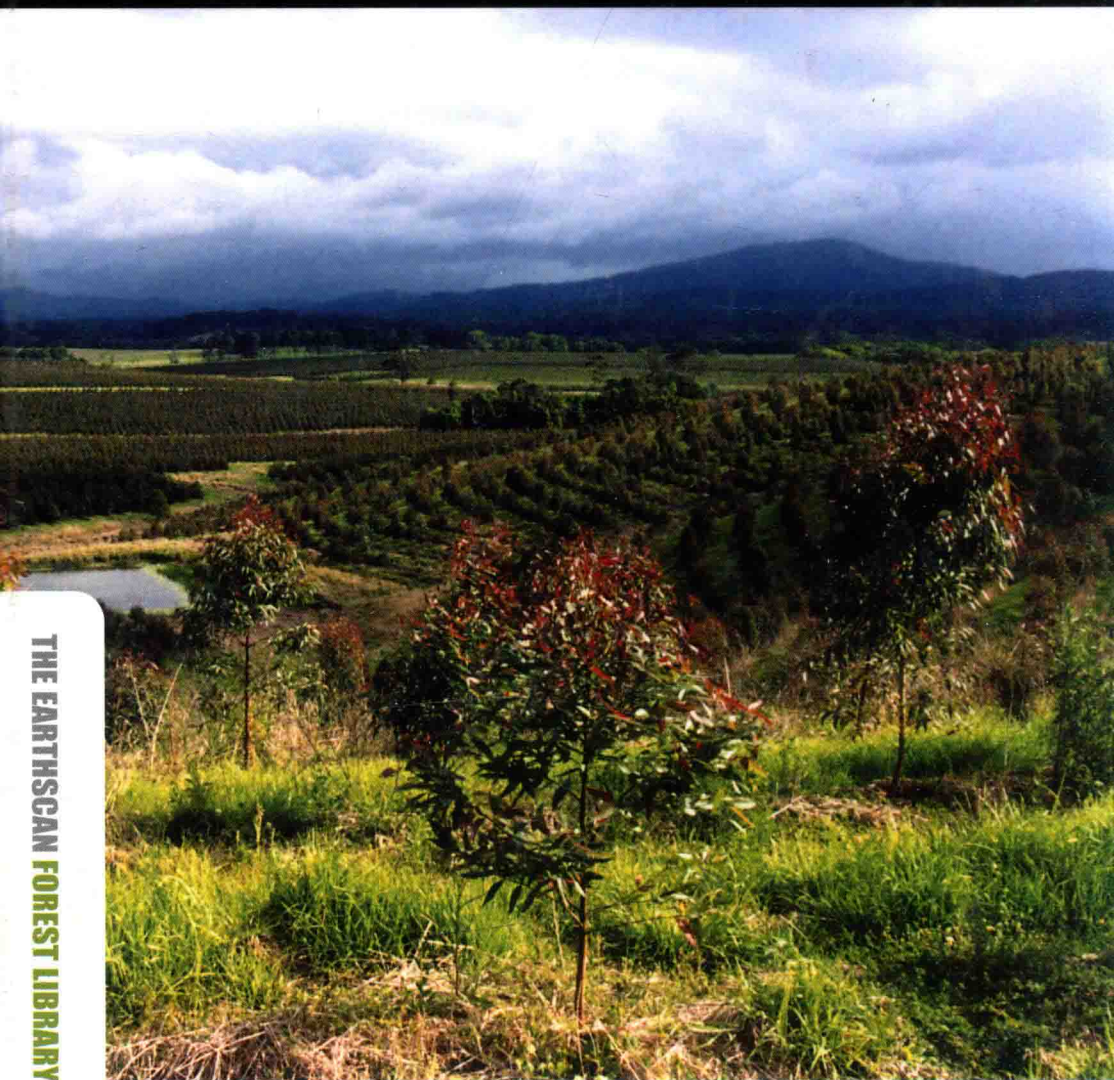


Ecosystem Goods and Services from Plantation Forests



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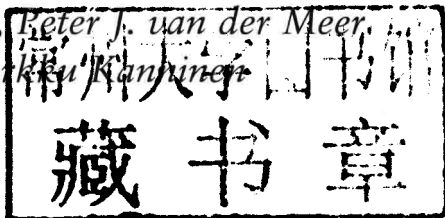
EDITED BY JÜRGEN BAUHHUS, PETER VAN DER MEER
AND MARKKU KANNINEN



Ecosystem Goods and Services from Plantation Forests

Edited by

*Jürgen Bauhus, Peter J. van der Meer,
and Markku Kanninen*



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Ecosystem Goods and Services from Plantation Forests

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Foreword

When Dr. Juergen Bausch invited me to write a foreword for the book “Ecosystem Goods and Services from Plantation Forests”, I knew I was about to enjoy a very interesting and motivating reading. All of its eight chapters fulfilled my expectations. This publication, produced by a renowned group of forest researchers and academics presents a fresh, balanced and well documented vision concerning the roles, potential benefits and challenges of planted forests, looking at the potential contribution of these valuable resources to the continuous and enhanced flow of ecosystem goods and services.

The preliminary results of the FRA 2010 confirm the global trend of expanding planted forest areas at an average of 5 million ha per year. And presently, societies are expecting more from planted forests. Information on how to approach forest plantations from a comprehensive set of market and non-market benefits is inadequate, hence the value of this book in filling up this gap.

While the economic value of sustainably managed natural forests may be higher than forest plantations, the latter is a clear option for degraded lands and low-productivity agriculture and livestock areas. The book explains how properly planned and implemented forest plantations can yield wide-ranging benefits beside timber. In the context of developing new mechanisms to generate financial compensation for forest environmental services, such as the A/R CDM and REDD +, this is indeed very timely.

The self-contained chapters of the book allow for easy reading. The book discusses the global perspectives of forest plantations as well as analyses their contribution to carbon sequestration; their possible impacts on watershed management, and the opportunities and state of knowledge on how plantation forests contribute to biodiversity conservation. In presenting quantification and valuation methods of ecosystem services from plantations as well as some silvicultural options to enhancing biodiversity in planted forests, and by critically reviewing outgrower schemes aimed at involving smallholders in forest plantation activities, the book provides valuable guidance to the forest practitioner, the researcher and academician, and anyone with interest in sustainable development at the rural level.

The book features two inspiring chapters on policies to enhance ecosystem goods and services from plantations and key recommendations for sustainable forest plantations. These are of particular interest to the policy maker and directly relevant to the following specific objectives of the International Tropical Timber Agreement (IITA 2006):

“(j) Encouraging [ITTO country] members to support and develop tropical timber reforestation, as well as rehabilitation and restoration of degraded forest land, with due regard for the interests of local communities dependent on forest resources; and

(q) Promoting better understanding of the contribution of non-timber forest products and environmental services to the sustainable management of tropical forests with the aim of enhancing the capacity of [ITTO country] members to develop strategies to strengthen such contributions in the context of sustainable forest management, and cooperating with relevant institutions and processes to this end”.

In presenting up-to-date and unbiased information and analysis, the book contributes to the work of ITTO and its members in the achievement of the abovementioned objectives, as much as it can benefit other related agreements, institutions and forest policy initiatives worldwide.

The need to include forest plantations in an overall landscape approach is highlighted in the book. Plantation forests are an ever more significant element shaping our present landscapes. These forests constitute a potential source of income as well as other direct and indirect socio-economic and environmental benefits, thus enabling the fulfillment of human needs while promoting the conservation of forest ecosystems.

The book tackles issues that have only been recently brought up to the forestry debate. It assists in identifying further research needs and provides the reader with a clear view of the opportunities and challenges confronting forest plantations. It opens the window for the support of innovative forest management using the landscape approach, for the long term benefit of man, woman and the environment.

I trust the readers will enjoy the book as much as I did.

Emmanuel Ze Meka
Executive Director
International Tropical Timber Organization – ITTO
Yokohama, April 2010

Preface

The recognition that forests provide important environmental benefits is not new. Already in 400 BC Plato recognized that the loss of forests could lead to soil erosion and the disappearance of water springs. Since then the knowledge about the diverse functions of forests has greatly advanced, particularly following the development of modern forestry, which began with the use of forests for early industries in the 18th century, and the establishment of ecology as a scientific discipline in the 20th century. The term 'environmental services' first came into use in the 1970s after which the term 'ecosystem services' was coined. Forest ecosystem goods such as timber, food, fuelwood, fodder, ornamental and medicinal resources, as well as ecosystem services such as carbon sequestration, soil and water regulation and habitat for pollinating species and wildlife, are all vital to human health and livelihoods.

Traditionally, many of the non-timber goods and services from forest ecosystems have been viewed as free benefits to society. Owing to the fact that many of these 'public' goods and services are difficult to quantify, and that no market exists for many of them, their value has seldom been expressed in market prices. This is one of the reasons why these public goods from forests were given little weight in private, public, and corporate decision-making.

For a long time it was commonly accepted that 'regular' forest management would not only provide sustainable yields of timber products but would also offer all other ecosystem goods and services in sufficient quantity and quality. It is now well established that this may not be the case in many situations. Processes such as the Millennium Ecosystem Assessment have made us aware that the many changes to natural ecosystems resulting from their use and exploitation have led to the degradation of a range of ecosystem services, possibly with serious implications for our well-being.

Tree plantations are artificial forests that differ greatly from natural ecosystems in terms of their structure and function. While the area of natural forests is shrinking, tree plantations are expanding at a rapid rate and dominate the landscapes in some regions of the world. Due to the strong focus on wood production in large-scale industrial plantations, much debate has been initiated about the lack of balance in ecosystem goods and services, and about the social and economic costs versus benefits of large-scale tree

plantations. However, with the increasing global demand for timber and woody biomass, it is clear that tree plantations are here to stay because they represent a very efficient production system for a much-needed renewable resource.

As Jack Westoby stated in his book, *The Purpose of Forestry*, from 1987: 'Forestry is not about trees, it is about people. And it is about trees only insofar as trees can serve the needs of people.' The International Union for Conservation of Nature (IUCN) has estimated that the needs of more than 1 billion people in rural areas can only be met through the ecosystem goods and services provided by forests. Therefore, we claim that it is timely to ask how, and to what extent, forest plantations can help provide these different ecosystem goods and services. We were interested to know how forest plantations might substitute or augment ecosystem goods and services from native forest, and how they could be designed and managed to optimize the provision of ecosystem goods and services such as provision of habitat, clean water, and carbon sequestration. In addition, we wanted to explore how ecosystem goods and service from plantations may be valued, how their delivery may be promoted through appropriate policies, and how local people may actually benefit from this. In this book, we aim to present the current knowledge on these issues. The perspective that we adopt focuses on the non-timber goods and services as the production of wood from plantations has been dealt with in great depth in other publications.

This book originated from work undertaken as part of a project funded by the European Union on the role of forest plantations in a crowded world. The main ideas and concepts emanating from this project were presented and discussed at an international conference on Planted Forests and Sustainable Development held in October 2006 in Bilbao, Spain. Part of this conference was a scientific forum on 'Ecosystem Goods and Services from Planted Forests', and most keynote presentations from this conference have been developed into the chapters for this book.

The time between the inception and publication of this book enabled the contributors to develop and present new ideas and perspectives on these themes and to incorporate the most recent literature. However, in the interim, some changes in the contributors to the book occurred. In particular, we wish to mention Ian Calder, a world-class hydrologist of international renown, who succumbed to motor-neuron disease in May 2009. He will be remembered in particular for his critical examination of public misconceptions of the hydrological effects of forests. Ian was committed to completing his chapter, even until shortly before his death. We are very grateful to Rodney Keenan and Albert Van Dijk for taking over the discussion of the interactions between planted forests and hydrological cycles at a late stage of development of this book and for providing an equally fitting contribution.

The primary conclusion of our book is that tree plantations can meet the needs of a broad range of stakeholder groups. There is now a large body of knowledge and experience showing that tree plantations, if appropriately

planned, designed and managed, can deliver a wide range of ecosystem goods and services on both landscape and stand scales. Importantly, the benefits and impacts of plantations are highly context specific. Therefore, the range of impacts and benefits associated with plantation forests, which typically differ from those of other landscape components such as native forests or agricultural lands, need to be assessed, agreed upon and managed in a landscape context. Tree plantations that provide for a range of ecosystem services are likely to be more complex in design and management on a stand and landscape scale than conventional large-scale monocultures. The chapters of this book discuss how this may be achieved with regard to ecosystem services such as the maintenance of hydrological cycles, provision of habitat for biodiversity, and sequestration of carbon. One of the major environmental benefits of plantations does not actually relate to the plantations themselves, but to the fact that they help reduce the harvesting pressure on native and semi-natural forests.

This body of knowledge about the impacts of plantations and their contributions to ecosystem goods and services provides the foundation for developing governance regimes that are consistent with the principles of sustainable forest management. In accordance with these widely agreed principles, societies have the right to expect that plantation forests will deliver more benefits than costs. However, the manner in which trade-offs between different ecosystems goods and services are reached, and the extent to which different interest groups share the benefits will ultimately remain a value judgement. It is clear, however, that enhancing the provision of ecosystem goods and services from plantation forests is an important facet of realizing the benefits of this increasingly important form of forestry.

With this book, we hope to convince the reader that tree plantations, despite their predominant simplicity in structure and shape, and despite the high intensity of management needed, can play an important role in solving, and mitigating some of the pressing current global problems such as the increasing demand for resources and energy, poverty, climate change, or the loss of biodiversity. However, we also aim to demonstrate that much still needs to be done to optimize the diverse functions of tree plantations to serve the needs of people. We hope that this book will encourage readers to engage in this process.

Jürgen Bauhus, Peter van der Meer, and Markku Kanninen
March 2010

Acronyms

A/R CDM	afforestation and reforestation project activities under CDM
ABARE	Australian Bureau of Agricultural and Resource Economics
C	carbon
Ca	calcium
CCAR	California Climate Action Registry
CDM	Clean Development Mechanism
CERs	Certified Emission Reductions
CEPLAC	Comissão Executiva de Planejamento da Lavoura Cacaueira
CIFOR	Center for International Forestry Research
CO2FIX	a model for quantifying carbon sequestration in forest ecosystems and wood products
COP	Conference of the Parties
DWAF	Department of Water Affairs and Forestry (South Africa)
ECCP	Economic Cross-Cultural Programme
EGS	ecosystem goods and services
ETS	emissions trading scheme
EU	European Union
FAO	Food and Agriculture Organization (of the United Nations)
FSC	Forest Stewardship Council
GPP	gross primary production
Gt	gigaton
hh	harvested per household
ILO	International Labour Organization
IPCC	Intergovernmental Panel on Climate Change
ITTO	International Tropical Timber Organization
IUCN	International Union for Conservation of Nature
LULUCF	land use, land-use change and forestry
M	million
Mha	million hectares
MLA	multidisciplinary landscape assessment
N	nitrogen
NETFOP	NETworking FOrest Plantations
NGO	non-governmental organization

NPP	net primary production
NTFP	non-timber forest product
NWFP	non-wood forest product
OECD	Organisation for Economic Co-operation and Development
P	phosphorus
PDM	pebble distribution method
PES	payment for ecosystem services
PIFFR	Fiscal Incentives for Forestation and Reforestation
REDD	Reduced Emissions from Deforestation and Degradation
t	metric ton
TEV	total economic value
UNCED	United Nations Conference on Environment and Development
UNFCCC	United Nations Framework Convention on Climate Change
UNFF	United Nations Forum on Forests
WCPA	World Commission on Protected Areas
WWF	World Wide Fund for Nature

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