Ghana Darwin Initiative Biodiversity Policy & Practice Brief

No. 2: Smallholder Oil palm Management and Biodiversity

Key Messages

Ghana's smallholder oil palm farms support high levels of biodiversity.

Smallholder oil palm farmers' adoption of Best Agricultural Practices (BAPs) can increase fruit yields while supporting biodiversity conservation.

Summary

- Smallholder oil palm farmers play a vital role in the global production of palm oil but have much lower yields than large-scale industrial plantations. In recognition of this yield gap, smallholders are increasingly encouraged to adopt 'Best Agricultural Practices' that can potentially boost fruit yields while minimising harm to biodiversity. However, there is little evidence concerning impacts of crop management on biodiversity in oil palm smallholdings.
- We studied the biodiversity of birds, butterflies, moths and ants on oil palm smallholdings in Ghana, first comparing oil palm with protected forest, then examining how the management of oil palm plantings affected species richness and composition.
- We found that smallholder oil palm farms supported high levels of biodiversity compared to large-scale industrial plantations, with little evidence that biodiversity was adversely affected by increasing management intensity in keeping with Best Agricultural Practices.
- We identify a number of recommendations focusing on conserving biodiversity in smallholdings through sustainable best practice.

Background

Concern is growing over adverse effects of agricultural expansion and intensification on global biodiversity. Oil palm production is of particular concern, with IUCN recently reporting more than 400 species facing severe threats from oil palm production, largely associated with large-scale industrial plantations.

Smallholder oil palm farmers play an important role globally (~40%) in the production of palm oil. In Ghana, oil palm smallholdings occupy about 300,000 ha (~95% of the total area of oil palm cultivation) and produce 84% of the overall output. Few studies, however, have examined smallholder oil palm systems in West Africa, where oil palm is an endemic species of tree.

Of great important is that biodiversity provides multiple benefits to managed ecosystems[1]. For instance, in agricultural landscapes, both ants and termites can enhance soil fertility by improving soil structure, and termites additionally break down cellulose and lignin, which are rich in nitrogen, making it more readily available to plants. In addition, insects and birds may act both as pollinators and as predators of crop pests, so increasing crop production and hence farmers' incomes.

Our project, supported by the UK Darwin Initiative, collected data on these issues in 2017 from a smallholder oil palm growing landscape around Kakum National Park in Ghana, with a focus on biodiversity of birds, butterflies, moths and ants. The aim of this policy brief is to summarise our results around three key questions: **(1) What is the species richness of biodiversity in oil palm compared to forest? (2) How do**

[1] IUCN, 2013

management intensity levels in smallholdings affect biodiversity? (3) Do increases in fresh-fruit bunch yield come at the cost of lower biodiversity in smallholdings?

To examine the richness of biodiversity in oil palm landscapes around Kakum National Park, we set up study stations on 31 smallholder oil palm farms in two areas around the park, with additional stations in the forest acting as control sites. At each station, we counted birds and sampled butterflies, moths and ants (the data presented here are from May to September 2017), and we made measurements relating to farm management activities and environment (numbers and sizes of trees and shrubs growing in addition to oil palm, understory temperature, herb-layer height, ground cover, soil nutrients). We then used statistical models to compare species richness and composition in oil palm and forest, and to examine species richness in relation to management intensity of oil palm.

1) What is the species richness of biodiversity in oil palm compared to forest?

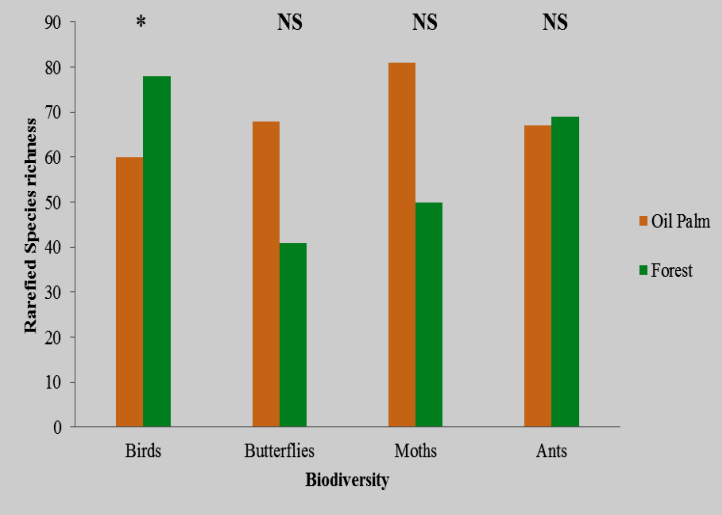

Figure 1 Rarefied species richness for birds, butterflies, moths and ants in forest and oil palm. *Difference between habitats is significant at 5% level of probability; NS, difference is not statistically significant.

Rarefied species richness, taking account of variation in the numbers of individuals recorded in each habit, was significantly higher in forest than in oil palm for birds, but there was no significant difference between habitats for any of the other three taxa **(Figure 1)**.

Across all four taxa, ~60-80% of those species recorded in forest were also present in oil palm, compared to only ~15-30% for industrial growers.

Farms with large trees growing above the oil palm canopy had greater species richness of birds while butterflies and moths were more abundant at sites with well-developed ground vegetation.

2) How do management intensity levels in smallholdings affect biodiversity?

Within oil palm, increasing management intensity did not adversely affect species richness for birds, butterflies or ants. There was, however, a trade-off between management intensity and the number of species of moths (~50% difference across the range of management intensities), but those species most affected were of low conservation concern and more common at less intensively managed sites (**Figure 2**).

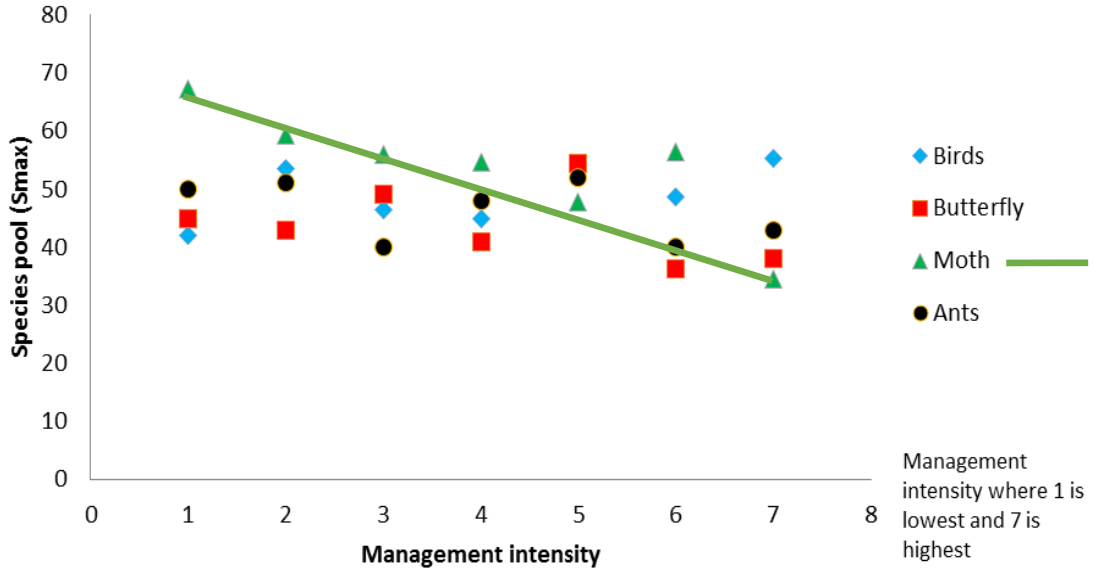

Figure 2 Management intensity in relation to species richness for birds, butterflies, moths and ants in oil palm. Green line shows significant decline in moths but other taxa were not affected.

3) Do increases in fruit yield come at the cost of lower biodiversity in smallholdings?

Oil palm fresh-fruit bunch (FFB) yields ranged from 1.5 t ha^{-1} yr^{-1} to 17.6 t ha^{-1} yr^{-1}, whereas potential yields for Ghana are up to 25 t ha^{-1} yr^{-1}. Those farms that retained large trees emerging above the oil palm canopy had greater species richness of birds but lower average yields. Overall, however, there was no systematic relationship between FFB yield and biodiversity.

Other than the RSPO guidelines, we found no evidence of strong policies on biodiversity governing the current practices in the oil palm sector. This suggests that policies aimed at agricultural development in this sector are unlikely to address all dimensions of biodiversity, and that other policy interventions will likely be required.

Discussion

We found that across taxa, ~60-80% of those species recorded in protected forest were also present within oil palm. This was in marked contrast to industrial plantations, which typically support only ~15-30% of forest species. The reasons for this difference were probably related to the lower intensity of crop management on smallholder farms. For instance, smallholders did not apply agrochemicals such as herbicides and pesticides, in contrast to most industrial growers. The small size of smallholdings (<10 ha) compared to large industrial plantations might also have allowed more mobile species to move more easily across the landscape. Oil palm may also support greater biodiversity in West Africa, where it is a native species, than elsewhere where it is an introduced crop.

Our results suggest that many smallholder oil palm farmers could manage the understory vegetation on their farms more intensively, in line with recommended Best Agricultural Practices, without marked detrimental effects on biodiversity. This could enable more farmers to maximize their farm resources and eventually bridge the yield gap potential for Ghana while conserving biodiversity within the landscape. Thinning of large shade trees above the canopy could also increase fruit yields, though at the likely cost of reducing avian biodiversity.

Recommendations

Smallholder oil palm farmers have the potential to increase fruit yields through adoption of Best Agricultural Practices without adversely affecting biodiversity within the landscape. Hence they could take advantage of this to improve their crop management while maintaining support for biodiversity.

Smallholders can gain support for adopting Best Agricultural Practices (BAPs) by being part of the Round Table for Sustainable Palm Oil (RSPO) schemes to enable them better to understand and implement these practices to enhance fruit harvests while supporting biodiversity.

Smallholder oil palm farmers could take advantage of oil palm being native to Ghana with high agro-ecological sustainability to enhance the biodiversity it supports.

Smallholders should take critical care of tree removal in the landscape since large trees are a key resource for many of the bird species recorded and play essential roles in the ecosystem.

For further information contact:

Ghana – Rebecca Asare, Michael Sasu and Linda Ofosuhene (NCRC)

UK – Keith Hamer (University of Leeds); Jane Hill (University of York)

UNIVERSITY OF LEEDS

CERTIFIED SUSTAINABLE PALM OIL RSPO

UNIVERSITY of York

Solidaridad

KNUST

DARWIN INITIATIVE

NCRC NATURE CONSERVATION RESEARCH CENTRE