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Edited by Andreas Kontoleon, Unai Pascual and Timothy Swanson

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Biodiversity Economics

Human-induced biodiversity loss is greater now than at any time in human history, with extinctions occurring at rates hundreds of times higher than background extinction levels. The field of biodiversity economics analyses the socio-economic causes of and solutions to biodiversity loss by combining the disciplines of economics, ecology and biology. This field has shown a remarkable degree of transformation over the past four decades and now incorporates the analysis of the entire diversity of biological resources within the living world. *Biodiversity Economics* presents a series of papers that shows how bio-economic analysis can be applied to the examination and evaluation of the problem of various forms of biodiversity loss. Containing state-of-the-art bio-economic research by some of the leading practitioners in the field, this volume will be an essential research tool to those working on biodiversity issues in the academic, policy and private sectors.

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Contents

<i>List of figures</i>	<i>page</i> ix
<i>List of tables</i>	xii
<i>List of contributors</i>	xvi
<i>Preface</i>	xx
<i>Acknowledgements</i>	xxii
<i>Foreword</i>	xxiv
JEFFREY A. MCNEELY (Chief Scientist IUCN)	
Introduction	1
ANDREAS KONTOLEON, UNAI PASCUAL AND TIMOTHY SWANSON	
1. Do we really care about biodiversity?	22
DAVID W. PEARCE	
Part I. Causes of biodiversity loss	
A. LAND CONVERSION	
2. The economics of land conversion, open access and biodiversity loss	59
EDWARD B. BARBIER	
3. Estimating spatial interactions in deforestation decisions	92
JUAN A. ROBALINO, ALEXANDER PFAFF AND ARTURO SANCHEZ-AZOFEIFA	
4. Resource exploitation, biodiversity loss and ecological events	115
YACOV TSUR AND AMOS ZEMEL	

vi	Contents	
	B. INVASIVES	
	5. Pests, pathogens and poverty: biological invasions and agricultural dependence	133
	CHARLES PERRINGS	
	6. Prevention versus control in invasive species management	166
	DAVID FINNOFF, JASON F. SHOGREN, BRIAN LEUNG AND DAVID LODGE	
	C. INTERNATIONAL TRADE	
	7. Trade and renewable resources in a second-best world: an overview	203
	ERWIN BULTE AND EDWARD B. BARBIER	
	8. International trade and its impact on biological diversity	246
	RAFAT ALAM AND NGUYEN VAN QUYEN	
	Part II. The value of biodiversity	
	A. CONCEPTS	
	9. Designing the legacy library of genetic resources: approaches, methods and results	273
	TIMO GOESCHL AND TIMOTHY SWANSON	
	10. Why the measurement of species diversity requires prior value judgements	293
	STEFAN BAUMGÄRTNER	
	B. TECHNIQUES	
	11. Combining TCM and CVM of endangered species conservation programme: estimation of the marginal value of vultures (<i>Gyps fulvus</i>) in the presence of species–visitors interaction	313
	NIR BECKER, Yael CHORESH, MOSHE INBAR AND OFER BAHAT	
	12. Valuing ecological and anthropocentric concepts of biodiversity: a choice experiments application	343
	MICHAEL CHRISTIE, NICK HANLEY, JOHN WARREN, TONY HYDE, KEVIN MURPHY AND ROBERT WRIGHT	

Contents	vii
13. Spatially explicit valuation with choice experiments – a case of multiple-use management of forest recreation sites	369
PAULA HORNE, PETER BOXALL AND WIKTOR ADAMOWICZ	
Part III. Policies for biodiversity conservation	
A. CONTRACTS	
14. Auctioning biodiversity conservation contracts: an empirical analysis	389
GARY STONEHAM, VIVEK CHAUDHRI, LORIS STRAPPAZZON AND ARTHUR HA	
15. An evolutionary institutional approach to the economics of bioprospecting	417
TOM DEDEURWAERDERE, VIJESH KRISHNA AND UNAI PASCUAL	
16. An ecological-economic programming approach to modelling landscape-level biodiversity conservation	446
ERNST-AUGUST NUPPENAU AND MARC HELMER	
B. IMPLEMENTATION	
17. The effectiveness of centralised and decentralised institutions in managing biodiversity: lessons from economic experiments	481
JANA VYRASTEKOVA AND DAAN VAN SOEST	
18. Conserving species in a working landscape: land use with biological and economic objectives	501
STEVE POLASKY, ERIK NELSON, ERIC LONSDORF, PAUL FACKLER AND ANTHONY STARFIELD [<i>published in Ecological Applications</i> , 15 (4), pp. 1387–1401, 2005]	
19. Balancing recreation and wildlife conservation of charismatic species	531
DORIS BEHRENS AND BIRGIT FRIEDL	
20. Modelling the recolonisation of native species	557
ANDERS SKONHOFT	

Cambridge University Press
978-0-521-15465-9 - Biodiversity Economics
Edited by Andreas Kontoleon, Unai Pascual and Timothy Swanson
Frontmatter
[More information](#)

viii Contents

**Part IV. Managing agro-biodiversity: causes, values
and policies**

21. On the role of crop biodiversity in the management of environmental risk	581
SALVATORE DI FALCO AND JEAN-PAUL CHAVAS	
22. Assessing the private value of agro-biodiversity in Hungarian home gardens using the data enrichment method	594
EKIN BIROL, ANDREAS KONTOLEON AND MELINDA SMALE	
23. Agricultural development and the diversity of crop and livestock genetic resources: a review of the economics literature	623
MELINDA SMALE AND ADAM G. DRUCKER	
<i>Index</i>	649

Figures

1.1. Stylised costs and benefits of ecosystem service provision	<i>page</i> 25
1.2. Beneficiary pays	40
1.3. Incremental costs and the GEF	41
3.1. Illustration of the observations, neighbourhoods and neighbours	104
3.2. Region 1 and Region 2	107
6.1. Schematic of the invasion process	170
6.2. The influence of risk aversion and discounting on collective prevention	186
6.3. The influence of risk aversion and discounting on collective control	188
6.4. Dynamic effects of risk aversion and discounting on collective variables	189
6.5. Dynamic effects of risk aversion and discounting on biological variables	190
6.6. The influence of risk aversion and discounting on private adaptation	191
6.7. The influence of risk aversion and discounting on the probability of invasion	193
6.8. The influence of risk aversion and discounting on invader abundance	194
6.9. The influence of risk aversion and discounting on welfare	196
7.1. An equilibrium for the 2×2 small open economy	213
7.2. Open access equilibrium in the single-market bio-economic model	216

x	List of figures	
7.3.	Open access resource exploitation and trade in a resource-abundant economy	220
7.4.	Trade patterns between North and South	226
7.5.	Harvesting and growth in the absence of substitution possibilities	228
10.1.	Biodiversity indices differ by the information on species and ecosystem composition they use	304
11.1.	Three-stage scenarios	324
11.2.	Revenues versus welfare in two alternatives	336
11.3.	Expansion path	338
12.1.	Conceptual framework – biodiversity concepts	354
13.1.	Example of a choice set used in the choice experiment instrument	375
13.2.	Welfare impacts of different scenarios with two models	381
14.1.	BushTender [©] pilot areas in Victoria, Australia	390
14.2.	Supply curves from BushTender [©]	402
15.1.	The bioprospecting chain	425
15.2.	The monetary benefit flow from the KMBS	430
15.3.	Estimated cumulative distribution of farmer households and their respective WTP, controlling for cultivating and non-cultivating households of <i>Trichopus</i>	438
16.1.	Landscape appearance as dependent on farming and land use structure	449
16.2.	Stylised structure of a landscape for the construction of a mathematical interface between spatial representation and geometric measures of field sizes	450
18.1.	A base case land-use pattern on the 14×14 landscape where every parcel is put into its highest economic use	524
18.2.	The base case landscape economic-biological score efficiency frontier	526
18.3.	Various base case land-use patterns for points that lie on the base case efficiency frontier	527
18.4.	The efficiency frontiers from two reserve-site selection scenarios simulated on the default 14×14 landscape	528

List of figures	xi
18.5. Land use patterns on the default 14×14 landscape that have landscape biological (<i>LB</i>) scores of approximately 77 for the reserve-site selection scenarios and the base case	529
18.6. Efficiency frontiers associated with alternative 14×14 landscapes	529
18.7. Efficiency frontiers for various sensitivity analyses on the default 14×14 landscape	530
19.1. The structure of the protected area model for the ecosystem approach ($\mu = 0$) and the flagship approach ($\mu = 1$).	536
19.2. The optimal dynamic visitor control strategy for the flagship approach and the ecosystem approach with low weight on the habitat ($\nu_2 = 1$)	547
19.3. The optimal (steady-state) value of the habitat, eagle population and number of visitors for different values of ν_2	548
20.1. Wolf–moose economic equilibrium	572
22.1. Location of the selected ESAs	599
22.2. Sample choice set	603

Tables

1.1. Estimates of protected area costs (after James <i>et al.</i> 1999)	<i>page</i> 34
1.2. Debt-for-nature swaps – flow of funds 1987–2003	41
1.3. GEF-allocated funds and co-financing 1991–2002 (\$ million)	42
1.4. Summary of flows of biodiversity conservation funds (\$ million p.a.)	43
1.5. The alleged ‘global value’ of the world’s ecosystems	46
2.1. Mexico – random effects estimation of agricultural land expansion, 1960–1985	70
2.2. Thailand – random effects estimation of mangrove loss and shrimp farm area expansion, 1979–1996	79
2.3. Thailand – estimated elasticities for mangrove loss and shrimp farm area expansion, 1979–1996	81
3.1. List of plot characteristics	105
3.2. Descriptive statistics for Region 1 and Region 2	108
3.3. Estimates of the interaction parameter (ρ)	109
3.A.1. Regression results: probit estimates and second-stage estimates from 2SPLS	113
3.A.2. Regression results: first stage	114
5.1. Changes in inclusive wealth in China, India and sub-Saharan Africa, 1965–1996	138
5.2. Depletion of natural capital, 2003	139
5.3. Economic losses to introduced pests in crops, pastures and forests in the United States, United Kingdom, Australia, South Africa, India and Brazil (billion dollars per year)	146

Cambridge University Press
 978-0-521-15465-9 - Biodiversity Economics
 Edited by Andreas Kontoleon, Unai Pascual and Timothy Swanson
 Frontmatter
[More information](#)

List of tables	xiii
5.4. Environmental losses to introduced pests in the United States, United Kingdom, Australia, South Africa, India and Brazil (billion dollars per year)	146
5.5. Economic sanitary and phytosanitary instruments	153
6.1. Firms in the sample	182
6.2. Variables in the sample	183
6.3. Prices	183
6.4. Parameters	184
6.5. Risk preference structures	185
6.6. Changes in cumulative welfare from baseline (\$)	197
8.1. Autarky prices of the agricultural and manufacturing goods	256
8.2. Change in the amount of cleared land under autarky and free trade for different population sizes	259
8.3. Impact on Southern consumer utility of positive environmental sensitivity to biodiversity loss	260
8.4. Change in the amount of cleared land with two types of Northern consumers	262
8.5. Change in the amount of cleared land under free trade with two types of Northern consumers and different levels of income shares for the 'green consumers' ($L_2 = 2$)	263
8.6. The impact on biodiversity of population increase in the South	264
8.7. The impact on biodiversity levels of population increase in the North under free trade	264
8.8. The impact on biodiversity of population increase under free trade when population increases both in the North and the South	265
8.9. The impact of a technology subsidy on the 'cleared land' and the utility of Northern and Southern consumers.	265
8.A1. Parameters values used for numerical calculations	268
11.1. Travel cost – regression Hai-Bar	321
11.2. Travel cost – regression Gamla	322
11.3. CVM questionnaire – socio-economic characteristics of the three samples	324

Cambridge University Press

978-0-521-15465-9 - Biodiversity Economics

Edited by Andreas Kontoleon, Unai Pascual and Timothy Swanson

Frontmatter

[More information](#)

xiv	List of tables	
11.4.	CVM questionnaire – WTP in the three samples (in NIS)	326
11.5.	CVM questionnaire – use and non-use values in the three samples (in NIS)	326
11.6.	CVM questionnaire – regression results of Gamla	328
11.7.	CVM questionnaire – regression results of Hai-Bar	329
11.8.	CVM questionnaire – regression results of general population	330
11.9.	CVM questionnaire – comparing socio-economic variables of the three samples and their relation to WTP	331
11.10.	The value of the marginal vulture at each site (in NIS)	332
11.11.	Break-even point under different scenarios (number of vultures)	333
11.12.	Cost-benefit ratios (CBR) under the different scenarios	333
11.13.	Pricing, revenues and welfare	335
11.14.	Summary of scenarios for species–visitors interaction	337
12.1.	Summary of studies that have valued biological resources	350
12.2.	Summary of biodiversity attributes and levels used in the choice experiment	356
12.3.	Logit models for Cambridge and Northumberland CE samples	360
12.4.	Implicit prices for Cambridge and Northumberland CE samples	361
13.1.	Summary of the attributes and their levels used in choice instrument	376
13.2.	Estimated model parameters (and standard errors) using site-specific and average species richness	378
14.1.	Northern Victoria BushTender [©] pilot – participation	401
14.2.	Gippsland BushTender [©] pilot – participation	401
14.3.	Bids for the Northern Victoria pilot	401
14.4.	Bids for the Gippsland pilot	401
14.5.	Comparison of fixed-price scheme to discriminating auction	403
14.6.	Management agreements taken up in Gippsland pilot	404

List of tables	xv
14.7. Area of habitat secured under contracts: Northern Victoria	404
14.8. Area of habitat secured under contracts: Gippsland	405
14.A1. Northern Victoria awareness model	413
14.A2. Gippsland awareness model	414
14.A3. Northern Victoria participation model	415
14.A4. Gippsland participation model	416
15.1. Variable definitions and estimated double bounded dichotomous choice model	434
15.2. Mean WTP of Kani households (in Indian rupees)	437
18.A1. Summary of various base-case land-use patterns (as presented in Figures 18.3a–e) that have landscape economic and biological score combinations that lie on the efficiency frontier	525
19.1. Base case parameter values for the flagship approach	545
19.A1. Classification of equilibria according to K and $D > 0$	555
20.1. Value categories	562
20.2. Wolf recolonisation example – comparative static results.	573
21.1. Sample statistics	588
21.2. Econometric estimates of mean, variance and skewness of yield	589
22.1. Home garden attributes and attribute levels used in the choice experiment	602
22.2. Home garden management and agrobiodiversity by ESA	604
22.3. Conditional logit regression of stated preference, choice experiment data	608
22.4. Conditional logit regression of revealed preference, farm household data	609
22.5. Conditional logit regression of combined stated and revealed preference data	611
22.6. Willingness to accept compensation welfare measures for each agro-biodiversity attribute per ESA per household per annum	614
22.7. Willingness to accept compensation welfare measures for home garden management scenarios per ESA per household per annum	616

Cambridge University Press

978-0-521-15465-9 - Biodiversity Economics

Edited by Andreas Kontoleon, Unai Pascual and Timothy Swanson

Frontmatter

[More information](#)

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Edited by Andreas Kontoleon, Unai Pascual and Timothy Swanson

Frontmatter

[More information](#)

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xvii

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978-0-521-15465-9 - Biodiversity Economics

Edited by Andreas Kontoleon, Unai Pascual and Timothy Swanson

Frontmatter

[More information](#)

xviii List of contributors

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Frontmatter

[More information](#)

List of contributors

xix

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Edited by Andreas Kontoleon, Unai Pascual and Timothy Swanson

Frontmatter

[More information](#)

Preface

The field of biodiversity economics, i.e. the analysis of the problems at the interface between the disciplines of economics and biology, probably has its origins primarily in the work of Colin Clark. Much of this early work looked at the exploitation of fisheries in the context of various institutional assumptions: open access, social planning, etc. Since these early efforts, the field of biodiversity economics has expanded in many different directions. It still concerns the analysis of the causes of resource overexploitation and decline, but also includes within its core the examination of the sorts of externalities involved (values) and the types of policies applied. In addition, and most crucially, the field now encompasses many resources other than simply marine resources: forests, wildlife, and even genetic resources (used in agriculture and pharmaceutical industries). The entire diversity of biological resources within the living world is now brought within the field of biodiversity economics.

All of these problems share a common aspect – the dynamic nature of biological resources. Biological resources are distinctive in that they live and grow and respond to other living things. This generates a common analysis across the entire discipline that focuses on how human societies interact with other living things and how management should take biological characteristics into consideration.

In this volume we provide a set of papers that demonstrates the application of this framework across the entire range of issues currently under consideration within this important field. We divide the volume into four sections, three representing the core areas of biodiversity economics and the last a demonstration of their application in a concrete context (agricultural biodiversity). In Part I, we commence with a set of eight papers comprising an examination of the causes of biodiversity loss. Then in Part II we turn to a section of five papers assessing the issues concerning the valuation of biodiversity. In Part III we examine the range of policies for biodiversity conservation. Finally, in Part IV, we include a case study on agricultural biodiversity: causes, values and policies. The volume as a whole serves as a demonstration of the means by which bio-economic

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Frontmatter

[More information](#)

analysis might be applied to the examination and evaluation of the problem of various forms of biodiversity losses.

The volume emanates from a collaborative effort undertaken by an interdisciplinary network of European scientists (known as BioEcon) working to advance economic theory and policy for biodiversity conservation. The BioEcon network has provided a platform for economists, lawyers and natural scientists from leading European academic and research institutions as well as members of prominent policy organisations to work together on advancing our understanding of the anthropogenic causes of biodiversity decline as well as on developing novel economic incentives for biodiversity conservation.¹ Over the past decade more institutions from all around the world have become involved in the network activities (such as its annual conference) while the network has provided the launching pad for many new researchers and research agendas in the field of biodiversity economics.² We hope that this volume will help to consolidate this relatively new field and continue to encourage new researchers and new research agendas in the area.

ANDREAS KONTOLEON, UNAI PASCUAL, TIMOTHY M. SWANSON

¹ The partners in BioEcon are: Alfred-Weber-Institute, University of Heidelberg, Germany; Center for Development Research, Department of Economics and Technological Change, University of Bonn, Germany; Centre for Economic Research, Tilburg University, Netherlands; Centre for Environment and Development Economics, Environment Department, University of York, UK; Centre for the Philosophy of Law, Université catholique de Louvain, Belgium; Department of Economics, Norwegian University of Science and Technology, Norway; Department of Economics, School of Oriental and African Studies, UK; Department of Economics, University College London, UK; Department of Land Economy, University of Cambridge, UK; Finnish Forest Research Institute, Vantaa Research Centre, Finland; Fondazione Eni Enrico Mattei, Italy; Laboratoire Montpellierain d'économie Théorique et Appliquée, Centre National de la Recherche Scientifique, Université Montpellier 1, France.

² Details of all network activities can be found at www.bioecon.ucl.ac.uk

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Frontmatter

[More information](#)

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Lastly, we would like to dedicate the volume to the late Prof. David Pearce who has been an esteemed colleague, collaborator, teacher and friend to the contributors to this volume. Over the past thirty years Prof. Pearce has made several important conceptual and methodological contributions towards our understanding of the causes of biodiversity decline while he has been instrumental in popularising and establishing economic instruments for biodiversity conservation into major policy fora. The introductory chapter written specifically for this volume was sadly one of Prof. Pearce's last works. In this paper Prof. Pearce explores the strength and nature of societies' preferences for conserving biodiversity resources and finds that in many contexts actual conservation actions and budgetary outlays fall considerably short of the 'rhetoric' over how much we care about biodiversity. His insightful piece concludes by highlighting the importance of accurately valuing and accounting for biodiversity resources and services in public decision making, which constituted a recurrent and far-reaching policy message from his important body of work.

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Edited by Andreas Kontoleon, Unai Pascual and Timothy Swanson

Frontmatter

[More information](#)

Acknowledgements

xxiii

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Foreword

I am delighted to see that biodiversity economics has become a discipline in its own right. Those of us who have been addressing the multiple dimensions of biodiversity have long sought better ways of incorporating economic thinking into our various challenges. Biodiversity loss is a serious preoccupation for the entire science of conservation biology, which has its own journal and scientific society, but it remains weak in delivering appropriate policy advice, largely because it is not able to demonstrate the economic implications of policy alternatives.

Other parts of the biodiversity community deal with what ultimately is an economic relationship, namely sustainable use. While the concept certainly has significant ethical dimensions, it more fundamentally deals with the costs and benefits of alternative management strategies, and these often will be based on economic principles. Is it more cost-effective to have safari hunting of rhinoceros, or photo safaris? How can economic calculations of sustainable off-take incorporate stochastic events, such as annual changes in rainfall (and thus productivity of vegetation)?

Others working on biodiversity focus on very specific issues, such as the impact of invasive alien species on natural ecosystems and human economies. Quantification of the negative impacts of these invasive alien species can help to convince policy-makers to design, implement and support appropriate measures to prevent such species from becoming established or to manage them efficiently once they have become part of an ecosystem. Biodiversity economics has much to contribute to the problem of invasive aliens, clearly demonstrating the suitability of alternative approaches to the problem.

I was also pleased to see the attention being given to the non-wild parts of biodiversity, here called 'agro-biodiversity'. The relationship between domesticated landscapes and the surrounding matrix has significant economic dimensions, as these non-domestic landscapes provide important ecosystem services to the agricultural lands. These include providing clean water, supporting pollinators, maintaining habitats for wild relatives of domesticated plants and animals (thereby providing genetic materials

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Frontmatter

[More information](#)

Foreword

xxv

for the future), forming soils and ameliorating climate extremes. All of these have economic dimensions, and biodiversity economics has a key role to play in helping to develop appropriate incentive measures, such as systems of payment for ecosystem services, that are efficient and equitable as well as environmentally effective.

These are just a few of the topics where biodiversity economics is making important contributions. It is especially pleasing to see the breadth of institutions involved in BioEcon, demonstrating that biodiversity economics is built on a solid consensus of scholarly research.

I would like to close by paying homage to David Pearce, whose many contributions to biodiversity economics over the past few decades have been the foundation upon which so many other contributions have been built. His economics-based perspectives have helped to legitimise the arguments conservationists have been making for many decades, while also usefully challenging some of our cherished assumptions. His opening chapter well summarises many of the ideas that made his contributions so powerful to policy-makers and scientists alike. This is a worthy monument to his numerous contributions.

While biodiversity economics addresses issues such as valuation, incentives and tradeoffs, it is also apparent from this volume that much work remains to be done. This book is the best available account of the current state of the art in this important discipline. I have no doubt that the coming years will lead to even more dramatic progress in biodiversity economics. The future diversity of life on our planet depends on such progress.

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