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CURRENT TRENDS AND DEVELOPMENT OF PLANTATION FORESTRY IN ASIA PACIFIC COUNTRIES

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ABSTRACT

Natural forests in the Asia-Pacific region are under increasing pressure to meet demands for wood and fibre, while continuing to provide a vast array of environmental and social services. Future increases in demand for wood are likely to be met largely from forest plantations. This paper reviews the current extent and distribution of the global forest plantation resource, as well as plantation distributions in the Asia-Pacific region. The paper provides a range of modeled scenarios that identify likely ranges of future plantation wood production. It also provides a brief review of key factors likely to determine future plantation investment patterns, as well as a brief overview of recent policy initiatives and trends relating to plantation establishment in the Asia-Pacific region.

INTRODUCTION

During the past 30 years the Asia-Pacific region has increased dramatically in importance as a consumer of forest products. The region now equals Europe in the consumption of all major wood and paper products, and trails North America in the consumption of only sawn timber and wood-based panels. Asian consumption trends have been largely driven by two key factors, increasing wealth (as evidenced by increased per capita consumption) and increasing populations (evidenced in increased total consumption).

Taken at face value, the key trends on the supply-side are in opposition to this increasing trend. The most evident, or at least the most publicized, trend in Asian forestry is that areas of natural forests are declining, and particularly, that less natural forests are available for wood supply. Considerable attention has, consequently, focused on identifying means of alleviating potential wood and fibre shortfalls. For a number of Asian countries a primary solution has been to markedly increase imports of forest products. Other solutions have included increased levels of recycling, improved processing conversion efficiencies, increased utilization of harvesting residues and, of course, the establishment of forest plantations.

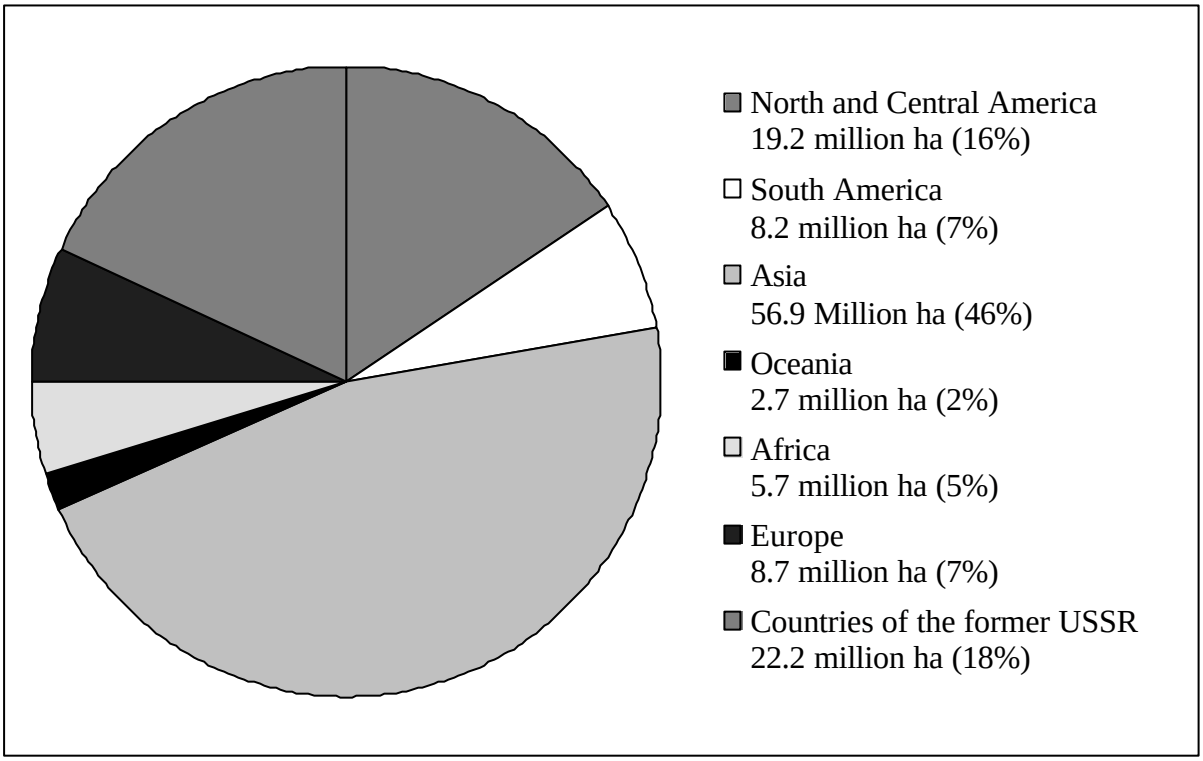
While there is scope for steady improvements in the efficiency of resource utilization (both in the forest and at the mill), and some potential for increasing recycling rates, there is increasing consensus that future increases in global wood demand will have to met largely from plantation forests.

ASIA-PACIFIC PLANTATION FORESTS IN A GLOBAL FRAMEWORK

Forest plantations presently account for only a small proportion of the world's total forest area. FAO estimates that, in 1995, the global plantation estate totaled 123.7 million hectares, or approximately 3.5 percent of the world's total forest area. Industrial plantations (plantations primarily established as a source of industrial wood and fibre) were estimated to account for 103.3 million hectares.

In terms of global plantation resources, the Asia-Pacific region is an extremely important player. Figure 1 shows the global distribution of forest plantations by region. It is notable that the combined Asia and Oceania regions account for 59.6 million hectares (48 percent) of the world's plantation forests.

Figure 1 The global distribution of forest plantations by region in 1995



Pandey, 1997.

More revealing however, is the total share of the global forest plantation resource held by just a handful of countries. Five countries have each established more than 10 million hectares of forest plantations: China (21.4 million ha); United States of America (18.4 million ha); Russian Federation (17.1 million ha); India (12.4 million ha); and Japan (10.7 million ha). Together, these five countries account for 65 percent of the global forest plantation resource. And of course, three of these countries are members of the Asian region. The overall concentration of forest plantation resources in a handful of countries is further demonstrated by the fact that only an additional 13 countries have an area of forest plantations exceeding one million hectares. Thus, 18 countries account for 87 percent of the world's forest plantations. Ten of these countries are in the Asia-Pacific region.

While plantation forest areas can give a very broad approximation of plantation wood production potential, the development of national age-class structures for plantation forests allows considerable refinement of these assessments. Age-class information enables more accurate assessment of the current level of wood production from plantations and likely future changes in production levels. FAO recently published a study[1] that derives representative age-class structures on a country-by-country basis, consistent with published information. This classification for industrial plantations is illustrated, by region, in Figure 2.

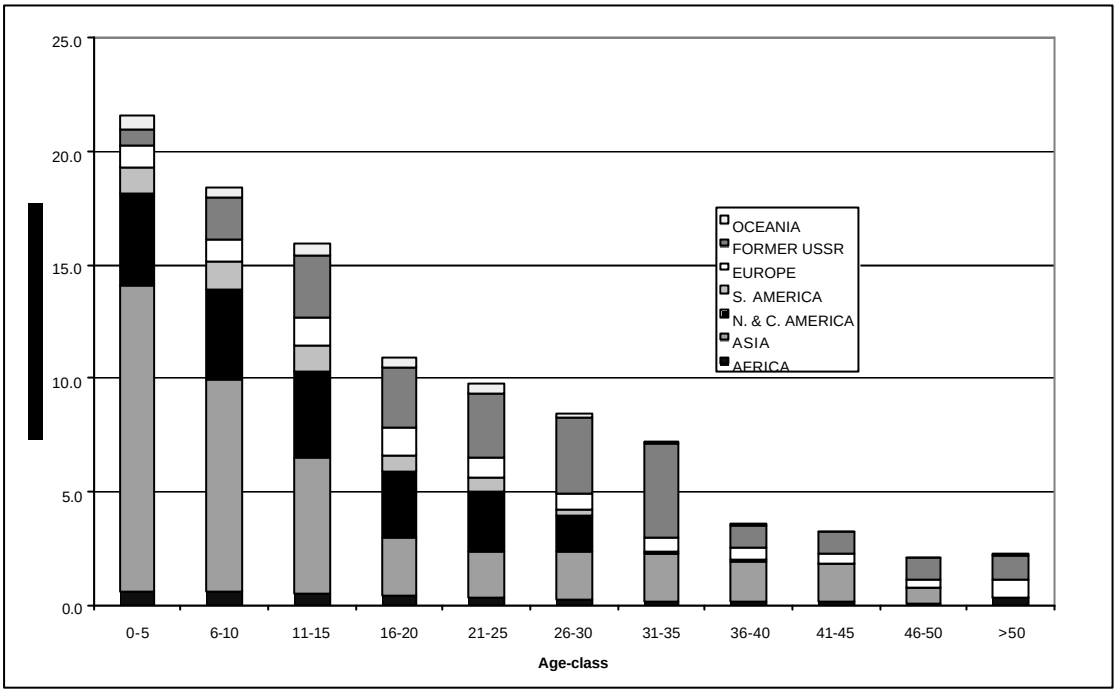
Two dominant trends are apparent in Figure 2. Firstly, as noted earlier, the preponderance of Asian plantations compared with the other regions, is clearly evident. This is particularly the case for plantations established in the past decade. Asian plantations constitute 40 percent of

[1] Brown (1999)

the global total in Figure 2, and 57 percent of the plantations established since 1985. Adding plantations for Oceania raises the latter figure above 60 percent.

The second conspicuous feature of Figure 2 is the very high proportion of plantations aged less than 15 years, particularly in developing countries. Overall, 54 percent of industrial plantations are less than 15 years of age, with 21 percent planted between 1990 and 1995.

Figure 2: Derived industrial plantation age-class structure by region 1995



Brown, 1999

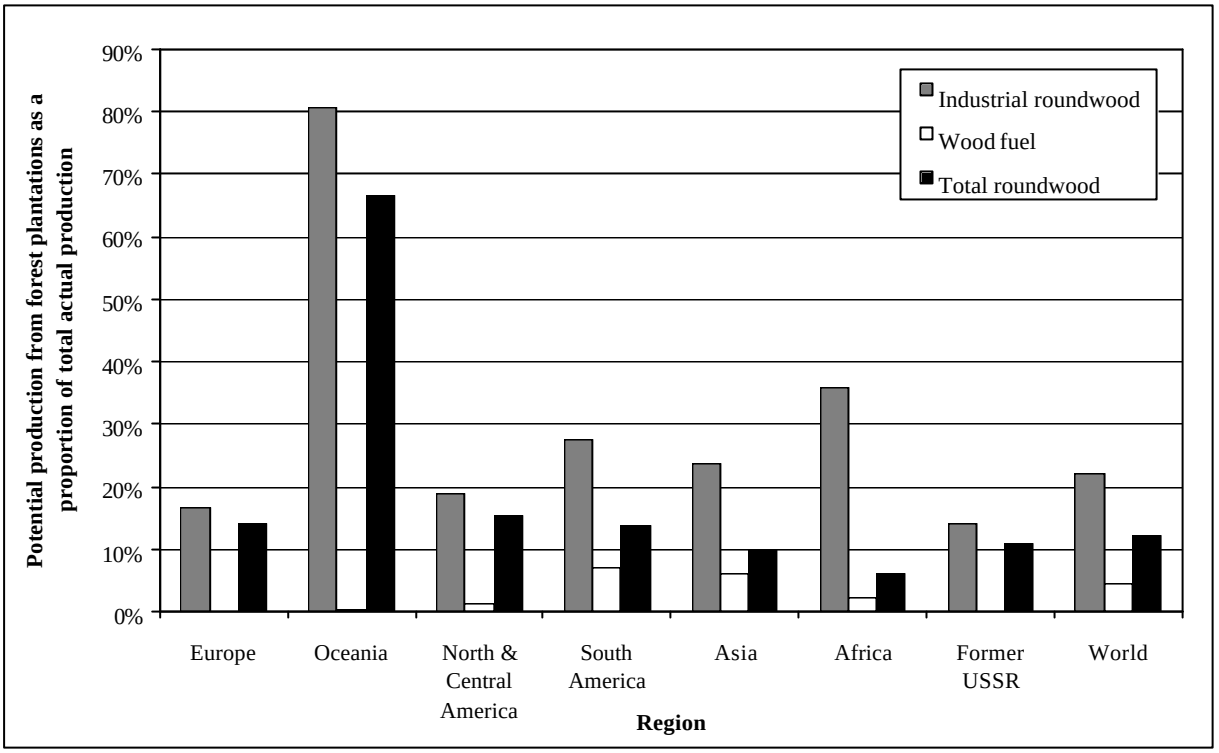
Only 2.2 percent of plantations in Figure 2 are aged more than 50 years. A further 15.6 percent are between 30 and 50 years of age. This is largely the result of acceleration in the rate of new plantation establishment, but also reflects the harvesting of mature plantations in the older age-classes and a general shortening of rotation lengths in many countries.

Current industrial roundwood production from plantations is estimated to comprise around 331 million cubic metres, or approximately 22 percent of global industrial roundwood production. Figure 3 shows regional estimates of total roundwood production, industrial roundwood production and fuelwood production, from plantation forests, as a proportion of overall production for these categories.

The "bottom-line" shows that current plantation production is estimated to be supplying around 12 percent of the world's total roundwood harvest. The harvest from plantations designated "industrial" constitutes, however, a far greater proportion of reported industrial roundwood production, than does the proportion of non-industrial plantation relative to fuelwood production. Non-industrial plantations are estimated to contribute only 4.4 percent share of global fuelwood production.

Plantation production for industrial roundwood is particularly important in the Oceania region, where 80 percent of industrial roundwood is plantation-grown. Africa (35 percent), South America (27 percent) and Asia (23 percent) also have above average proportions of industrial roundwood produced in plantations. Production from plantations in a handful of countries in each of these regions – Australia, New Zealand, Chile, China, Japan and South Africa – is sufficiently large to draw these regions ahead of the global average.

Figure 3: Estimated plantation wood supply as percent of total roundwood harvest - 1995

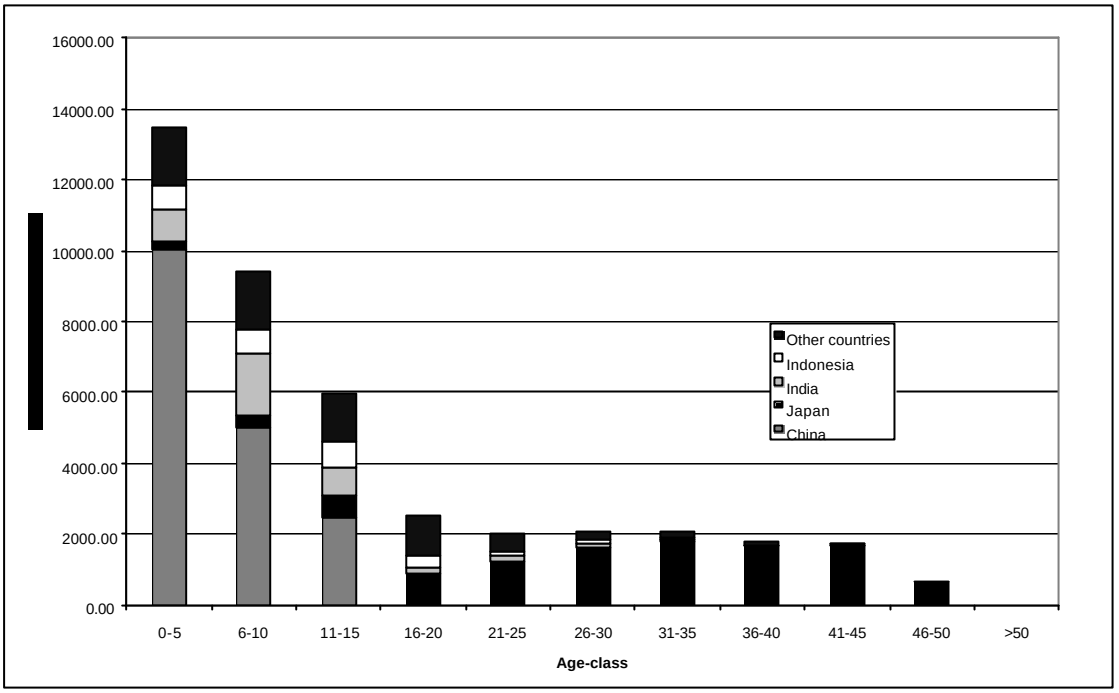


Brown, 1999

TRENDS IN ASIA-PACIFIC

Asia's three largest plantation countries, China, India and Japan, account for 78 percent of plantations in the region. The resources in each of these three countries are of markedly different composition. All of Japan's plantations, despite an increasingly heavy emphasis on protection functions (one-third of all Japanese forests are classified as protection forests), are classified in this analysis as industrial plantations. Conversely, two-thirds of India's plantation forests are non-industrial, mainly for fuelwood purposes.

Figure 4: Derived industrial plantation age-class structure by country - Asia 1995



Brown, 1999

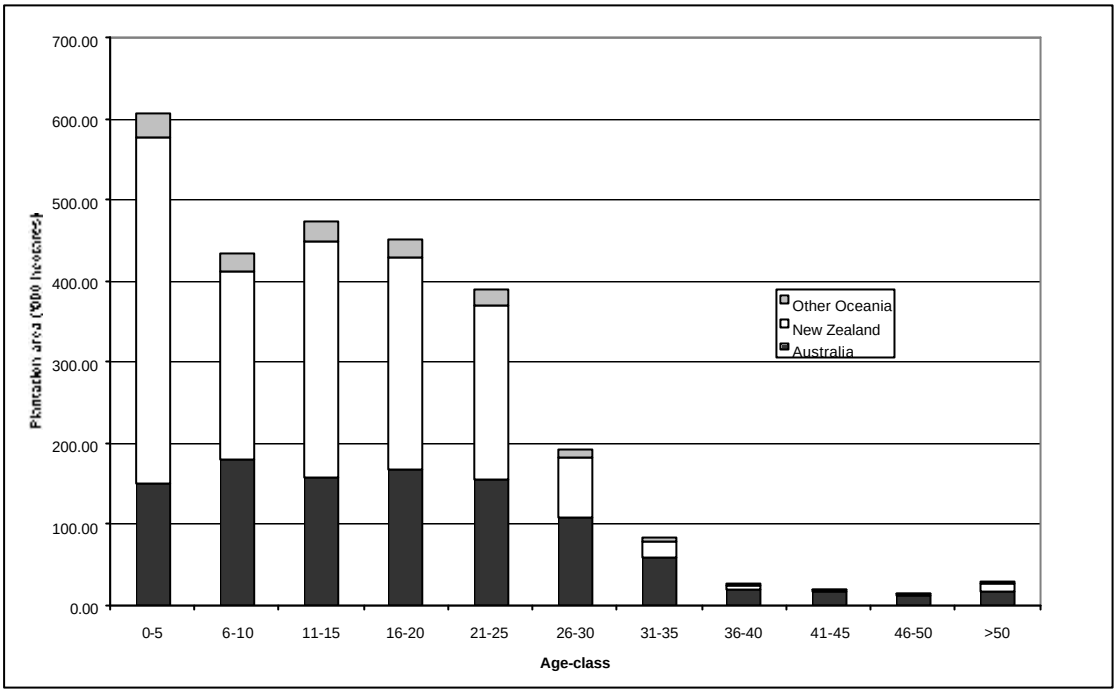
Figure 4 shows that the majority of Asia's industrial plantations are aged less than 15 years. This is largely due to a very rapid acceleration in plantation establishment in China, and due to the short rotations generally used in that country. Japanese plantations predominate in the older age-classes. In Japan around 45 percent of forests are classified as plantations (10,067,000 hectares), almost all of which were planted in the post-war reconstruction. The main species are sugi (*Cryptomeria japonica*), hinoki (*Chamaecyparis obtusa*), pine and Japanese larch (*Larix leptolepis*).

China's timber plantations comprise mainly *Cunninghamia lanceolata* and a variety of pine species. More than 80 percent of China's plantations are of industrial species.

India, the third of the "plantation-giants" in the Asia region, has a markedly different plantation focus with more than two-thirds of plantations designated non-industrial, largely for fuelwood purposes. Pakistani and Bangladeshi plantation forests have similarly high proportions designated for fuelwood. Not surprisingly, India's plantations are dominated by fast growing hardwoods, particularly, *Acacia* and *Eucalyptus* species. Teak (*Tectona grandis*) is the most commercially important timber species planted, totalling around 1 million hectares. Pakistan has similar proportions of *Acacia* and *Eucalyptus* species but also has significant areas planted in *Dalbergia sissoo.* Bangladeshi plantations are dominated by mangrove species, but also has around 70,000 hectares planted in teak.

Other Asian countries with plantation resources exceeding one million hectares are Indonesia, Democratic People's Republic (DPR) of Korea, Republic of Korea, and Vietnam. Indonesia has planted 3 million hectares of predominantly industrial plantations. *Tectona grandis, Acacia mangium* and *Pinus merkusii* are among the most common of a considerable range of species. DPR Korea has established 2.2 million hectares of plantations with *Larix leptolepis* and *Pinus koriaensis* accounting for around 60 percent of the resource. The Republic of Korea has planted slightly more than 2 million hectares with *Larix leptolepis* and *Pinus koriaensis* also dominating the resource, though considerable area has been planted in *populus* species. Vietnam has established 1.05 million hectares of plantations in a variety of species of which *Pinus* and *Eucalyptus* species are the most common.

Figure 5: Derived industrial plantation age-class structure by country - Oceania 1995



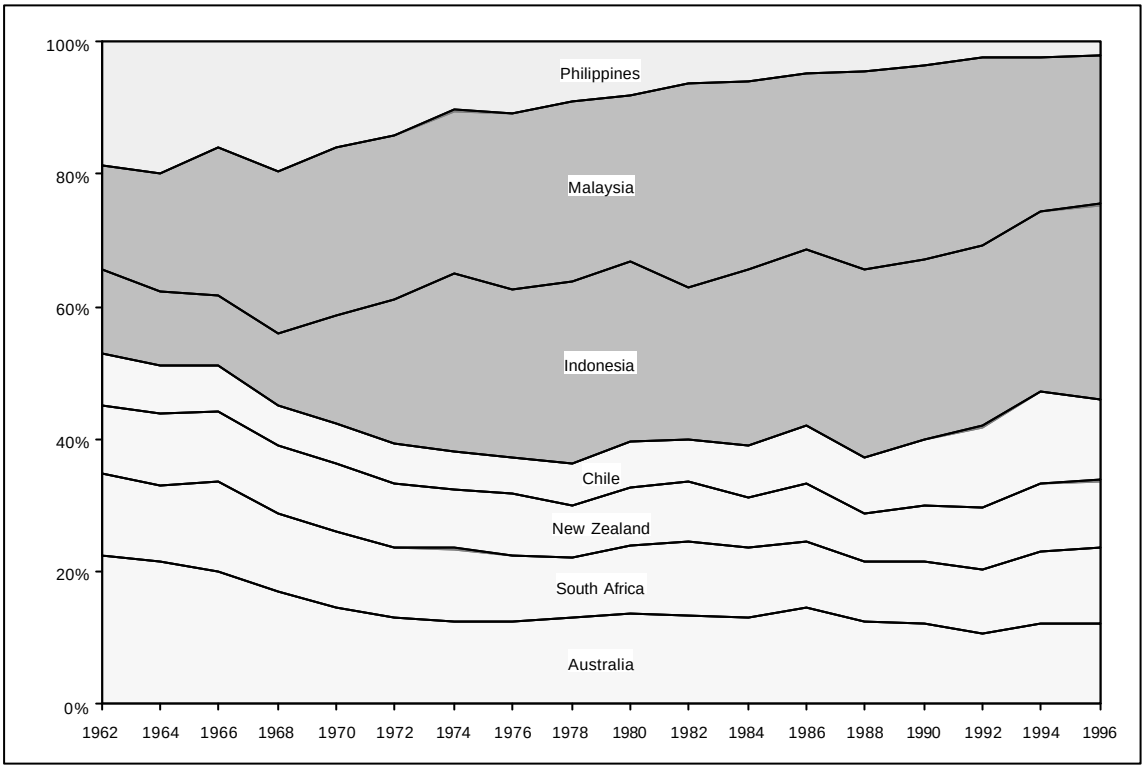
Brown, 1999

Figure 5 shows the age-class distribution for plantation forests in Oceania. The dominant plantation species in Oceania is *Pinus radiata.* This species accounts for 91 percent of plantation area in New Zealand, and 62 percent in Australia. Other pine species, most notably *Pinus caribaea* in Fiji, and *Pinus 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*) and teak (*Tectona grandis*) plantations.

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

New Zealand, Australia, Chile and South Africa comprise a grouping 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 during this decade. These new plantation supplies seem likely to significantly alter the composition of Asia-Pacific wood and fibre markets. Figure 6 illustrates some significant trends in wood production during the past 40 years, comparing Southeast Asia with the Southern Plantation Countries.

Figure 6: Comparative shares of wood production: South-east Asian countries vs Southern plantation countries



FAO, 1997

Figure 6 shows proportionate shares of wood production between seven countries. This graph highlights the point that large tracts of natural forests are likely confer advantage in the short-run, but that advantage will eventually move according to other competitive factors such as the ability to grow trees quickly, well-developed forestry infrastructure, and access to capital. Hence, the Philippines, having exhausted its natural advantages in the 1960s, has become a minor player in international wood markets. Malaysia and Indonesia commenced logging in natural forests later and have exploited their natural advantage through the 1970s and 1980s. In the 1990s, however, there are signs that the fast-growing plantations of the Southern Plantation Countries are beginning to capture market share from Indonesia and, particularly, Malaysia. Over the next decade, given significant increases in plantation areas coming on stream, this trend is almost certain to continue, irrespective of the difference in wood qualities from the respective countries.

FUTURE PLANTATION WOOD PRODUCTION

FAO has modelled three scenarios for future wood supply from forest plantations as part of the Global Forest Products Outlook Study Thematic Study on Plantations. The three forest plantation scenarios are:

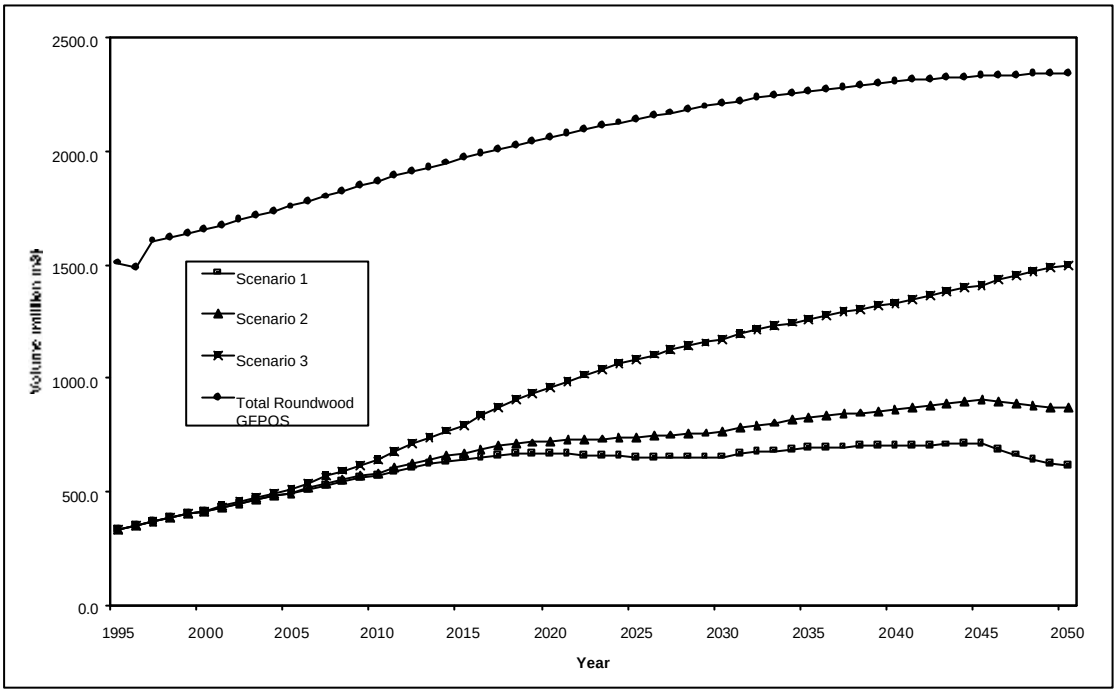
Scenario 1 provides a baseline forecast, by assuming that forest plantations are not expanded beyond their current area and that all areas are replanted after harvesting.

Scenario 2 assumes that new planting will increase the forest plantation area at a constant rate of 1.2 million ha per annum in total (equal to 1% of the current area of forest plantations).

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

Figure 7 compares future wood production from industrial plantations under each of the three scenarios is compared with a forecast of industrial roundwood consumption derived using long-term trend analysis, to 2050.

Figure 7: Comparison of projections for industrial roundwood production with three plantation scenarios



Brown, 1999

Several points of interest can be noted from Figure 7.

1. There is little difference between the three forest plantation scenarios until 2010. This is because trees already in the ground will determine production over the next 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 cubic metres to 712 million cubic metres. Note, however, this growth in plantation 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 supply additional new demand.
3. Scenario 2 increases at approximately the same rate as projected new demand for roundwood. Scenario 2 shows an increase in plantation wood production to 906 million cubic metres. Note, however, that current levels of harvesting in natural forests, recycling, etc. would need to be maintained if no other new fibre sources are found, or efficiency is not significantly improved.
4. Only Scenario 3, with its relatively large landuse implications, would enable forest plantations to substitute for wood production from natural forests. Scenario 3 expands plantation production to 1.5 billion cubic metres, approximately equal to current levels of global industrial roundwood consumption. Under Scenario 3, the industrial 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 plantation establishment rates. Consequently, much is likely to be determined by the future availability of land for new planting and perceptions of supply-demand balances for wood and fibre. In general, it should be expected that plantations will supply a high proportion of feedstock to fibre based industries and for the production of utility sawntimber. High quality hardwood timbers, especially, are likely to continue to be sourced from natural forests, although plantation grown teak can be expected to become increasingly important.

FOREST PLANTATION INVESTMENT OPPORTUNITIES

Economic constraints to plantation investments centre on rates of return and generally bear a relationship to ecological constraints on production. This is because rates of return depend crucially on initial investment costs, the price of the final product and the speed with which return on investment is generated (i.e. how fast a tree can grow). Thus, in many important temperate forestry countries such as Canada, Sweden, Finland and the Russian Federation, trees simply do not grow fast enough to enable plantations in these countries to be truly competitive in tree growing against highly productive countries in the Asia-Pacific region. For example, Sohngen et al[2] suggest:

Because land is generally available for these plantations and because relatively small management inputs can lead to substantial future gains, subtropical plantations are a better investment than are temperate forests.

At present this view, perhaps, pays insufficient attention to other elements of competitive advantage. Many developed temperate countries continue to have significant advantages in infrastructure, technology and labour skills, over developing countries. Advantages arising from integrated processing and marketing functions are also important. That is, significant advantages (for example, supply security, stable raw material pricing and material scheduling advantages) generally accrue to companies that own both forests and processing facilities. Similarly, processors located close to their markets generally capture marketing advantages. The presence of strong clusters of supporting industries will be similarly important. The crucial point is that the ability to grow trees quickly is only one, in a complex set of factors that will determine success in forestry. An excessive focus on production concepts is unlikely to be a good substitute for strongly-based systemic development.

An important feature to take into account is private sector reactions to external events (e.g. feedback effects of policy changes) and in response to competitors' actions. A major policy change in one country may trigger significant changes in other regions. For example, changes to (and uncertainty about) US forest policies in response to the Spotted Owl issue, and concurrent log export bans imposed in Sabah and Sarawak, had significant effects on wood prices around the Pacific Rim. In several countries this stimulated additional plantation establishment. Similarly, there remain a variety of conflicting views over future scarcity of wood and fibre. To a large extent this divergence of opinion is the result of the poor quality, and scarcity, of globally aggregated data. As data availability and quality improves, private sector and governments may alter their plantation strategies.

In terms of future plantation establishment, the prevailing economic principle may well be the law of diminishing returns. A case can be made, for example, that the best plantation sites (in comparative advantage terms) are already occupied. Consequently, future plantation sites will be both less profitable and confront investor portfolios already significantly weighted by existing plantation investments. Similarly, market perceptions of plantation-grown wood are

[2] Sohngen B, Mendelsohn R, Sedjo R and Lyon K; *An analysis of global timber markets*; Resources for the Future: May 1997.

that it is generally inferior to natural timber. While plantations may be able to expand their role in fibre-based industries, there remain considerable barriers to expanding market share held by, for example, luxury hardwoods. Plantation grown teak (*Tectona grandis*) may be an exception to this rule.

ASIA-PACIFIC POLICY INITIATIVES AND TRENDS

Plantation establishment in the Asia-Pacific region is largely being carried out according to three distinct models:

1. plantation establishment led by central- or state-government planting programmes;
2. plantation establishment under community-based development; and
3. private sector-led plantation establishment.

Many countries are utilising some combination of all three.

Central government programmes

Central government-led plantation establishment is particularly notable in China and Vietnam.

The Chinese Government attaches great importance to forestry development. Key ecological programmes such as the Three-North Shelterbelt Development Programme, the Coastal Shelterbelt Development Programme, and the Taihang Mountain Afforestation Programme have been carried out under State planting programmes. China also has a very significant proportion of its plantations under community collective management. China plans to increase the country's forest cover to about 17 percent by 2010, a substantial area of which will be plantations. During the period 1996-2010, China plans to bring a total area of 9.73 million ha into timber plantations. New plantations of mainly high-yield, high growth, species, will comprise 5 million hectares of this area.

A central plank in Vietnam's forestry strategy is the Industry Plantation Programme. This programme envisages the establishment of 5 million hectares of intensively managed industrial plantations, by 2010, to meet the country's future demands for wood and fibre. The Government has created a plantation fund, which lends money at favourable interest rates for tree planting. Significant resources have also been allocated from the Government's central budget for state-led plantation establishment. Vietnam has also however, made available private sector taxation concessions and exemptions to encourage plantation establishment. Lands allocated to households for tree-planting activities have had tenure guaranteed through land-use certificates. Measures have been taken to encourage foreign investment in plantations, both through donor efforts and encouragement of joint venture plantation establishment.

Community-based programmes

Community-based plantation establishment schemes comprise an important component of development in a number of countries including India, Nepal and the Philippines. Countries such as Bangladesh, Laos, Myanmar, and Sri Lanka are also recognising the merits of, and endeavouring to implement, systems of community-based afforestation/reforestation and forest management.

In India, participatory activities in plantation establishment centre around the concept of Joint Forest Management. The Federal Government issued detailed guidelines to all States and Union Territories to involve local communities in the rehabilitation and protection of degraded forests through Joint Forest Management. The concept formally recognises the importance of associating local people in protection, management and development of forests and envisages mobilising communities through the formation of Village Forest Committees. Communities are empowered to manage degraded forests, including carrying out reforestation activities, on a benefit sharing basis. India also maintains a strong network of federal and state government tree-planting schemes.

Nepal and the Philippines also have strong community forestry plantation programmes. Nepal has established community-based Forest User Groups, to which the user rights and land ownership of specific tracts of forest have been ceded by the Government. Forest User Groups may receive a cash subsidy as an incentive for plantation, development and protection. Community-based forest management and plantation schemes in the Philippines will be familiar to many in the audience. Three major people-oriented forestry programmes have been implemented: the Integrated Social Forestry Programme (ISFP); Forest Land Management Agreements (FLMA); and Community Based Forest Management (CBFM).

Private sector-led planting

In New Zealand and Australia (among others), plantation establishment is mainly carried out by the private sector. In these countries, a critical mass of plantations has been established by the government, with ownership to many plantations, along with responsibility for plantation establishment, gradually devolved to the private sector. Neither country provides significant incentives for plantation establishment. Plantation forestry is regarded as a business, where afforestation activities are primarily assessed on the basis of profitability. Nonetheless, both countries have significantly, expanded their plantation estates in recent years, with the Australian government setting a goal of the country having established 3 million hectares of plantations by 2020, and the New Zealand government periodically mentioning plantation establishment "targets" ranging up to 100,000 hectares per annum.

CONCLUSIONS

The analysis suggests a central conclusion that the role of plantation forests in meeting future wood and fibre demands will increase during the next 30 years, irrespective of future rates of plantation establishment. Forest plantation wood supplies for the next decade are already largely determined by trees in the ground and, in many countries, a considerable increase in areas of plantation forests reaching harvestable age is expected. Thus, by 2010, the annual yield of plantation grown industrial roundwood is estimated to increase from the current 331 million cubic metres to around 600 million cubic metres.

Beyond 2010, plantation production forecasts are increasingly dependent on assumptions of new planting rates, and on assumptions of improvements in annual increments. There is scope, depending on policy decisions and markets, for forest plantations to play a dominant role in industrial wood and fibre supplies. A more likely scenario is probably that the proportion of forest plantation-grown wood will increase, but natural forests will continue to supply a modest majority of industrial roundwood.

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