

Soil biodiversity in rapidly changing tropical landscapes: scaling down and scaling up

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In: Book chapters

Year published

- 2005

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Access

- [Library link](#)
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keywords

- [Biodiversity](#)
- [Ecology](#)
- [Ecosystems](#)
- [Landscape](#)
- [Soil sciences](#)

Region

- [Southeast Asia](#)

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Abstract:

Soil has generally been regarded as something of a 'black box' by ecologists. The importance of soil is obvious: it provides physical support for plants, and both the living and non-living components contribute to a variety of important environmental functions. Soil is a species-rich habitat, but many questions about the ecological significance of the soil's biological diversity, and in particular how it affects ecosystem function, have never been asked. The linkages between above-ground ecology, which is rich in ecological theory, and below-ground ecology, where investigation has been restricted by methodological difficulties, have not been made. Technical developments, including isotopic and molecular methods as well as experimental and modelling approaches, have led to a renaissance in soil biodiversity research. The key areas are reflected in this exciting volume which brings together many leading contributors to explore the role and importance of soil biota. A major synthesis focusing explicitly on soil biodiversity and ecosystem function Integrates a vast body of literature on recent theoretical and technological developments in soil ecology and plant-soil relations Provides a strong research basis for both policy development and practical management of soil biodiversity in a changing world

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Soil biodiversity in rapidly changing tropical landscapes: scaling down and scaling up, in: R. Bardgett, M.B. Usher, D.W. Hopkins (Eds.), Biological Diversity and Function in Soils, Cambridge University Press, Cambridge, pp 295-318. Goodsell PJ, Underwood AJ, Chapman MG. 2009. Evidence necessary for taxa to be reliable indicators of environmental conditions or impacts. across these scales: subhabitats of high internal (alpha) diversity can comprise a landscape of limited total (gamma) diversity if all the subhabitats are similar (low beta diversity), whereas if a landscape is made up of widely differing habitats (high beta diversity), all of fairly low alpha diversity, the gamma biodiversity may be fairly high. We show that individual farmers in tropical countries are unlikely to manage soil biodiversity in a fashion that is congruent with society's objectives in the absence of appropriate policy interventions. A basic question which policy-makers and donors funding soil biodiversity research implicitly address in their decisions is: How important is soil biodiversity' and for whom?

At the landscape scale, we analyzed the spatial characteristics of the area in relation with a 30-year history of spring fire events extracted from the Landsat archive, and climatic data. Logistic regression was used. Such lands are subject to successional changes in vegetation and it seems necessary to provide effective methods for a sustainable ecosystem management of those lands. However, factors which determine successional processes, especially fires, have not been studied in detail. At the local scale, we sampled soil and vegetation at two sites and in three biotopes at each site: mature forest and two neighboring biotopes affected and unaffected by fire. Changes of soil pH, a reduction of the litter habitat and increased anthropogenic disturbance via site management practices add to degradation. In the present study, litter arthropod communities were compared between three levels of forest use (none, small and large timber extraction) and two types of cacao plantations (under natural shade trees and under a polyculture of planted shade trees).

Giller KE, Bignell D, Lavelle P, Swift M, Barrios E, Moreira F, Van Noordwijk M, Barrios I, Karanja N, Huising J (2005) Soil biodiversity in rapidly changing tropical landscapes: scaling down and scaling up. In: Bargett RD, Usher MB, Hopkins DW (eds) Biological diversity and function in soils. Cambridge University Press, Cambridge, pp 295–318 [Google Scholar](#).