



Assessing factors that influence pollinator communities and coffee yield among three coffee production systems in Honduras



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Introduction

Insect pollination is known to increase crop yields. Studies have found that insect pollinators, especially bee density and visitation rates are higher in coffee farms closer to natural forests. There are three coffee production systems (Integrated Open Canopy [IOC], sun, and shade) used in Latin America. These systems vary in the abundance of native forests spared. Thus, we hypothesized that pollinator communities and coffee yields would differ among coffee systems.

Methods

- We examined the effect of forest coffee production system on pollinator density, morphospecies richness and diversity, and visitation rate in 19 coffee farms (8 IOC, 7 shade, and 4 sun)
- We also estimated the contribution of pollinator services to coffee yield at 32 farms (12 IOC, 12 shade, 8 sun) by comparing coffee cherry production on branches that were open (OB) and closed (netted; NB) to pollinators during the coffee flowering period.

Results

- Pollinator density, diversity, and visitation rate were not predicted by proportion of forest in the surrounding landscape, distance to forest, or coffee production system (Table 1).
- Coffee yield for open branches in IOC (0.60g uva/flower) and shade (0.47 g uva/flower) farms were similar, but yield was higher for open branches in IOC than sun (0.24g uva/flower; Fig. 1) farms. Ecosystem services by insect pollinators increased coffee yields by 400%, 74%, and 4% in IOC, shade, and sun farms, respectively.

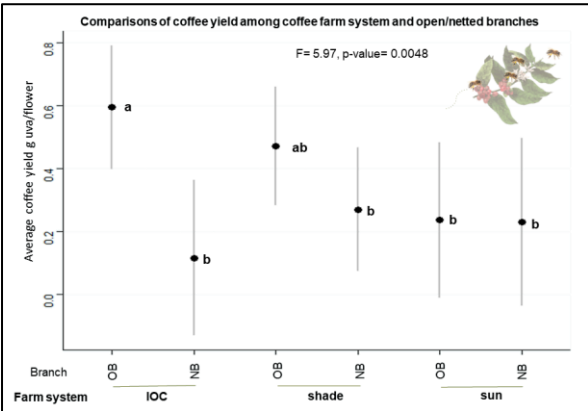
Table 1. Univariate models for each covariate to test if they were predictive of bee density

Model	K	AICc	Delta	
			AIC	AICwt
λ (Elevation)	5	101.01	0.00	0.32
λ (Null)	4	102.16	1.15	0.18
λ (Forest area _{100mts})	5	103.33	2.32	0.10
λ (Forest distance _{2HAs})	5	103.53	2.52	0.09
λ (Forest area _{500mts})	5	104.04	3.03	0.07
λ (Forest distance _{10HAs})	5	104.05	3.04	0.07
λ (Forest area _{250mts})	5	104.06	3.05	0.07
λ (Forest Cover)	5	104.15	3.14	0.06
λ (Farm System)	6	106.07	5.06	0.02

Discussion

These results suggest that while forest and coffee farms did not influence pollinator communities in our study area, pollinators do significantly contribute to coffee yield. Our pollinator community sampling intensity may not have been sufficient to elucidate the detailed relationships we hypothesized regarding pollinator communities and forests.

Figure 1. Comparison of coffee yield between open and netted branches in three farm types



References

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