



Forestry Department

Food and Agriculture Organization of the United Nations

Forest Plantations Thematic Papers

***ROLE OF PLANTATIONS AS SUBSTITUTES FOR NATURAL FORESTS IN
WOOD SUPPLY – LESSONS LEARNED FROM THE ASIAN-PACIFIC
REGION***

Based on the work of

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CONTENTS

	Page
1. Introduction	4
2. Status of Natural Forest Availability for Timber Production	4
2.1 Natural forests, harvests and forest growth – a delicate balance	5
2.2 Removal of natural forests from production –recent trends	6
3. Global Plantations – Emerging Role in Timber Production	7
4. The Asia – Pacific Region – Implications of Natural Forest Conservation and Logging Bans	8
4.1 Natural forest status	8
4.2 Plantations in the Asia - Pacific region	9
4.3 Asia – Pacific region protected areas and unavailable natural forests	11
4.4 Asia – Pacific regional experiences with logging bans	12
4.4.1 Thailand	13
4.4.2 Sri Lanka	13
4.4.3 Philippines	14
4.4.4 New Zealand	14
4.4.5 China	14
4.4.6 Vietnam	15
4.5 Lessons learned from Asia – Pacific experiences	15
4.5.1 Impacts on timber production	15
4.5.2 Alternative timber supplies	16
4.5.3 International trade implications	16
4.5.4 Comparative advantage	17
4.6 Conditions for plantations to successfully substitute for natural forest timber	18
4.6.1 Access to Forest Lands	18
4.6.2 Technical and Economic feasibility	18
4.6.3 Use Conditions and Tenure	19
4.6.4 Market Access	19
4.6.5 Investment Capital	19
5. Conclusions	19
References	20

1. Introduction

A serious, growing concern over natural forests has been evident over the past decade. Deforestation and degradation has continued at often-alarming rates in spite of schemes for long-term sustainable forest management and the creation of extensive protected areas for natural forest conservation. While such reservations create a variety of protected forests, commercial timber harvesting is prohibited where non-timber values are deemed to outweigh timber values, removing forests from production.

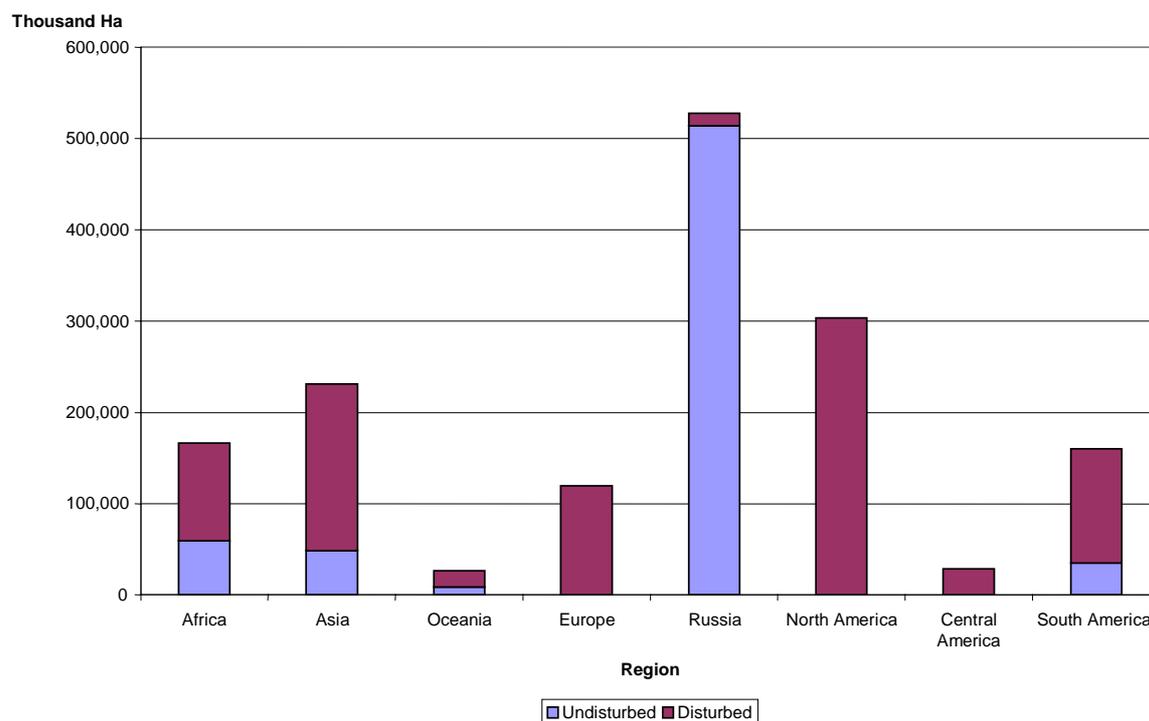
Deeply rooted misgivings about the ecological status of natural forests, and the cumulative adverse consequences of past conventional forest management and policies, question the future of sustainability. Given the widespread concerns about past natural forest use, the pace of deforestation, and the degraded condition of much of the remaining forests, should more forests be set aside in favor of natural forest conservation? If so, where will future timber supply derive? Can man-made forest plantations provide a significant alternative to offset the impact of continued deforestation and degradation of natural forests?

2. Status of Natural Forest Availability for Timber Production

There were 3 454 million hectares of forest, including some 3 221 million hectares of natural forest, throughout the world as of 1995 (FAO 1998a, 1999). It is estimated that about 48.5 percent of natural forests are potentially available for timber harvest. Global distribution and availability differ significantly by region. The largest aggregate area of natural forests is in South America and Russia. The availability of natural forest for harvest is greatest (in terms of actual area) for Russia and North America, while the share of natural forests deemed available for harvesting within a region is the greatest for Europe (85.1%), Russia (76.0%), Asia (56.6%) and North America (56.0%).

Only Russia presently holds significant areas of undisturbed natural forests (514 million ha; 77 percent) that are available for harvesting (Figure 1). In contrast, all natural forests in Europe, North America and Central America that are available for harvest are considered disturbed. Natural forests in legally protected areas are unavailable for harvesting. Additional natural forests, as defined by FAO, can also be unavailable for harvesting by reason of:

- I. Physical conditions and terrain, such as steep slopes.
- II. Remote locations and limited access through lack of infrastructure (roads, etc) and transport.
- III. Other factors, such as low productivity, poor stand quality, lack of commercial species, etc.

Figure 1: Distribution of natural forests available for harvesting by condition and region


Source: FAO, 1998a

Overall, only 290 million hectares (17.5%) of natural forests are unavailable for harvesting under legally protected status. Asia, Russia and South America lead in the legal designation of protected natural forests¹ in terms of area. Some 256 million hectares are considered as unavailable for harvesting due to physical constraints (Category I) with the majority in South America, followed by North America and Africa. Remoteness and lack of infrastructure (Category II) accounts for over 365 million hectares of which about 69 percent is in South America. Degraded and poor quality natural forests (Category III) account for over 746 million hectares or over 45 percent of natural forests not available for harvesting, with significant amounts in Central America, Russia, Africa, South America, Asia, Europe and North America.

2.1. Natural forests, harvests and forest growth – a delicate balance

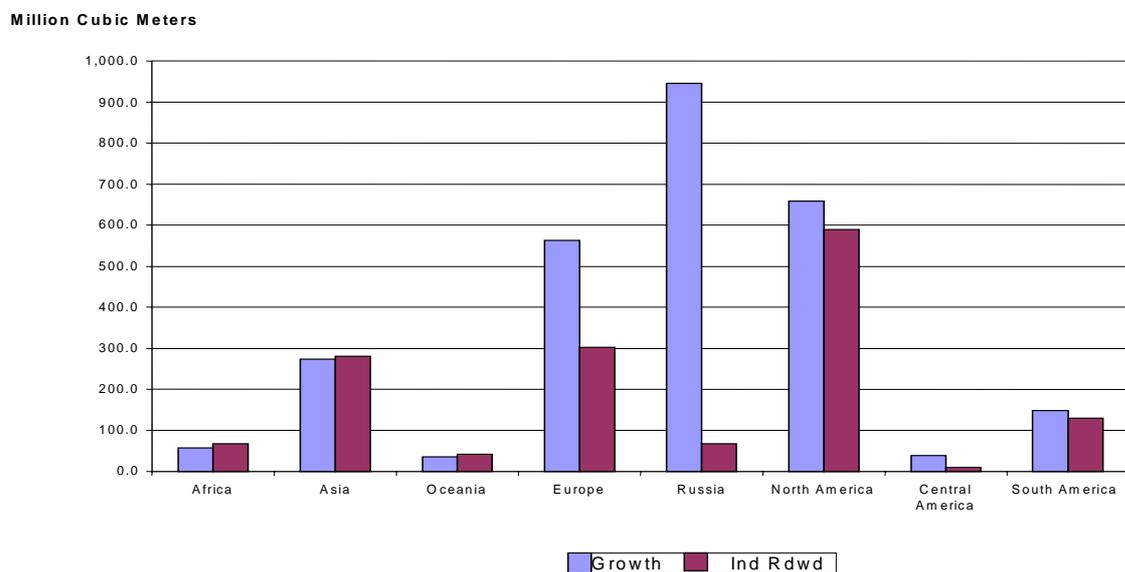
A large majority of timber production is harvested from currently available natural forest. Globally, an estimated 3 354 million m³ was removed from the world's forests of which 56 percent is woodfuel. Woodfuel is most significant in Asia and Africa while industrial roundwood production was heavily concentrated in North America, Asia and Europe.

Industrial roundwood removals illustrate the delicate relationship between estimated growth of commercial species in the available natural forests in comparison to industrial roundwood production (Figure 2). While the picture may give an impression that an overall balance of

¹ Legal designation as a protected area, however, seldom assures effective protection on the ground. The actual status of such areas may be quite good, or alternatively there may be continuing degradation and deforestation.

harvest and growth has been achieved, this is not so since much of the current harvesting is not sustainable and that the productivity of degraded forests are low.

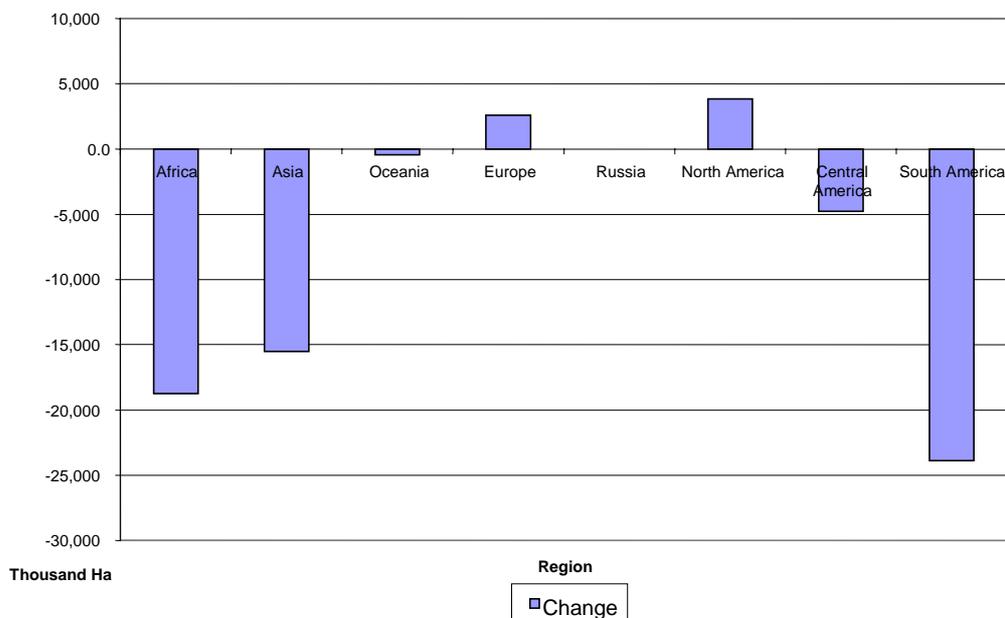
Figure 2. Industrial roundwood production and growth of commercial species by region



Sources: FAO, 1998a, and FAO, 1999

The natural forests most under pressure for harvesting, Africa, Asia, and Oceania, are also the regions with the lowest net growth rates from currently available natural forests. Further, these regions also are experiencing the most severe deforestation and forest degradation (Figure 3).

Figure 3. Deforestation by region between 1990 and 1995



Source: FAO, 1999

2.2 *Removal of natural forests from production – recent trends*

Deforestation is the most critical factor in the reduction of natural forest area available for harvesting. An estimated 11.4 million hectares of natural forests are deforested annually. However, the recent trend to designate additional protected areas is also significant, removing natural forests from the production forest base. FAO has estimated that some 290 million hectares are now under some form of legal protection. Between 1970-1990 the number of legally designated protected areas increased by about 140 percent, while the gross area (including non-forest) increased from about 550 million hectares to almost 1 200 million hectares (FAO 1998a).

3. **Global Plantations – Emerging Role in Timber Production**

Forest plantations make up only 3.5 percent of global forest area (FAO 2000 – see also Working Paper FP/13). Tropical plantations make up 45 percent of the estimated 124 million hectares of plantations. Plantations are most effective in substituting for industrial wood (pulpwood, sawlogs etc) and provide about 22 percent of the supply². Only 4 percent of non-industrial wood used comes from plantations. Forecasts, largely based on trees already planted, suggest that plantations will make up a bigger proportion of wood use in the next 20 or so years (FAO 2000). But can plantations keep pace with both declining natural forest production and growing consumption?

An optimistic estimate of the permanent loss of existing natural forest production through further deforestation and degradation, based on recent deforestation rates, suggests that the annual decline in production from disturbed forests could be 6.2-7.0 million m³ ha⁻¹ yr⁻¹.³ Without significant increases in both the available area and productivity of industrial plantations of commercial species, the present net growth of 84 million m³ annually would be overtaken by reductions due to deforestation alone within 12-14 years, a period shorter than the growing cycle of most industrial plantations. Removing additional areas of natural forests through establishment of new protected areas or expanded logging bans would further reduce harvests. Much of this protected area would likely be taken from available undisturbed forests that have higher current growth and productivity (approximately double) than the disturbed forests.

Global consumption of timber is also projected to increase. Total roundwood consumption was projected as increasing at an annual rate of 1.12 percent between 1994-2010, from 3.21 billion m³ to 3.84 billion m³ (FAO 1997). Industrial roundwood was projected to increase 1.20 percent annually, from 1.47 billion m³ to over 1.78 billion m³. This increase of over 300 million m³ by 2010 far exceeds the estimated net current growth from industrial plantations of 84 million m³.

² In part, this ratio is subject to interpretation based on definitions of “plantations”. Managed second and third forests of North America and Europe may be included as “plantations” depending upon data sources.

³ This estimate assumes that degraded forests become the primary source of deforestation as non-sustainable use further deteriorates forest stands. Estimate reflects trends in the African, Asian, Central American and South American regions, which together experienced a deforestation rate of almost 12.9 million hectares annually. These regions account for just over 586 million hectares of ‘available’ natural forests, with over 443 million hectares considered as ‘disturbed’ with a current potential for harvesting of only 0.5-1.5 m³ ha⁻¹. Data derived from FAO, Global Fibre Supply Model (1998)

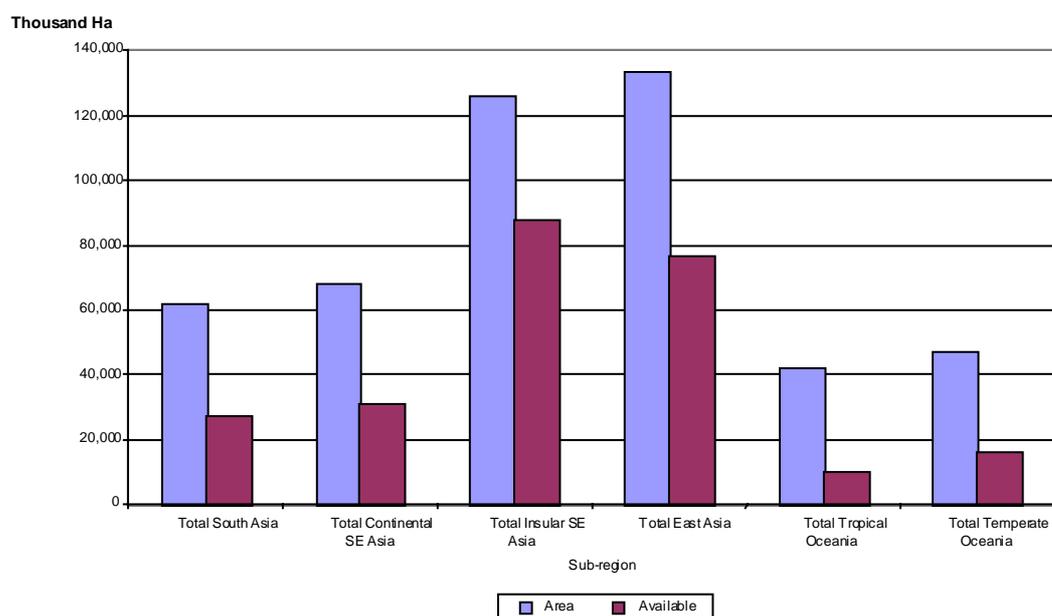
4. The Asia-Pacific Region – Implications of Natural Forest Conservation and Logging Bans

4.1 Natural forest status

The Asia-Pacific Region includes over 552 million hectares of forests, including 478 million hectares of natural forests⁴, but only about 249 million hectares are presently considered as available for harvest. Insular SE Asia and East Asia dominate in terms of both total natural forests and the area available for harvesting (Figure 4). About 236 million hectares are considered unavailable for harvest at present, including about 89.5 million hectares in legally protected status and 146.5 million hectares that is unavailable due to physical and economic constraints.

The Asia-Pacific sub-region continues to experience deforestation and degradation. For 1990-95, this region experienced a decline of almost 16.3 million hectares of natural forests or approximately 3.25 million hectares annually. The largest losses were in Indonesia (-5.4 million ha), Myanmar (-1.9 million ha), Malaysia (-2.0 million ha) and Thailand (-1.6 million ha). The Philippines had the largest rate of deforestation at 3.5 percent annually, followed by Pakistan (2.9%), Thailand (2.6%), and Malaysia (2.4%).

Figure 4. Asia-Pacific natural forests: Total and area available for harvesting



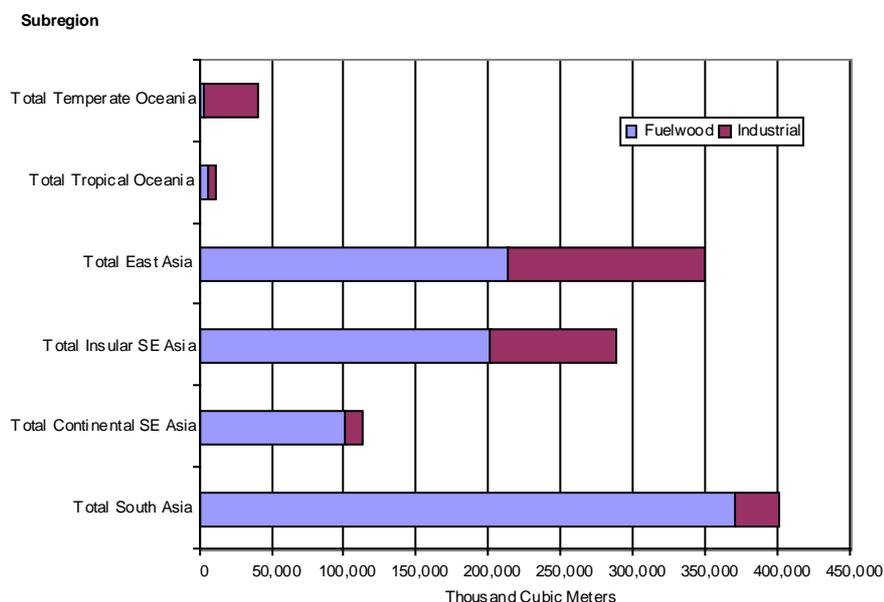
Source: FAO, 1998a

The Asia-Pacific region produces substantial roundwood, both for firewood and as industrial timber. In 1996, the estimated production was approximately 1 199 million m³ of which 75 percent was woodfuel (Figure 5). India, Indonesia and China accounted for the majority of the firewood. Industrial roundwood production was primarily from East Asia (China) and Insular

⁴ As used here, the Asia-Pacific Region conforms to the general region of the Asia-Pacific Forestry Commission. The Western & Central Asia sub-region as used in FAO statistical sources has been excluded for this analysis.

SE Asia (Indonesia and Malaysia). Oceania production was almost entirely from New Zealand and Australia, with a moderate volume (3.2 million m³) from Papua New Guinea.⁵

Figure 5 Asia-Pacific roundwood production by timber type and Sub-Region, 1996



Source: FAO, 1999

Total natural forest growth was estimated at about 328 million m³, while industrial roundwood production is an estimated 304 million m³ (Figure 6.). While East Asia (China) shows an apparent positive growth over harvest, South Asia and Insular SE Asia both have large deficits. These sub-regions demonstrated high rates of deforestation. Temperate Oceania shows a slight imbalance, but reflects the exclusion of the proportionately high share of industrial timber from New Zealand which is derived from plantations rather than from natural forests.

4.2 Plantations in the Asia-Pacific region

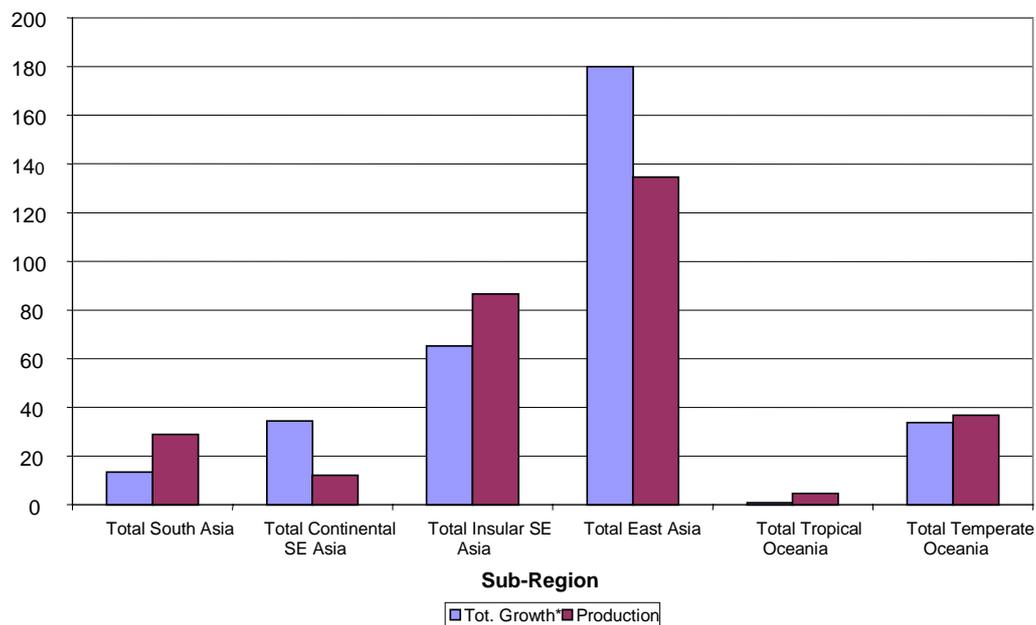
The Asia-Pacific region has about 57.4 million hectares of industrial plantations, with a net area of approximately 46.8 million hectares. However, only 3.5 million hectares of industrial plantations are presently considered available for harvest (Figure 7) while large areas of industrial plantations in India, Indonesia, Malaysia and China are young and immature, not yet capable of significant contributions to timber harvests.⁶

⁵ This data reflects officially recorded and acknowledged harvests. An unknown, but significant, illegal harvest is widely assumed within the region.

⁶ Data for plantations are derived from FAO, Global Fibre Supply Model (1998) and were estimated in 1997. National data would indicate both additions to industrial plantations and a higher proportion at or near maturity for industrial harvesting.

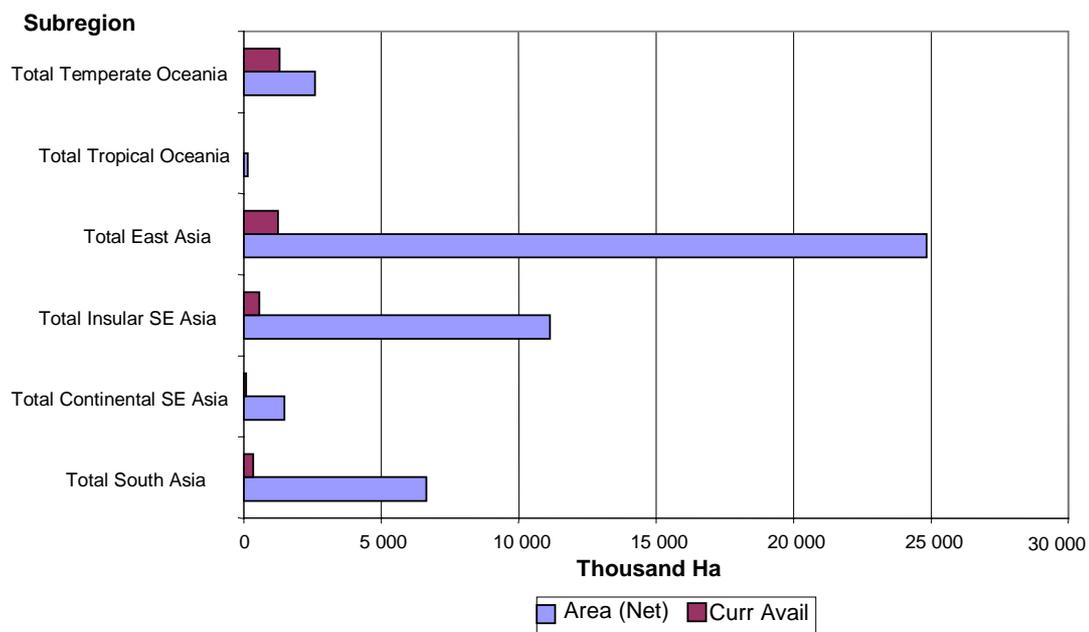
Figure 6 Comparison of net growth of commercial species on available Asia-Pacific natural forests and industrial roundwood production

Million Cubic Meters



Sources: FAO, 1998a and FAO, 1999

Figure 7: Asia-Pacific industrial plantations by Sub-Region: Total (net) vs plantations available for harvesting



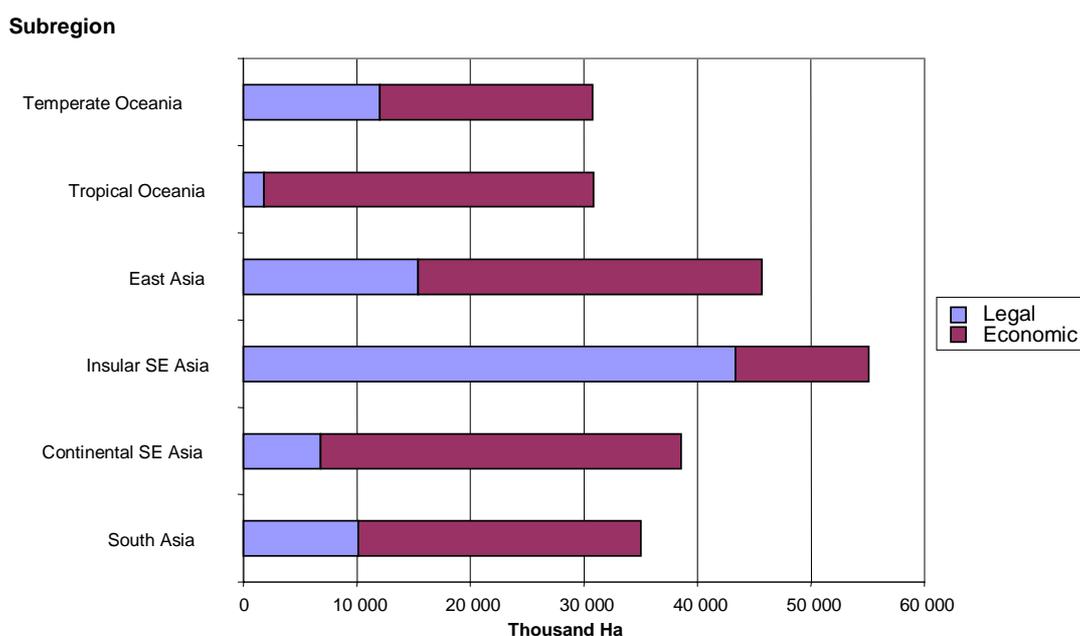
Source: FAO, 1998a

The estimated Asia-Pacific annual growth on the industrial plantations now available for harvest is about 36.1 million cubic meters. The highest share is in Temperate Oceania with growth of 19.5 million cubic meters (Australia and New Zealand), followed by East Asia with growth of 10.5 million cubic meters (primarily China).

4.3 Asia-Pacific region protected areas and unavailable natural forests

Asia-Pacific has some 89.5 million hectares of legally protected forests, removed from harvesting (Figure 8). The largest legally protected natural forest area is in the Insular SE Asia region (43.3 million hectares) including almost 40 million hectares in Indonesia and 2.8 million hectares in Malaysia. East Asia accounts for 15.4 million hectares of protected area, with over 13 million hectares in China. In spite of the legal protected status, substantial concern remains about the adequacy of the actual on-the-ground protection. Controversy also continues as to the need to set aside additional areas for the protection of representative biodiversity, critical watersheds, and habitat for rare and endangered wildlife and flora.

Figure 8 Economic and Legal unavailable natural forests in Asia-Pacific region by sub-region



Source: FAO, 1998a

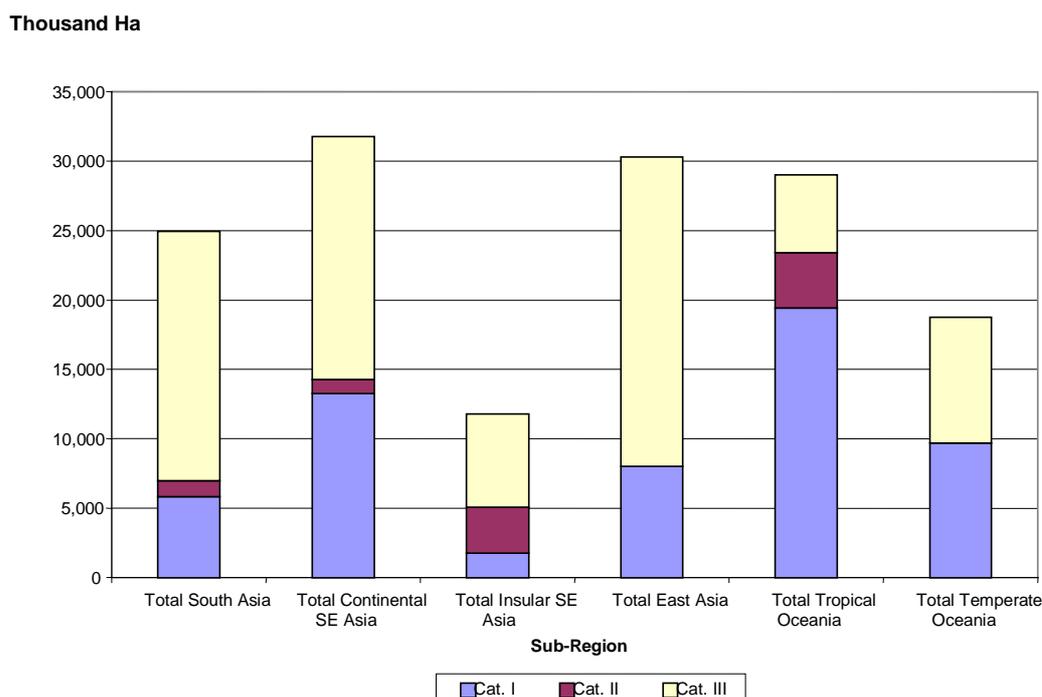
Much of the 146.5 million hectares of natural forest currently unavailable in Asia-Pacific is due to physical and economic reasons (Figure 8). This includes forests in Continental SE Asia (31.8 million ha.), East Asia (30.3 million ha.), Tropical Oceania (29.0 million ha.) and South Asia (24.9 million ha.).

Causes of natural forest unavailable for harvesting vary considerably (Figure 9). Physical conditions and terrain (Category I) restricts harvesting on some 58 million hectares, primarily in the Tropical Oceania sub-region (Papua New Guinea, 17.6 million ha.), and Continental SE Asia (Laos, 4.5 million ha. Myanmar, 5.7 million ha. Thailand, 2 million ha.) Other

countries with substantial physical constraints on natural forests include India (4.8 million ha.), China 5.0 million ha.) and Australia (9.7 million ha.).

Remoteness and lack of access is less of a constraint in Asia-Pacific (9.5 million hectares) due to generally heavy population pressures in rural areas. Indonesia (3.4 million ha.), Papua New Guinea (4 million ha.) and Laos (1 million ha.) and Nepal (0.9 million ha.) accounting for almost all of this area.

Figure 9 Asia-Pacific natural forests unavailable for harvesting due to physical-economic reasons



Source: FAO, 1998a

Low productivity, degraded forests and other site conditions (Category III) limit harvesting on a total of 79.1 million hectares. East Asia, led by China (16.3 million ha.) and Japan (4.5 million ha.), accounts for about 23 million hectares with South Asia (India, 15 million ha.) accounting for an additional 17.9 million hectares. In Continental SE Asia, Thailand has an estimated 6.8 million hectares followed by Laos (4.4 million ha.) and Vietnam (3.9 million ha) of such natural forests. In Temperate Oceania, Australia has about 8.5 million hectares in Category III.

4.4 Asia-Pacific regional experiences with logging bans

FAO undertook a study of logging bans in the Asia-Pacific Region at the request of the Asia-Pacific Forestry Commission (APFC). The objective was to better understand the role of such bans on harvesting when imposed as a means of achieving natural forest conservation.⁷ The

⁷ Asia-Pacific Forestry Commission, "Study of Efficacy of Removing Natural Forests from Timber Production as a Strategy for Conserving Forests", FAO, Regional Office for Asia and the Pacific. Study reports forthcoming.

study included six case studies with a variety of experiences - China, New Zealand, Philippines, Sri Lanka, Thailand, and Vietnam.

An estimated 100 million hectares of natural forests, or about 20 percent, in the Asia-Pacific region was either in legally protected areas or in areas covered by complete logging bans. While recognizing the existing protected area network in the region, the APFC study sought to understand the efficacy of the more sweeping and often precipitous imposition of comprehensive harvest restrictions through national logging bans. Such policies are often a political response to natural disasters and typically apply broadly (national or regional) to natural forests that previously were allocated to timber production or multiple uses including timber.

Policy goals for timber bans in the Asia-Pacific are seldom well articulated. Rather such actions are responsive to significant symptoms and consequences of perceived forest policy 'failures'. Undesirable outcomes from conventional forest practices and utilization are widely taken as self-evident justification for swift and decisive actions. Deforestation and forest degradation of natural forests are a common symptom behind many logging bans. Problems of overcutting beyond sustainable levels, the impact on other forest values and the assumed incompatibility of logging with the protection of environmental functions including damage to residual forest stands and related multiple uses are also common issues in log ban debates. Loss of biodiversity, critical habitats and representative ecosystems, the deterioration of watersheds and water quality, soil erosion, sedimentation and flooding are frequent perceived as environmental consequences of failures in conventional forest practices and harvesting. Finally, the lack of effective reforestation is often seen as a frequent outcome of logging.

Whatever the reasons leading to bans, logging bans have relatively large, immediate, and unanticipated impacts on timber supply. Indirectly bans impact persons and economic units dependent upon forest harvesting, transport, processing and consumption of forest products. Forest plantations, actual or potential, are commonly assumed to be the logical alternative timber supply source. However explicit linkages between logging bans and plantations as an alternative are seldom addressed in logging ban policies, legislation or implementation. The growing role of economic reforms towards more market-based production and consumption decisions (including profitability), together with the implications of comparative advantage in open international trade in forest products, are only indirectly acknowledged in national logging ban policy.

The experiences and findings from the six country case studies illustrate the linkage between natural forest conservation and logging bans and the role of forest plantations as a substitute source of timber supply. (FAO 2001)

4.4.1. Thailand

As a result of their policy to preserve all the remaining natural forest and other conservation areas, the Thailand government is promoting increased plantations with 60:40 split between private and state. The plantations will rehabilitate land and supply timber to the domestic market. The pursuit of large-scale plantations has faced strong opposition from rural people who saw them as benefiting the rich. Since 1992 the efforts have been on small plantations with local participation, but with minimal success. The effect of the logging ban has been

increased illegal logging in neighboring countries so putting the pressure elsewhere. The almost 900 000 hectares of plantations, planted since 1906, are not meeting the demand.

4.4.2. Sri Lanka

The 2 million hectares of natural forests are owned and managed, including any harvesting and wood marketing, by the State. There are 130 000 hectares of plantations of which over 92 000 hectares are state owned. Planting started in the late 1920s and are mainly teak, eucalyptus, mahogany and pines. Prior to the logging ban in 1989 on some forests, the harvest was about 980 000 m³ with 44 percent coming from the natural forests, about 8 percent from plantations, and the remainder was non-forest wood, such as homegardens and rubber and coconut plantations. At this time Sri Lanka was almost self-sufficient in wood, most of which (90 percent) went to woodfuel. The planned harvest from plantations for the current period was to have been 90 000 m³ but it is likely to about one third of this. Plantations have suffered from poor management, inappropriate species, encroachments, and fire and elephant damage. Homegardens and other non-forest plantations, coupled with imports of logs, sawn timber and panel products have been assisting to make up the deficit.

4.4.3. Philippines

Logging bans or harvest moratoria cover about 70 percent of the 15.9 million hectares of forests. The allowable cut from natural forests has dropped from 5 million m³ in 1990 to one tenth that level. While the current demand is expected to be about the 1990 level, only 12, 15 and 1 percent of this is coming from natural forests, coconut and plantations respectively. Another 16-20 percent is met by imports and the remaining half has apparently been taken up by substitution to steel and cement and illegal sources. Plantations, while recognized as being the only reliable source of wood, have not met expectations. Government policies on industrial plantations have changed very frequently leading to instability and uncertainty, resulting in low investment. Philippines is currently focusing on wood imports.

4.4.4. New Zealand

About 24 percent of New Zealand is covered in natural forest and about 6 percent in plantations, mainly *Pinus radiata*. Plantation planting began in the late 1800s and by 1915 it was recognized that the natural forests would not be able to supply the wood requirements. Both the state and private companies undertook large plantings between 1927 and 1932. By 1954 harvesting from plantations overtook that from natural forests and today there is almost no wood coming from the latter. Large additional plantings started in the 1960s with export in mind. Today production from the plantations is about 17 million m³ of which over half go to export. Projected annual cut is for about 30 million m³ in 2010. In 2000 a logging ban on all State owned forests was instituted. Internally the concern is how to meet the requirements for decorative and specialty wood that traditionally have come from the native forests.

4.4.5. China

China has 134 million hectares of forests of which about 65 percent are natural. Due to natural disasters China has established a priority for natural forest conservation and protection with harvesting to shift to timber plantations. The current 10-year plan calls for new planting both fast growing timber plantations and protection plantings on a 1:4 ratio. Over half the plantations are in the southern region, while the natural forests are largely in the Northeast and Southeast. Current timber plantations are generally low quality with estimated volumes at harvesting averaging $74 \text{ m}^3 \text{ ha}^{-1}$ compared to $208 \text{ m}^3 \text{ ha}^{-1}$ in natural forests. There is estimated to be potential shortfalls of industrial timber of over 27 million m^3 in 2003. This will be met by imports although eventually plantations will assist.

4.4.6. Vietnam

Plantations cover 1.5 million hectares of which about 42 percent are production forests. Most are young and are located in the central and northeast regions. Natural forests cover 10.9 million hectares, and harvesting is being reduced as a result of deforestation, degradation and the need for watershed protection. There was a 40 percent decline in production from natural forests between 1990 and 1998 to 1.35 million m^3 . Firewood exploitation has decreased by 20 percent but illegal logging has increased. About 30 percent of large logs used for sawn timber current come from natural forest, 50 percent from plantations including rubber, and about 20 percent are imported. Shortages of 1.5 to 2 million m^3 are expected to continue until 2005 so imports are expected to grow. Demand is also rising. There are plans to regenerate 1 million hectares of natural forest and to plant a further 5 million hectares of plantations, of which 3 million will be for industrial uses. Funding for this programme is still uncertain.

4.5 Lessons learned from Asia-Pacific experiences

4.5.1 Impacts on timber production

The Asia-Pacific region natural forests considered available for harvesting are experiencing heavy pressures for harvesting which contribute to continuing deforestation and which spill over onto “presently unavailable” forests. The expected harvest from the natural forests is expected to decline in the Asia-Pacific region. Gross annual growth of commercial species on presently available natural forests exceeds present harvest of industrial timber by about 24 million m^3 , compared to the production of 304 million m^3 . Only Continental SE Asia and East Asia have positive net growth. This is partly offset by a negative balance of almost 16.2 million m^3 for Japan. Significant negative balances exist for India (-16.2 million m^3), Malaysia (-24.9 million m^3), Thailand (-2.8 million m^3), and Papua New Guinea (-2.4 million m^3).

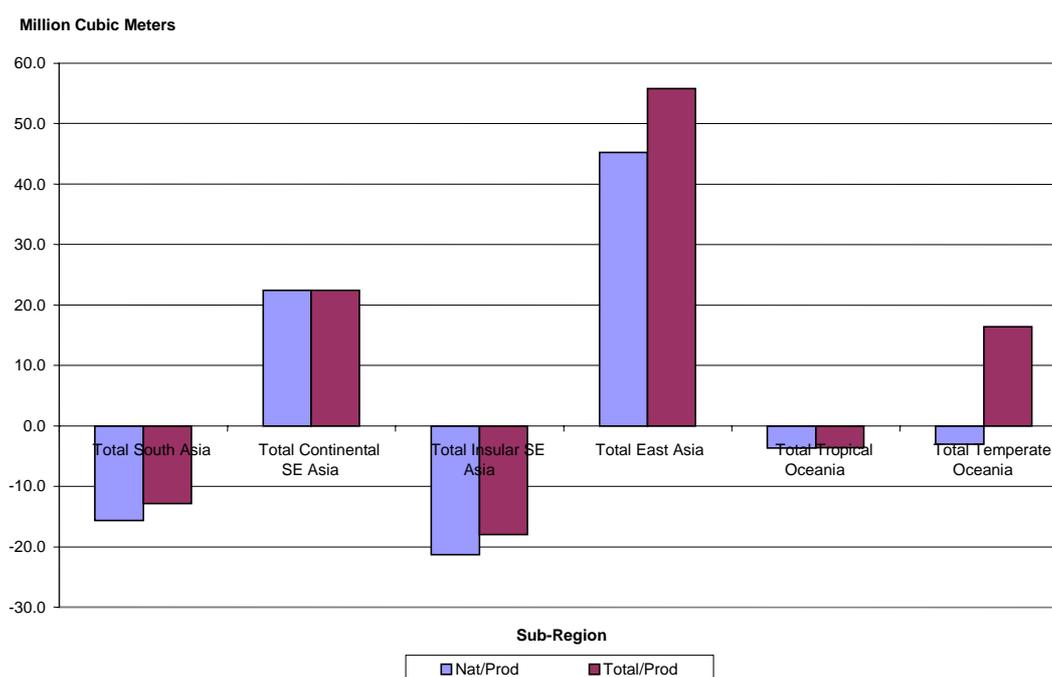
Continued deforestation and degradation at the present rate of about 3.25 million hectares annually will further reduce the capacity of Asia-Pacific to produce industrial timber from natural forests. With an average cutting cycle of about 38 years, present harvesting intensity is about $34 \text{ m}^3 \text{ ha}^{-1}$ for undisturbed natural forests and $17 \text{ m}^3 \text{ ha}^{-1}$ for disturbed forests. Based

on the ratio for available undisturbed and disturbed forests⁸, continuing deforestation could reduce regional harvest by about 1.77 million m³ per year. The banning of harvesting on one million hectares of “average” available natural forest could reduce potential harvests by approximately 550 thousand m³ annually.⁹ For example, China’s logging ban affecting 41.8 million hectares with an estimated reduction in harvest of 19.9 million m³ by 2003 implies an average reduction of 476 thousand m³ for each million hectares.

4.5.2 Alternative timber supplies

Asia-Pacific logging bans involve significant assumptions about alternative timber supply from current or future plantations. The possible shift of China’s harvest to “One Timber Base” is founded on a significant expansion and maturing of fast growing, high-yield industrial plantations. Likewise, Vietnam is relying on the successful implementation of the “5 Million Hectare Programme” for offsetting the logging ban. Serious consequences in both the Philippines and Thailand illustrate the problems when assumed commercial plantations do not develop as planned.

Figure 10. Balance between estimated growth from available natural forests and plantations in the Asia-Pacific Region and total industrial roundwood production



Sources: FAO, 1998a, and FAO 1999

If net growth of commercial species from available natural forests and total estimated growth from industrial plantations are available for harvest, the situation for Asia-Pacific would improve by virtue of the estimated 36 million m³ of growth from industrial plantations. The

⁸ Undisturbed forest is 22.2% of available natural forest; while disturbed forest accounts for 77.8%.

⁹ The assumed ratios used here are averages for the Asia-Pacific Region as estimated in the Global Fiber Supply Model (FAO, 1998) and are used for illustration only. Actual impacts would vary by individual country, the ratio of disturbed to undisturbed available natural forests, and the details of any specific logging ban policy.

balance between total growth from both natural forests and plantations compared to the 1996 level of industrial timber production improves to +60 million m³ (Figure 10). South Asia, Insular SE Asia, and Tropical Oceania continue to show deficits. Only Temperate Oceania switches from a deficit to a positive balance by virtue of recognizing New Zealand's harvest primarily derived from existing plantations. Malaysia and India continue to show significant deficits even taking into account plantations.

4.5.3 International trade implications

With growing open trade in forest products, individual countries are able to offset inadequate domestic forest and plantation resources through increased import of industrial timber. The Asia-Pacific case studies indicate the difficulty of being self-sufficient in face of deforestation and adequate plantation resources. Thailand, Philippines, Vietnam, and Sri Lanka have promoted greater production from plantations as a strategic part of imposing logging bans for natural forests, but with minimal success. Sri Lanka has significant capacity for timber from private home gardens and other non-forest resources, but Thailand, the Philippines, and Vietnam do not have such a supply source. These four nations have become net importers of industrial wood, with imports expected to continue to increase. China needs greater imports, at least during the transitional period towards greater future capacity from immature high-yield, fast growing plantations. Only New Zealand has sufficient plantation resources to offset declining production of natural forest timber and to produce a surplus for export.

International trade, supported by plantations in the exporting country, also opens the possibility of shifting environmental damage and deforestation between countries or regions. One country that takes actions to protect and conserve its natural forest resources can 'export' the problems to the supplier country through pressures to harvest for export. For example, there have been allegations that Thailand's logging ban has resulted in both illegal logging and greater imports along the border areas of Lao, Cambodia and Myanmar. Protection of natural forests in China has led to greater imports from the Russian Federation, potentially contributing to unsustainable harvesting in parts of the Russian Far East and East Siberia.

4.5.4 Comparative advantage

Reduction in output from natural forests either through deforestation, degradation, logging bans, sustainable management, or enlargement of protected areas also leads to domestic and international price adjustments. To the extent that the market-based prices prevail, both suppliers and consumers respond and adjust output and consumption decisions.

A country that has had a comparative advantage in harvesting of natural forest timber may not enjoy an advantage in plantations. A large number of obstacles exist in the Asia-Pacific region to creating economically viable commercial plantations, particularly in relatively small-scale operations. The advantage may shift to other areas within a country, or even between countries. For China, the switch to a plantation-based "One Timber Base" will have substantial impacts regionally within the country. Changing sources of timber supply is a serious threat to established forest based enterprises in the traditional State-owned natural forest regions of the Northeast, Inner Mongolia and the Southwest. Plantations will result in new production capacity in the south coastal provinces that are much more favorably located

for high yield, fast-growing species and access to markets. Timber will also be imported in increasing quantities from the Siberian regions of Russia. New Zealand, as a prime source of intensively produced plantation timber, may well exploit export markets in Asia-Pacific at the detriment of plantation development within other individual developing countries.

In the past, non-economic factors and political considerations have influenced many decisions regarding plantations. Details of species substitution, efficiencies in growing and harvesting, transport, size or scale of operations, and a number of other considerations impact where and how plantations will develop throughout the region. Comparative advantage is largely based on market economics which is increasingly influencing, if not determining, plantation decisions.

4.6. Conditions for plantations to successfully substitute for natural forest timber

The growing influence of economic advantage and international trade as the basis for plantation development suggests that several fundamental conditions must exist in order to provide long term incentives for stimulating investments in intensively growing industrial wood.

4.6.1 Access to Forest Lands

Governments legally hold most of the natural forest and lands potentially available for plantation development in the Asia-Pacific region. Use rights are often unclear and tenures subject to political risk. Land may not be made available on a scale sufficient to make commercial operations feasible. In Vietnam, for example, smallholdings under the allocation of forest use to individual farmers, effectively limit the practical feasibility of economically viable private plantations. The earlier policy emphasis in Thailand on large scale, industrial plantations was strongly resisted by local communities and individuals as transferring resource control to 'the rich' and often non-local parties at the expense of local welfare

In many cases only the poorest or degraded forestland may be allocated for local development. Better forests with healthier forest stands are mainly "reserved" for State administration and control. With high rates of poverty, the Philippines, Thailand and Vietnam have faced social conflicts between indigenous local people and conflicts between traditional forest use rights and the desire for commercial development. New Zealand, with extensive private plantations, has demonstrated the feasibility of placing plantations on "a totally independent commercial footing" and encouraging private foreign investment. Sri Lanka also demonstrates the feasibility of creating tenures that permit small-scale home gardens to become the most significant source of commercial timber.

4.6.2. Technical and Economic feasibility

Much is known about the yields, growth rates and technical characteristics of species, industrial and woodfuel plantations in the Asia-Pacific region. However, strategies for growing wood will not guarantee economic feasibility reflecting returns on investments and capital flows. Some poplar and eucalypt plantations in China, for example, may be phased out as they mature due to a lack of adequate demand or profitability.

4.6.3. Use Conditions and Tenure

Where private ownership is not culturally acceptable (as in much of Asia-Pacific) various arrangements are required to determine and allocate tenures or use rights. For example, New Zealand needed to develop clear policies for the conditions of sale/transfer of State plantations allowing for recognition of native Maori claims to the land. Market reforms are leading to new and innovative tenure schemes in China. Conditions of use, decision-making authority, investment, and the ability to capture economic returns need to be clearly identified and guaranteed if private confidence and commitment are to be achieved.

The transferability of long-term tenures and use rights is also important as a pre-condition for private plantation development. Without legal protection of such rights, and given the long-term nature of plantation investments, the willingness to provide human resources, capital and labor to growing trees is constrained. In the Philippines, for example, the frequency of policy changes and the corresponding uncertainty has had serious negative impacts on private plantation development. In Thailand, a bias against commercial large-scale investors for plantation development, and the need to obtain cooperation of numerous small local farmers or communities makes viable operations difficult or impossible. Other forms of governmental regulation and uncertainty such as transport permits, harvesting restrictions or licenses, taxes, royalties or fees for privately grown trees, etc all act as deterrents to private participation in plantation development.

4.6.4. Market Access

Producing timber on a commercial basis also implies the need for developed market structures and economic infrastructure capable of assuring efficiency in the procurement of inputs and the sale and distribution of outputs. Market information, regarding short and long term assessments and forecasts, together with technical product knowledge is required to guide independent managers and producers of plantation timber. Freedom to sell and distribute output without transportation constraints or pricing restrictions is also basic to functioning markets

4.6.5. Investment Capital

As Vietnam's "5-Million Hectare Programme" illustrates, commercial plantations are an expensive undertaking. Massive investments will frequently require joint participation by local and commercial interests, governments, and potentially international foreign direct investment or aid assistance in the form of grants or loans. China's progress in plantations in the past decade has been made feasible in large part by assistance from the World Bank through a series of afforestation projects assisting in over 2.5 million hectares of plantations. Evidence of technical and biological feasibility, or even superiority, of a fast growing, high yield plantation does not assure availability of investment capital and economic viability

Efficient growing of plantation timber does not also assure advantage in domestic processing of that material. Much of the forest industry infrastructure and technology is old or obsolete in the Asia-Pacific region, requiring significant capital investment for modernization.

Integrated utilization for more complete recovery of useable products, including wood-based panels, from waste or residues can extend the resource as well as enhance economic returns. However, the capital investments required for efficient technology is often lacking.

5. CONCLUSION

The Vietnam country case study for the APFC review of logging bans posed the following questions in the introduction:

“Where will materials for forest industries come from to replace the wood volume previously exploited from natural forest? How much can the potential wood supply from planted forest be in the following years? Does the planted forest wood meet the need for wood of forest industries?”¹⁰

It is clear that plantations will play an increasingly significant role in future timber supply. The answers to these and related questions, however, will only be answered on a case-by-case basis as governments and investors determine where and how plantations can be technically, economically and socially feasible – as well as environmentally friendly. In the near term, plantations in Asia-Pacific can contribute towards offsetting, but not replacing, reductions in harvests from natural forests. It is likely that for both the Asia-Pacific Region and globally that the current pace of industrial plantation development will barely keep pace with losses from deforestation and the additional transfer of natural forests to protected status. Timber imports will increase, placing new demands on Asia-Pacific suppliers who will need to demonstrate that they can provide sustainably produced plantation timber. Economic development will also continue to stimulate demand, adding significantly to consumption. Plantation development for substantial increases in industrial wood, while theoretically possible, is presently not sufficient to offset both growing consumption and declining natural forest harvests.

¹⁰ Efficacy of Removing Natural Forests from Timber Production as a Strategy for Conserving Forests – Vietnam”, draft country study report, Vu Huu Tuynh and Pham Xuan Phuong, Hanoi, Vietnam, May, 2000, p. 1. FAO/Asia-Pacific Forestry Commission.

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