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"Filling gaps and removing traps
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Land-Use Intensification Gradient and Vegetation Diversity Loss Reduce Termite Abundance in Humid Lowland Forest of Cameroon

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Abstract

Increasing pressure of human activities leads to a large-scale land-use change including deforestation, cropland expansion or agricultural intensification, which is reflected in the loss of soil quality. While forest conversion to cropland in slash-and-burn agriculture initially increases soil fertility by the input of ashes, the long-term soil degradation and biodiversity loss due to vegetation removal may have detrimental impacts on ecosystem services in the long-run. Apart from ash-originated nutrient input, agricultural activity as well as natural vegetation depend on nutrients originating from soil organic matter (SOM) decomposition, which is, particularly in tropics, mediated by termites. Therefore, termite species richness and abundance are considered suitable indicators of ecosystem functioning and nutrient cycling. In the present study, we evaluated the changes in vegetation structure, termite abundance and diversity as well as soil properties along the land-use intensification gradient in lowland humid forest of Cameroon. The four most common land-use systems included: primary forest (PF) which has been without disturbance for at least 70 years, secondary forest (SF) occasionally used for timber collection, cocoa agroforestry system (CA) and maize cropland (MC) established on area which was burnt 5 months before the study. All studied termite variables (abundance, genus richness, and diversity) decreased along land-use intensification gradient, and all were positively related to vegetation basal area, tree species diversity and richness, canopy cover and number of tree individuals. On the other hand, termite communities were negatively related to soil CEC, soil pH and Ca, which were all the highest in the MC when compared to other systems. Nevertheless, such amelioration of soil acidity and increase of base cations was likely a short-term result of slash-and-burn management, rather than a direct cause of termite abundance reduction. Therefore, the maintenance of diverse and abundant vegetation, either in its natural state or as diversified agroforestry systems, is the key mechanism to maintain functional termite communities, which can serve as ecosystem engineers and contribute to the long-term ecosystem productivity and soil health.

Keywords: Biodiversity, cocoa agroforestry, land-use system, soil fertility, vegetation structure

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