

2014

September

Can Cattle Grazing in Mature Oil Palm Increase Biodiversity and Ecosystem Service Provision?*

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How to maximise biodiversity within oil palm plantation habitats, and the role this biodiversity plays in ecosystem functioning and crop production are key areas of research. Increasingly, cattle are being grazed under mature oil palm as a source of income for local communities, and to control the understory vegetation.

Dung beetles (Coleoptera: Scarabaeidae: Scarabaeinae) play a pivotal and easily quantifiable role both in tropical forests and agricultural grasslands by providing key ecosystem functions and services, such as nutrient recycling, bioturbation, fly and disease control, and mediating greenhouse gas fluxes. However, dung beetle diversity, composition, and the role they play in ecosystem service provision in oil palm landscapes are largely unknown.

*Dung beetle communities and dung removal rates were studied in 36 blocks of oil palm, half of which were cattle grazed, as part of a larger project investigating the importance of biodiversity for crop production in oil palm plantations. Nineteen species of dung beetles were recorded across all the sites. Dung beetle abundance, but not species richness, was higher in cattle grazed oil palm. In particular the large nocturnal tunnelling species, *Catharsius renaudpauliani* Ochi & Kon, which is in one of the most functionally important genera in South East Asia, was found in high abundances only in the cattle grazed oil palm. Dung removal rates were significantly higher in plots that were grazed compared to in plots that were ungrazed. Plots grazed by cattle had average removal rates in 48 hours of 80 per cent ($\pm 6\%$), similar to those recorded in old growth forests, compared to only 11 per cent ($\pm 3\%$) in ungrazed plots. Thus, dung beetle abundance, and hence removal rates, appear to be determined by the presence of large mammals, rather than the level of habitat degradation or complexity per se.*

The results suggest that cattle grazing may also help to increase biodiversity and maintain soil ecosystem functioning. The increase in dung beetles through cattle grazing is predicted to help restore soil ecosystem functioning, for example by having a positive impact on soil hydrological properties and fertility.

Keywords: Biodiversity, cattle integration, dung beetle, ecosystem function, soils.

