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“Filling gaps and removing traps
for sustainable resource management”

Diversity of Natural Pollinators in Cocoa Agroforests in the Peruvian Amazon

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Abstract

Despite the importance of cocoa (*Theobroma cacao*, L.), fruit yield remain relatively low. A very low fruit set of cocoa relative to the numerous produced flowers has been connected to low pollination intensity. Abundance of cocoa pollinators (mostly Diptera: Ceratopogonidae) is influenced mainly by the availability of breeding material. One of the best breeding opportunities for pollinators represent ecosystems with heterogeneous shade cover and those where substrates of decomposing cocoa leaf litter and fruit husks are available in sufficient amount. Pollinator-friendly practices would lead to higher number of pollinators and consequently to a higher yield. The objective of this study was the evaluation of cocoa agroforests as a suitable habitat for pollinators in general and cocoa pollinators in particular and its subsequent potential to yield enhancement. The experiment was conducted in three different cocoa agroforestry systems in the Peruvian Amazon with different characteristics, including vegetation structure, canopy cover and soil cover. Insect trapping took place in parallel to monitoring the phenological patterns of the flowering and fruit set. Afterwards evaluation of captured insects was conducted. Chosen families of Hymenoptera and Diptera order were determined to morphospecies and their abundance and diversity was calculated. The abundance of pollinators in general was the highest in the system with the highest number of species of shade trees and with the highest shade cover. There were no differences in insect species diversity and richness among systems. The abundance of Ceratopogonidae insects was very low in all systems and that is why they were excluded from our study. Other potential cocoa pollinators are small individuals from the Diptera order (namely the families Cecidomyiidae, Drosophilidae and Phoridae). Results indicated that agroforestry systems with adequate canopy shade cover and enough leaf litter could be considered as the best habitat for cocoa pollinator enhancement. However, an additional long-term survey needs to be done.

Keywords: Diptera order, flowering, *Theobroma cacao*, tree species diversity