



Tropentag, September 20-22, 2017, Bonn

“Future Agriculture:
Socio-ecological transitions and bio-cultural shifts”

Bee Pollinator Communities and Human Disturbance in West-African Savannahs – Implications for Crop Yield?

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Abstract

In many parts of the world pollinators and pollination services are threatened by land use changes involving degradation of semi-natural habitats or the conversion into agricultural land. Such disturbances are often leading to lowered pollinator abundances or diversity thereby increasing risks to humans by e.g. lower crop yield.

Our study is the first of its kind in West-Africa to monitor bee communities' change across gradients of human disturbance and the functional consequences thereof.

Bee species richness, abundance and diversity was monitored by pan traps during 22 months covering two rainy and two dry seasons in 2014 until 2015. Traps were installed in savannah plots of varying disturbance intensities (low, moderate, high) and in nearby cotton and sesame fields.

Species richness was stable at all sites. Whereas bee abundance increased with intensified land use, bee diversity decreased significantly. Bee communities in the moderate and high disturbed sites comprise only subsets of the communities in the least disturbed site. Crop yield in cotton was positively associated with bee abundance regardless of disturbance intensity. No correlation was found in sesame. Particularly wild bees were relevant for crop productivity even when honey bees were abundant. Hence, the presence of specific species in a pollinator community drives the positive pollinator abundance – pollination service relationship, in particular for fruit set. Retention of diverse bee communities is important because species are likely to vary in sensitivity to different disturbances, making service provision more stable.

A clear spillover of bees from savannah into cotton fields was observed during the rainy season when crops are mass flowering indicating that agricultural areas serve as important food resources for bee species in times when resources in the savannah are scarce. Even though our study did not reveal negative effects of disturbance on crop yield, the results nevertheless emphasise the importance of the conservation and restoration of diverse pollinator communities to maintain their pollination service and hence human benefits.

Keywords: Abundance, bees, Burkina Faso, diversity, floral resources, pollination, seasonal variation, spillover, sub-Saharan Africa

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