

**What does it take?
The role of incentives in
forest plantation development
in Asia and the Pacific**

Executive Summary



Asia-Pacific Forestry Commission

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in Asia and the Pacific

Executive summary

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FOREWORD

The Asia-Pacific region is endowed with extensive and biologically diverse forests. Hundreds of millions of people depend directly on these forests for their livelihoods. Many more people make use of the products and enjoy the services that the forests provide. Since the middle of the last century, the region's natural forests have provided millions of cubic metres of wood annually, supporting a wood-processing industry that employs millions.

Over the past two decades, political developments, and macro-economic and extra-sectoral policies have affected forests of Asia and the Pacific to an unprecedented extent. Many countries in the region continue to suffer the effects of deforestation and forest degradation, and today the natural forests are treasured as much for the environmental services they provide, as for the wood they produce. Millions of hectares have been protected as parks and reserves, or otherwise declared off-limits to the logging industry. As a result there have been dire predictions of an acute shortage of wood or a timber famine.


Responding to the diminishing capacity of the region's natural forests to produce timber, many countries have turned to forest plantations. Plantations have the potential to be a highly productive and sustainable source of wood and non-timber forest products. They can also provide social and environmental services, including storing carbon, combating desertification and rehabilitating degraded lands.

Historically, public-sector agencies have dominated forest plantation development in most countries in Asia and the Pacific. However, for a variety of reasons, it has been widely accepted that private small- and large-scale producers offer considerable comparative advantages when it comes to growing trees and producing industrial wood in plantations. Consequently, there is a growing interest in involving the private sector directly in the development of forest plantations, and governments and their respective forestry agencies are increasingly asking what it takes to encourage non-government entities to grow trees. In other words, they are looking for the right incentives to make growing trees attractive to small- and large-scale investors.

To date, there has been no comprehensive study of incentives that encourage plantation establishment and management in Asia-Pacific countries, despite the fact that the region leads the world in plantation development. The existing body of analysis is small and fragmented and conclusions are preliminary in nature. As a result, countries of the region have not benefited fully from past experiences and scarce financial resources continue to be spent inappropriately.

To address this knowledge gap, the Asia-Pacific Forestry Commission (APFC) implemented a regional study to assess the impact of incentives on forest plantation development. The findings of the study clearly indicate that a blueprint for engaging non-government investors in forest plantation development does not exist. What has emerged, however, is that clear, consistent and stable policies and a favourable investment climate are essential ingredients to promote the development of forest plantations by small- and large-scale producers.

In presenting the findings of the study, FAO and its partners are pleased to continue their support for sustainable forest management in the Asia-Pacific region. We hope that this publication will help policy-makers and foresters to better understand the key issues, challenges and opportunities concerning the effective involvement of the private sector in forest plantation development.



He Changchui
Assistant Director-General and
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Context and background

Forest plantations make up about 16 percent of the forest cover of the Asia-Pacific region and the region accounts for around 61 percent of the world's plantation forest. Historically, public-sector agencies have dominated forest plantation development in most countries in the region. This pattern has changed in many countries over the past 10 to 20 years, mainly for four reasons. First, devolution of forest management has led to greater involvement of communities and the private sector in forestry. Second, the performance (financially and biologically) of public-sector plantations – with few exceptions – has been disappointing. Third, shrinking government budgets make it impossible for most forest departments to devote as many resources to forest plantations as they have in the past. Fourth, problems related to weak governance structures are driving many countries to reconsider the role of government in administering forest resources and in implementing forest programmes.

These developments have been paralleled by a shift in the main objectives of forest management, which traditionally focused on timber production. Although forest policies and management objectives diversified and expanded long before the United Nations Conference on Environment and Development (UNCED), since 1992 forestry has become even more multidimensional. Forests are increasingly valued for supporting local livelihoods and helping to reduce poverty, for providing local environmental services and as a reservoir of global biodiversity. In the Asia-Pacific region, this shift in thinking has affected forestry immensely over the last 10 years. Perhaps the most far-reaching outcome is that forest areas set aside for conservation have expanded considerably and that the area of production forests has declined even faster, due to unabated deforestation rates and, even more so, due to complete or partial harvesting restrictions – the logging bans (Durst *et al.* 2001).

The environmental impact of the various conservation measures, especially logging bans, has been mixed. In terms of wood supply, domestic timber supplies derived from natural forests have been reduced substantially. As a consequence of such developments, the search is on for means to generate alternative wood supplies. While some countries have turned to imports – at least in the short term – most have attempted to augment forest plantation resources. Today more industrial roundwood is sourced from plantations and trees outside forests in Asia and the Pacific, than from natural forests (Brown and Durst 2003). With the public sector retreating from direct involvement in planting and tending trees, the question is whether the private sector can grow the wood that many expect is needed.

***Historically,
public-sector
agencies have
dominated forest
plantation
development***

Asia-Pacific Forestry Commission mandate

During the 18th Session of the Asia-Pacific Forestry Commission (APFC), held in Noosaville, Australia in May 2000, the Commission reviewed the results of the regional study on the *Impacts and effectiveness of logging bans in natural forests in Asia-Pacific* (Durst *et al.* 2001) and considered issues identified by the study as requiring additional information and analysis for effective policy-making. Among other suggestions, the Commission recommended conducting collaborative activities in the area of commercial forest plantations. In light of the above, the APFC undertook a comprehensive multicountry study on the *Impacts of incentives on the development of forest plantation resources in the Asia-Pacific region*.

The study's aim and scope

There are several examples in the world where clear, consistent and stable policies, a conducive investment climate and well-programmed incentive schemes have made a significant impact on the success of forest plantation development. In contrast, where initiatives have been ill conceived or poorly implemented, the results have been disappointing despite heavy investment by governments. It is common knowledge that vast plantation areas are of very poor quality. Others exist on paper only, because mismanagement or some disaster led to their premature death in the field. Others were never established, but appear in records only to spuriously indicate that targets have been reached and funds spent.

This regional study was designed to comprehensively examine the reasons for the mixed results and to provide guidance in policy formulation to those countries interested in stimulating investments in tree growing through the provision of incentives to large- and small-scale growers. The study focused on policy instruments and mechanisms aimed at stimulating investment in commercial plantations grown for profits, while recognizing that forest plantations can also be established to meet broader social and environmental objectives.¹

This publication is based on country case studies conducted in Australia, China, India, Indonesia, Malaysia (Sabah), New Zealand, the Philippines, Thailand and the United States of America.² The countries were selected to represent examples of major private-sector involvement in plantation development. In addition, experiences from other countries were reviewed to strengthen the results of the study.

¹ Readers interested in the broader role of incentives in natural resource management should consult Sanders *et al.* (1999) and FAO (1999).

² The United States of America was included in the study as part of the Asia and the Pacific region, since it borders the Pacific Ocean, has territories in the Pacific and is a member of the Asia-Pacific Forestry Commission. The contribution from Malaysia focuses on the experiences of only one company, Sabah Softwoods Berhad (SSB) in Sabah, East Malaysia.

***The study is based
on nine country
case studies***

Many governments and their respective forestry agencies are increasingly asking what it takes to effectively involve the private sector and local communities in forest plantation development. Hence, the main purpose of the study was to gain insights into this pertinent question.

The principal objectives of the study were to:

- Document plantation development in the Asia-Pacific region;
- Analyse past and current experiences in providing direct and indirect incentives for tree planting;
- Assess the broader socio-economic and political conditions that encourage investments in forest plantations; and
- Provide recommendations for enhancing the involvement of the private sector in plantation development.

Structure of this document

Section 1 provides an overview of plantation development in the Asia-Pacific region. It highlights the considerable increases in establishment rates during the 1990s and the more mixed results of the past several years.

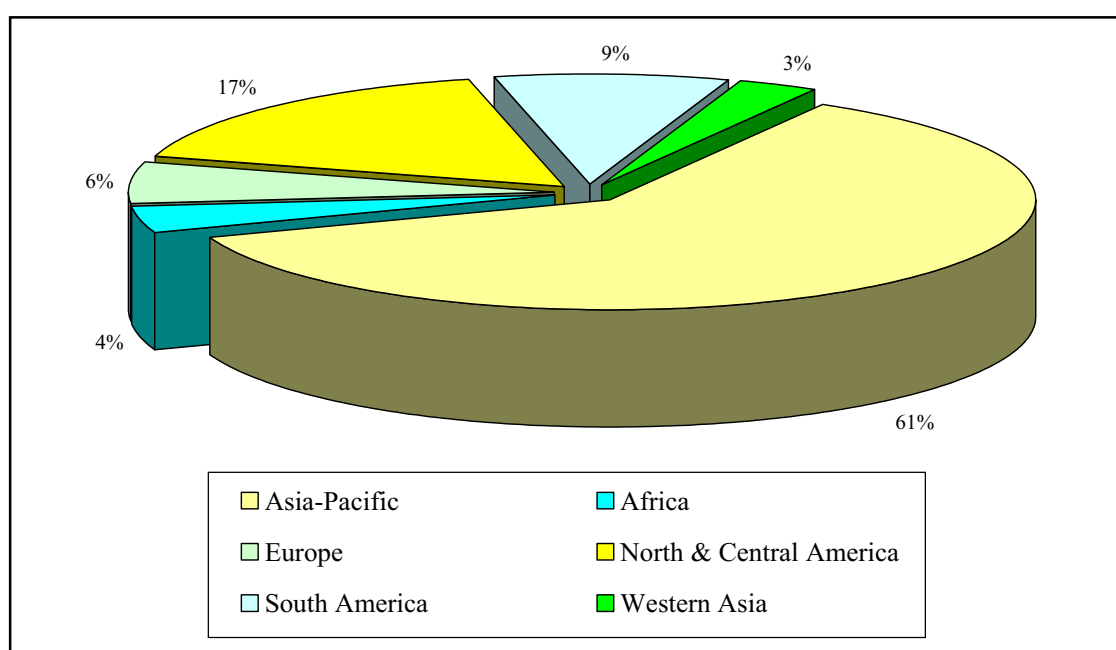
Section 2 introduces the concept of, and a rationale for, providing incentives. It takes the reader through an assortment of diverse and sometimes confusing definitions. If it is agreed that incentives should only be applied for achieving public goals, what then is the justification for providing incentives to potential private investors in plantation establishment? There are a number of reasons that justify the transfer of scarce resources, especially in the nature of direct incentives, to commercial tree growers. There are also circumstances where such transfers should not be made.

Section 3 summarizes the main insights gained from the case studies. The impact of incentives on plantation development depends on numerous issues. There are considerable differences among the nine countries that were part of the regional study. What works in one country does not necessarily achieve the same outcomes in another country, even if situations are seemingly similar. Notwithstanding the diversity and the different paths taken to expanding plantation areas, a common theme emerges. The picture that surfaces is sufficiently coherent to conclude the section with guiding principles for supporting plantation development.

Section 1

Plantations in the Asia-Pacific region: an expanding resource

Forests in the Asia-Pacific region cover approximately 699 million hectares (FAO 2001). Of this area, some 113.2 million hectares are forest plantations, or 16 percent of the total forest resource. This is considerably higher than the global average of plantations, which stands at around 5 percent. The Asia-Pacific region accounts for some 61 percent of the world's plantation forests (Figure 1).



Source: FAO 2001.

Figure 1: Global distribution of forest plantations by region in 2000

The majority of the global forest plantation resource is been established in a small group of countries. Five countries from Asia rank among the top ten plantation countries in the world: China (46.7 million hectares); India (32.6 million hectares); Japan (10.7 million hectares); Indonesia (9.9 million hectares); and Thailand (4.9 million hectares).³ Together, these five countries account for 55 percent of the global forest plantation resource, and 91 percent of Asia-Pacific plantations.

Between 1990 and 2000, forest plantations were established on around 34 million hectares in the Asia-Pacific region (excluding Japan, Australia and New Zealand). This is a marked increase on the 27 million hectares established during the 1980s. India

*Five countries
from Asia rank
among the top ten
plantation
countries in the
world*

³ Most figures are drawn from FAO (2001). These have been updated wherever possible.

(1.5 million hectares *per annum*) and China (1.2 million hectares *per annum*) currently have the highest plantation establishment rates (Brown and Durst 2003). During the 1990s, plantation establishment in the region increased significantly (FAO 2003). This trend is likely to continue in the coming years, due to an increasing demand for wood and wood products, although in recent years planting rates in some countries have declined for a variety of reasons.

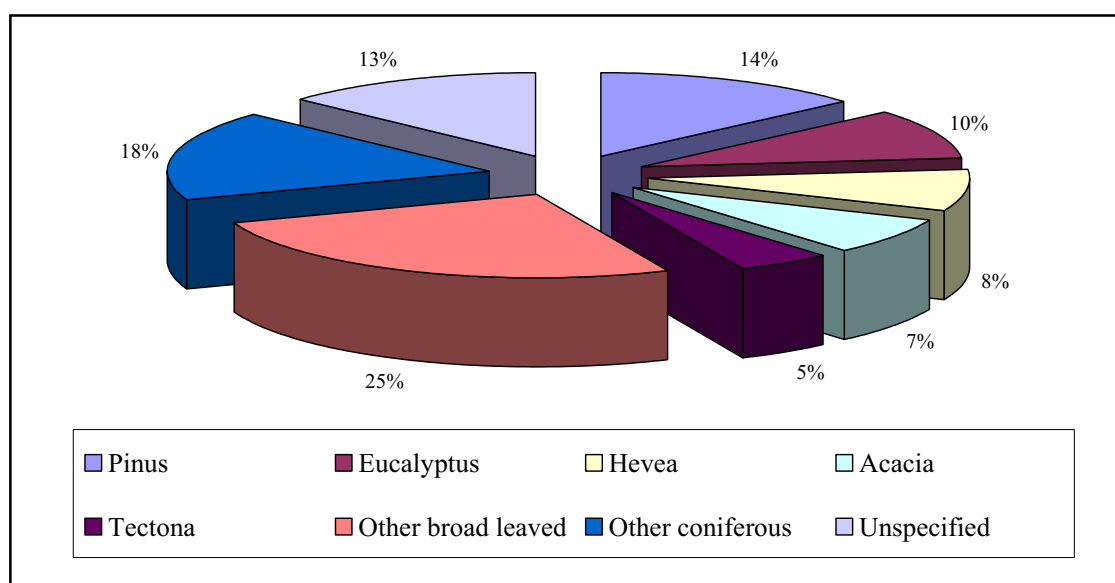
There has been a very rapid acceleration in plantation establishment in China during the past 20 years. China's forest plantations comprise mainly Chinese fir (*Cunninghamia lanceolata*), poplars and a variety of pines. In Japan, 45 percent of forests are classified as plantations, almost all of which were planted during the postwar reconstruction. The main species are sugi (*Cryptomeria japonica*), hinoki (*Chamaecyparis obtusa*), pine and Japanese larch (*Larix leptolepis*).

Forests plantations in India have, generally, had a markedly different focus, with more than two-thirds designated as non-industrial plantations. Although many of the plantations were established to produce fuelwood, a large percentage have subsequently been harvested for construction purposes and pulp. In recent times, there has been a shift in planting towards industrial purposes. India's plantations are dominated by fast-growing hardwood species, particularly, acacias and eucalyptus. Teak (*Tectona grandis*) is commercially the most important timber species planted, totalling around 1 million hectares.

Indonesia has 9.8 million hectares of predominantly industrial plantations. Rubber (*Hevea brasiliensis*) is the most widely planted species, followed by teak, pines and *Acacia mangium*.

Thailand's plantations are similarly dominated by rubber, with teak being the second most important plantation species.

Overall, pine, eucalyptus and rubber are the most import plantation species grown in the region (Figure 2).



Source: FRA (2000).

Figure 2: Distribution of species in Asia and the Pacific

The dominant plantation species in Oceania is *Pinus radiata*. It accounts for 89 percent (MAF 2004) of the plantation area in New Zealand, and 59 percent in Australia (NPI 2004). Other pine species, most notably *Pinus caribaea* in Fiji, and *P. caribaea* and *P. oocarpa* in northern Australia make up the bulk of the softwood plantations. *Eucalyptus* species in Australia predominate in hardwood plantations although Fiji also has significant areas of mahogany (*Swietenia macrophylla*).

Both New Zealand and Australia commenced plantation programmes prior to 1930. Significant areas of plantations have now reached maturity and are being harvested. Substantial plantation areas in New Zealand and Australia are in second rotation, with a few in a third rotation. New Zealand, Australia and Fiji all anticipate significant increases in their plantation wood production during the next decade.

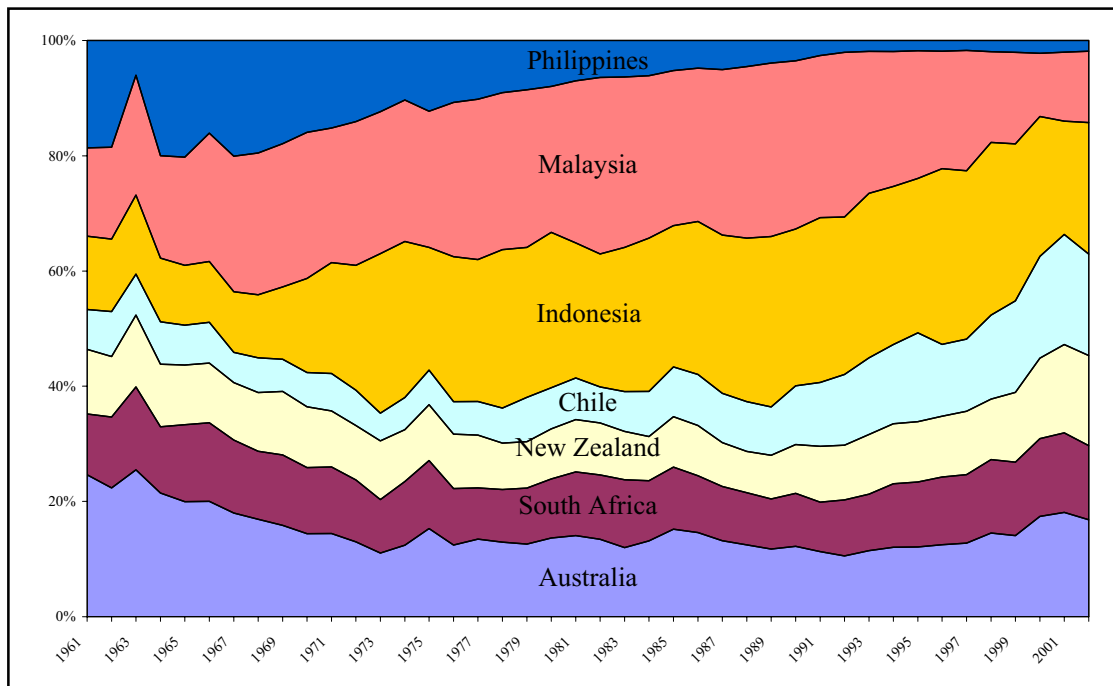


Production: shifting from natural forests to forest plantations

New Zealand, Australia, Chile and South Africa comprise a group commonly known as the southern plantation countries. These four countries are characterized by large, mainly *Pinus radiata*, plantation estates, with significant export potential and age-class profiles that imply rapid increases in production over the next 15 to 20 years. These new plantation supplies seem likely to significantly alter the composition of Asia-Pacific wood and fibre markets.

During the past 40 years, wood production has shifted from the natural forests of the traditional Southeast Asian producers to southern plantation countries (Figure 3). Large tracts of natural forests are likely to confer an advantage in the short-run, but that advantage will eventually diminish owing to advantages that plantations offer, that is, the ability to grow uniform trees quickly in accessible areas. Hence, the Philippines, having exhausted its natural forests during the 1960s and 1970s has become a minor player in forest product markets. Malaysia and Indonesia commenced logging in natural forests later and have exploited their natural advantage through the 1970s and 1980s. During the 1990s, the fast-growing plantations of the southern plantation countries began capturing the market share from Indonesia and Malaysia. At present the southern plantation countries account for more than 60 percent of roundwood production share of the seven countries, up from about 40 percent in the mid-1980s.

Wood production has shifted from the natural forests of the traditional Southeast Asian producers to southern plantation countries



Source: FAOSTAT (2004).

Figure 3: Comparative shares of wood production: Southeast Asian countries versus southern plantation countries

Future plantation wood production

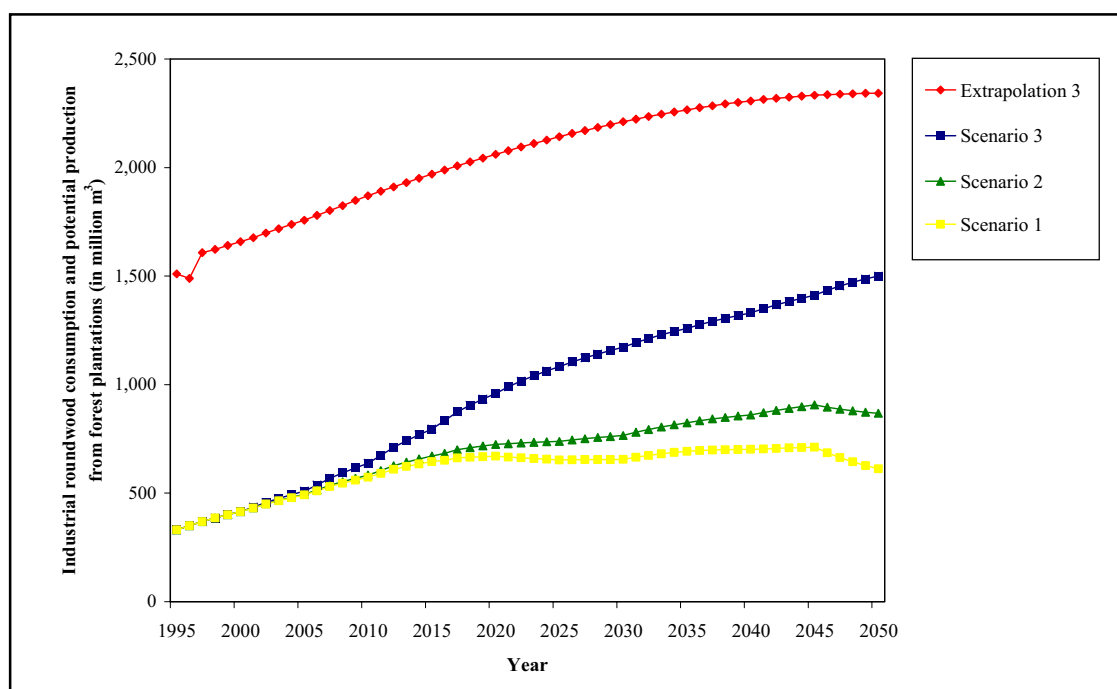
The future production of wood from plantations is of great interest to both the public and private sectors. Brown (1999) modelled three scenarios for future wood supply from forest plantations, as part of the plantation component of the *Global forest products outlook study*.

Scenario 1 provided a baseline forecast, by assuming that forest plantations are not expanded beyond their 1999 area and that all areas are replanted after harvesting.

Scenario 2 assumed that new planting would increase the forest plantation area at a constant rate of 1.2 million hectares *per annum* in total (equal to one percent of the area of forest plantations in 1999).

Scenario 3 assumed that the annual rate of new planting estimated in 1995 (4.71 million hectares in total) is maintained until 2010, after which it is reduced by 940 000 hectares at the start of each of the following decades (that is, until it declines to zero in 2050).

Figure 4 compares future wood production from industrial plantations under each of the three scenarios, with a forecast of total industrial roundwood consumption derived using long-term trend analysis, to 2050.



Source: Brown (1999).

Figure 4: Comparison of projections for industrial roundwood production with three plantation scenarios

Several points of interest can be noted from Figure 4.

1. The difference between the three forest plantation scenarios until 2010 is not significant. This is because trees already in the ground will determine production over the current decade.
2. The heavy weighting towards the youngest age-classes in the global distribution means that even Scenario 1 (zero new planting) shows a significant increase in wood production from forest plantations. Scenario 1 shows an increase in production from 331 million to 712 million m³. Note, however, this growth production would be insufficient to keep pace with the forecast growth in roundwood consumption, and additional new sources of wood or fibre would need to be found to meet further new demand.
3. Scenario 2 increases at approximately the same rate as projected new demand for roundwood. It shows an increase in plantation wood production to 906 million m³. Note, however, that under this scenario – to meet demands for industrial wood – current levels of harvesting in natural forests, recycling, etc. need to be maintained if no other new fibre sources are found, or efficiency is not significantly improved. This is, however, unlikely as the levels of harvesting in natural forest are decreasing and are likely to continue decreasing in the future due to the smaller area of available forest resources, increasing inaccessibility of the remaining forests and an increasing number of policies such as logging bans that have been imposed to protect the remaining natural forest resources.
4. Only Scenario 3, with its relatively large land-use implications, would enable forest plantations to substitute for wood production

from natural forests. Scenario 3 expands plantation production to 1.5 billion m³, approximately equal to current levels of global industrial roundwood consumption. Under Scenario 3, the forest plantation share of industrial roundwood production is estimated to increase from the current 22 percent, to 64 percent in 2050.

The long-term production forecast from forest plantations is very sensitive to the assumptions made about future forest establishment rates. The future rate of plantation establishment will be determined to a considerable extent by the availability of suitable and affordable land, policies, incentives, profitability of alternative crops, the opportunities that the Clean Development Mechanism (CDM) may offer, and perceptions of supply-demand balances for wood and fibre. In general, it is expected that plantations will supply a high proportion of raw material to fibre-based industries and for the production of utility sawntimber. High-quality hardwood timbers are likely to continue being sourced from natural forests, although plantation-grown teak can be expected to become increasingly important.

Alternative sources of wood and fibre

An increasing demand for wood and fibre has resulted in the identification of various alternative sources. There are a number of interesting sources in Asia and the Pacific including coconut palm, oil-palm, bamboo and agricultural residues. Although these sources cannot completely replace timber, they can supplement traditional wood resources, especially in the form of fibre.

Coconut palm (*Cocos nucifera* L.) has a long history of cultivation in the tropics, spanning some 4 000 years. The main product of the palm is coconut oil. There are some 10 million hectares of coconut palm plantations in the Asia-Pacific region (Durst *et al.* 2004). Large quantities of stems become available at the end of a rotation (50-60 years depending on the variety). The anatomical properties of the stem make it difficult to process the stem using conventional tools. Despite the fact that the lumber is not very durable, the relatively low cost of the material makes it appealing. Another advantage of coconut is the green image of the product, as it is an agricultural by-product.

Oil-palm (*Elaeis guineensis* Jacq.) is a plantation species widely grown for its oil. The area under oil-palm is rapidly increasing and many rubber plantation owners are switching to oil-palm due to the higher profit margins. By 2001, there were approximately 6 million hectares of oil-palm plantations, of which 80 percent are located in the Asia-Pacific region (Killmann 2001). Unlike the coconut palm, the stem of the oil-palm is not suitable for direct use as a wood substitute. However, research on the use of the empty fruit bunches for the production of Medium Density Fibreboard (MDF) has been carried out and subsequently, two plants have been established in Sabah and Peninsular Malaysia (Durst *et al.* 2004). Other potential uses for oil-palm residues include: moulded furniture, sawing and laminating palm stems, particleboard manufacture and the production of activated charcoal (Razak 2000).

As of 2001, there were about 4.8 million hectares of oil-palm plantations in the Asia-Pacific region

Although bamboo has a long history of use in Asia, it is increasingly becoming an important source of raw material for further downstream processing, as new uses for it have emerged. Traditionally the culms were used as a wood substitute for construction and scaffolding and the shoots of certain species were eaten. New processes use bamboo as raw material for particleboard, fibreboard, plybamboo, laminated boards, bamboo flooring and pulp and paper (Ruiz-Perez *et al.* 2001). Bamboo furniture is also a rapidly growing market segment. China and India have the world's largest bamboo resources, with 4 million hectares and 10 million hectares, respectively (Ruiz-Perez *et al.* 2001; Ganapathy 1997).

Agricultural residues are also becoming increasingly important sources of non-wood fibre. Straw, a by-product of grain production, is used extensively for the production of pulp and paper. It is also possible to produce a panel board, with similar characteristics to MDF, using straw. Bagasse, the fibrous residue that is left over after the extraction of juice from sugar cane, is used for producing paper in several countries, including India, the world's largest sugar-cane producer. The use of rice husks for the production of reconstituted panel boards is being investigated in Malaysia.

The Kyoto protocol and the role of plantations as carbon sinks

The Kyoto Protocol was negotiated in December 1997. It requires that developed countries as a group reduce their greenhouse gas (GHG) emissions by 5.2 percent compared to 1990 levels, between 2008 and 2012. The Kyoto Protocol recognizes forests, their soils and products in climate change mitigation. According to the protocol, reductions can be achieved by two means: (i) reducing the amount of emissions and (ii) increasing storage. Three so-called "flexibility mechanisms" were included in the Kyoto Protocol to help developed countries meet their reduction targets cost-effectively. These include Emission Trading, Joint Implementation and the Clean Development Mechanism (CDM). The latter enables developed countries to achieve a portion of their emission reductions by implementing carbon sequestration projects in developing countries.

Afforestation and reforestation were recognized as the only eligible land uses under the CDM. This offers interesting opportunities for the establishment of plantation forests for sequestering carbon. It has led to a steep increase in the establishment of plantations in developing countries with some 4 million hectares of plantations having been established for GHG mitigation (Carle *et al.* 2002). Most of these plantations have been established by international investors and international development banks, such as the World Bank. Despite the fact that certain aspects of the CDM are still under negotiation and the technical instruments and standards for carbon accounting are still under development, forest plantations have interesting prospects to be utilized as carbon sinks. It is anticipated that forest plantations will play an increasingly important role in carbon sequestration and the implementation of the Kyoto Protocol.

Some 4 million hectares of plantations having been established for GHG mitigation

Summary

The Asia-Pacific region has a large plantation resource, accounting for 61 percent of the global forest plantation area. Five of the top ten plantation countries are located in the region; together these countries account for 91 percent of the total plantation resource in the region. The rate of plantation establishment has increased dramatically during the 1990s. There has been a shift in wood production in the region, from predominantly natural forest production to plantation forest production over the past 40 years.

The demand for plantation wood is likely to increase in the future. The wood from plantations will be used as feedstock for fibre-based industries and for the production of utility sawntimber. High-quality timbers are most likely to continue to be sourced from natural forests, with the possible exception of teak.

Other sources of wood and fibre are becoming increasingly important. Coconut palm, oil-palm and bamboo are a few of the promising alternatives. Although these sources cannot replace timber entirely, they can supplement traditional wood resources, especially in the form of basic fibre.

The inclusion of reforestation and afforestation activities in the Kyoto Protocol offers interesting possibilities for plantation forests. To date, some 4 million hectares of plantations have been established for GHG mitigation.

Section 2

Incentives: key concepts, typology and rationale

While there is no dearth of definitions for incentives, a single agreed definition does not exist (Meijerink 1997). Defined in very broad terms, an incentive is anything that motivates or stimulates people to act (Giger 1996; cited in FAO 1999). Sargent (1994; cited in Tomforde 1995) defines incentives as signals that motivate action. Other definitions refer to the “incitement and inducement of action” (Enters 2001). Within the context of development projects, incentives have also been described as “bribes” and “sweeteners” (Smith 1998).

To be of interest and to have an impact, incentives need to affect the cost-benefit structure of economic activities such as plantation management. Hence, in the context of the regional study, incentives can be defined as *policy instruments that increase the comparative advantage of forest plantations and thus stimulate investments in plantation establishment and management.*

This definition is broader than the more narrow definition for subsidies. The latter are of a purely pecuniary nature and usually viewed as payments provided to reduce the costs of or raise the returns on an activity. The broader definition includes research and extension, which are important elements in supporting plantation development. The definition also includes sectoral and macro-economic policies which, as will be argued in the concluding chapter, establish much of the general investment climate and heavily influence the economic behaviour of individuals and corporations. Consequently, the spectrum of incentives is considerably broadened and a distinction is made between direct and indirect incentives (Figure 5).

The distinction between direct and indirect incentives is somewhat blurred. Direct incentives are designed to have an immediate impact on resource users and influence returns to investment directly. Indirect incentives on the other hand have an indirect effect through setting or changing the overall framework conditions within and outside the forestry sector. There are some overlaps. For example, tax concessions for plantation investors are a direct incentive, whereas general tax reductions for fuel are considered indirect incentives, because they lower production and transport costs within – as well as outside – the plantation sector.

***Direct incentives
are designed to
influence returns
to investment
directly***

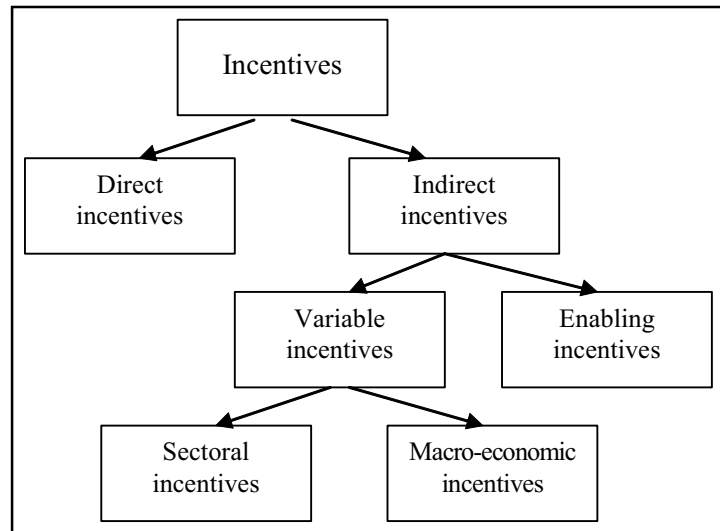


Figure 5: Typology of incentives

Subsidies for plantation schemes

Subsidies to the forestry industry in the developed world have far exceeded those provided by developing country governments. At present the average subsidy for plantation schemes in 11 EU countries is US\$1 421/hectare, with an additional US\$761/hectare for maintenance. This compares with subsidies of less than US\$400/hectare for most plantation schemes in South America. However, most developing countries with significant plantation interests have used, or continue to use, incentives and subsidies as a means of encouraging the industry. For example, between 1974 and 1994, the Chilean government spent some US\$50 million on afforestation grants. In Brazil, subsidies and taxation incentives were used to encourage the establishment of plantations, and in recent years Ecuador and Colombia have adopted a similar incentives model to Chile. Ecuador currently provides planting and maintenance incentives amounting to US\$300/hectare. Paraguay provides US\$350/hectare for planting and US\$100/hectare for maintenance for the first three years.

Source: Cossalter and Pye-Smith (2003)

Direct incentives are provided directly by governments, development agencies, non-governmental organizations and the private sector.

Direct incentives include the following:

- goods and materials (e.g. seedlings, fertilizers etc.);
- specific provision of local infrastructure;
- grants;
- tax relief or concessions;
- differential fees and access to resources;
- subsidized loans; and
- cost-sharing arrangements and price guarantees.

Indirect incentives can be divided into *variable incentives* and *enabling incentives* (Table 1). Variable incentives are economic factors that affect the net returns that producers earn from plantation activities. Enabling incentives on the other hand mediate an investor's potential response to variable incentives and help to determine land use and management (FAO 1999). They can also be viewed as elements in the investment environment that affect decision making.

A country’s enabling incentives determine to a considerable extent investment risks, and information about them needs to be constantly updated to guide investors.

Table 1: Distinguishing variable from enabling incentives

Variable incentives		Enabling incentives
Sectoral	Macro-economic	
Input and output prices Specific taxes Trade restrictions (e.g. tariffs)	Exchange rates General taxes Interest rates Fiscal and monetary measures	Land tenure and resource security Accessibility and availability of basic infrastructure (ports, roads, electricity etc.) Producer support services Market development Credit facilities Political and macro-economic stability National security Research and development Extension

In the Asia-Pacific region, virtually all of the incentives in Table 1 have been or are currently used somewhere to stimulate tree growing. There has been a gradual evolution in the way that governments in the region have provided encouragement, with increasing recognition that provision of enabling incentives, the removal of structural impediments and market distortions or the creation of an “overarching climate of enterprise” is the most effective (and economically efficient) incentive in the long run. This shift in thinking has also unfolded in Latin America with a move from subsidies as corrective measures to the removal of impediments (Haltia and Keipi 1997).

The “new” conventional wisdom

The “new” conventional wisdom does not advocate subsidies as corrective measures to offset distortions existing elsewhere in the economy; rather it proposes the direct elimination of those distortions.

Source: Keipi (1997)

Justification for providing incentives

Why are incentives necessary, or more specifically, what is the rationale for providing incentives to potential investors in forest plantation development? Why should taxpayers be interested in supporting the economic activities of others? Why should the private sector provide support to small-scale growers? If potential investors are dissatisfied with the low returns on their investments in plantations, would it not be more appropriate to suggest they invest in a more profitable land use?

Meijerink (1997) argued that incentives should only be applied for public goods. From an economist's perspective, incentives are meant to correct discrepancies between the financial attractiveness and the broader benefits to society (FAO 1999). Gregersen (1984; cited in Pardo 1990) pointed out that incentives from the public to the private sector are justified in an economic sense when one or both of the following conditions exist:

- Social benefits are greater than private benefits associated with a given private action; and
- Social costs are less than private costs associated with the given action and social benefits are at least equal to private benefits.

Where plantations provide environmental services such as watershed protection and carbon sequestration, incentives are appropriate because private net returns are often lower than social benefits. Real world incentives that fall into this category include those offered under the:

- Soil Bank Program, Agricultural Conservation Program and the Conservation Reserve Program in the United States of America;
- “Grain for Green Project” and the Great West Development Program in China;
- Landcare deductions for capital expenditures on soil conservation, prevention of land degradation and related measures in Australia;
- The Green Isarn Project in Thailand; and
- Benefit-sharing arrangements under joint forest management in India.

In each of these cases, incentives bridge the divergence between public and private goals and support activities that are primarily in the public interest.

Incentives are not needed when the private returns from plantation management exceed those from other land uses

Rice for trees

The “Grain for Green Programme” (in full, *Conversion of Farmland into Forests and/or Grasslands Programme*) introduced in western China in 2000, aims to reverse land degradation and soil erosion through the conversion of almost 15 million hectares of steep lands that are currently cultivated or barren into forest and pasture by 2010. It will do this by providing a mixture of food and cash subsidies in the first eight years (2 250 kg of grain in South China and 1 500 kg of grain in North China, and 300 yuan [US\$36] for management annually) and 750 yuan for seedling costs per hectare in the first year.

Source: Liu (2003)

Incentives are not needed when the private returns from plantation management exceed those from other land uses (Haltia and Keipi 1997; Williams 2001). In this case, the provision of incentives translates into a misallocation of public sector resources, merely enabling investors to earn “above normal” returns.

While addressing environmental concerns is an important justification, others include the goal of generating employment (particularly in less developed rural areas), and to jump-start the development of national forest industries in countries with comparative advantages such as Indonesia and Chile (Williams 2001). Incentives may be particularly justified to increase the pace of plantation development where a developing industry requires a minimum supply of raw material (Scherr and Current 1999). A rapid increase in scale is especially critical in commodity industries like pulp and paper, where economies of scale are essential for competitive operation (Clapp 1995).

The downside of incentives

The use of incentives, especially direct incentives, to induce particular behaviour, has been at the centre of intense, and sometimes fierce, debates. Incentives, particularly subsidies⁴, are not without their critics who contend that incentives can lead to economically incorrect allocation of productive factors.

Programmes pressured to show progress frequently offer incentives to people “to win friends and influence people by resorting to handouts under the guise of incentives” (Smith 1994, p. 8). This should not come as a surprise considering that a briefing note for project desk officers, consultants and on-site project staff defined incentives in the following way (GTZ 1995):

Incentives are understood to be project measures geared to motivating the local population to use their natural resources on a sustainable basis.

Attractive incentives offered in the early stages of a new initiative or project run the inherent risk of simply “buying” participation; the interest shown is not of a long-term nature and participation is just a pretense. Especially in natural resource management projects, subsidies have often succeeded in stimulating the adoption of conservation measures that were abandoned or even actively destroyed once payments ceased (Lutz *et al.* 1994). The same has been observed for plantations (Sawyer 1993). It should be obvious that particularly with regard to commercial activities, incentives should act as a catalyst and should not be the cause for change. If an incentive is the primary cause for behavioural change, the discontinuation of that incentive is likely to become a cause for reversal.

Related to the issue of triggering activities for the wrong reason, sometimes people defer activities they would normally initiate without assistance until they have been given an anticipated incentive. In the worst-case scenario, the provision of incentives might have unintended, perverse side effects. For example, incentives for plantation development may contribute to unplanned conversion of natural forests. A lack of financial support for the management of plantations coupled with incentives limited to plantation establishment

Attractive incentives run the inherent risk of simply “buying” participation

⁴ In 2001, the World Bank welcomed subscribers to an electronic seminar on “The political economy of persistent and perverse subsidies.”

may lead to intensive planting activity without any real expansion of the total plantation area in the long run. Young plantations are simply destroyed and the land replanted to capture the financial support.

As Tiffen (1996, p. 168) has pointed out, “even poor people can find capital for what is really profitable....” Hence, low levels of investments in plantations, especially by small-scale farmers, may not be caused by a lack of capital but rather by insufficient information about suitable technologies, market opportunities and legislation, particularly related to environmental issues and taxation. The risk is that the reasons for inaction may not be properly understood and that financial incentives, provided in lieu of advice, are wasted. Technology transfer and extension programmes are the appropriate medicine for lack of knowledge.

Crowding out of investment

The “crowding-out effect” occurs when government spending directly substitutes for private sector expenditure that would otherwise have occurred. Thus, a degree of crowding out occurs when incentives are provided to plantation growers who would have planted trees without them – or when a higher rate of incentive is paid than would have been necessary to induce a grower to plant trees. Thus, crowding out is a theoretical measure of the overall efficiency of an incentive. In practice, of course, crowding out is impossible to measure, except in very broad terms.

Among most of the case study countries, very little work has been done to measure the relative efficiency of incentives. In Indonesia, it can be observed that during the 1990s, subsidies encouraged around 900 000 hectares of planting under joint venture arrangements, while independent private companies planted 700 000 hectares during the same period, receiving no such subsidies. The significant planting carried out by private companies that were ineligible for subsidies suggests an element of crowding out was likely present. It also shows that subsidies were not absolutely necessary to encourage the establishment of short-rotation plantations.

Zhang (2004, see full report) reports several studies examining crowding-out effects in the United States of America:

Among the existing landowner behaviour studies, Boyd (1984) and Boyd and Hyde (1989) find that landowners who would have invested on their land anyway would use public funding instead. Bliss and Martin (1990) report that cost-sharing does not change the level of management practiced by active forest managers, and Cohen (1983) concludes that the substitution effect of public for private funding in tree planting on non-industrial private forestlands is between 30 to 50 percent, while Zhang and Flick (2001) find a smaller (17 percent) impact. On the other hand, both de Steiguer (1984) and Lee et al. (1992) find no evidence of such substitution effect on plantation investment on non-industrial private lands.

Section 3

WHAT DOES IT TAKE? STUDY OUTCOMES

The purpose of this section is to provide a synthesis of the nine country case studies, identify common threads and differences and present guiding principles for encouraging private sector investments in forest plantation development.

In general, the long-term nature of tree growing makes investments in tree plantations distinct from many alternative investment options. The synthesis therefore starts with a brief illustration of the characteristics in forest plantation investments.

Of all the incentives that have been provided not one emerged as definitely “perverse.” Incentives are neither inherently good nor bad. Viewed as policy instruments, their impacts depend very much on when they are used during the development of a country’s plantation estate. It is useful therefore to look closely at the stages that the countries have reached, i.e. the continuum from initiation to maturation.

Direct and indirect incentives can be presented in a hierarchical order of sophistication. The order starts with the relatively simple provision of free seedlings, which is still a common incentive offered around the world. It continues through such incentives as tax relief for individual entrepreneurs or adjustments of interest rates, which favour all investors. The order reaches its highest level when policy instruments are applied to create a favourable and attractive investment climate through the reduction of risks and the removal of structural impediments. The analysis that follows progresses up the hierarchy and discusses aspects surrounding the provision of incentives and their impacts.

A significant, but not surprising, conclusion is that there is no single path to success. If this were the case, a blueprint for providing incentives could be prepared. It is however possible to identify some guiding principles that, if followed, will contribute to achieving a viable plantation sector. The principles are presented at the end of the chapter in the form of “do’s and don’ts” for plantation policies.

***Incentives are
neither good nor
bad***

Characteristics of forest plantation investments

There are several characteristics of plantation investments that strongly influence investors’ decision making relative to alternative

The long gestation period adds greatly to the uncertainty and risk of plantation investments

investment options. The most obvious is the long-term nature of growing trees, with a very high proportion of expenditures early on, and most of the revenues coming only at the end of a rotation. In short-rotation plantation forestry, rotations can be as short as five years. Typically, however, maturity is not reached before years 10 to 20, depending on the production objectives. In temperate regions rotations are often much longer. This long gestation period adds greatly to the uncertainty and risk of plantation investments. The lack of regular cash flow often leads to liquidity problems and there are usually considerable difficulties in withdrawing from the investment before the trees have reached maturity. In addition, there are inevitable uncertainties about future prices of products and inputs – especially regarding the prices and marketability of the final plantation harvest.

Because of progressive income tax systems (under which tax rates escalate with increased income) and the large but periodic returns from a single plantation, individual investors can be hit with the highest marginal taxation rate in the year of harvest unless tax relief is provided. However, if continuous replanting takes place after clear-felling, then a less fluctuating revenue stream can be expected in the long run. The minimum commercially viable investment in a plantation is also likely to be large, relative to an investment in agriculture on the same land.

These uncertainties and characteristics give ample cause for investors to shy away from the plantation sector despite apparent advantages of investing in plantations (e.g. expected increases in demand for wood products, diversification of investment portfolios, assuring long-term supplies for downstream industries, potential profits in the long run). Thus, there remain regular calls for assistance in the form of incentives.

A brief history of plantations in the study countries

The impact of incentives on plantation development differs from country to country, even where situations seem similar. The countries included in this study in which plantation development is often considered to be successful (for example, Australia, New Zealand, United States of America) are all economically developed countries where the overall importance of agricultural production in the economy has declined relative to the other sectors, agricultural intensities and productivity are high, population pressures are low and the majority of people reside in urban areas (Tables 2 and 3).

The decline in the importance of agricultural production in Australia, New Zealand and United States of America has made (especially marginal) agricultural areas more readily available for growing trees, although in recent years tree growers have lamented the shortage of suitable land at affordable prices. In the other six countries, with perhaps the exception of Malaysia, land availability – especially access to suitable land with a clear title – remains a severe constraint. Even in Peninsular Malaysia, potential investors perceive land shortages as a constraint to tree growing (Krishnapillay and Ong 2003).

In recent years tree growers have lamented the shortage of suitable land at affordable prices

Table 2: Basic country data (2002)

Countries	Land area ('000 ha)	Population				Economic indicators	
		Total (millions)	Density (pop./km ²)	Annual rate of change 1996-2002 (%)	Rural (%)	GNI Per capita, (US\$)	Annual growth rate of GDP
Australia	768 230	19.6	2.5	1.1	9	19 740	3.5
China	932 742	1 281.0	137.3	0.8	62	950	8.0
India	297 319	1 048.3	352.6	1.7	72	470	4.6
Indonesia	181 157	211.7	116.9	1.3	57	710	3.7
Malaysia	32 855	24.3	74.0	2.3	41	3 540	4.1
New Zealand	26 799	3.9	14.6	0.7	14	13 710	3.8
Philippines	29 817	79.9	268.0	2.2	40	1 020	4.6
Thailand	51 089	61.6	121.0	0.7	80	1 980	5.2
U.S.A.	915 895	288.4	31.5	1.2	22	35 060	2.3

Note: Data derived from <http://www.worldbank.org/data/countrydata/countrydata.html>

Common to all countries, natural forests have been, and in some countries (for example, Indonesia and Malaysia) still are, viewed as a considerable land reserve for agriculture and industrial development. In most countries, forest conversion rates were high as populations expanded and as long as agriculture was a considerable contributor to national development. At the same time, natural forests were viewed, overtly or intuitively, as standing capital to be liquidated to fuel economic development. As long as natural forests were extensive, there was no apparent reason to plant trees. In fact, forests were – and in some countries still are – viewed as barriers to development without due recognition of their environmental and other values.

Table 3: Forest resources

Countries	Land area ('000 ha)	Forest area, 2000 (or more recent figures)				
		Total forest ('000 ha)	Percentage of land area	Area per capita (ha)	Forest plantations ('000 ha)	Plantation area per capita (m ²)
Australia	768 230	165 896	22.0	8.7	1 666 ¹	827
China	932 742	163 480	17.5	0.1	46 700	35
India	297 319	67 554	21.6	0.1	32 578 ²	330
Indonesia	181 157	104 986	58.0	0.5	9 871	470
Malaysia	32 855	19 292	58.7	0.9	1 750	800
New Zealand	26 799	7 946	29.7	2.1	1 827 ³	4 030
Philippines	29 817	5 789	19.4	0.1	753	100
Thailand	51 089	14 762	28.9	0.2	4 920	810
U.S.A.	915 895	225 993	24.7	0.8	16 238	590

Source: FAO (2001)

¹ as of 2003 (NFI 2004)

² as of 2001 SFI (undated)

³ as of 1 April 2003 (MAF 2004).

Over recent decades, this view has slowly changed and the widening gap between demand and domestic supply (the fear of a timber famine) stimulated significant activities in the plantation sector in Australia, New Zealand and the United States of America as early as the 1920s. Notwithstanding the land shortage, in many countries, the plantation area has grown considerably. Does this mean that the

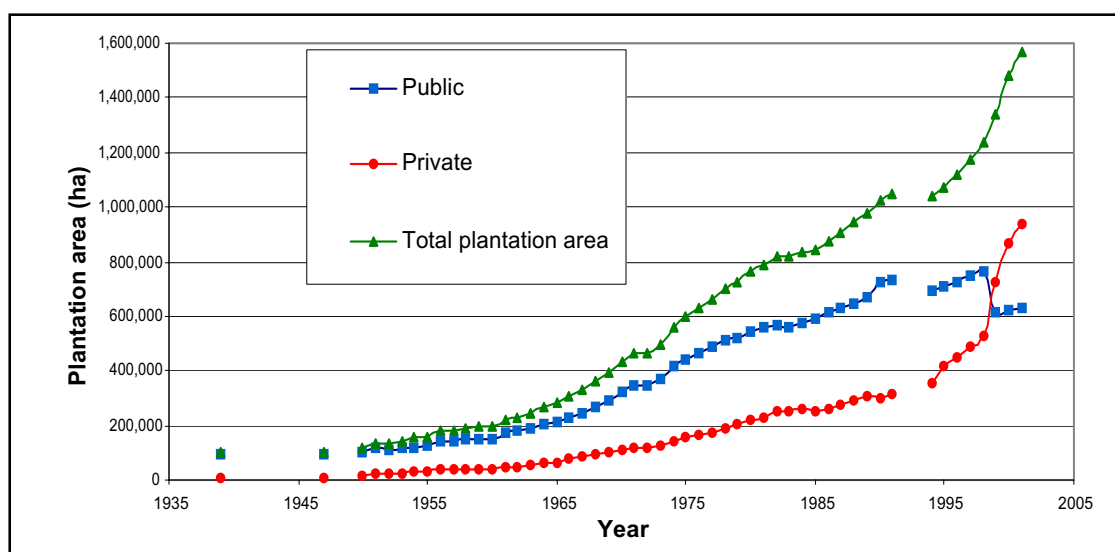
conditions for plantation development have become more encouraging and/or that governments have selected the right incentives to turn an inherently risky investment into a lucrative venture? Before attempting to answer this question, the analysis turns briefly to forestry development and the historical planting trends in the countries studied.

Australia

Forests in Australia cover 155 million hectares, with most classified as open savannah woodlands. Plantations make up slightly more than one percent of the forest area but contribute 60 percent of annual timber production. State forestry agencies initiated efforts to establish plantations in the late 1800s. Until the 1950s, the private sector played only a minor role in the plantation sector. By the early 1970s, around 500 000 hectares of plantations (predominantly softwoods) had been established. Steady progress until 1990 saw the Australian plantation estate increase to more than 1 million hectares. Since 1995, a rapid acceleration in private planting (predominantly hard-woods) has seen the Australian plantation estate increase to about 1.67 million hectares (NFI 2004; Figure 6).

Large areas of plantations were transferred from the public to the private sector in the late 1990s

Large areas of plantations were transferred from the public to the private sector in the late 1990s, through privatization/corporatization of state (public) plantations. Today, about 57 percent of the plantations are in private hands. In 1997, the industry and government developed a partnership, called *Plantations for Australia: The 2020 Vision*, to develop plantations and processing industries. The partnership aims to extend the plantation estate to 3 million hectares by 2020. However, since 2000 annual planting rates have decreased from about 137 500 to 42 300 hectares in 2003, mainly due to a shortage of suitable land at affordable prices and uncertainty over tax provisions. This latter uncertainty was resolved only in April 2002 (NFI 2004). Hence it is questionable whether the target set by *The 2020 Vision* can be reached.



The 2000/2001 period was derived from only two years of data and may be higher than the long-term plantation expansion rate.

Figure 6: Australian forest plantation development by tree ownership#

China

Forests in China cover 163.5 million hectares, with plantation forests totaling 46.7 million hectares (Table 4), or 29 percent of the total forest area. For much of the twentieth century, the forest area of China was in decline, reaching a low point measured by the second forest inventory (1977-1981) of 115.3 million hectares (12 percent national forest cover). Much deforestation was a direct result of overharvesting and insufficient investment in forest regeneration. This negative trend was reversed with the initiation of the Three-Norths Shelterbelt Development Programme in 1978. By 1999, more than 25 million hectares had been planted under the programme. In the late 1980s, China started a number of large-scale afforestation and reforestation projects, which accelerated planting rates even further. Extensive tree planting has been coupled with logging bans in natural forests, which highlights the urgency of a shift to wood production from plantations. Moreover, the government is seeking to raise the forest cover to 19.4 percent (by 2010) and 26 percent (by 2050). Recent statistics suggest that plantation establishment has increased significantly. The establishment rate for 2002 is reported to have exceeded 7 million hectares. Forest lands in China are owned by either the state (42 percent) or forest collectives (58 percent), with most collective forests managed by rural households under contractual arrangements. Collectives, including the private sector, dominate ownership of forest plantations, while state forests primarily comprise natural forests.

Extensive tree planting has been coupled with logging bans in natural forests

Table 4: Change in the area of total plantation forests* (million ha)

	Area of closed plantation	Net increase between inventories
1 st Inventory	23.69	NA
2 nd Inventory	22.19	-1.50
3 rd Inventory	31.01	8.82
4 th Inventory	34.25	3.24
5 th Inventory	46.67	12.42

Source: SFA (2000)

* Total plantation forests include plantations, economic forests and bamboo forests.

India

In India, forests cover 67.5 million hectares or 22 percent of the total land area. Forest plantations total 32.6 million hectares, constituting more than 50 percent of the total forest area. India's forests are under tremendous pressure due to the country's large population. Approximately 3.4 million hectares of forest were cleared between 1951 and 1972, mainly for agricultural purposes. The planting rates between 1956 and 1979 ranged from 62 000 to 244 000 hectares (Pandey 2000). Until the mid-1970s, forest plantations played only a minor role, extending over approximately 3 million hectares. This changed in 1976, when a National Commission on Agriculture report identified the potential of plantations to meet shortfalls in industrial wood and fuelwood production. The following 15 years were marked by numerous social forestry projects, which led to an annual

Annual planting rates have declined slightly to about 1.5 million hectares

expansion of the plantation estate by about 1.7 million hectares. Donor support for most forestry projects ended in the early 1990s. This triggered a shift from social forestry to Joint Forest Management (JFM) – by 2003 more than 84 000 JFM groups were managing over 17 million hectares of forest land (Bahuguna 2004) – and enabled the private sector to claim a greater stake in forest plantation development. In recent times, annual planting rates have declined slightly to about 1.5 million hectares. Of the total forest plantation area of 32.6 million hectares more than 10 million hectares were planted by farmers and public and private institutions with seedlings distributed by state forestry agencies (Pandey 2000).

Indonesia

Indonesia has undergone significant deforestation, with around 60 million hectares of forests cleared since 1950. Officially, the country’s forest area stands at around 105 million hectares (FAO 2001), although numerous sources estimate forest cover has fallen below 100 million hectares in 1997 (FWI/GFM 2002). The current rate of deforestation is officially acknowledged to be around 2 million hectares *per annum*, which implies actual forest cover may well have fallen below 90 million hectares. Indonesia has almost 10 million hectares of forest plantations, including approximately 3.5 million hectares planted with rubber (*Hevea brasiliensis*). Until about 1990, the involvement of the corporate sector in plantation development was negligible. On the other hand, smallholders had always played an important part in the plantation sector and had established 4.6 million hectares as early as 1969 (Booth 1988; cited in FWI/GFM 2002). Officially, between 1990 and 1997 (when Indonesia was affected by the Asian financial crisis, about 1.6 million hectares were planted), although doubts about the accuracy of this figure remain. The crisis, subsequent political changes, poor law enforcement and land-use conflicts continue to discourage investments in Indonesia’s forestry sector. The planting rate has dropped from 230 000 hectares in 1997 to 78 000 hectares in 2000.

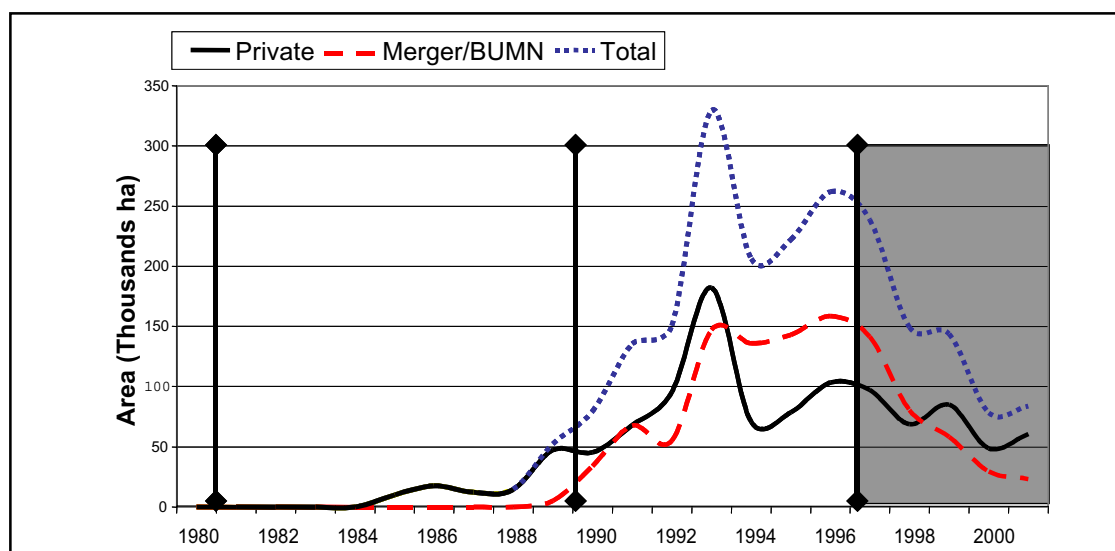


Figure 7: Annual plantation development in Indonesia (1998-2002)

New Zealand

New Zealand's forests cover more than 7.9 million hectares, of which about 1.8 million hectares are plantations. Large-scale plantation establishment began in the early twentieth century, with a significant acceleration during the Great Depression of the 1930s. By 1936, almost 300 000 hectares of plantations had been established. The government initiated a second wave of tree planting in the early 1960s, driven by Forest Service planting and incentives to the private sector. By the mid-1980s, the national plantation estate covered more than 1 million hectares. Large-scale deregulation of the New Zealand economy included the privatization of many state-owned assets including the vast majority of plantation forests. Since the mid-1990s, a third wave of private sector planting has markedly expanded the plantation forest area in New Zealand. New plantings peaked in 1995, when close to 100 000 hectares were established (Figure 8). At 14 900 hectares in 2003, new planting is well below the average afforestation rate of the last 30 years (MAF 2004).

New plantings peaked in 1995, when close to 100 000 hectares were established

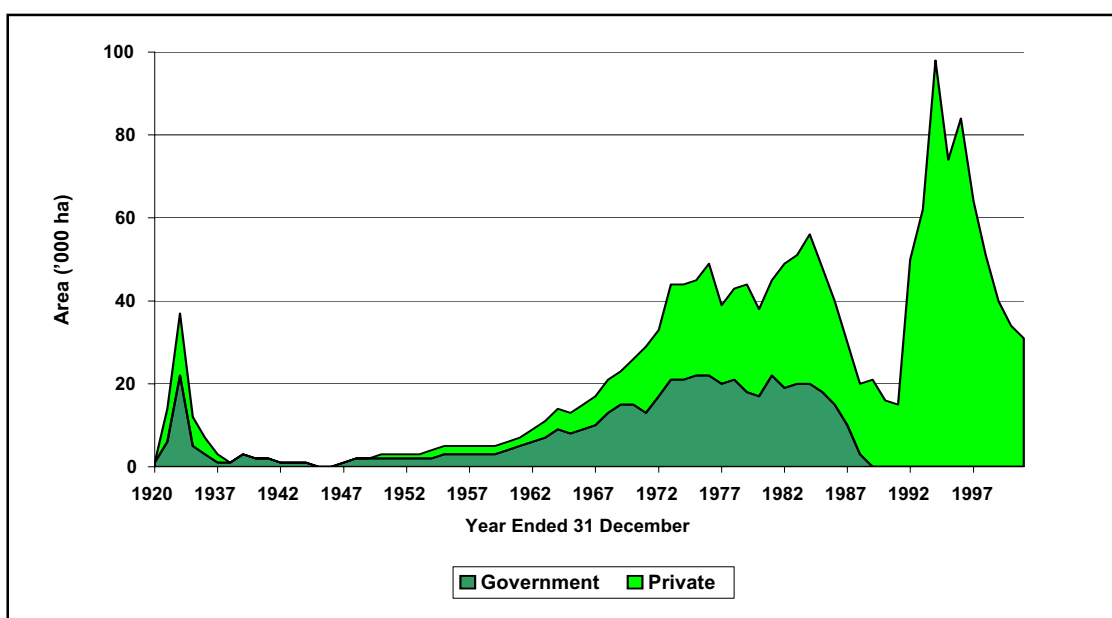


Figure 8: Annual government and private new planting in New Zealand

The Philippines

In the Philippines, forests cover 5.8 million hectares or 19 percent of the total land area. Forest cover has declined substantially since the mid-1930s, when the natural forest area was estimated at 17 million hectares, and deforestation remains a problem. Through the 1950s until the late 1970s, forestry was a mainstay of the Philippine economy. Forest plantation establishment in the Philippines largely dates from the *Presidential Letter of Instruction No. 145* in 1973, which issued a directive to promote the establishment of plantations and tree farms. Between 1980 and 1985, plantation development was accelerated through the Industrial Tree Plantation (ITP) Programme

that attempted to directly involve timber license agreement holders in tree growing. However, the bulk of the plantations were established by the government. Of the 750 000 hectares of plantations established to date, most were planted in the late 1980s and early 1990s, with very little expansion since the Asian financial crisis started in 1997.

Table 5: Forest plantings of the government and private sectors in the Philippines (ha)

Period	Government (includes contract reforestation from 1989 onwards)	Private sector		
		TLA reforestation compliance	Industrial wood planting	Planting for environmental purposes
Before 1980	184 029	67 689	6 634	15 358
1980-1985	179 389	111 300	20 681	18 653
1986-1992	425 802	132 956	28 803	6 130
1993-1998	147 609	95 138	18 901	27 048
1999-2001	69 799	8 893	3 421	4 561

Sabah (Malaysia)

Forests in Sabah (Malaysia) cover 4.56 million hectares, or almost 61.8 percent of the total land area of the state. Almost two-thirds of the plantations in Sabah have been planted since 1990. In 2001, plantations extended across 146 311 hectares. *Acacia mangium* is the most common plantation species, comprising more than half of all forest plantations. Forest plantation development started in 1973. In contrast to Peninsular Malaysia, tree planting was initiated through state corporations and later was followed by private and public companies. During the 1990s, annual planting rates averaged about 10 000 hectares. Despite the government's efforts to encourage forest plantation development, tax incentives alone did not sufficiently stimulate investments in tree growing. This is clearly reflected in that the current establishment ratio of oil-palm to forest plantations is about 6:1. Between 1995 and 2000, the area under oil-palm increased twice as fast as forest plantations. Between 2000 and 2001, forest plantations even declined by approximately 8 000 hectares. There are several reasons for the lack of interest in forest plantations including limited land availability, high land rents and premiums (a one-time payment) for forest plantations compared to other land uses, competition with agricultural plantations (mainly oil-palm), and the much higher financial returns that can be gained by investing in oil-palm plantations.

***In Sabah,
the current
establishment
ratio of oil-palm to
forest plantations
is about 6:1***

Thailand

Forest cover in Thailand totals 14.8 million hectares, with a plantation estate comprising 4.9 million hectares, or 33 percent of the total forest area. Thailand's plantation estate is dominated by rubber plantations, which constitute 43 percent of the total plantation area. In 1961, the country was estimated to have forest cover amounting to 27.4 million hectares. During the next 30 years, forest cover declined

by approximately 45 percent, prompting the government to impose a total ban on harvesting in natural forests in 1989, in the aftermath of a major flashflood in Southern Thailand. Plantation development over the same period was modest. Between 1961 and 1991, the Royal Forest Department, the main engine of plantation development (with the exception of rubber plantations), established 540 000 hectares of forest plantations. The turning point in Thailand's forestry sector was the imposition of the logging ban. In late 1992, the Royal Forest Department was formally directed to shift its focus from forest exploitation to forest conservation. The Re-afforestation Act of 1992 was specifically designed to encourage the private sector to develop forest plantations. For the next five years, the government initiated numerous projects (for example, the Private Reforestation Extension Project, Fast-growing Trees Reforestation Project, the Reforestation and Extension Project in the Northeast of Thailand), which triggered a surge in plantation development. There is a severe lack of accurate data on area covered by plantations for most species. It appears that between 1986 and 1997 the area planted with *Eucalyptus* increased from 53 500 to 438 500 hectares. However, as in Indonesia, the expansion in Thailand was short-lived owing to the Asian financial crisis. Only rubber plantations have continued to attract some interest in recent times (Figure 9).

The Re-afforestation Act of 1992 was specifically designed to encourage the private sector to develop forest plantations

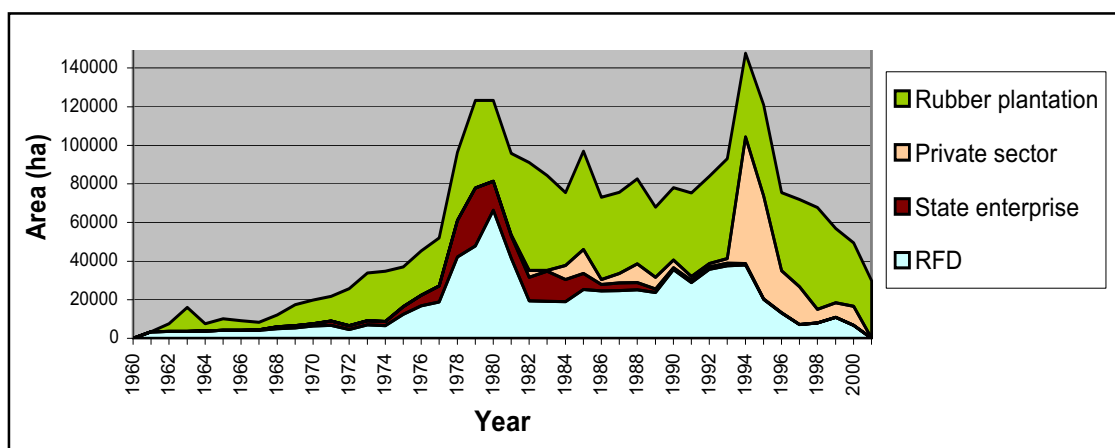


Figure 9: Annual planting rates of forest and rubber plantations between 1960 and 2001

United States of America

The United States of America has approximately 226 million hectares of forests extending over almost 25 percent of the country. Two-fifths of the country's forests and other wooded lands are owned by the state (much of this in the west and mountainous regions, and Alaska) and other public institutions; most of the remainder is owned by private individuals and forest companies. Forest plantations cover 16.2 million hectares, and constitute approximately 7 percent of all forests. Tree planting was of little significance before the Second World War. Between 1945 and 1976, it was fuelled by high timber prices, technological advances and favourable tax policies. Private owners planted 11.7 million hectares during the period. Private tree-planting areas increased 90-fold from an annual area of

Private tree-planting areas increased 90-fold between 1946 and 1976

6 408 hectares in 1946 to 579 000 hectares in 1976, representing an annual increase of 16 percent. From 1977 to 1999, there was a phase of steady growth. The area planted annually reached a record level of 1.3 million hectares in 1988, when tree-planting under the Conservation Reserve Program was at its peak (Figure 10). At the same time, private tree planting still expanded but at a much lower annual rate of 2.4 percent. In 1999, the private tree planting area was about 1 million hectares. The rate of tree planting by the forest industry declined during the second half of the 1990s owing to the sluggish prices of forest products, restructuring of the forest industry, the sale of timberlands to other corporations and the forest industry firms' new emphasis on productivity rather than size of timberland ownership.

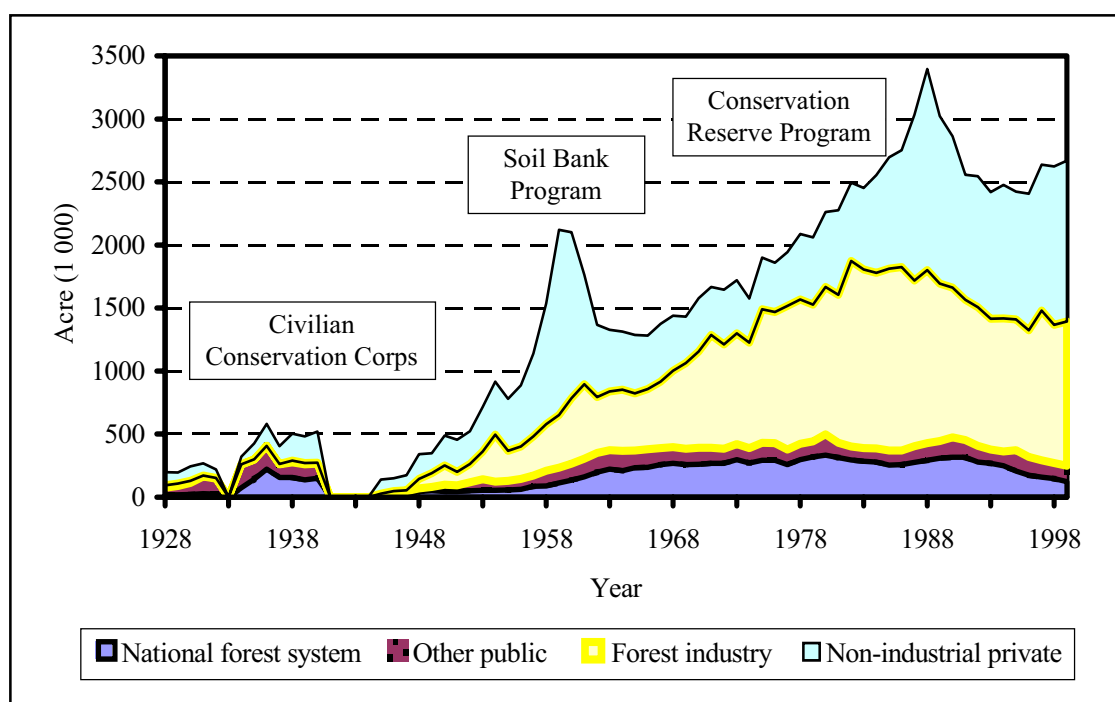


Figure 10: Tree planting in the U.S.A., 1928-1999

Similarities and differences in plantation histories

While there are some clear differences with regard to forest plantation development in the nine countries, there are also some similarities.

Although in some countries data are of variable quality, which complicates an assessment of developments in the forest plantation sector, two general conclusions can be drawn. First, there has been a pronounced shift from public to private sector involvement, which includes large-scale corporate investors, forest industries, farmers and local communities. In Sabah and the United States of America, the bulk of plantations has always been in private or semi-private hands. In several countries, the government had initiated tree growing on its own or with the assistance of donor-funded projects. Although in most countries there have been long-running attempts to involve the private sector, greater participation by private growers started only during the

1980s and in some countries (for example, Thailand, Indonesia) only in the 1990s.⁵ Shifts were most dramatic in New Zealand where the government sold off most of its plantations during the 1990s. Of the 1.827 million hectares plantation estate, today the State holds only a meager 87 000 hectares (MAF 2004).

Second, most of the plantings started during the 1980s peaked during the mid- to late 1990s and have since slowed, with the exception of China. There are numerous reasons for this quite uniform development. Australia, New Zealand and the United States of America have reached a maturation or consolidation stage, although each country's forest policy envisages a continued expansion in the plantation estate. However, land-use competition and lower than expected forest product prices since the price spike of the early 1990s, have dampened investor interest to some extent. Also, the number of plantations that are reaching the end of their first rotation is increasing steadily. For example, in parts of Australia, plantations are into their third rotation (Roberts 2002) and the area harvested is increasing rapidly, so that some new investment funds are being directed to re-establishing sites after harvesting, rather than planting of new sites (NPI 2004). In other words, reforestation is replacing afforestation, a clear indication of a mature plantation sector.

China and India find themselves in the early acceleration stage. The economies of both countries have been growing steadily during the past 10 years. This development has freed financial resources for the expansion of plantations. The transfer of responsibilities to communities (India) and households (China) also assisted state efforts in tree growing. Due to land shortages in India (mainly artificially generated due to land ceiling laws⁶) progress in plantation development has somewhat slowed, but maturation is not yet in sight. The private sector shows great interest in covering larger areas with trees and many companies collaborate closely with farmers in wood production (Lal 2004).

Indonesia, the Philippines and Thailand are still at the initial stage of plantation development. This is not to say that tree growing in these three countries does not have a history. It is rather that the involvement of the private sector is in its infancy. There are two main reasons for this. First, for decades the three countries viewed their natural forests as an inexhaustible resource. To some extent, this continues to be the case in Indonesia. In the Philippines and Thailand, however, the imposition of logging bans indicates that forest departments have had a change of mind. Both countries were unprepared for the impacts of logging bans on wood supplies. Although substantial efforts were undertaken to involve the private sector in tree planting and, sometimes, generous direct incentives were offered, progress came to almost a complete halt when the Asian financial crisis hit in 1997. Although developments in Indonesia are not a mirror image of what has happened in Thailand and the

***Australia,
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Thailand are still
at the initial stage
of plantation
development***

⁵ This assessment excludes the fact that for decades smallholders in a number of countries contributed quite substantially to plantation development.

⁶ The land ceiling laws do not allow the holding of large areas (maximum is 21.85 hectares) by the private sector.

Philippines, private sector development has never really got off the ground. Annual planting rates between 1993 and 1998 averaged 250 000 hectares in Indonesia, but these were reduced to negligible levels in the late 1990s. The former approach to large-scale plantations led to land-use conflicts and a new beginning will have to be made. Also, as Potter and Lee (1998, cited in Williams 2001) observed, even the subsidized returns from fast-growing plantations, the industrial timber plantations, or *hutan tanaman industri* (HTI), were rather unattractive. Oil-palm on the other hand was, and still is, a lucrative crop.

Sabah is a special case. State corporations and companies played a major role in tree growing right from the start in 1973. Planting rates have been steady, although the recognition that considerably higher returns could be achieved on alternative investments (such as oil-palm), has led to a decline in interest. Plantation development has never accelerated sufficiently to reach the maturation stage and currently the area covered is barely stable or perhaps even in decline.

Use of incentives in Asia and the Pacific

A variety of incentives have been used throughout the Asia-Pacific region. Comparisons among the studied countries are necessarily broad, since even schemes that are generically similar differ in detail. For example, there is little potential for analysing the “price sensitivity” of plantation growers to various cash grant schemes, since circumstances in different countries (and over time in the same country) vary markedly. Similarly evident is the incompatibility of various tax concessions offered in countries. However, a broad evolutionary hierarchy can be perceived in the types of incentives offered at different stages of plantation development (Figure 11).

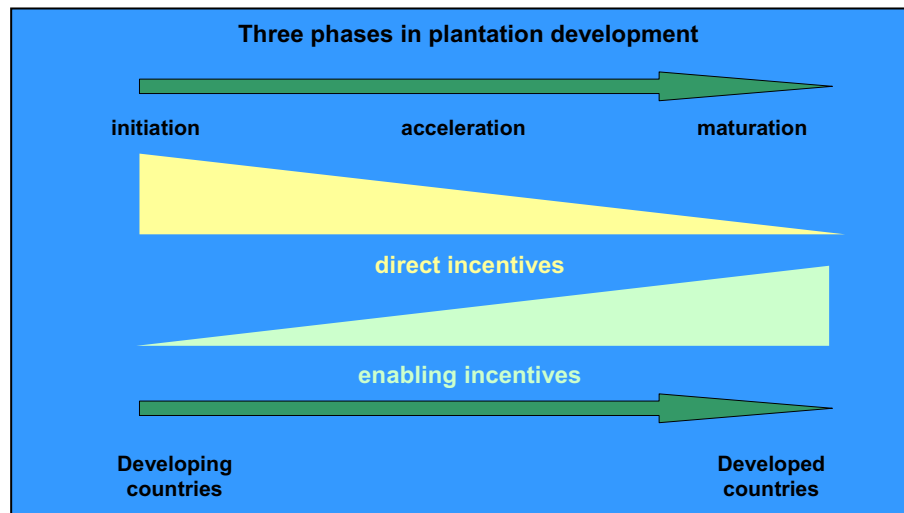


Figure 11: Incentives and plantation development over time

In most countries covered by the study, forest plantation development on a significant scale was initiated by the State, which supports the argument that an initial critical mass is necessary to ensure private-sector involvement in plantation development. Once the

involvement of the private sector is sought more directly, the use of incentives appears to progress gradually from provision of free inputs, to grants and loans, to tax concessions, to joint venture arrangements and finally to a focus on creating an enabling environment and removing structural impediments (Table 6).

Table 6: Plantation development and incentives (reported examples)

Country	State planting	Low-cost seedlings	Land grants	Nursery subsidies	Survival incentives	Grants to growers	Concessionary loans	Tax concessions	Joint venture arrangements	Research and extension	Resource security	Focus on enabling incentives and removal of structural constraints
Australia	X						X	X	X	X	X	High
China	X	X	X			X	X			X	X	Medium
India	X	X	X	X	X	X	X		X	X		Low
Indonesia	X					X	X	X		X		Low
New Zealand	X	X	X			X	X	X	X	X	X	High
Philippines	X		X				X	X		X		Low
Sabah (Malaysia)	X							X		X		Medium
Thailand	X	X				X	X			X		Low
U.S.A.	X	X	X			X		X	X	X	X	High

Early government efforts to engage the private sector in tree planting have tended to focus on the provision of physical incentives. In the United States of America and New Zealand, one of the earliest incentives was land grants, which encouraged settlement and, under certain conditions, tree planting. As long as governments maintained extensive land banks in sparsely settled regions this was a relatively low-cost incentive, which promoted both tree planting (not necessarily very effectively) and settlement. More recently, China has provided significant land allocations to farmers for tree growing.

The provision of free-of-charge seedlings and fertilizer has been a common physical incentive. Such free inputs are appealing because they are straightforward and less intimidating – especially to small-scale investors – than more bureaucratic incentives such as grants and subsidized loans, which may require complicated forms and paperwork. However, free physical inputs often do not stimulate planting as effectively as cash grants, because most grants are financially more attractive and provide more flexibility than bulky physical inputs. Yet, many forest agencies still favour the provision of free or low-cost seedlings because within their own administrative systems funds for nursery activities can be easily budgeted.

Cash grants and concessionary loans have proven popular at various times in most of the countries studied. These instruments have engendered significant planting in China, while in Thailand the effectiveness of grants was mixed, mainly because they were not sufficiently attractive. In a number of the countries studied, these more direct financial incentives have been followed by a more complex approach – namely, the offering of tax concessions for plantations. Tax breaks – which have been notably successful in Australia,

Free physical inputs often do not stimulate planting as effectively as cash grants

New Zealand and the United States of America – can be especially effective in helping bridge the long gap between the initial plantation investment and later harvest revenues.

More recently, several countries, which earlier focused mainly on physical incentives and later indirect incentives, have shifted to the emphasis on enabling incentives, removing structural constraints and creating an attractive environment for plantation investment.

Direct incentives – what can they achieve?

Assessing the impact of direct incentives in isolation from other incentives is very difficult, and the results can be misleading. In an environment characterized by strong disincentives (for example, complex requirements for obtaining permits for cutting, transporting and processing wood, low timber prices, inconsistent policies, high fire risks, high land prices, high interest rates, uncertain marketing opportunities) and an opaque bureaucracy, direct incentives may have only marginal effects. In the worst cases, these may lead to misallocation of funds, trigger investments in plantations that are ultimately not viable, or have long-term negative impacts on interest in growing trees.

Owing to a lack of monitoring, it is difficult to determine the extent to which direct incentives have accelerated planting relative to other factors. In some locations, extensive areas have been planted without direct support, which suggests that funds have sometimes been spent inefficiently or unnecessarily.

When the general investment climate is favourable and demand for wood increases, direct incentives can definitely increase the speed with which the private sector is drawn to forest plantations. The most effective direct incentives include tax concessions and favourable capital gains treatment. Loan and grant schemes have achieved mixed results – some being more generous than others – and have favoured predominantly large-scale investors.

There are five caveats to this general assessment:

- Many direct incentives are difficult and costly to administer properly and transparently, and it is questionable whether the high transaction costs they incur make them an efficient tool, particularly for attracting small-scale investors.
- Tax concessions can only work if investors actually pay taxes. This is especially significant in countries where paying taxes is sometimes seen more as an option than a requirement.
- Direct incentives are easily abused. Free seedlings may be resold, loans used for unintended purposes and corruption is virtually impossible to control.⁷

Many direct incentives are difficult and costly to administer

⁷ For example, the Ministry of Forestry in Indonesia revoked the timber concessions of 15 companies owing to their failure to develop required industrial timber plantations. Companies had been awarded a total area of 989 079 hectares, but developed only 188 950 hectares, despite the government providing them with loans for the purpose (Jakarta Post, 12 November 2002).

- Direct incentives are frequently flawed if they are designed according to the interests of the provider (usually the government), rather than with the needs of the recipients in mind.
- In some instances, World Trade Organization rules or national policies may preclude the use of certain types of overtly protectionist incentives such as import restrictions.

It all depends!

[In Chile,] incentives through subsidies were successful because they were complemented by the creation of a credible environment for investment, guaranteed private property, and stable 'rules of the game'. With none of the above, subsidies would probably not have been as successful as they were.

Source: Castellanos (2001)

Indirect incentives – a solid foundation for investments

The study results indicate that variable and enabling incentives generally play a much larger role in encouraging investments than direct incentives. Direct incentives can influence the speed of change, but are an expensive and frequently inefficient means to affect change.

As commercial investments in forest plantation development aim to maximize financial returns, high timber prices – and perceptions that prices would continue to climb in the future – have sometimes triggered investments in tree growing. Perhaps the most attractive and tempting recent stimulus for many investors in Asia and the Pacific was the global spike in wood prices in 1993 and 1994, which triggered a planting boom in many countries. Conversely, when wood prices have been generally low, or especially where prices have been kept artificially low, plantation investments have been sluggish. Under such circumstances, investor interest is seriously dampened irrespective of the provision of other incentives. Examples include:

- price controls, as they existed in New Zealand until 1965;
- depressed timber prices due to cheaper imports (for example, Canadian exports to the United States of America);
- a policy of cheap raw material for the wood-processing industry (for example in Indonesia); and
- illegal logging (for example in Indonesia and India).

Prices also need to be reasonably predictable and provide returns to investments comparable to, or better than, those from similar land uses (for example, oil-palm, rubber or pastoral farming). In Malaysia, current returns to investment in oil-palm are considerably higher than for fast-growing trees, thus discouraging potential investments in forest plantations. Alternative investment opportunities will always compete with forestry and even where the plantation sector is well established some investors may switch to other land-based

Perhaps the most attractive stimulus for many investors in Asia and the Pacific was the global spike in wood prices in 1993 and 1994

investments such as dairy farming, as indicated by Terry McFadgen, the former Chief Executive of Fletcher Forests Ltd. in New Zealand. In early 2003, he warned that “if the forestry industry continues to perform at its current level and if dairy continues to perform better, then yes there will be some conversions” (Graham 2003). There never appears to be much room for complacency, even in a “success-story” country such as New Zealand.

A key factor in obtaining significant levels of investment in plantations has been political, institutional and macro-economic stability. Although it is difficult to disentangle specific factors from the overall investment environment, it is clear that investments are forthcoming when risks are perceived to be low and governments signal unambiguous support for private-sector involvement in plantation development (Clapp 1995). This has not been the case for the Philippines and Indonesia, which explains to a considerable extent, the relatively poor performance of tree planting by the private sector in these countries.

A crucial factor is resource security. The decollectivization of land and forest tenure in China, beginning in 1978, provides an excellent example of the importance of respected and protected property rights. A principal goal of the reform was to encourage farmers to manage forest resources sustainably and to plant trees. The reform has been neither smooth nor uniform, and forest tenure arrangements often vary even among townships. Consequently, not all collectives have been equally enthusiastic. However, a clear pattern is discernible: where decollectivization has gone furthest there have been significant increases in investments in tree growing (Lu *et al.* 2002).

A key factor in obtaining significant levels of investment in plantations has been political, institutional and macro-economic stability

Unbundling ownership rights to increase resource security and comfort

Markets can potentially play a much wider role in forest management than they have in the past if a more detailed approach is taken to the definition of rights. If need be, ownership of rights can be unbundled to retain public ownership of land while privatizing the timber resource or other commercial goods and services.

Source: Ferguson and Chandrasekharan (2004)

Just as clear tenure arrangements have underpinned the success of forest plantation development in Australia, New Zealand, the United States of America and parts of China, uncertain tenure has constrained investment in Indonesia, Thailand and the Philippines. In extreme cases, tenure and land-use conflicts have resulted in the destruction of plantations and equipment (Kartodihardjo and Supriono 2000), which is certain to deter investors.

In New Zealand, the development of infrastructure (for example, roads, railways, modern port facilities, hydro-electric power stations) by the government paved the way for large-scale processing initiatives and assured potential planters that the government was serious about developing a viable plantation sector. Similar developments occurred in Australia and the United States of America. These measures were complemented by increased research and extension, which reduced risks, raised yields and effectively lowered the costs of plantation establishment.

In several countries, policies are in place to encourage plantation development, but little is done to translate them into action on the ground. It is critical to follow up supportive policies with strategies and actions that provide a tangible framework to encourage and enable investment. This may include examining incentive structures across all sectors of the economy to ensure a level playing field for investments in forest plantations. The role of the public sector as a forest owner and manager should regularly be reviewed to ensure that public-sector plantations do not compete unfairly with private-sector investments. Public-sector plantations are affected differently by taxes and land prices and often determine log prices and log allocation, as has been the case in Australia. In addition, the rates of return from public-sector plantations may not reflect the market cost of capital.

Removing impediments to plantation development often means reducing or eliminating subsidies in other directly competing sectors of the economy, especially in agriculture. In Thailand, for example, financial support through the Rubber Plantation Aid Fund for the replanting of rubber amounts to approximately US\$1 000/hectare, whereas the Private Reforestation Extension Project offered less than half that amount for timber plantations. If governments are truly committed to augmenting wood supplies, then such substantial differences provide the wrong signal to investors. Other factors may also sour the investment climate for plantations relative to other sectors, such as when markets for plantation products are restricted in discriminatory fashion, or when foreign investments in plantations are constrained relative to other sectors.

Removing impediments to plantation development often means reducing or eliminating subsidies in other directly competing sectors

Same approach but different results

One of the crucial differences between the Chilean and Indonesian experiences is that plantations are presently the highest yielding land use in many regions of Chile, whereas oil-palm is much more lucrative in Indonesia. Subsidies provided to oil-palm growers further discouraged timber plantation development.

Source: Williams (2001)

A key point is that policies need to be consistent over time. Frequent policy changes result in increased risks and provide a climate of insecurity for investors, especially given the inherently long-term nature of plantation investment. In some countries, frequent changes of government have resulted in repeated changes in policies and the erosion of support mechanisms. For example, between 1982 and 2002, Thailand had 10 governments, and the new governments rarely followed the paths of their predecessors. Political stability has also led to conflicting policies and constrained investments in the Philippines and Indonesia.

Policies need to be consistent over time

In most countries, the expansion of plantations has been to some extent paralleled by increasing objections over the use of natural forests for timber production. As concerns over the fate of natural forests has increased, decision makers have passed a variety of harvesting restrictions in many countries (Durst *et al.* 2001). While this has provided a window of opportunity for investments in

plantations, environmental concerns over single-species forest plantations also translated into a worry for investors. In Thailand, environmentalists warned that, “commercial eucalyptus plantations are incompatible both with forest conservation and with village livelihood(s)” (Lohmann, 1990, p. 9; see also Lang 2002). Although the discussion on the environmental impacts of plantations, especially related to catchment hydrology, is plagued by myths and misperceptions (Cossalter and Pye-Smith 2003), environmental campaigns against tree plantations have clearly affected investor behaviour in some countries, including the United States of America. In addition, these campaigns have led to the condemnation of some “exotic species” such as *Eucalyptus camaldulensis* as an inherent evil, in many countries in Asia.

The notoriety of eucalyptus

..., under certain soil and climatic conditions, it might be ecologically feasible and economically profitable to clear-cut a forest and replant it in a monoculture (such as eucalyptus). While this might be profit-maximizing, it is unlikely to be social welfare maximizing because forest plantation monocultures are associated with notoriously low ecological services.

Source: Kahn (2002)

Finally, it must be asked whether incentives in any form are justified on social grounds. Forest plantations generate employment, but this benefit may be outweighed by job losses in agriculture at the local level and by the costs of significant restructuring in local economies (Tonts *et al.* 2001). In Australia, for example, there is widespread unease about the impact of plantations on demographic, economic and social structures. Key responses that have been used by both plantation companies and governments to resolve concerns include information dissemination, improved communication and consultation strategies, adjustments to statutory and strategic planning systems, and collaborative approaches that bring different stakeholders closer together (Schirmer and Tonts 2002).

Addressing community concerns in Australia

The *2020 Vision* recognises the role that plantations play in the community, and encourages Vision partners to address the social and environmental changes being experienced by communities in areas where plantations have developed rapidly. This includes providing a role for community participation in the on-going development of the plantation resource.

Examples of this approach include the development of a “Good Neighbour Charter” by the plantation timber industry in Tasmania. The Good Neighbour Charter contains a set of best practice guidelines as a minimum standard for community engagement by the Tasmanian Plantation Timber Industry.

Source: Plantations 2020 (<http://www.plantations2020.com.au/community/>)

Where social benefits are insignificant, the private sector, and particularly the processing industry, has an important role in motivating landowners to plant trees. In India, a legal ceiling on

landholdings prohibits private companies from establishing large-scale plantations. To overcome this constraint, private companies have offered a number of incentives to smallholders, including technical assistance and buy-back guarantees (Saigal *et al.* 2002). Similar arrangements have been put in place in other countries (for example, Australia, Indonesia, New Zealand, the Philippines and Thailand), which indicates that private companies may be in a better position than governments to reach small-scale growers through outgrower schemes (Desmond and Race 2003).

There is broad agreement that high social benefits, coupled with insufficient or even negative private returns, are a rational justification for offering incentives to investors. However, in many cases the social benefits are not obvious, nor is tree growing inherently unprofitable. Applied economic analysis is rarely used to assess whether a particular level of support is justified. This is not surprising, since broad agreement on how social benefits should be valued is even more elusive. Thus, incentives tend to be offered based on less tangible criteria, including in some cases political manoeuvring and favouritism.

Private companies may be in a better position than governments to reach small-scale growers through outgrower schemes

Conclusions and recommendations

The roles played by the private and public sectors in forest plantation development have undergone major changes in Asia and the Pacific, although the level of success in attracting private investors to plantations varies considerably. Plantation development can be divided into three stages: initiation, acceleration and maturation. Australia, New Zealand and the United States of America had reached the maturation stage by the 1990s, but most Asian countries are still in the initiation or early acceleration stage.

Direct incentives are most likely to be important in the initiation stage, to raise awareness and to increase the pace and scale of plantation establishment, especially to build up raw material supplies for a nascent processing sector. However, direct incentives can only be effective if an enabling environment already exists or if investors believe that first steps towards creating an enabling environment have been initiated. Direct incentives should be complemented and ultimately replaced by variable incentives and accompanied by research and extension. If a direct incentive becomes obsolete in the acceleration stage, this is a good sign of its success (Williams 2001).

Over the long term, a favourable investment climate, research, technical assistance and well-established markets usually have greater influence than direct incentives such as free seedlings, subsidized credit or cost-sharing of planting expenses. In countries with a long history of providing incentives, it has become evident that incentive systems must be timely, well-targeted and flexible if they are to successfully engage the private sector in forest plantation development.

In countries that have reached the maturation stage, it has been recognized that key measures to maintain private-sector interest in

plantation development are related to the reduction of barriers and the removal of structural impediments and operational constraints. Some measures such as providing adequate tenure arrangements and resource security are difficult to undertake, but crucial to success. Others such as tax reforms, removing unnecessary regulations and eliminating bureaucratic procedures (licensing and permits) are just as important and in many cases easier to realize. While there is no single effective strategy, it is possible to outline some guiding principles that will contribute to achieving a viable forest plantation sector.

Guiding principles for plantation policy	
DO	DO NOT
<ul style="list-style-type: none"> ■ provide a stable and coherent forest policy that is supportive of economic activities ■ ensure that other (non-forestry) policies are aligned so that plantation investment can occur on a level playing field ■ develop strong research and extension support for plantation development ■ establish strong industry clusters, including supporting infrastructure, a competent labour force and appropriate practices and technologies ■ collect and make readily available objective, high-quality resource information to support policy making, forecasting, planning and monitoring ■ encourage healthy debate and discussion on the merits and reasons for offering particular incentives 	<ul style="list-style-type: none"> ■ promote inequitable land-use policies that favour other sectors (e.g. agriculture) over forest plantations ■ persist with export or import controls that hinder the development of efficient wood processing and/or forest plantation establishment ■ maintain policies that allow plantation development with detrimental environmental and/or social impacts, causing conflict among private companies, communities and environmental groups ■ crowd out private-sector investment in plantations by unnecessarily maintaining public-sector involvement, and especially do not grant public plantations privileges that prevent the private sector from competing ■ keep policies and incentives in place longer than necessary, keeping in mind that the most successful incentives are those that can be phased out ■ retain bureaucratic procedures and other disincentives that directly or indirectly reduce returns to investors

Most people agree that forest plantations can help meet the increasing demands for wood and provide public goods and services, although in some cases they can also have negative social and environmental impacts. Most people also agree that appropriate incentives – particularly enabling incentives – play a key role in stimulating plantation development. However, there are two caveats that need to be considered. The first is to recognize that the forestry sector is not alone in asking “What does it take?” The agricultural sector has its

own advocates, often backed by generous incentives. Proponents of forestry need to recognize that alternative land uses may offer similar, or even greater, benefits to society. Under such circumstances it may be pointless to offer incentives for plantation development, since it may be more economically efficient to invest in alternative land uses.

The second caveat concerns the conventional belief that timber shortages will assure lucrative markets for wood indefinitely into the future. Recently, warnings of the exact opposite scenario have emerged, suggesting a possible timber glut in the future (Adams 2002). If this proves true, promoting too many plantations now may result in a rude awakening further down the road for investors and those who encouraged them.

A final observation from the studies is that, in a historical context, incentives have largely been applied in an *ad hoc* manner. As improved understanding of the mechanisms and conditions related to economic growth and development has evolved, it has become apparent that, in many instances, plantation incentives have been less successful than they might otherwise have been, had various disincentives to plantation establishment also been addressed and had governments directed their attention also to creating enabling environments. Just as good physical site preparation is important for enhancing tree growth, so too, preparing a favourable policy and administrative foundation is crucial for supporting successful plantation development.

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As the role of the public sector in forest plantation development is diminishing, governments and their respective forestry agencies are increasingly asking what it takes to encourage non-government entities to grow trees. There is much interest in offering incentives to prospective small- and large-scale investors. Yet, little is known about the role that direct and indirect incentives have in influencing plantation development.

What does it take? The role of incentives in forest plantation development in Asia and the Pacific helps fill this knowledge gap by examining how incentives influence plantation development, through a series of country case studies in the Asia-Pacific region.

Although direct comparisons between countries are problematic, a common theme emerges: clear, consistent and stable policies and a favourable investment climate are essential ingredients to promote the development of forest plantations by both small- and large-scale producers. These factors show to be more important than the provision of direct incentives such as free seedlings or tax deductions. The overall picture that emerges is sufficiently coherent to outline a set of guiding principles that should help policy makers and forest managers to better understand the key issues, challenges and opportunities concerning private investment in forest plantation development.

