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Farm Tree Planting and the Wood Industry in Indonesia : a Study of *Falcataria* Plantations and the *Falcataria* Product Market in Java

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Abstract : Given that the cutting pressure on natural forests in Indonesia must now be reduced, it is vital that the forest industries adjust accordingly and shift their resource base from natural forests to plantations. This study is presented in an attempt to help develop a tree plantation strategy for Indonesia and so facilitate this industrial transformation. Focusing in particular on the issues surrounding farm tree planting, a case study format is adopted in a treatment of *Falcataria*, a preferred plantation species used in agroforestry systems mainly in Java. This study describes i) some characteristics of the *Falcataria* product market ; ii) the institutional framework that accommodates *Falcataria* plantations ; and iii) the role of the government in the development of *Falcataria* plantations. By way of conclusion, this study asserts that the *Falcataria*-based industries possess a suite of promising characteristics in the context of current trends in the world wood trade on the grounds that they support a high value-added market for environmentally friendly products.

This study also highlights the need for local markets in Indonesia to be nurtured in order that *Falcataria* products can be successfully advanced onto the international market. In developing a plantation strategy for private lands, the government is cautioned that any scheme is likely to fail in the absence of adequate preparation. Thus it is seen as essential that incentive measures be put in place in support of market growth ; several such incentive measures are reviewed here. In this respect, it may be necessary for the public sector to learn what constitutes a successful initiative from the example set by private enterprise. This document also stresses various issues relating to land tenure and the operation of plantation systems. Nonetheless, given the broader context of a resource development strategy for Indonesia, it is recognized that tenure and plantation systems are not the sole avenue for analysis. A more robust understanding of market-based issues is also required. Such themes may include the development of market research methodology ; the use of forest certification in marketing ; and the creation of various incentive measures for tree plantations. In order to develop a national resource development strategy, consensus building by way of workshops which involve all concerned individuals and organizations is now a process fundamental to achieving successful reform in the forestry sector.

Key words : Indonesia, plantation strategies, Java, farm tree planting, *Falcataria*.

1 Purpose of this study

1.1 Background

Given the scale and nature of the problems associated with the depletion of the forest resource in Indonesia, the Government of Indonesia (GoI) and the Consultative Group on Indonesia (CGI) have resolved an international commitment on forest policy development in the form of a Memorandum of Understanding. The priorities of the GoI-CGI commitment are defined by 12 agenda items and are embodied by the following five core activities (Hardjowitjitro, 2001) :

1) Eradication of illegal logging
2) Control of forest fire
3) Restructuring of the forest industry (industrial down-sizing)
4) Development of forest plantations for forest and land rehabilitation
5) Decentralization of the forestry sector

Accordingly, CGI is expected to coordinate its programme of activities in such a way as to be compatible with these commitments, and must also assist the forest industry in shifting its resource base from natural forests to plantations, in order to reduce the pressure on natural forests. This paper sets out to address CGI's objectives by analysing the development of tree plantation strategies in Indonesia as a means of facilitating this industrial transition.

In Indonesia, two main approaches to tree plantation development can be recognized : i) industrial tree planting (HTI) and ii) farm tree planting (or tree plantations grown on private or customary lands). Although both approaches are important as a resource development strategy, the present study focuses on the issues concerning the latter : farm tree planting.

Here, a case study format is adopted in a treatment of the production and marketing of a particular plantation tree species, namely *Falcataria*. Native to the Moluccas and New Guinea, *Falcataria* is a preferred plantation species in Indonesia and has figured particularly in the development of plantations in Java (Parwirohatmodjo, 1992). It is fast growing and used widely in the production of pulp, paper, veneer, plywood and furniture. (Charomaini & Suhaendi, 2002). Several scientific names have been applied to *Falcataria* (including *Albizia falcataria* (L.) Fosberg, *Paraserianthes falcataria* (L.) Nielsen, *Albizia falcata* (L.) Backer, *Albizia moluccana* Miq. and *Adenanthera falcataria* L., all of which are generally accepted as synonyms of *Falcataria moluccana* (Miq.) Barnaby & Grimes), though in Java it is locally known as *Sengon*. Nomenclatural issues aside, in this study the name *Falcataria* is used to refer to the species

in a broad sense.

In addition to its industrial uses, *Falcataria* is a popular choice as an intercropping species in Indonesia (Djogo, 2002), and consequently, a number of typical problems associated with the role of trees in farm planting can also be identified. This makes it an ideal subject for analysis. Since, however, *Falcataria* is most widely planted in Java, this island forms the main geographical focus of the study.

1.2 Objectives

The present study describes :

i. Some characteristics of the *Falcataria* product market ;
ii. The institutional framework that accommodates *Falcataria* plantations ; and
iii. The role of the government in the development of *Falcataria* plantations.

Whilst some of the findings concerning *Falcataria* plantations in Java can be used to form generalizations about other tree planting practices in other parts of Indonesia, as has been mentioned, many of the findings presented here are specific to Java Island and should not simply be applied to the situation on other outer islands.

2 The *Falcataria* product market

2.1 World wood products market

Araya (2002) claims that although on a global scale the wood industries have been going through a period of major change since the early 1990s, the traditional wood industries in Indonesia are becoming outdated. The two main changes that have occurred in the world wood industry are that wood products have become increasingly (a) high value-added and (b) environmentally friendly.

Araya argues that the shift towards a high value-added products market is illustrated, for example, by the substitution of lumber by laminated and finger-joint wood products as well as by OSL and PSL. Similarly, plywood has been taken over by particleboard, OSB and fibreboard. At the same time, the wood panels market has expanded whilst the traditional solid wood market has shrunk.

With regards to the shift towards environmentally friendly wood products, Araya points out that timber is increasingly being sourced from plantation forests, and that forest certification systems have been expanding rapidly to guarantee wood products that are derived from sustainably managed forests. In addition, the use of wood resources has become more efficient in the manufacturing sector, adding weight to the claim of environmental superiority. Environmental claims can be made if low quality resources become high value-added products via a capital- and/or labour-intensive manufacturing processes.

Effectively, these trends set the standards with which the Indonesian wood industries must catch up. In this context, Araya (2002) asserts that, in order to support an industrial transition aimed at sustaining an export market, the role of the domestic market in Indonesia should not be neglected, since it is here that exporters stand to learn by accommodating those products rejected at the international level. In any case, because export markets often experience day-to-day fluctuations, strengthening the domestic market could help to reduce the financial risks for those involved in the wood trade.

Based on Araya's argument as outlined above, the current state of the *Falcataria* product market is investigated in the following sections. In particular, three working questions are addressed : 1) How can *Falcataria* trees be processed into high value-added products for the export market? 2) Which aspects of *Falcataria* products could be regarded as being environmentally friendly? 3) How is the domestic *Falcataria* market organized?

2.2 *Falcataria* for high value-added wood products

Solid *Falcataria* wood has a white color and rough texture. It is a light material that is easily worked in manufacturing processes ; it is not strong enough to serve as a structural component. *Falcataria* is a fast-growing tree and its log prices are usually very low. As a result of these characteristics, *Falcataria* has traditionally been used mainly locally for low value-added products, and has been neglected as an industrial timber of high value-added uses.

Recently, however, *Falcataria* has been used to produce many high value-added products in response to natural resource constraint. Among industrial uses, for example, furniture makers are increasingly using *Falcataria* in the manufacture of tabletops and drawers. Colour boxes made from *Falcataria* have become common and can now be readily found in DIY stores in Japan and other countries.

In addition, *Falcataria* is also used for bare core and block boards in which small pieces of *Falcataria* are laminated and finger-jointed together to form high value-added products. This is a typical example of an efficient resource use practice, which Araya (2002) defines as characteristic of "the world trend".

Door manufacture is also a promising area of development, as *Falcataria* is increasingly used to make the inner sections of doors, often being finished by MDF products on either side. Because MDF products are often made from plantation trees, such as rubber wood and pine, *Falcataria* doors can be regarded as being environmentally friendly since they are produced using a combination of farmed trees and recycled wood fibre.

Of particular note is that *Falcataria* doors are certified as fire-resistant in the UK and are widely used in McDonalds hamburger chain stores ; currently, *Falcataria* products exported by a single Java-based company account for 50 per cent of the market for

fire-resistant doors in the UK. That is, as a result of its unique set of characteristics, the *Falcataria*-based industries are establishing a firm position for themselves in the global wood products market.

2.3 *Falcataria* for environmentally friendly wood products

As already mentioned, *Falcataria* products can be promoted as being environmental friendly because *Falcataria* trees are grown mostly on private land such as farms, and not on land claimed from natural forest. Moreover, farm tree planting is indicative of community development, which is regarded as being complementary to the process of environmental conservation. In addition, many final *Falcataria*-based products are combined with other wood materials derived from plantations, such that environmental claims may still be justly made.

Here, the relationship between *Falcataria* products and environmental friendliness is summarized. First of all, the use of plantation resources may be regarded as being environmentally friendly. Indeed, even traditional plywood companies, including timber concession holders, have gradually shifted their resource base towards plantation forests in order to produce wood products such as plywood and LVL. *Falcataria* has become the centre of attention in this movement.

Secondly, environmental claims can be made where an efficient resource use system, as opposed to wasteful resource extraction systems, has been established. In this context, *Falcataria* has become a preferable material. Some companies, in fact, have introduced new rotary machines in order to utilize smaller logs with 20-25 cm diameters. In this way, technological developments make efficient resource use possible, endorsing the economic viability of *Falcataria* plantations with 6-year rotations.

Thirdly, environmental claims can also be made if low quality wood materials are converted into high value-added wood products through labour- and/or capital-intensive manufacturing processes. Usually, labour-intensive processing is a transition stage prior to capital-intensive processing, as the labour costs and the standard of living in a society increase. A typical case is the plywood industry in Indonesia. In comparison with particleboard and fibreboard, for example, plywood manufacture is a labour-intensive process (in particular, repairing deficiencies in a veneer is extremely labour-intensive). Along with a shortage of quality raw materials and rising labour costs, this is the main reason why the plywood market is shrinking around the world. However, Indonesia is still at a stage where labour-intensiveness forms a competitive edge for the industry : it is still important for a country like Indonesia to have an industry generating a large amount of employment. In essence, whether a labour-intensive industries are appreciated in social terms or not, *Falcataria* plywood manufacture is appropriate to the Indonesian economy at this moment and well poised to make valid environmental claims.

Over all, the *Falcataria* industry exhibits a unique combination of characteristics, allowing it to produce both high value-added and environmentally friendly products suitable for the contemporary export market. Figure 1 shows the recent trends in *Falcataria* product export. Based on prices in US dollars, the huge decrease which occurred in 1998 may be over-exaggerated because the Indonesian rupiah - US dollar exchange rate dropped significantly following the Asian economic crisis. Nonetheless, the figure illustrates that the export of value-added products began in earnest during the late 1990s at a time when *Falcataria* lumber exports were decreasing. According to the author's personal communication with furniture and plywood makers, the *Falcataria* product export market is thought to have expanded since the year 2000. This phenomenon is too recent to have been captured by any official statistics.

2.4 *Falcataria* for local markets

As Araya (2002) points out, local markets can support the export industries by accommodating products rejected on international markets. This is the case where domestic markets are able to absorb those products being produced for international trade. Currently, however, there is little domestic demand for high value-added *Falcataria* products in Indonesia.

However, from the point of view of *Falcataria* growers, the presence of a stable local log market is the main concern. Therefore, low value-added *Falcataria* products specific to the domestic market are also of central importance given that the export market can fluctuate greatly over short time frames, as shown in the Figure 2. In particular, exports from Sumatra exhibit drastic fluctuations. Although the precise reason for this is unknown, it is thought that the rise and fall of relatively few exporters can dictate the overall outcomes of *Falcataria* export.

In other words, in order to sustain the export industries, the availability of two kinds of products in local markets is optimal : i) products designed for the international market and ii) products specific to local

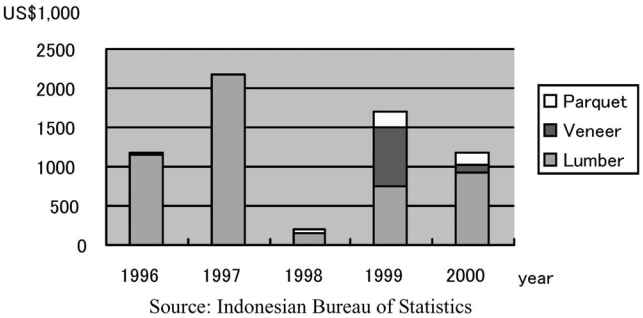

Fig. 1 *Ealcataria* exports by product.

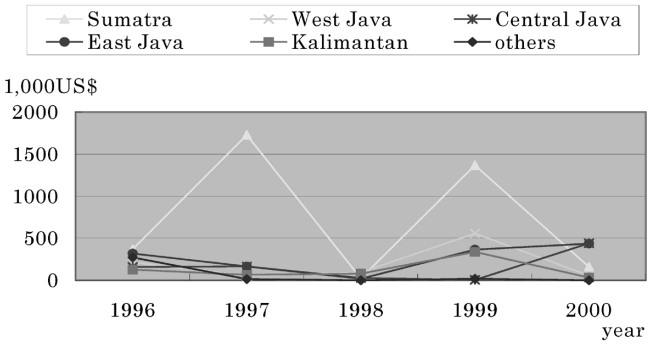

Fig. 2 *Ealcataria* exports by region.

use. The current condition of the local markets as it relates to these two kinds of products is discussed in the following section.

2.4.1 The local market for *Falcataria* products designed for international trade

As has been shown, those *Falcataria* products for which there are strong export markets are : i) building and wood working materials including plywood, LVL, finger joint lumber and bare core, and ii) final products, such as doors and furniture, some parts of which are made of the above materials.

Presently, there is no local market for these kinds of *Falcataria* products in Indonesia, where value-added components are mostly traded vertically between manufacturers and finished products are sold predominantly to overseas buyers. Some exporters and manufacturers outsource part of the manufacturing process to several local makers so as to spread the risks inherent in the market. For example, bare core is commonly manufactured at small local factories and sold on to exporters. This is the typical market structure for high value-added *Falcataria* products.

2.4.2 The local market for *Falcataria* products specific to local uses

There are many specialist *Falcataria* sawmills which produce goods specifically for the local market. In West Java alone, there are at least 140 *Falcataria* sawmills (PT Data Consult, 2002). As one of the cheapest wood materials available to local people, *Falcataria* lumber is typically used for consumable or disposable products, such as pallets and boxes. In other cases, however, *Falcataria* lumber is used for structural components such as roof frames and for concrete panels, which, considering its physical characteristics, is not really appropriate. For housing materials, *Falcataria* is good for non-structural or ornamental parts, such as window frames. Although a solid local market for *Falcataria* products exists, so do several key problems. With respect to high value-added products, only vertical transactions have been developed between manufacturers : there is virtually no consumer market for high value-added *Falcataria* products. In order to nurture the *Falcataria* export industries, it is vital that the public sector be encouraged to play a greater role in the creation of a domestic market for a wider range of products. For example, the use of *Falcataria* in public facilities is suggested as a good starting point to promote high value-added *Falcataria* products.

Another problem is the lack of any organized strategy to explore further the local market for low value-added products. As has been mentioned, *Falcataria* is a light material and as such its usage should be limited. Currently, however, *Falcataria* lumber is used for structural components in house construction and for concrete panels, both of which require physical strength. This may be due to a lack of knowledge on the part of the consumer, or because the low cost of *Falcataria* products ensures it is extensively utilized, regardless of usage. As far as possible, the public sector should support extensive wood product research to develop an improved and more appropriate, as well as novel strategy for local *Falcataria* usage.

In addition, reports from local people in West Java suggest that *Falcataria* sawmills are producing a lot of residue as industrial waste. This is clogging up the rivers and waterways where it is being dumped, causing local environmental problems. Given that these residues could be utilized for energy production and in the manufacture of fertilizers, pulp and paper, for example, the coordination of different resource uses is required to reduce environmental problems and ensure the development of efficient resource use practices. In order to do so, it is important to introduce the concept of lifecycle assessment in *Falcataria* use chains.

2.5 *Falcataria* for the international market

This section gives a brief assessment of the *Falcataria* export market. Figure 3 shows how exports of *Falcataria* products bound for a range of consumer countries have varied in the period 1996 to 2000. Until 1998, Japan was the main destination for exports. However, following the Asian economic crisis of 1998, the export market has diversified, with growing consumption of *Falcataria* products in many Asian countries, including Hong Kong, China and Korea. However, if *Falcataria* export is to develop further as a major national industry through targeted international sales, it is vital that the diversity of consumer preferences in relation to wood

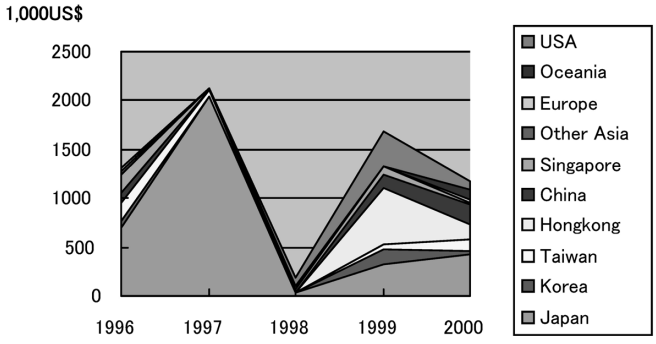

Fig. 3 *Falcataria* exports by destination.

products between different countries is better understood. Market research in each destination country is essential in this context.

As there is no comprehensive information available on the global *Falcataria* market as a whole, some information on the plywood industry is provided here. Although, as been mentioned earlier, *Falcataria* plywood is a promising product for export, increasingly factory managers involved in the *Falcataria* plywood trade are recognising the competitive threat posed by poplar plywood from China. According to such sources, the price for 3 mm *Falcataria* plywood on the export market in spring 2002 was US×360/m^3, whereas that of Chinese poplar plywood in the same period was US×270/m^3. To make matters worse for Indonesian manufacturers, the competitiveness among domestic industries is weakening because of recent economic trends tending to increase the strength of the Indonesian rupiah against the US dollar, as well as the rising minimum wage in Indonesia. In addition, some analysts hold a slack work culture responsible for a relatively low productivity in Indonesia, as compared with the Chinese labour force.

On the other hand, there are positive signs for the future development of the Indonesian *Falcataria* plywood industry :

1) Indonesia's basic economic competitive edge in world markets will improve in the long run as China's participation in WTO opens up Chinese markets and non-tariff regulations, such as minimum wage regulations, are enforced.
2) In the long run, *Falcataria*'s 6-year rotation will prove to be economically advantageous for Indonesia, as Chinese poplar requires around 12 years to reach a harvestable age.
3) In comparison with China, where national initiatives have created elaborate production systems in the primary industries including poplar plantations and the plywood industries, the Indonesian government has yet to develop any effective measures concerning the *Falcataria* plywood industries. That is, there remains great potential to develop the role of the public sector to support the *Falcataria* industries in Indonesia.

Unfortunately, there are as yet no effective evaluation measures for the various opinions stated above. Indeed, long-term appraisals of international markets generally involve too much uncertainty to allow accurate predictions to be made. However, the C.E.O. of one plywood company underlined the importance of resource development by saying, "after all, resources come first and we just follow them. In fact, we are ready for investment to utilize them". If this is the case, the development of *Falcataria* plantations dictates the movement of the industry.

3 Institutional arrangements relating to *Falcataria* plantations

This section focuses on the institutional issues relating to *Falcataria* plantations. Firstly, the current state of *Falcataria* plantations in Java is summarized, with explanation of how and where these have been developed. Secondly, the institutional framework concerning the development of *Falcataria* plantations is discussed, with reference to the incentives in place to encourage the establishment of new plantations. Finally, the role of the public sector in *Falcataria* plantations is discussed.

3.1 Current state of *Falcataria* plantations in Java

PT Perhutani is the national forestry corporation in charge of the management of state owned forests on Java Island. Of the approximately 3 million hectares of national forest estate managed by PT Perhutani in Java, production forests accounts for 1.92 million hectares (64 per cent). This is the area in which organized plantation forestry is practiced. However, only 7,000 hectares of this area is composed of *Falcataria* plantation, as shown in Table 1. Accordingly, traditional plantation species, such as Teak and Pine, account for most of the PT Perhutani plantation forests.

Other conditions under which *Falcataria* plantations are seen are *Hutan Rakyat,* which can be translated as 'social forestry'. Contrary to the conventional concept of social forestry, however, *Hutan Rakyat* is comprised of private forest land situated around villages in Java. The term 'social' is probably applied because villagers are typically contracted to work in these forests by landowners. As Table 2 illustrates, approximately 0.3 million hectares of *Hutan Rakyat* exist on Java Island. Unfortunately, however, there are no statistics available on *Hutan Rakyat* tree plantations. Nonetheless, it is known that *Falcataria* is (amongst others) a preferred tree for planting within *Hutan Rakyat.*

In addition, because it is capable of fixing atmospheric nitrogen and is therefore a common choice in intercropping systems, *Falcataria* is also often seen on farmland. *Falcataria* is also often used as a prime shade tree in coffee and cacao fields. Theses farm-based *Falcataria*

Table 1 PT Perhutani in Java.

Total Area: 3.01 Million hectares

Production Forests:	**1.92Million ha**
Teakwood:	1.09 Million ha
Pine tree:	0.57 Million ha
Damar:	0.08 Million ha
Mahoni:	0.07 Million ha
Meranti:	0.02 Million ha
Snokeling:	0.02 Million ha
Acacia Mangium	0.02 Million ha
Falcataria	**0.007Million ha**

*Note: All *Falcataria* is in East Java (PT Perhutani Unit II).

resources have a potential for industrial use although, again, no statistical information is currently available.

Furthermore, *Falcataria* has been widely planted in empty spaces and on otherwise unused land, as ornamental or roadside trees. In light of these and other uses and because *Falcataria* plantations have developed in a rather ad hoc fashion, it is hard to estimate the resource base quantitatively for the entire island. However, it is important to recognise all classes of plantation outlined here as an industrial resource since they largely occur in populated areas where they may be easily accessed and utilized.

3.2 Land tenure and *Falcataria* plantations

As has been emphasized, *Falcataria* plantations are largely developed on private land outside of existing forests. In addition, there is usually no specific forest management plan applied for their management. As is highlighted in Figure 4, this inherent resource structure implies the way in which a strategy for the development of *Falcataria* plantations should be devised.

As would be the case for the formation of any plantation development strategy, the institutional framework as it pertains to *Falcataria* plantations must first be clarified. For example, the following questions need to be addressed :

1) Should *Falcataria* plantations be developed beyond private land?
2) Is there a need to introduce a comprehensive forest management system for the management of *Falcataria* plantations?
3) If so, what should the role of the public sector be in this transition?

Crucially, the development of an institutional framework has to be based on data derived from existing *Falcataria* plantations. Since, however, there are currently no statistics available, it is vital that a coordinated data collection system be developed in order to allow research to be conducted and information to be collated for the enhanced management of the plantation resource.

3.3 Incentive measures to encourage establishment of new *Falcataria* plantations

In order to encourage the development of *Falcataria* plantations on private land, it may become necessary to institute incentive measures. In this context, the government is expected to play a central role. However, without thorough preparation, any government scheme is likely to fail. It is sometimes essential for the public sector to learn what constitutes a successful private initiative.

3.3.1 Unsuccessful government initiatives

With respect to *Falcataria* plantations, the Indonesian government has introduced several incentive schemes, including KUHR in 1998, as illustrated in Figure 5. This scheme relies on the cooperation of three bodies : the government to provide funding, private companies to produce a management plan, and farmers or landowners to grow the trees. The Ministry of Forestry is supposed to monitor the whole process.

Whilst in theory this system appears to be robust, in practice there are many problems. According to Nawir (2000), KUHR has not been successful because :

1) Company participants have not been fully committed to the scheme ;
2) Participants in the scheme have failed to consistently adhere to the administrative require-

Table 2 **Hutan Rakyat*' or social forestry as potential areas for *Falcataria* plantation.

	Area (ha)	Type of Trees
West Java	45,000	mix-plants, including *Falcataria*
Central Java	180,000	*Falcataria*, Acasia, Mahoni, Jati, other intercropping plants
East Java	70,000	*Falcataria*, Mahoni, Jati, Acasia

Source: Director General of Land Rehabilitation and Social Forestry

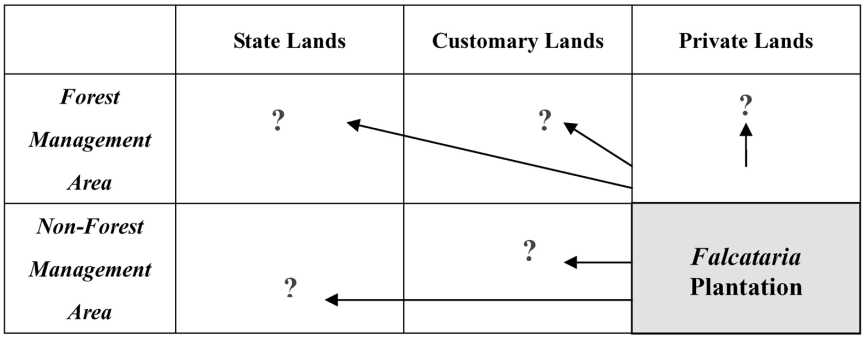

Fig. 4 Future direction for *Falcataria* plantations in Java.

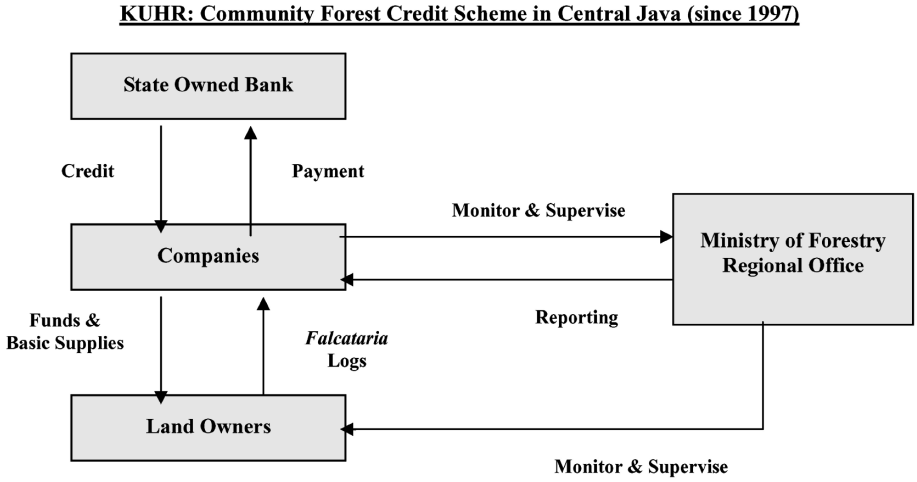

Fig. 5 Unsuccessful governmental initiatives in *Falcataria* plantation development.

ments set by the Ministry of Forestry ;

3) Tree growers do not possess adequate knowledge of silviculture, especially in terms of plantation maintenance activities ;
4) Monitoring has not been systematically practiced by the Ministry of Forestry neither at the provincial nor the district level ; and
5) Despite being the main source of funding for KUHR, Reforestation Funds have not been made available, further preventing the Ministry of Forestry from meeting its commitments.

On top of this, some business people in the wood industry have pointed out that clear objectives have not been defined for each of the three participating bodies in the scheme. With regards to the participant companies, there is insufficient awareness of the *Falcataria* product market, and therefore a lack of planning for what should be made and in what volume. Similarly, there is a lack of knowledge amongst tree growers regarding how to best manage the trees to harvestable age, and what to do with them once they have done so. Furthermore, there is evidence to suggest that many tree growers have been seeking plantation funds without any real intention of planting trees. If this is the case, the scheme is obviously open to abuse and potentially a moral hazard. Once the government commits to this kind of project, it is crucial that it has in place a system ready to simultaneously monitor progress and regulate its effective implementation.

3.3.2 A successful case of private initiative for *Falcataria* plantation development

Recently, Kutai Timber Indonesia (KTI), a part Japanese-financed wood company, has initiated a series of *Falcataria* plantation contracts with several private institutions (Table 3). KTI's partners include farmers, farm companies, local governments, highway administration companies and universities. In this way, KTI has launched new bilateral contracts with a broad range of institutions.

The contents of these contracts have been concluded on a case-by-case basis. Principally, KTI provides seeds and funds, guaranteeing the purchase of logs at the going market price at the time when the trees reach maturity (usually 6 years after planting). In return, KTI is ensured a 30 per cent crop share from its contracted partners. Guaranteed supply is vital for the successful realization of the business.

In addition to the establishment of bilateral plantation contracts, the company has also established its own plantation wood lots and nurseries. Some nurseries are used for experimental purposes.

Concerning the initiatives that KTI has undertaken with private institutions, the company president said in an interview,

"Short-term benefits are important. But more importantly, our activities are designated for educational purposes. We are hoping in the near future that local people will develop *Falcataria* plantations by their own choice. That would be a long-term return for our investment."

Compared to government-initiated plantation projects such as KUHR, KTI's initiative seems to be working much better. This is largely because the company has decided to shift its resource base from natural forests to *Falcataria* plantations, forcing the company to commit to the scheme very seriously. In other words, KTI has a clear objective in its plantation project. Besides, farmers and other partners also know exactly what they are going to get once their crop is harvested and when they are going to get it, which in turn supports the successful maintenance of plantation practices. This sequence of events is an important lesson for government agencies in determining the direction of future policy related to plantation development strategies.

4 Role of government in farm tree planting

In this section, the role of the government in the development of *Falcataria* plantations is discussed. The topics here consist of two components : i) resource development strategy and ii) market development strategy.

Table 3 KTI's Bilateral Plantation Contracts.

Partners: land owners	Agreed conditions	Crop sharing (% partner gets)
Farmers	KTI provides seedlings and plantation fund	70-90
Farm companies	KTI sells seedlings at one-third of market price	100
Local governments	KTI provides seedlings and labour for plantation	80
Highway administrations	KTI provides seedlings and plantation fund	70-80
Universities	KTI provides seedlings and plantation fund	80

4.1 Defining a strategy for resource development

As mentioned earlier, *Falcataria* plantations are found mostly on private non-forest land and are not managed to any predefined management programme. For the public sector, the first thing to consider is whether or not *Falcataria* plantations should be developed beyond these boundaries. Depending on the direction in which the government decides to go, different sets of political options will ensue.

4.1.1 Concentrating *Falcataria* plantations on unmanaged private land

If the government chooses to develop *Falcataria* plantations only on private lands, indirect measures to help farmers are an obvious political choice. Such indirect measures may include :

1. Enhancing knowledge on all aspects of *Falcataria* plantation management ;
2. Optimizing the combination of different plants in intercropping systems ;
3. Subsidizing farmers' tree plantations ;
4. Ensuring farmers' bargaining power against that of distributors (providing market information etc) ; and
5. Facilitating bilateral contracts (if similar systems to that of the KTI initiative are to be developed).

In the event that *Falcataria* plantations are developed as a matter of high priority in the context of a national tree plantation strategy, these are some of the basic political options for the public sector. Additional political consideration will be required if the government decides to develop *Falcataria* plantations on state lands.

4.1.2 Expanding *Falcataria* plantations onto state owned forest management land

Should the government choose to develop *Falcataria* plantations on state land, an additional set of policy instruments may be required. For example, because *Falcataria* has not traditionally been a preferred tree species h13 on PT Perhutani plantations, reasonable land use coordination with other tree species may be necessary.

Other considerations would involve the harmonization of state strategies with the activities of the private sector. For example, the combined output of private sector woodlots and state *Falcataria* plantations could, if inappropriately coordinated, result in oversupply. In that eventuality, state forests would be expected to regulate their output and so maintain the market in a stable condition. In order to do so, intensive market research would be vital on the part of the government. Also, strategic plans could be developed with manufacturers and exporters to find an optimal level of *Falcataria* log supply.

4.2 Defining a strategy for market development

There are several tasks that the public sector could undertake in order to further promote the development of the *Falcataria* product market. The areas in which the public sector could assume meaningful roles include the :

1. Creation of an information network ;
2. Organization of market research ;
3. Establishment of a reputation for eco-friendliness ; and
4. Formation of a competitive industry.

4.2.1 Creation of an information network

Information is a key to success in the promotion of the *Falcataria* industry. For example, since there are many consumer countries for *Falcataria* exports, collecting market information in each country is important in order to organize production strategies. Similarly, it is also important that information on domestic activities, such as plantations, distribution networks and production, be accurately compiled, organized and made accessible.

4.2.2 Organization of market research

Market information cannot be arbitrarily collected. Along with a solid research design, a systematic data

collection methodology should be established. Accordingly, *Falcataria* market movements should be monitored and reported.

4.2.3 Establishment of a reputation for eco-friendliness

As already discussed, *Falcataria* products have a number of strong characteristics which justify them as being eco-friendly. In this respect, the public sector could organize advertisement projects for *Falcataria* product and utilizing forest certification schemes may be a practical avenue to attain this goal. In particular, farm tree planting has been esteemed as one of the most favorable reforestation options for certification under the ongoing standard development scheme led by the Indonesian Eco-label Institute (LEI). Therefore, supporting the LEI process would be an astute way for the government to proceed.

4.2.4 Development of a competitive industry

There are various ways for the government to help industries remain competitive. For example, exemptions from some taxing schemes and/or application of deregulation measures often convey great advantages to companies. Also, the establishment of various schemes to attract investment is something that only the government can effectively do.

5 Conclusion

Compared with general trends in world wood markets, it is apparent that *Falcataria* products have a range of promising characteristics. Indeed, *Falcataria* can be used in the manufacture of products that are both high-value added as well as environmentally friendly. Although a domestic market in Indonesia has not yet developed for high value-added *Falcataria* products, increased investment is likely to create such a market in the long run particularly since there is presently a growing market for low-value added products. The presence of a strong local market is essential in order to encourage potential tree growers to start *Falcataria* plantations through their own undertaking.

Given the market appeal of *Falcataria* products, the encouragement of *Falcataria* plantations by means of various support measures should be viewed as a feasible development option for the government. However, given that information on the plantation resource is at present limited, it must be recognized that there is as yet no scientific bases upon which to develop further plans for the *Falcataria*-based industries or for *Falcataria* plantations. The public sector must as a matter of absolute priority establish an information network for *Falcataria* products. In the mean time, *Falcataria* plantations could be promoted, in a modest way, as private, unmanaged forests.

In any case, *Falcataria* plantation development should be incorporated into a larger project focusing on a national resource development strategy for Indonesia. For example, KTI has a very serious economic interest in a continual wood supply. As shown in Figure 6, the company is anticipating wood supply mainly from plantations, half of which is coming from public forests. For this company, having several resource bases is important in order to reduce risk. Correspondingly, it may be appropriate for the public sector to develop a combined wood supply system, sourcing timber from natural forests, private plantation forests (including farm plantations), and public plantation forests (or industrial plantations).

This document has dealt with *Falcataria* plantations in Java, emphasizing farm tree planting. A general conclusion for the foregoing discussion is that there are many positive aspects of the *Falcataria* plantations in Java. With respect to future research directions, however, a logical way forward would seem to be to test other tree species outside of Java Island. This should allow for a better understanding of the institutional relationship between industrial plantations and farm plantations, and so promote their better management. For example, it may be necessary to respond to questions such as : how might the potential roles of farmers be accommodated in huge plantations of other species such as *Acacia Mangium*?

As it is, this document has stressed the issues relating to land tenure and plantation systems. However, these two elements are not the only means with which to analyse resource development strategies in Indonesia. A more detailed appraisal of the issues more directly

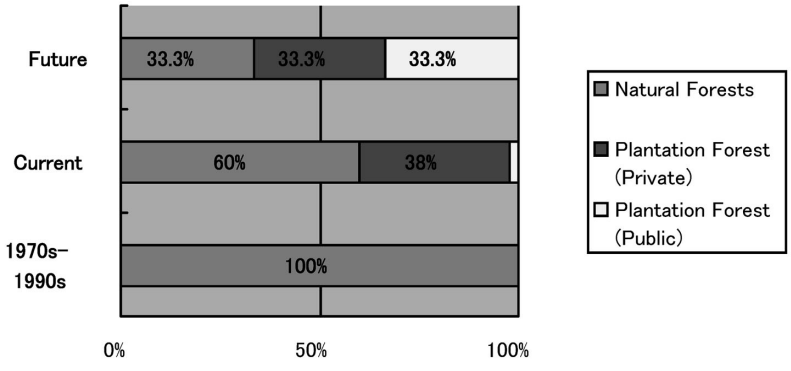

Fig. 6 KTIs wood supply base : past, present and future.

pertaining to the market would be also helpful. Themes may include issues such as development of market research methodologies ; use of forest certification for marketing ; and creation of various incentive measures to promote the development of tree plantations. In any case, in order to develop a resource development strategy for Indonesia, consensus building, through workshops involving the range of stakeholders, would now seem a necessary process.

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