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Book Review

Book review of Coffee Agroecology: A new approach to understanding agricultural biodiversity, ecosystem services and sustainable development. By Ivette Perfecto and John Vandermeer, USD$57.95 on Amazon, Published by Earthscan from Routledge, New York, NY. ISBN: 978-0-415-82681-5.

A greater understanding is required of the specific interspecies interactions fostered in agroecological systems, which facilitate biodiversity conservation on productive farmland. The recently published book *Coffee Agroecology* uses shade coffee production as a model to document these ecological relationships and explore how they benefit local habitats and provide ecosystem services. The volume illustrates for readers how this is achieved through the use of agroecological approaches – where farming practices build on the landscape's natural ecology. Authors Ivette Perfecto and John Vandermeer, both respected professors at the University of Michigan and experts in the field of ecology, investigate agroecological dynamics through the analysis of numerous scientific studies carried out by themselves and other researchers; these are woven together into an enlightening narrative. The focus of the book, shade coffee production systems (as opposed to production in full sun), examines where trees are planted alongside cultivated coffee plants in order to provide shade for the coffee. Chapters in the book detail how the resulting diversity of trees and plants provides habitats for numerous other species, which in turn can limit pests of the coffee and promote biodiversity across trophic levels. The wider impact of this discussion is that such lessons from shade coffee production can be a model for how agroecological systems in general provide ecosystem services on farms and increase biodiversity on larger scales.

To account for the benefits of agroecological coffee systems, the volume starts with an explanation of macro-level issues and then tackles micro-level interactions. The authors begin by stating the importance of improving the most highly degraded habitat patches – which often occur on land used for agriculture. After articulating this point, they analyse the patchy distribution of communities, and then discuss specific relationships both within, and between, trophic levels. Woven into this narrative are illuminating examples, most often from the authors' study plot in Chiapas, Mexico and the tropical ant – and keystone species – *Azteca*; other studies that support the authors' position are also included. In the book's final chapters, the reader returns to an analysis of wider themes in conservation that contextualize these species interactions from ecological, social and economic perspectives.

A highlight of the book is undoubtedly its presentation of the unexpected relationships found to occur between organisms. Such findings serve to reiterate the complexity of species interactions that influence the provision of ecosystem services. For example, research finds that organisms do not need to kill others to be influential – *Azteca* ants benefit coffee plants by simply removing the Coffee Berry Borer (*Hypothenemus hampei*) pest from coffee seeds; the ants also aggravate bees, which then spread pollen at larger distances. Reports of such specific, and sometimes surprising, connections document how on-farm biodiversity is able to support the cultivated crop. The documentation of such links between numerous species repeatedly emphasizes how intricate interactions in agroecological systems can support biodiversity and benefit coffee plants.

The book's detailed description of, and focus on, ecological dynamics is not surprising as the authors are most experienced in this field. However, as a result, critical physical associations in agroecological systems – such as nutrient cycles – are given little attention. Potential readers should be aware that this book's strength, as well as its limitation, is its dominant and detailed ecological focus.

A further weakness, in part arising from the book's ecological focus, is that limited arguments are made for how biodiversity can be more valued by producers, consumers and policy makers. Detailed graphical models are presented to illustrate how increased value for biodiversity will augment the likelihood of producers adopting agroecological approaches. A brief suggestion is made that this value could be created through the use of coffee certification systems and consumer education. Yet, this does not adequately explain how the prioritization of biodiversity can practically occur – which is a critical step in fostering preference for agroecological approaches. To make a contrasting point, a description is given of a USAID program in Costa Rica that effectively *reduced* biodiversity by promoting coffee intensification. It would benefit the reader to be introduced to examples where policies or programs have increased farm biodiversity. After chapters of thoroughly explained ecological interactions, the section on socio-economic aspects lacks robustness in its explanation of how to augment the value of biodiversity so that more farmers consider shade coffee systems.

The book effectively convinces the reader of agroecology's benefits by incorporating numerous studies on the symbiotic interactions between organisms in shade coffee

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systems. Apart from recommending this approach to production for crops outside of coffee, there are limited suggestions for practitioners who wish to incorporate agroecological methods on their farms. The authors have not written a handbook on best practices in coffee agroecology – rather, they advocate that each context must determine its own ideal mix of ecological interactions to support.

The lack of suggestions for producers is almost expected as the authors' experience, and the book's strength, is the documentation of existing ecological interactions. The level of detail provided here, often presented in multivariable graphs and equations, can become overwhelming for readers who lack a background in quantitative data analysis. Fortunately, Perfecto and Vandermeer are kind to their audience and provide clearly articulated explanations and summaries in each chapter. The accessible writing style makes it a book that could be widely read by people with an interest in agroecology; however, the volume is of particular relevance for students and researchers in the fields of agriculture, ecology and biodiversity conservation. It is also relevant to policymakers who are considering the promotion of agroecological approaches for its depiction of how biodiversity fosters ecosystem services in agricultural systems.

Through its detailed documentation of ecological interactions between individual organisms and across landscapes, *Coffee Agroecology* contributes to practical explanations of how agriculture and biodiversity conservation may take place simultaneously. Despite worldwide pressure from capitalist markets to focus on agricultural yields, there are also quieter calls to preserve the increasingly fragmented habitats of species large and small. In *Coffee Agroecology*, coffee production is a model for how agricultural systems can incorporate the environment's natural ecology to provide habitats for species that often benefit the cultivated crop. Through detailing specific inter-species interactions and connecting them to population dynamics at a larger scale, readers learn how agriculture is capable of protecting biodiversity and reducing species extinctions. This model presented by Perfecto and Vandermeer illustrates how meeting consumer needs for agricultural commodities does not need to come at the cost of ecological communities: robust agroecological systems are capable of supporting both humans and the natural environment.

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