

PLANTED FORESTS

Uses, Impacts and Sustainability



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Edited by

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Published by

Food and Agriculture Organisation of the United Nations

and



www.cabi.org

CABI is a trading name of CAB International

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A catalogue record for this book is available from the British Library, London, UK.

Library of Congress Cataloging-in-Publication Data

Planted forests : uses, impacts, and sustainability / edited by Julian Evans.
p. cm.

Includes bibliographical references and index.

ISBN 978-1-84593-564-1 (alk. paper)

1. Afforestation—Social aspects. 2. Afforestation—Environmental aspects.
3. Tree farms—Social aspects. 4. Tree farms—Environmental aspects.
5. Sustainable forestry. I. Evans, Julian, 1946-

SD409.P685 2009
333.75'152-dc22

2009018693

Published jointly by CAB International and FAO.
Food and Agriculture Organization of the United Nations (FAO)
Viale delle Terme di Caracalla, 00153 Rome, Italy
website: www.fao.org

ISBN: 978 1 84593 564 1 (CABI)

ISBN: 978 92 5 106222 7 (FAO)

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Typeset by AMA DataSet Ltd, Preston, UK.
Printed and bound in the UK by MPG Books Group.

The paper used for the text pages in this book is FSC certified.
The FSC (Forest Stewardship Council) is an international network to promote responsible management of the world's forests.

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Foreword

The goal of sustainable forest management has received considerable attention in international negotiations. The Rio Declaration (UNCED) and several of the United Nations conventions, as well as the United Nations Forum on Forests (UNFF) and other international processes, meetings and key publications, have recognized the critical role of forestry, including planted forests, in achieving sustainable development and mitigating the effects of climate change.

Planted forests have been a legitimate land use for centuries. They have expanded rapidly in both area and impacts in recent decades. In 2005 it was estimated that planted forests constituted only 2% of global land area (7% of forest area), or about 271 million hectares. The potential industrial roundwood production from planted forests in 2005 was estimated at 1.2 billion m³ or about two-thirds of global industrial roundwood needs. The significance of planted forests and recognition of their contributions to a range of development goals are anticipated to increase in coming decades. Planted forests provide not only wood, fibre and fuel, but also other non-wood forest products. Moreover, they sequester carbon, rehabilitate degraded lands, help in restoring landscapes, protect watersheds and agricultural soils, and provide recreational areas and amenities. There is increasing public awareness that wood products have advantages over competing products made of other materials (cement, plastics and metal) in that wood is renewable, energy efficient and environmentally friendly if managed in a responsible manner. Intensively managed planted forests are an effective land use for these purposes.

Ownership of planted forests globally, calculated on an area basis, is: government, 50%; smallholders, 32%; and private-sector corporate, 18%. The corporate private sector employs forestry professionals who deploy improved genetic stock and nursery practices, apply intensive silvicultural management and invest in fire and forest health protection that result in high productivity and quality forest products that command premium prices on the market place. The application of new knowledge and technology in planning and improved

practices is not always adopted in government and smallholder plantings, particularly in developing countries.

A lack of knowledge, capacity and capability in providing enabling policies, laws, regulations, plans and technical support systems, particularly in developing countries, have led to some planted forest investments causing land-use, social and environmental conflicts, as well as resulting in poor forest health, productivity and returns on investment. Through a multi-stakeholder process, FAO prepared *Responsible Management of Planted Forests: Voluntary Guidelines* (FAO, 2006b) and has embarked upon a programme of country capacity-building to balance the social, cultural, environmental and economic dimensions of planted forest in landscape management approaches to increase the contribution of planted forests to sustainable livelihoods and land use.

Policy makers, managers and forest investors must consider the unique context in which they are investing in planted forests and respond to the prevailing and perceived driving forces, including socio-economic conditions, markets, consumer demand and new technologies. In each context they must consider the production technologies, market place, the wood industries sectors and also social demands and environmental covenants.

FAO is committed to strengthening country capacity in formulating enabling policies and technical standards for responsible management of planted forests. The goal is to increase their provision of goods and services towards achievement of sustainable livelihoods and land use and, in particular, to mitigate the effects of climate change and provide a renewable source of wood, fibre and fuel.

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Preface

This book provides a synthesis of the uses, impacts and sustainability of planted forests by looking at the past, outlining the present situation and highlights the outlook and issues for the future. The principles and key considerations of the *Voluntary Guidelines for Responsible Management of Planted Forests* (FAO, 2006b) are cross-cutting throughout the book.

The first introductory chapter sets the scene for the book, briefly introducing the role planted forests play, their strengths and weaknesses, and their potential for the future.

Chapter 2 gives the origins of early planting and the evolution of planted forests in recent history, awareness of the impacts of sound silviculture and more recently the need to meet social, cultural, environmental and economic objectives and provide a wide range of goods and services.

Chapter 3 details, and gives some history to, the issue of definition of planted forests highlighting the continuum of different forests and intensities of management (including planted forests) and trees outside forests across the landscape. The chapter introduces the management objectives, whether productive or protective.

Chapter 4 synthesizes highlights of the FAO's *Global Planted Forests Thematic Study* (Del Lungo *et al.*, 2006), including the results and analysis of the global survey of planted forest 2005. Survey results are summarized on an area basis (1990, 2000, 2005), according to forest plantations, planted semi-natural forests and total planted forests, by productive or protective purpose. Additional information according to ownership, species, growth rates, age classes, rotation and end uses is also summarized. Detailed area tables by country are available in the Appendix.

Chapter 5 summarizes the key findings of FAO's *Global Planted Forests Outlook 2005-2030* (Carle and Holmgren, 2007), which highlights that although planted forests cover less than 3% of land area, they contribute a considerably higher proportion of overall goods (wood, fibre, fuel) and environmental and social services, now, and increasingly in the future.

Chapter 6 outlines the different roles of planted forests including social, environmental, and ecological roles in different contexts. The multiple facets of planted forests are highlighted for production of wood, fibre, fuel; soil and water protection, mitigating the impacts of climate change (carbon sinks or carbon sequestration); and amenity, recreational or landscape restoration.

Chapter 7 focuses upon the critical aspects of policy, institutional and ownership of planted forests. The different perspectives of private sector corporate and smallholder are highlighted from an investment perspective. The chapter draws upon a study commissioned by FAO *Corporate Private Sector Investment Dimensions of Planted Forest Investments* (Neilson, 2007a).

Chapter 8 reviews the issues relating to sustainability of planted forests through subsequent rotations. Issues such as planted forests and their management impacts on soils, nutrient balance, threats (insects, diseases and other pests) and site changes are raised as well as risks they pose such as that of invasive species. Management interventions to minimize risks are suggested.

Chapter 9 summarises the key issues drawn from each chapter and concludes that planted forests fulfil a critical role in the social, environmental and economic dimensions of sustainable forest management and these will increase in the future.

Owing to the significance emerging from the data about the importance of planted forests worldwide, FAO decided to publish this synthesis of its working papers both to draw out crucial impacts and issues and, by inviting an external editor, to set planted forests in a wider context. We hope the book will be of assistance to many from policy maker to practitioner.

Acknowledgements

Sincere thanks are extended to all those who contributed to the organization and contents of this book. Several people were involved in addition to the authors named.

Supervision of this book was provided by Jim Carle, Chief, Forest Resources Development Service (FOMR), FAO, who provided the resources and guidance on scope and technical content.

Katrine Myrseth and Kate Beauchamp, Imperial College London, and Eleanor Harland, Forest Research, provided assistance with background research and help with the bibliography. Martin Evans of Agriprojects Consulting Ltd, Cambridge, provided input on the fast-developing biofuels industry. Hugh Evans, Forest Research UK, summarized pest and disease issues affecting planted forests worldwide.

Permission is given by John Turnbull, co-author of *Plantation Forestry in the Tropics* (2004, 3rd edition), and by Oxford University Press, to reproduce material from that book and which appears here mainly in Chapter 2.

Special thanks to Alberto Del Lungo, FOMR, FAO, who provided technical support in the planted forest database, figures and photos. Graciela Andrade, FOMR, FAO, supported the project in countless ways. Rachel Tucker, Publishing Planning and Rights Manager, FAO, provided the critical liaison between CABI and FAO for development of the project into book form. Stephen Evans provided invaluable support to the editor.

Illustrations: all photographs were provided by the editor (J. Evans) or from FAO's Photo Library except fig. 8.9 which is reproduced by permission of Professor J.L. Innes, University of British Columbia.

Fig. 6.7 is reproduced in its present form from Evans, J. and Turnbull, J. (2004) *Plantation Forestry in the Tropics*, 3rd edition, Oxford University Press, Oxford (Fig. 22.1, page 354).

Fig. 8.4 is reproduced in its present form from Evans, J. (1999) *The Sustainability of Forest Plantations – the Evidence*. Department for International Development, London (page 18). The original was redrawn with permission of Dr E.K.S. Nambiar.

1 Introduction

J. EVANS

1.1 Planted Forests at a Critical Point

From time to time there comes a tipping point when an occasion or set of circumstances clearly set the agenda for the future. Such a critical point may have been reached with the ascendancy of planted over natural forests for supplying many industrial commodities, some environmental services and even a few wildlife benefits. This ascendancy can be traced in FAO's own work, and particularly its publications, from its inception nearly 60 years ago through the seminal conference on Man-Made Forests and their Industrial Importance in 1967 and numerous technical reports, newsletters and successive World Forestry Congress proceedings, to this book today. Planted forests have come of age.

In asserting this view – that planted forests are playing a role far in excess of what their actual area might suggest – limitations are recognized. They do not and cannot substitute natural forest formations: they are not an alternative but are complementary. They may help ease some pressures on natural forests, but that is unlikely to be their major role, desirable as this might be. Planted forests, in all their variety, offer major opportunities but are no panacea to the ills that beset the world's forests at large, namely, destruction and deforestation, the loss of ecosystems and environmental services, and perhaps most important of all, the loss of somewhere to live for many groups of people too often on the fringe of society. Tree planting and planted forests have a role to play and are part of the solution to these ills.

Identifying the role planted forests play, examining their strengths and weaknesses, and exploring in what ways they are part of the future of the world's forest resources is the aim of this book. Planted forests are often no more than the foresters' equivalent of a farm crop, but which through sound management can deliver some benefits beyond those purely of production. It is here that the farm analogy breaks down. First, as stands of trees grow, mature and regenerate, they can certainly continue to be worked as 'crops', but many are managed in



Fig. 1.1. Planted *Fagus sylvatica* in southern England exhibiting features of natural woodland.

ways through which they come to appear less and less artificial and take on features of naturalness (Fig. 1.1). The latter has commonly occurred when native species constitute the planted forest. Second, all planted forests can offer several, even many, benefits over and above that of production, but none ever truly substitutes for natural forest. This book recognizes both these opportunities and the limitations. The outlook is neither infinitely rosy nor doom laden for planted forests. The attempt is made to bring a balanced view of a silvicultural tool that has come of age to serve some of humankind's needs.

The book draws on the latest research, both commissioned by FAO and in the published domain, and the experience of many people. But a 'health warning' is added. Inferences drawn rely on the reliability of the data and statistics available and their quality. In the chapters that follow this limitation is recognized. The point is made because it is a re-evaluation of data about planted forests that largely occasions this book.

1.2 Classifying Forest as 'Planted'

Classifying forests is surprisingly inexact for those that have been planted and therefore data concerning their extent are uncertain. There are, of course, reasons other than classification for such misreporting. For tropical and subtropical countries, Evans and Turnbull (2004) note several causes.¹ To these can be

added the pressure to report what a nation's policy or plan stipulates, or a regional manager demands, rather than what is actually achieved. However, the issue here is not so much the figures themselves and these sorts of imperfections, but whether the extent of planted forests is poorly estimated because of what is or is not classified as 'planted'. The uncertainty has arisen because many forests that were planted long ago do not look like 'plantations' with all the perceived connotations the word conveys (Fig. 1.1).

One note of caution is that, in much of what has been written, even in the recent past, the terms 'plantation', 'forest plantation' and 'planted forest' have been used interchangeably as virtual synonyms (e.g. Savill *et al.*, 1997; Anon., 1999, 2003; Boyle *et al.*, 1999; Evans and Turnbull, 2004). Here a clear distinction is developed. 'Planted forest' includes all of what is generally understood as 'plantations' or 'forest plantation', but also incorporates other forest types originating largely or wholly from tree planting. What this means and what types of forest are included in this wider embrace is the purpose of Chapters 2 and 3.

1.3 Outline of the Book

To describe fully what 'planted forest' means and the implications this term has, it is important to sketch the history of tree planting, particularly the early history which is often forgotten, to place in context the questions and issues faced today. This is the subject of Chapter 2. On this foundation, in Chapter 3, the matter of definitions is explored, followed by a description of the *Global Forest Resources Assessment 2005* (hereafter FRA 2005) classification (FAO, 2005a). Thus Chapters 2 and 3 set the scene for the new data concerning planted forests reported in FRA 2005 and emerging from FAO's thematic study (Chapter 4) and their implications for forest production (Chapter 5). Chapter 6 analyses issues and explores in more depth the roles planted forests can be expected to play. Chapter 7 addresses the critical questions of who owns the world's planted forests, how this is changing, and what roles policy and institutional issues play. Chapter 8 examines the whole matter of sustainability of planted forests – how safe is it to rely on growing trees in this way. Conclusions are in Chapter 9. As well as the substantial bibliography, full data of planted forest areas for all the key countries are included in the Appendix.

1.4 Global Planted Forests Thematic Study

FAO's Global Planted Forest Thematic Study (FAO, 2006c) has been reported in working papers that detail the survey, responses, the associated desk study and results in status and trends in planted forests, as shown in Table 1.1. This book draws on all this research to present a detailed overview and draw conclusions.

The working papers themselves are aimed at a target audience of forestry planners and policy-makers as well as other interested parties, at national, regional and global levels, and are available from FAO.

Table 1.1. Key FAO working papers providing source material for this book.

No.	Title	Description
35	Global Planted Forests Thematic Study: Supplement to Forest Resources Assessment 2005 – Guidelines for National Reporting Tables for Planted Forests	Guidelines to national correspondents for completion of reporting tables in the planted forests survey
35a	Global Planted Forests Thematic Study: Country Responses to Reporting Tables for Planted Forests Survey	Country reporting tables for 36 countries with major planted forests areas
35b	Global Planted Forests Thematic Study: Supplementary Desk Study on Planted Forests	Supplementary desk study for 23 countries with significant areas of planted forests
38	Global Planted Forests Thematic Study: Results and Analysis	Main results, analysis, summary tables, figures, conclusions, recommendations and full data tables in annexes

Note

1 Areas reported 'should only be considered as approximate as the quality and quantity of plantation data are very dependent on the capacity of national forest inventory systems to collect and analyze data. Different sources often cite widely divergent figures for any one country. Some countries in official reports equate annual planting achievement with numbers of tree seedlings produced with no check on what land has actually been successfully planted; this invariably results in overestimates. In other cases the full ground area of poorly stocked plantations is also included which is misleading in terms of the quantity of standing timber' (Evans and Turnbull, 2004, p. 32).