

Preface

Large areas of the world's tropical forests have been cleared in the last 100 years. Much of this forest land has been transformed into productive agricultural land. However, many areas have not and are now marginal for agriculture or have been largely abandoned. The areas involved are huge. One estimate suggests there are 350 million ha of former tropical forest lands around the world that were once cleared but are now degraded in some way (ITTO 2002). This is equivalent to an area roughly double the size of Indonesia.

Of the forests remaining, extensive areas have been degraded by logging. This is not because logging necessarily causes such damage but simply because the logging was poorly managed. The damage they have suffered means many of these supposedly renewable resources are now incapable of supporting a second cutting cycle, at least within the foreseeable future. As a consequence, large areas of these badly logged forests will probably also be cleared for agricultural purposes. These changes have transformed tropical landscapes. In most countries the original forests were once a 'sea' that completely surrounded villages and farms. In less than a single human lifetime many of the residual forests have become small 'islands' in a 'sea' of agricultural land.

These events have affected livelihoods and changed environmental conditions. Some people have become very wealthy as a result of the changes. However, most have not and large populations of relatively poor people now live in these transformed landscapes. Many have been displaced from their traditional homelands and live on less than two dollars a day despite the wealth produced by logging. Deforestation and forest degradation have also caused massive environmental damage. Large numbers of species have become extinct and many areas are now largely devoid of native wildlife. In other areas wildlife persists but the surviving species have greatly diminished populations making them highly vulnerable to future changes. Erosion of topsoil has been common leading to changes in soil fertility. Water quality, and sometimes water availability, has been adversely affected.

There have been four broad policy responses to these events. One has been to try to increase the productivity of cleared agricultural lands to make better use of them and reduce the need to clear any more forest. A second has been to conserve more of the remaining forests in a network of National Parks and protected areas. A third has been to encourage the greater use of reduced-impact logging to decrease the

damage caused by harvesting operations. The final response has been to reforest some of the land that has been cleared and then abandoned. It is this fourth response that is the focus of this book. Just how should such reforestation be carried out? In particular, how might it be done in a way that it overcomes degradation, restores some of the key ecological processes and functions of tropical forests and, at the same time, improves the livelihoods of local people?

Although many state agencies and large industrial corporations are engaged in tree-planting the present rate of tropical reforestation is much less than the present rate of tropical deforestation. Two things can be said about this reforestation. Firstly, it commonly involves a remarkably small number of species from an even smaller number of genera (e.g. *Pinus*, *Eucalyptus*, *Acacia*, *Tectona*) despite the extra-ordinary biological diversity of the region. Secondly, many of the large, homogenous plantations being established are good for producing goods such as pulpwood, particleboard or veneer but they are not necessarily able to provide many of the ecological services that disappeared when the first waves of deforestation swept across the tropics. These plantations are generating financial rewards to their owners but many are accentuating the process of landscape simplification and homogenisation that was begun with deforestation.

There is another group participating in reforestation whose role is often unrecognized and these are the small landholders. Some of these farmers are using the same species and reforestation methods being used by the bigger industrial growers because the silviculture of these species is well-known and they are profitable to grow. But many are interested in using a much broader range of species and reforestation methods because they want to produce a wider variety of goods and services. Their capacity to do this is hampered because much less is known about the silviculture of these other species, the site conditions they prefer or the ways they might be grown in plantations.

Reforestation to improve livelihoods involves more than simply planting trees. If landholders are to benefit from tree-planting then there must be markets for the goods and services they produce and these prospective growers must be aware of their opportunity costs. Reforestation may benefit the community as a whole but it may also be disadvantageous for certain people as well. How are these trade-offs to be made? The book attempts to address these types of questions while recognising that the value of generalisations are sometimes limited and that specific situations often require site-specific solutions.

Reforestation to improve conservation outcomes is equally difficult. Most forms of reforestation are likely to have some conservation benefits but there are very large differences in the capacity of different types of reforestation to generate these benefits. For example, large monocultures of exotic tree species will not be as effective as polycultures of native species in creating habitats for wildlife. Likewise, monocultural plantations may sometimes be less useful for watershed protection than a well-established grass cover. The task of reforesting degraded lands to conserve residual biodiversity is made especially difficult because so little is known of the habitat requirements of most tropical forest biota. Further research should help overcome this problem except that there is often a mismatch between the types of problems faced

by field managers seeking to restore some kind of forest cover in degraded lands and those being addressed by conservation biologists. Sophisticated techniques are often being used by conservation biologists to investigate inconsequential or highly specialized problems but without any regard for the socio-economic or political context in which the problem is immersed. This book seeks to discuss some of the research priorities arising from deforestation and degradation although it deals more with ecosystems than with the conservation needs of particular species.

The geographic scope of the book needs some clarification. It covers the tropical and sub-tropical areas of Southeast Asia and the Southwest Pacific (subsequently referred to, rather loosely, as the Asia-Pacific region). This is a politico-geographical setting without any particular ecological rationale except that the dominant vegetation is tropical forest. On this basis, northern Australia is included but the temperate regions of that continent are not. This region is clearly diverse. It contains evergreen rainforests, deciduous forests and woodlands as well as large areas of grasslands, shrublands and secondary forests created by human activities. These various communities include some of the world's most biologically diverse ecosystems. In the opinion of the famous nineteenth century naturalist Alfred Russell Wallace '... no part of the world can offer a greater number of interesting facts for our contemplation, or furnish us with more extensive and varied materials for speculation in almost every great department of human knowledge' (Wallace 1863 p. 217).

The human societies present in the region are equally diverse. They include a variety of ethnic and religious groups which speak over 1,000 languages. Some of these people live on their traditional lands while others are recent migrants. Some have formal ownership of the land they are using while many others do not. Some people are comparatively wealthy, but large numbers of people remain living in circumstances below international poverty benchmarks. The states in which they live use a range of political, legal and economic systems with some governments being able to exert considerable control over land use practices while others are not. The region is one in which significant economic growth has taken place in recent years and includes some of the so-called 'Asian Tiger' economies but it also includes countries where economic development has been slow.

Despite this socio-economic and political diversity there appears to be growing recognition across the region that forest conservation is important and that some reforestation should take place. This does not mean that these views are held with equal enthusiasm or that all governments or communities are yet acting upon them. Nor does it mean there is agreement on how this reforestation should be done. In this respect it is interesting that one of the lessons emerging from recent experiences is that there is no single formula or recipe for reforestation. Rather, there are distinct benefits in exploring a variety of approaches.

To a person with a hammer every problem seems like a nail. The potential benefits of reforestation seem obvious to foresters and restoration ecologists. However, that should not blind us to the fact that reforestation may not always be the best way of dealing with degraded lands; nor might it be the most efficient way of improving livelihoods or overcoming poverty. Some degraded lands might be better used for cropping or other purposes that may have a far greater impact on poverty. Certainly

some farmers will take this view. Nonetheless, reforestation may be the best way – and sometimes the only way – of rehabilitating some of the most degraded areas and, at the same time, generate improvements in livelihoods and conservation outcomes. This book aims to show that there are encouraging developments occurring across the region from which lessons can be drawn by anyone interested in rehabilitating other tropical forests.

This book has been written in four parts. The first section (Chapters 1 to 3) outlines the problems. It describes the scale of deforestation and degradation and some of the factors responsible and argues that those wishing to undertake reforestation for conservation reasons must also seek to improve rural livelihoods if there is to be any chance of success. The second section (Chapters 4 to 8) outlines some of the ways reforestation might be carried out. These include encouraging natural regeneration as well as various forms of plantation establishment and forest restoration. It considers the extent to which each of these different approaches is able to supply both goods and ecological services. The third section (Chapters 9 and 10) considers how these options might be implemented in practice. Implementation involves improving the financial returns from tree growing to land managers and determining the best ways of incorporating tree plantings into farms. The fourth section (Chapters 11 and 12) explores the problems of scaling-up and reforesting large areas. This section considers how the benefits from tree growing can be maximised at a landscape scale and the institutional settings needed to facilitate reforestation across larger areas. The book concludes by considering in Chapter 13 the likely opportunities and constraints on reforestation across the region in future.

Throughout the book there is an emphasis on creating new forests that are resilient rather than on simply improving productivity. This means there is a bias towards forms of reforestation that promote diversity and heterogeneity rather than just biomass. There is also a focus on silvicultural approaches that might appeal to smallholders rather than on techniques more appropriate for large industrial plantation owners. Overall, the intent is to show there are many silvicultural options open to those seeking to reforest degraded lands and that the technique currently most favoured – plantations of exotic species grown on short rotations – is only one of the many choices available.

Over the years I have been fortunate to have worked on tropical forest restoration and rehabilitation in various parts of Southeast Asia and the Pacific with a number of remarkable people. Much of what is within this book has been learnt from them or while in their company. They have included fellow academics and post graduate students, ecologists, field and research foresters and land owners interested in reforestation. I have also benefited from my association with the former Cooperative Research Centre for Tropical Ecology and Management in northern Australia (now sadly, closed), the Global Partnership on Forest Landscape Restoration, the Society for Ecological Restoration and the IUCN Commission on Ecosystem Management. The Australian Centre for International Agricultural Research funded research in Vietnam which was undertaken with my colleague Dr Huynh Duc Nhan (project FST 2000/003). Some of the as-yet unpublished results from that work are included in several chapters here.

Regreening the Bare Hills

Tropical Forest Restoration in the Asia-Pacific Region

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