ecological intensification in the context of traditional farming practices.

Level of originality/innovation

The project is fundamentally innovative since few studies have so far addressed the highly complex interactions between local agroforestry management, site conditions and landscape structure on biodiversity, associated pest suppression and pollination services, crop yields, as well as resulting management tradeoffs or synergies in a comprehensive approach. The data collected in this project will allow the analysis of both single and combined ecosystem services of vertebrates and arthropods at local and landscape scales. Our results will thus provide an important contribution to improving ecological intensification of tropical land use, balancing ecological and human needs.

Primary researchers involved

This project will be conducted in collaboration of the Universities Würzburg (Prof. Dr. Ingolf Steffan-Dewenter) and Göttingen (Prof. Dr. Teja Tscharntke) in Germany, and the University of Vienna (Dr. Bea Maas) in Austria. In collaboration with our Peruvian partners, we will disseminate results via publications and informative workshops to stakeholders such as farmers, national and international social-ecological NGOs.