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“Can agroecological farming feed the world?  
Farmers’ and academia’s views”

## Biodiversity and food production in agroforestry systems

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### Abstract

Intensive agriculture is one of the main drivers of biodiversity loss. Agroforestry systems and organic farming have the potential to maintain and promote biodiversity. It is often argued that it comes at the cost of losing productivity. In Bolivia, a long-term trial was established in 2008 to evaluate the agronomic, ecological and economic performance of different cacao production systems, i.e., monocultures and agroforestry systems under organic and conventional management and a complex agroforestry system without external inputs. Here we present our results on biodiversity and food production. Overall, we found that agroforestry systems and organic farming support both. The bird diversity was positively related to the vertical complexity and tree diversity, decreasing from complex agroforestry to monocultures. The ant species diversity did not vary among systems; however, the species composition did. The herbal plant diversity and composition differed mainly between organic and conventionally managed systems. Widely distributed herbal species, including exotic species, were more common in non-organic cacao production systems. In addition to species diversity, cacao production systems also affected biological interactions. For instance, higher pollinator abundance was found in more complex agroforestry than monoculture and cacao trees growing in agroforestry showed a more efficient water use by reducing the transpiration rate. Cacao yield was similar in both organic and conventional agroforestry systems, but slightly lower in the organic monocultures over the whole years. Cacao production was higher in the monocultures compared to agroforests, but when considering all the crops, agroforestry systems had 3–4 times higher total production (in dry matter) than the monocultures.

**Keywords:** Agroforestry, ants, biodiversity, birds, cacao, herbs, long-term trial, organic farming, pollinators, yield