Farmers and the forest: Can agroforestry actually conserve biodiversity?

CenTREAD Working Group*

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*The CenTREAD Working Group (part of the Center for Tropical Research in Ecology, Agriculture, and Development at the University of California Santa Cruz, http://centread.ucsc.edu) is a diverse group of scholars from the natural sciences, the social sciences, and interdisciplinary studies. We have research interests in tropical conservation and a range of experiences working with agroforestry and conservation. Participants in developing this review included Nicholas L. Babin, Daniel Barrantes-Arias, James A. Barsimantov, Martha Bonilla-Moheno, Rebecca J. Cole-Guerra, Brooke Crowley, Brian M. Dowd, Gregory S. Gilbert, Karen D. Holl, Julie A. Jedlicka, Paula K. Jones, Timothy J. Krupnik, Blair C. McLaughlin, and Alex E. Racelis.

A Book Review For

Agroforestry and Biodiversity Conservation in Tropical Landscapes. Schroth, G., G. A. B. da Fonseca, C. A. Harvey, C. Gascon, H. L. Vasconcelos, and A-M. N. Izac, editors. 2004. Island Press, Washington, D.C. 576 pp. $45 (paperback). ISBN 1-55963-357-3.

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Correspondence and Proofs should be sent to:
Gregory G. Gilbert
Environmental Studies / CenTREAD
405 ISB, 1156 High St.
University of California
Santa Cruz CA 95064 USA
email: ggilbert@ucsc.edu
fax: (831) 459-4015
tel: (831) 459-5002
NOTE: 26 June 2005- 22 June 2006 I am on sabbatical in Panama; I am best reached at ggilbert@ucsc.edu or 011-507-314-9262

This book aims to evaluate the common claim that agroforestry serves to promote biodiversity conservation in tropical mosaic landscapes. It is written for students and practitioners of agriculture, forestry, and related disciplines. The editors and authors range widely in disciplinary expertise, including tropical agriculture, conservation biology, resource economics, and forestry. They hold positions in universities, non-governmental organizations, and research institutes.

The central goal of the book is to explore three hypotheses regarding the role of agroforestry in biodiversity conservation: (1) agroforestry helps to reduce pressure to deforest additional land; (2) agroforestry provides habitat and resources for some native plant and animal species; and (3) the conservation value of the forest fragments is greater if they are embedded in a landscape dominated by agroforestry rather than in a surrounding matrix of intensive agriculture and pasture.

The book considers each of these hypotheses in a multidisciplinary context and is arranged in five parts. Part I introduces major concepts of tropical conservation biology and landscape ecology, and notes the potential and limits of agroforestry to ameliorate the impacts of threats, such as habitat fragmentation and deforestation. Part II, on socioeconomic aspects, includes chapters on economic valuation methods, a critique of the ability of agroforestry to reduce deforestation, a case study of cacao production, and an introduction to conservation concessions. Part III focuses on landscape-level biodiversity conservation in a range of agroforestry practices including shifting agriculture, structurally complex agroforests such as rustic coffee plantations, living fences, and isolated trees in pastures.

Parts IV and V are somewhat eclectic groups of chapters. Part IV, entitled "Biodiversity as Burden and Natural Capital", addresses a range of issues including local perspectives towards protected areas, hunting, invasive species, and disease dynamics in agroforestry systems. Part V describes examples intended to complement the biological and economic evidence presented in the previous sections of the book. Chapters range from an uncritical description of a conservation project in the Brazilian Atlantic Forest to a thoughtful review of the silvopastoral and conservation benefits of *Acacia pennatula* in Nicaragua. The final chapter revisits the three original hypotheses in light of the

evidence presented in the book, concluding that whether each hypothesis holds true is highly context-specific. In this chapter and throughout the book the authors note knowledge gaps and highlight areas for future research in the management and conservation potential of agroforestry systems.

We were impressed to see agroforestry systems presented at a wide range of scales and connected to important ecological topics such as climate change, invasive species, diseases, and genetic diversity. Although many case studies concentrate on the American tropics, attempts are made to discuss systems in Africa, Southeast Asia, and Australia. Many chapters conveniently cross-reference each other within the volume, which helps limit overlap in material. However, definitions of agroforestry sometimes conflict among chapters, and a historical review of the topic could have provided continuity throughout the book. Much foundational literature is missing, most notably in the introduction. The absence of a critical analysis of past successes and failures of agroforestry as a development tool may give an overly optimistic impression of agroforestry as a strategy for conservation.

The hypothesis testing format of the book provides a useful framework to investigate whether or not agroforestry contributes to the conservation of biodiversity. We particularly appreciated the variety of viewpoints presented. Instead of only providing evidence in support of the view that agroforestry can help to conserve biodiversity, many authors provide useful critiques. This variety leads to a thorough appraisal of the ecological value of agroforestry systems (hypotheses two and three). For example, multiple chapters note that while agroforestry systems may host more diverse species assemblages, rarely has it been demonstrated whether or not organisms successfully reproduce in these systems. We appreciated that some chapters provide thorough and critical literature reviews on particular types of agroecosystems (e.g., Chapters 8, 9, and 11). But, a few chapters (e.g., Chapters 7 and 17) principally promote specific agroforestry projects, and do not fit well within the hypothesis testing framework.

We were concerned that parts of the book lack cultural sensitivity and do not adequately incorporate the reality of farming in tropical landscapes. For example, the

authors of one chapter fail to recognize the complex cultural values embedded in forest extractive practices for meat and medicines, by suggesting modern pharmaceuticals and domesticated livestock as suitable replacements (Chapter 14). Without supporting evidence, the authors propose that the widespread availability of Viagra could reduce the wild crafting of natural aphrodisiacs, and discount the cultural, educational, and conservation benefits of raising wild game. This style of top-down cultural engineering of food and health systems lacks an appreciation for the importance of local culture, and can lead to severe and unintended consequences. Conversely, we appreciated the ways in which Chapter 19 accounted for farmers' perspectives through the use of narrative, and would have liked to see this approach more often.

We appreciate that the book includes social scientific analysis, but these approaches are applied with mixed success. The critical economic analysis of the potential of agroforestry to reduce deforestation (Chapter 5) is useful, but its sobering lessons on the difficulties of agroforestry adoption are seldom applied elsewhere in the book. For example, idealistic prescriptions for the expansion of biodiversity-friendly land uses through conservation concessions (Chapter 7) lack practical suggestions for their widespread adoption. In addition, the socioeconomic and political constraints on the maintenance or adoption of biodiversity-friendly land use systems developed in Part II are presented as local phenomena and are not placed into a larger discussion of global socioeconomic and political forces. The impact of immigration on changing cocoa growing practices is ascribed to local causes (Chapter 6), neglecting international macroeconomic factors.

This book presents a useful but not comprehensive tool set for researchers and practitioners involved in agroforestry as a conservation strategy. It provides an excellent introduction to the potential of agroforestry for the conservation of tropical biodiversity, and a solid entrance into associated ecological literature. However, expanding the analyses to more explicitly include the socioeconomic challenges that farmers face as managers of tropical landscapes would allow for a more complete evaluation. Overall this book is a good entry point for further research and for the development of agroforestry as a means for conservation.