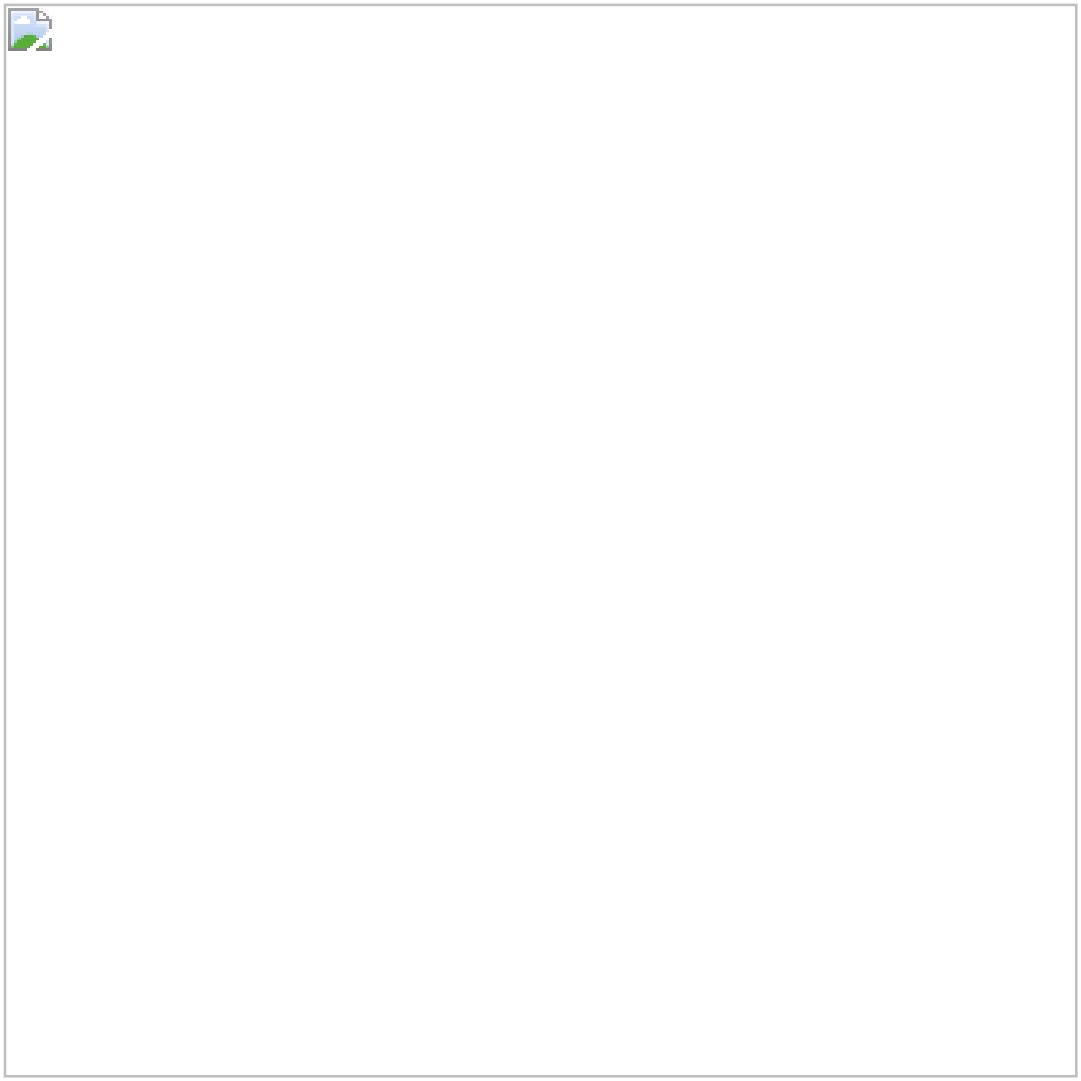

The Economics of Biodiversity Conservation: Valuation in Tropical Forest Ecosystems

Author: Glenk, Klaus

Source: Mountain Research and Development, 28(3) : 341-343

Published By: International Mountain Society

URL: https://doi.org/10.1659/mrd.mm045

Valuing Mediterranean Forests: Towards Total Economic Value

Edited by Maurizio Merlo and Lelia Croitoru. Wallingford, United Kingdom: CABI Publishing, 2005. xxii + 406 pp. US$ 140.00. ISBN 0-85199-997-2.

This book, edited by the late lamented Maurizio Merlo and his colleague from the University of Padova, is a heroic attempt at quantifying the 'Total Economic Value' (TEV) of Mediterranean forests across 18 countries. TEV is a concept first popularized by David Pearce and Kerry Turner, and represents the many ways in which a natural resource, such as a forest, is valuable to people. The editors make the point that Mediterranean forests have always been managed for multiple uses, not just timber harvesting. The many benefits from forests include timber, non-timber forest products such as cork and pine kernels, watershed and soil protection, biodiversity values, and recreation. Pastoral grazing regimes have also interacted with forest management for centuries.

The book is composed of 3 sections. Part 1 starts off by setting a historical context for forests in the Mediterranean, and describing their current nature and extent. The authors recognize that many of the benefits of forests are 'non-market' in that, due to the absence or imperfect enforceability of property rights and the nature of the goods provided, no market price exists to 'signal' the value of, for example, watershed protection and biodiversity conservation. Methods for placing monetary values on these non-market goods, such as contingent valuation and the travel cost approach, are then reviewed. A template for calculating TEV is presented—the idea being that all 'country studies' which follow in Part 2 will apply this template. The benefit categories set down in the template are shown in Table 1.

Whilst this particular treatment of TEV is a little 'old-fashioned,' it gets across the point that there are a wide range of forest-related benefits, only some of which are valued by markets, and some of which will accrue to people in the future. Moreover, the template makes the important point that environmental *costs* can also arise from the planting of new forests. The book sets out a method for calculating most of these values. Part 1 closes by summarizing the results from individual country applications of this template, noting that due to data problems, the template could not be evenly or equally applied in all cases. Part 2 of the book presents these individual country studies, from Algeria to Turkey to Slovenia, covering 18 countries in all. Part 3 discusses the institutional constraints on forest management, opportunities and initiatives for participatory management and ownership, and finally the need for an international agreement on Mediterranean forests.

But why would we want to calculate the TEV of forests? The authors give 2 reasons. First, so that policy-makers, forest managers and the general public will recognize the scale and variety of forest benefits—the argument here is that a benefit registered in monetary terms somehow carries more weight in a political sense than the same benefit expressed in some other manner. Second, so that such benefits can be incorporated into management decisions and forest planning. Herein lies the major problem with the approach taken. What the many authors end up measuring is the average per-hectare value of the current stock of forests, broken down by forest type and by component of total economic value. Yet what is of much more relevance from a management point of view is to know how these values would *change* if management actions were altered: for example, how the TEV per hectare of a particular type of forest would fall or rise if species diversity was increased, or recreation facilities improved, or a different felling regime adopted.

At the moment, the values in the book are more useful in terms of registering the wider value of the current stock of forests in, for example, Italy, in a national

TABLE 1 Benefit categories applied in country studies for calculating total economic value.

	Total economic value categories	Positive outputs	Negative outputs
1. Use values	1.1 Direct use	For example timber, firewood, cork, recreation	• Damage by fires • Erosion, floods • Loss of landscape values from plantation forests • Loss of biodiversity from forest planting on valuable habitats
	1.2 Indirect use	Watershed management, soil conservation, carbon storage	
2. Option values		Future recreation and biodiversity demands	
3. Non-use values	3.1 Bequest values	Landscape values and carbon storage to future generations	
	3.2 Existence values	Biodiversity, respect for rights	

accounting framework. Yet this only makes sense if we believe in the counter-factual question: "How much poorer would Italy be with *no* forests." However, the per-hectare values are of interest in comparing across countries: for example, the analysis reveals that recreation benefits are more important in the countries to the North of the Mediterranean than those to its South and East. Timber values are highest in Portugal and lowest in Lebanon. Grazing values are highest in Greece. As a whole, total economic forest values are also higher in the North (around 176 €/ha/year, with a highest recorded value of 344 €/ha/year for Portugal) than in the South and East (around 67 and 48 €/ha/year, respectively, with a lowest value of 6 €/ha/year for Egypt). The numbers are also of interest in comparing the different components of TEV—for example, watershed protection can account for about half of the total. Overall, direct use values (see Table 1) constitute around 70% of total measured benefits, with indirect use benefits accounting for another 15%.

Many criticisms can be made of this study. The numbers produced are often very approximate, resulting from the application of rather simple versions of valuation techniques, or very crude benefits transfer. 'Benefits' are sometimes valued using cost figures (especially in the case of biodiversity protection). However, the authors would argue—and I agree with them—that it still allows an important insight of the value of protecting forests, and into the multiplicity of ways in which forests matter to people.

Nick Hanley
Economics Department, University of Stirling, Stirling FK9 4LA, United Kingdom.
n.d.hanley@stir.ac.uk

doi:10.1659/mrd.mm043

Gradients in a Tropical Mountain Ecosystem of Ecuador

Edited by Erwin Beck, Jörg Bendix, Ingrid Kottke, Franz Makeschin, Reinhard Mosandl. Berlin, Germany: Springer, 2008. xxii + 522 pp. Ecological Studies Series, Vol 198. € 179.95. ISBN 978-3-540-73525-0.

The Northern Andes are recognized as one of the most biodiverse regions in the world, as well as one of the most threatened. It is imperative, then, that we understand better how tropical Andean ecosystems are changing, what the consequences will be, and how different forms of land use and management might lead to a more sustainable future. However, there is a problem. Mountain ecosystems are extremely heterogeneous, at a variety of scales. Biodiversity, with its own spatial and temporal variability, overlies the inherent environmental heterogeneity, and is then modified by variable land use practices. Of course, all these factors interact in a complex way. How do we even begin to explore such complexity?

In 1997 the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) launched a research project at the Reserva Biológica San Francisco (RBSF, run by Nature and Culture International) in the southern Andes of Ecuador, near Podocarpus National Park. The idea was to focus on a core area of about 1000 ha and bring together German and Ecuadorian multidisciplinary teams to work on the complexities of the local Andean ecosystem—a zone of evergreen mountain rain forest, with shrub and dwarf bamboo *páramo* at the highest altitudes.

The editors of this book have attempted to address the complexity of this mountain ecosystem through the work of 104 researchers in around 30 research groups. Clearly, this is quite a challenge, given that many less ambitious edited volumes fail to deliver a coherent theme. Here, the theme is gradients. Natural and induced heterogeneities at the local scale are linked together by means of a set of interacting natural and human activity gradients. The natural gradients include a vertical altitudinal gradient (1850–3100 m asl) and a horizontal gradient (a 30 km long transect at 1950 m asl representing transitions in humidity). Biodiversity sits within these natural gradients, but is affected by human activity gradients, corresponding to forest clearance practices, agriculture, and subsequent recovery after abandonment.

The introductory chapters describe the study area and the limitations of our knowledge of mountain rain forests in this part of the Andes. The interesting cultural background in this region is also explained. Contrasts are drawn between the indigenous Shuar community, traditionally practising shifting agriculture below 1000 m asl, the distinctive Saraguro community (resettled by the Incas from the Titicaca region of Bolivia) with mixed cultivation and cattle at mid-altitudes, and the numerically dominant *mestizos*—mostly colonists from elsewhere in southern Ecuador since the 1960s—growing cash crops and grazing livestock. The 'modernization' of these 3 communities and the conflicts between them are key factors in explaining the land use practices in different parts of the gradients, and acknowledging these differences is vital to developing socially compatible land management solutions.

The second section sets up the rest of the book by explaining the difficulty of studying a megadiverse ecosystem in a complex natural and cultural setting. The bulk of the volume presents the studies themselves, arranged into themes relating to the various gradients. For example, climate, soils, flora, fungi, fauna, water relations, nutrient status, biotic soil activities, forest stand

structure, and plant growth are all investigated in relation to the altitudinal gradient. Spatial and temporal heterogeneity patterns are also described. Natural disturbances (forest gap dynamics, landslides) are contrasted with those caused by human activities (eg sustainable and non-sustainable use of natural resources, slash-and-burn forest clearance, construction of roads and power lines). Other studies assess natural and enhanced regeneration of cleared and abandoned land.

The final chapter attempts to summarize the main findings of the work and identify key themes for the future. The use of fire as an agricultural tool has caused some significant problems, not least the apparently irreversible changes in vegetation cover from forest to bracken following slash-and-burn forest clearance. There are avenues worth exploring: to manage pastures more effectively, enhance existing forests, and regenerate abandoned pastures with socially and economically valuable trees. The way biodiversity interacts with ecosystem processes is still unclear and is another line of research for the future.

The many illustrations throughout the book are clear and informative. Colour diagrams and photographs are used to communicate complex ideas clearly and succinctly. Evidently, considerable attention has been invested in the visual representation of findings and ideas. For me, this investment paid off, and those responsible deserve praise for a job well done.

So, who should buy this book? It is expensive, and although I can see university libraries investing in a copy, I am not convinced many Latin American libraries or individuals will be in a position to buy one. The book is targeted at those interested in ecosystem studies and sustainable land management and resource use, but only one ecosystem is described and evaluated. To what extent is the RBSF study area typical of the wider situation in the Andes and mountains elsewhere? The limited information available for other areas makes this a difficult question to answer, but also highlights why the question is so important. The potential to apply findings from a well-funded research programme to areas with less available information is worth attention. Disappointingly, there are only limited attempts to address this in the book.

The individual studies frequently cross-reference to other chapters in the book. The editors and authors deserve credit for such comprehensive internal referencing, which helps considerably in tying together the various strands of research. However, wider contextual referencing is more variable, and a large number of relevant studies are not cited, even some very local to the study area. As examples of the kinds of references I was expecting—and acknowledging that there is no particular reason to cite these here rather than many others equally deserving of mention—I could point to the works of Keating (1995 onwards), Jokisch and Lair (2002), Buytaert et al (2006) and Keese et al (2007). Schneider (2004) reported remarkably similar bracken invasion in response to agricultural burning in the Yucután region of Mexico; and this is just one illustration of the links with other geographical areas that would have provided context and made the book more explicitly useful to a wider range of readers.

Despite these reservations, this book provides unrivalled detail for the region where the work was carried out, and acts as a model for investigation aimed at evidence-based management planning elsewhere. Many of the broad issues are commonly experienced in other parts of the Andes (and other mountains), as is the complexity of the problems and potential solutions. Although the detail may not transfer to other regions, some of the key ideas almost certainly will, albeit with modification. On this basis, I would recommend it to anyone interested in the complexities of mountain ecosystems, not just in the Andes.

The good news is that the DFG has already funded a follow-up programme in the same place: "Biodiversity and Sustainable Management of a Megadiverse Mountain Ecosystem in South Ecuador." This time, the emphasis is on transferring the research into effective land management actions. Hoping that this latest project finds room to look at the transferability of the outcomes to other places, I await the next volume with anticipation.

REFERENCES

Buytaert W, Celleri R, Willems P, De Bievre B, Wyseure G. 2006. Spatial and temporal rainfall variability in mountainous areas: A case study from the South Ecuadorian Andes. *Journal of Hydrology* 329:413–421.

Jokisch BD, Lair BM. 2002. One last stand? Forests and change on Ecuador's Eastern Cordillera. *Geographical Review* 92:235–256.

Keating PL. 1995. *Disturbance Regimes and Regeneration Dynamics of Upper Montane Forest and Páramos in the Southern Ecuadorian Andes* [PhD dissertation]. Boulder, CO: University of Colorado.

Keese J, Mastin T, Yun D. 2007. Identifying and assessing tropical montane forests on the eastern flank of the Ecuadorian Andes. *Journal of Latin American Geography* 6:63–84.

Schneider LC. 2004. Bracken fern invasion in southern Yucatán: A case for land-change science. *Geographical Review* 94:229–241.

Paul M. Ramsay
School of Biological Sciences, University of Plymouth, Plymouth, PL4 8AA, United Kingdom.
pramsay@plymouth.ac.uk

doi:10.1659/mrd.mm047

The Economics of Biodiversity Conservation: Valuation in Tropical Forest Ecosystems

Edited by K.N. Ninan, with S. Jyothis, P. Babu, and V. Ramakrishnappa. London, United Kingdom: Earthscan, 2007. £70.00. 336 pp. ISBN 1-84407-364-5, 978-1-84407-364-1.

The livelihoods of rural populations, in particular of those living adjacent to or within tropical rain-

forest areas, tend to depend largely on the continued provision of goods and services from their natural environment. Especially in the surroundings of conservation areas, such as national parks, people find themselves situated between predominantly globally-defined biodiversity conservation objectives and—often pressing—local needs for development. The significant overlap of poverty and biodiversity hotspots is illustrative of this pressure (Fisher and Christopher 2007). At least in the short term, local economic agents often face high opportunity costs for conserving biodiversity (Bawa et al 2004) due to income forgone, for example, by not converting forest for agricultural land use or intensifying forest use. This is one reason why the role of national and global social benefits is emphasized in closing the gap between private costs and social benefits of rainforest conservation, referred to as (global) market failure (Balmford et al 2002).

This book explicitly takes a rare focus on the *local* costs and benefits of biodiversity conservation in one of two biodiversity hotspots in India: the mountainous region of the Western Ghats. The presented analysis of costs and benefits of non-conversion borne at the local scale is an important contribution to an improved understanding of private motivations to convert tropical forests, which may facilitate the development of incentive mechanisms for conservation to account for market failure. The book does not excite with innovative economic approaches towards valuation—which in turn means that it is generic enough to appeal to those interested in the conservation of biodiversity in tropical forest areas in general.

The book is structured around 3 case studies in the Western Ghats that reflect a range of local situations, which differ with respect to population structure, land use, and legal status of forest protection. Two chapters precede the case studies. An introduction briefly establishes the main aspects driving biodiversity loss, the economic perspective on biodiversity conservation, general information on the methods used, and the research region. Chapter 2 is a detailed account of changes in land use, demographics and the populations of endangered species throughout the Western Ghats biodiversity hotspot. Overall, the authors conclude that there is cause for concern about the future of forests—and therefore biodiversity—in the Western Ghats, while regionally differing patterns of change are acknowledged. Interestingly, crop patterns are found to have changed as a result of 'wildlife attacks' on cropland, the costs of which are borne by locals. A vivid description of the acquisition of wildlife census data reveals problems and challenges related to the assessment of the state of wildlife and the governance of wildlife reserves. This is one of a few more 'entertaining' sections in an otherwise rather fact-laden book.

The core of the book comprises 3 chapters, each presenting a case study. The study areas are: 1) a coffee-growing village close to a protected forest; 2) tribal villages around or within a national park; 3) mixed cropping and livestock villages around a wildlife sanctuary. The structure of each of these chapters is similar: the case study setting is described; an analysis of the opportunity costs of forest conservation is presented; results from a local survey of public attitudes towards conservation and non-market benefits are reported; and the findings are summarized. The structural similarity facilitates comparison between the case studies, and therefore helps to put them into context. The book ends with summary conclusions and some policy recommendations.

In all 3 case studies, opportunity costs of biodiversity conservation in terms of benefits from coffee production and the collection and sale of non-timber forest products (NTFPs), as well as forgone income from agriculture and forest resources are found to be high and significant. In the level of detail and thoroughness, the analysis of opportunity costs in all 3 case studies is exemplary, and outstanding in the case of tribal villages which benefit from forests mainly by collecting NTFPs. The review on NTFP valuation and the discussion on the challenges of valuation and the way these challenges are addressed for this case study are truly enlightening. For the case of the coffee-growing village, damages by wildlife to crops are particularly relevant. An existing state compensation scheme for damage is found to be ineffective, partly because of high transaction costs involved in obtaining compensation and because of the legal status of the land on which the damage occurred. This example reveals that institutional aspects play an important role for the success or failure of (incentive) schemes for biodiversity conservation.

The second parts of the case studies, covering attitudes towards and preferences for conservation, are less convincing. A similar set of questions is used in all 3 case studies to assess perceptions and attitudes towards biodiversity conservation. It is encouraging that the vast majority of the villagers think that "environmental issues" and "conservation of biodiversity" are important, but doubts arise on how meaningful these questions can be. They are not very specific, response options were limited, and no attempt has been undertaken to understand what villagers actually had in mind when they were confronted with such complex terms as "biodiversity" or "keeping the ecosystem stable and functioning." The (stated) preference questions ask for the willingness to spend

time on elephant conservation, in the case of the coffee-growing and mixed arable and livestock villages, and to accept a re-location package as offered by the state, in the case of tribal villages in the national park. Although the preference exercises are interesting per se, their analysis and discussion of results lack the detail and thoroughness that is present in the rest of the book. Because of this, the attitude and preference parts only partially substantiate the authors' claim that knowledge on these aspects would be very important for policy-making (p 158).

This criticism should not take away from the fact that this book provides a wealth of relevant information that can help to develop economically sound strategies for biodiversity conservation in the Western Ghats. Some options are briefly touched upon in the closing chapter, which also highlights the importance of an effective long-term strategy for wildlife censuses as a basis for detecting change. Some readers may find the suggestion disputable that "especially beheading or long-term imprisonment for habitual offenders [*against the forest law*] … are worth considering and incorporating into the Indian Wildlife (Protection) Act …" to save elephants, leopards and tigers from extinction (p 226).

For consideration on the purchase of this book, it should be mentioned that one case study has already been published (Ninan and Sathyapalan 2005). K.N. Ninan is also editing a book entitled "Conserving and Valuing Ecosystem Services and Biodiversity" that will be published in late 2008 by Earthscan. It includes a chapter on "Non-timber forest products and biodiversity conservation—a study of tribals in a protected area in India": a title that has a striking resemblance to one of the case studies presented in the book reviewed here.

REFERENCES

Balmford A, Bruner A, Cooper P, Constanza R, Faber S, Green R, Jenkins M, Jefferiss P, Jessamy V, Madden J, Munro K, Myers N, Naeem S, Paavola J, Rayment M, Rosendo S, Roughgarden J, Trumper K, Turner R. 2002. Economic reasons for conserving wild nature. *Science* 297:950–953.

Bawa K, Kress W, Nadkarni N, Lele S, Raven P, Janzen D, Lugo A, Asthon P, Lovejoy T. 2004. Tropical ecosystems into the 21st Century. *Science* 306:227–228.

Fisher B, Christopher T. 2007. Poverty and biodiversity: Measuring the overlap of human poverty and the biodiversity hotspots. *Ecological Economics* 62(1):93–101.

Ninan KN, Sathyapalan J. 2005. The economics of biodiversity conservation: A study of a coffee growing region in the Western Ghats of India. *Ecological Economics* 55(1):61–72.

Klaus Glenk
Socio-Economic Research Group, The Macaulay Institute, Craigiebuckler, Aberdeen AB15 8QH, United Kingdom.
k.glenk@macaulay.ac.uk

doi:10.1659/mrd.mm045