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Pollinating insect communities in livestock farming landscapes with silvopastoral systems in the Amazon region of Colombia

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Abstract

Habitat loss is responsible for much of the global decline in biodiversity. Employing food systems that use sustainable practices in food production without endangering natural ecosystems is vital to halt biodiversity loss. Implementing silvopastoral systems in areas where livestock is already established could underpin improved food security, reduce land use change, minimize climate impacts, and contribute to biodiversity conservation. Here, we evaluate the role of two widely used silvopastoral systems - scattered trees in pasture and tree alleys - on pollinator diversity in the livestock-dominated Caquetá region of Colombia. We also evaluated forest patches and conventional livestock systems. We sampled pollinators with pan traps and entomological nets in four plots in 16 grids of 600 m x 600 m (a total sampling effort of 64 plots and 192 pan traps). We also evaluated vegetation composition and structure, and plant-insect interactions. We collected a total of 4,881 individuals of pollinating insects, comprising 600 morpho-species, 164 families, and 14 orders. The most abundant orders were Diptera (42.81% of all individuals), Hymenoptera (29.96%), and Lepidoptera (8.30%). We found scattered trees in pasture sites had the highest abundance of pollinators. This system also hosted more complex plant/pollinator networks (links per species, diversity of interactions) in comparison with tree alleys and conventional livestock systems. Dominant and very dominant pollinator species (Hill's number = 2) predominated in conventional livestock systems while rare or scarce pollinating insects were dominant in scattered trees in pastures and forests. Our results highlight that silvopastoral systems can help to conserve Amazonian plant and insect pollinator communities. Indeed, scattered trees in pasture supported the highest richness and abundance of insects. However, conserving remaining forests are important for holding unique pollinating insect species and host the highest plant diversity.

Keywords: Colombian Amazon, conservation of biodiversity, livestock, pollinators