Economic incentives and household perceptions on smallholder timber plantations: Lessons from case studies in Indonesia

By: Dede Rohadi1, Maarit Kallio, Haruni Krisnawati and Philip Manalu

Abstract

Growing interest in smallholder timber plantations stems from the high demand for timber in Indonesia. Smallholder timber plantations may also play an important role in poverty alleviation efforts. This paper discusses the socio economic value and challenges of smallholder timber plantations based on two smallholder timber plantation case studies in two districts in Indonesia, namely Gunungkidul district, Yogyakarta, and Tanah Laut district, South Kalimantan. The data was collected by household surveys, key informant interviews, and focus group discussions. The case studies showed that smallholders understand the potential benefits of timber plantations for livelihoods, but their real investment in the activities depended on existing market opportunities and smallholder’s capacity to obtain required production inputs. Policy interventions are required to improve the economic benefits of timber plantations for smallholders, but they should be based on the existing challenges in each specific area. Common necessary interventions include better extension services, government support for microfinance institutions, simpler timber marketing regulations, improved market opportunities and easier access by households to state land to expand their timber plantation areas.

Keywords: Financial analyses, farm forest, policy interventions, Tectona grandis, Anthocephalus cadamba

I. Introduction

Demand on wood, especially in Indonesia is growing. At the same time the capacity of natural forests to produce the demanded amounts of timber is decreasing. In the early 2000, Indonesia experienced a vast gap between the industrial demand for timber and the sustained produced timber. The gap arose assumptions that most of the wood (between 68% and 82%) consumed by the industries at that time came from illegal logging (Micski, 2008). The excessive logging of natural forest has even triggered natural forest degradation and recently forced some wood based industries to stop their production. The logging is usually followed by forest encroachment and area conversion to non-forest uses and these have caused deforestation rate of 1.08 million hectares annually within the period of 2000 to 2006 and created more than 30 million hectares of degraded land (Direktorat Bina Rehabilitasi Hutan dan Lahan, 2007).

The government of Indonesia has been trying various efforts to overcome the gap between the timber demand and supply through forest rehabilitation and timber plantation programs. One among the efforts is to increase rural people’s participation in timber plantation programs. The smallholders participation is implemented through various timber plantation and natural forest management schemes which include among others; the farm forest (Hutan Rakyat), community forest (Hutan Kemasyarakatan or HKm), village forest (Hutan Desa), people plantation forest (Hutan Tanaman Rakyat or HTR) and various partnership schemes between private companies and

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communities on timber plantations (e.g. Tyynelä et al., 2002; Nawir and Santoso, 2005; Van Noordwijk et al., 2007). Characteristics of these various schemes are presented on the Table 1.

Table 1. Characteristics of various people participation schemes on smallholder timber plantations in Indonesia.

<table>
<thead>
<tr>
<th>No.</th>
<th>Types of management system</th>
<th>Land tenure</th>
<th>Main actors (land users) who use the rights</th>
<th>Management purposes</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Community Forest or Hutan Kemasyarakatan (HKm)</td>
<td>State (provincial or district level)</td>
<td>Provincial or District Forestry Offices and Community groups</td>
<td>- Production - Conservation</td>
<td>- Damar forest in Lampung - Teak Community Forest in Java.</td>
</tr>
<tr>
<td>2</td>
<td>People Plantation Forest or Hutan Tanaman Rakyat (HTR)</td>
<td>State (district level)</td>
<td>Community groups, District Forestry Offices and possibly private companies (under contract agreement)</td>
<td>- Production</td>
<td>To be established in many parts in Indonesia</td>
</tr>
<tr>
<td>3</td>
<td>Village Forest</td>
<td>State (District to local/village level)</td>
<td>Community groups, individuals and village government (under contract agreement)</td>
<td>- Production - Conservation</td>
<td>Village forests in Java</td>
</tr>
<tr>
<td>4</td>
<td>Company-community partnership models</td>
<td>State owned company</td>
<td>Community groups and state owned companies (under contract agreement)</td>
<td>- Production - Conservation</td>
<td>PHBM or MHBM models in Java.</td>
</tr>
<tr>
<td>5</td>
<td>Company-community partnership models</td>
<td>Private companies</td>
<td>Community groups, individuals and private companies (under contract agreement)</td>
<td>Production</td>
<td>PT. Musi Hutan Persada in South Sumatera</td>
</tr>
<tr>
<td>6</td>
<td>Farm Forest</td>
<td>Private</td>
<td>Individuals</td>
<td>Production</td>
<td>Smallholder teak farm forests in Java</td>
</tr>
</tbody>
</table>

Smallholder timber plantations can also potentially contribute to household’s income and poverty alleviation (Scherr, 1997; Arnold, 2001; Angelsen and Wunder, 2003). In some places in Indonesia, such as in Java, people’s interest in planting timber is already reflected by the increasing areas that have been planted. Nevertheless, the expansion rate of these smallholder timber plantations has not yet achieved the expected growth levels. While the amount of land areas that potentially available for developing smallholder timber plantations have reached 41.5 million hectares, the established plantations up to 2004 was only around 1.5 million hectares (Hindra, 2006). This gap justifies the necessity of interventions from government or non government organizations to support the expansion of smallholder timber plantations. The interest of smallholders on planting timber trees is an important phenomenon to be studied; in particular it is essential to understand the driving factors that influence smallholder timber plantation activities. Through a better understanding of these factors, interventions to support the development of smallholder timber plantations could be done better in the future.

This paper aims to improve the understanding on the driving factors of smallholders’ investments on timber plantations, based on two case studies in Indonesia. Specifically the aim is to study following questions:
What are the available economical benefits of timber plantations for smallholders?
What are smallholder’s perceptions on these benefits as compared to other income generating activities?
What are the challenges for improving economical benefits and smallholders’ livelihoods through timber plantations?
What policy interventions are necessary for these challenges to overcome?

II. Research Methods

1. The case studies

This paper was based on two case studies of smallholder timber plantations in Indonesia, namely the smallholder teak (*Tectona grandis*) plantations in Gunungkidul district, the province of Yogyakarta and smallholder kadam (*Antheonaphalus cadamba*) plantations in Tanah Laut district, the province of South Kalimantan. The two case studies are part of ongoing research projects done by the Center for International Forestry Research (CIFOR) and its partners. Research on smallholder teak plantations is funded by The Australian Center for International Agricultural Research (ACIAR) and has been commenced since 2007. Research on smallholder kadam plantations is funded by the government of Germany (BMZ) and has been commenced since 2008. Both case study locations are presented on the Figure 1.

![Figure 1. The case study locations](image_url)

At Gunungkidul district, the case study was conducted at 7 villages spread over the northern, middle and southern parts of the district. Teak has been already cultivated by the people in this region since the 50’es and vigorously grows since the 70’es. The total area of smallholder teak plantations in this region is predicted to be around 28,000 ha (Suharto, 2008) and the total teak wood production in 2005 was around 86,000 m3 (*Dinas Kehutanan dan Perkebunan Kabupaten Gunungkidul*, 2005). The district plays an important role as teak wood supplier to teak furniture industries in Java, such as one in Jepara. Teak is planted on smallholder private lands, which in most cases are limited in size, often less than 0.5 ha per household.

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2 The research partners include The World Agroforestry Center (ICRAF), International Center for Applied Finance and Economics, Institut Pertanian Bogor (Inter-CAFE IPB), The Faculty of Forestry IPB, Forestry Research and Development Agency (FORDA) the Ministry of Forestry of Indonesia and the Farm Forest Consortium Hutan Lestari, the district of Gunungkidul.
In this region, teak plantations are generally found in two land use systems, i.e. *kitren* and *tegalan*. Kitren is a tree plantation system where teak is the dominating timber species. Other species used for varying purposes are also planted in kitren, such as mahogany (*Swietenia macrophylla*) and sengon (*Paraserianthes falcataria*) for timber, lamtoro (*Leucaena glauca*), glirisida (*Gliricidia sepium*) and kolonjono grass (*Panicum muticum*) for fodder, as well as fruit trees. In reality, there is almost no single kitren which is purely planted with teak without any other species. The tegalan is mostly planted with food crops such as paddy, corn, peanut, soy bean, mung bean and cassava, but in addition teak is grown as bordered trees or in strip planting. The density of teak trees in tegalan varies highly, and thus it is almost impossible to get a representative figure for the average teak density per hectare.

In South Kalimantan province, Tanah Laut district, the case study was conducted in the sub district of Jorong, village of Asem Jaya. The village is a resettlement area, mostly inhabited by Javanese and previously named as Trans 400. The number 400 was representing the total number of transmigrants in the beginning of the establishment. About 10% out of the current 383 families in this village was reported to have kadam plantation. Kadam plantation was developed since 2003 and was initiated by a plywood company (PT. Hendratna) which at the time of plantation establishment promised future market for the produced wood. Currently, the trees are approximately 4-6 years old, mostly planted distributed on smallholder’s land with uniform size of 0.75 ha or 1 ha. Other than kadam, the village has some *Acacia mangium* plantations which were established by a timber plantation company (PT. Hutan Rindang Banua). The acacia plantations were established through a partnership scheme between the company and smallholders, although in reality most of all plantation activities are done by the company, leaving the smallholders only as land leasers. Other than these timber species, rubber trees (*Hevea brasiliensis*) have been cultivated by the farmers relatively long period of time for latex production. More recently, the oil palm (*Elaeis guinensis*) has started to attract people as a prospective commodity. We included rubber and oil palm planting into our analyses in order to compare their profitability with timber plantations.

### 2. Data collection and analyses

The data was collected through household surveys, in-depth interviews, focus group discussions (FGD) and timber stand inventories. The household surveys were done using structured questionnaires that included questions related to; respondent identities, land ownership and land use systems, household income, household perceptions and motivations on timber planting activities, farm-based activities, household saving and credit behaviors and the social capital of farmers groups or associations. The household surveys were conducted for 275 households for the teak case study and 55 households for the kadam case study, including both tree planters and non-tree planters. However, during the analyses process, not all of the data was used due to some missing data and the analyses was based on the completed data. The in-depth interviews and FGD were used for collecting data on costs and revenues of farm based activities.

Using the collected data, following aspects were analyzed:

- financial analyses of timber (teak and kadam), rubber, oil palm and food crop plantations.
- household land ownership and land use systems
- household ’s main income sources
- household’s perceptions on their timber plantation activities.

Farm inventory on both teak and kadam plantations were conducted to gain knowledge on the current stand yields and predict future yields for the financial analyses.
The financial analyses were completed by calculating the cost and benefit ratio (BCR) and net present value (NPV). Due to some difficulties on obtaining complete data set, some of the cost components were based on some assumptions which also were built from the experiences gained during the in-depth interviews with key informants. These assumptions are explained in the respective farm-based activities as presented below.

Household perceptions and motivations of their farm based activities were analyzed using descriptive technique and presented through cross tabulations and graph visualizations.

3. Some assumptions in the financial analyses of the farm-based activities

In the financial analyses (BCR and NPV) some assumptions were used. On smallholder teak plantation case at Gunungkidul, the analyses were done on two land use types, i.e. kitren and tegalan. On kitren, we assumed that farmers allocate all of their land area for growing teak with 4 X 5 m planting distance or tree density of 500 trees per hectare. Input costs were calculated using the average figures based on the household survey and in-depth interviews to both individuals and group of farmers. The harvesting rotation was assumed to be 25 years with intermediate harvest through thinning which removing 50% of the total trees at the age of 15 years. The benefit value was based on the current average teak selling price according to the market survey. On tegalan system, the financial analysis was based on in-depth interviews with several farmers’ respondents. The costs of inputs and revenues were based on the last year’s experiences. Cost units were based on the average costs at the study site in 2009.

On kadam case study, we assumed that the planting distance was similar with teak, i.e. 4 X 5 m or tree density of 500 trees per hectare. Costs of input were based on the average values that were obtained during the in-depth interviews with some kadam planting respondents. Similar with teak plantation, we assumed that 50% of the trees were thinned at the age of 15 years, whereas the remaining trees were clear cut at the age of 25 years. The predicted timber production at the age of 15 years and clear cut was 115 m3 and 225 m3 respectively. Timber yields were predicted by an equation model developed based on stand inventory data at the case study site. Timber prices were based on the stumpage prices used by the nearest timber mill during the market survey in 2009 (Rp 125,000 per m3) and the expected price according to some farmers’ respondents (Rp 275,000 per m3).

For the rubber plantations, we assumed that the planting distance was 4 X 4 m, giving tree density of 625 trees per hectare. By the end of rotation (25 years), we assumed that the plantation had a salvage value of 150 m3 of rubber wood with the price of Rp 125,000 per m3. For the oil palm plantations, we assumed that the planting distance was 8 X 9 m or the tree density of 130 trees per hectare. Cost of input and revenues in the financial analyses were based on in-depth surveys of farmers planting oil palm.

III. Results and Discussions

1. Financial analysis of smallholder timber plantations and farm business

Summary of the financial analyses is presented on the Table 2. The table shows the BCR, NPV and other financial figures such as the cost of establishment, the cost for maintaining plantation until the first harvest and the potential income per month of the available options of farm-based activities. It is shown that the highest BCR and NPV values are obtained by the oil palm plantation, followed by some food crops plantings at tegalan system, rubber plantation, teak plantation and at the last the kadam plantation.
Table 2. Cost and benefit analysis of smallholder timber plantations and other farm based activities with 25 years rotation.

<table>
<thead>
<tr>
<th>No.</th>
<th>Types of plantation</th>
<th>Cost of establishment</th>
<th>Maintenance cost until the first harvest</th>
<th>Potential income per month</th>
<th>Net Present Value</th>
<th>B/C ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>million Rp USD</td>
<td>million Rp USD</td>
<td>million Rp USD</td>
<td>million Rp USD USD</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Teak plantations:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a. Kitren system</td>
<td>3.51 369</td>
<td>1.03 108</td>
<td>NA NA</td>
<td>15.07 1,586</td>
<td>2.35</td>
</tr>
<tr>
<td></td>
<td>b. Tegalan system</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Respondent 1</td>
<td>1.67 176</td>
<td>1.58 166</td>
<td>0.44 47</td>
<td>44.62 4,697</td>
<td>4.31</td>
</tr>
<tr>
<td></td>
<td>- Respondent 2</td>
<td>14.71 1,549</td>
<td>14.59 1,536</td>
<td>0.73 76</td>
<td>73.05 7,690</td>
<td>1.59</td>
</tr>
<tr>
<td></td>
<td>- Respondent 3</td>
<td>5.14 541</td>
<td>4.99 525</td>
<td>2.18 230</td>
<td>220.43 23,203</td>
<td>6.21</td>
</tr>
<tr>
<td></td>
<td>- Respondent 4</td>
<td>23.68 2,493</td>
<td>23.53 2,477</td>
<td>4.89 515</td>
<td>494.07 52,008</td>
<td>3.49</td>
</tr>
<tr>
<td></td>
<td>- Respondent 5</td>
<td>7.97 839</td>
<td>7.87 828</td>
<td>1.45 153</td>
<td>185.40 19,516</td>
<td>3.20</td>
</tr>
<tr>
<td>2</td>
<td>Kadam plantation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Low price</td>
<td>3.50 368</td>
<td>1.15 121</td>
<td>NA NA</td>
<td>-0.07 -7</td>
<td>0.99</td>
</tr>
<tr>
<td></td>
<td>- High price</td>
<td>3.50 368</td>
<td>1.15 121</td>
<td>NA NA</td>
<td>6.02 634</td>
<td>2.17</td>
</tr>
<tr>
<td>3</td>
<td>Rubber plantation</td>
<td>6.80 715</td>
<td>2.50 263</td>
<td>1.05 to 2.89</td>
<td>111 to 304</td>
<td>3.41</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>151.80 15,979</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Oil palm plantation</td>
<td>11.87 1,249</td>
<td>1.92 to 2.44</td>
<td>202 to 257</td>
<td>489 to 1,036</td>
<td>10.22</td>
</tr>
</tbody>
</table>

In Tanah Laut district, the oil palm plantation provided the highest financial benefit with BCR and NPV values of respectively 10.22 and Rp 484.89 million (US$ 51,040) per hectare. The results match more or less with farmers’ perceptions at Asem Jaya village, as many farmers believed that the oil palm plantation is a prospective business. The limitations of this land use option however are the relatively high cost of plantation establishment, i.e. around Rp 11.87 million (US $ 1,249) per hectare and the maintenance costs of about Rp 1.92 million (US $ 202) to Rp 2.44 million (US $ 257) per hectare per year until the first harvest at age 5 years. Oil palm plantation potentially provided monthly income of around Rp 4.65 million (US $ 489) to Rp 9.85 million (US $ 1.036) per hectare.

Rubber plantation was also a good option and provided BCR and NPV values respectively 3.41 and Rp 151.80 million (US $ 15,979) per hectare. Rubber has been cultivated already long time by the farmers at the region. Rubber plantation also required high input cost, although slightly lower than oil palm. The establishment costs were around Rp 7 million (US $ 737) and the maintenance cost of Rp 2.5 million (US $ 263) per hectare per year until the first harvest at age 4 years. The potential monthly income offered by rubber plantation was around Rp 1.05 million (US $ 111) to Rp 2.89 million (US $ 304) per hectare.

Kadam plantation required relatively lower establishment cost compared to oil palm and rubber, i.e. around Rp 3.5 million (US $ 368) and the maintenance cost of around Rp 1 million (US $ 105) per hectare per year. Maintenance costs were relatively low as the intensive maintenance was only required until the first 3 years after planting. Nevertheless this option provided the lowest BCR and NPV at the Tanah Laut case, i.e. 2.17 and Rp 6.02 million (US $ 634) per hectare at the
end of rotation with the moderate price assumption of Rp 275,000 per m³. If the low wood price scenario was applied, as currently offered by the local wood mill, i.e. Rp 125,000 per m³, kadam plantation is not financially promising as the BCR turn into less than 1 (0.99) and negative NPV. From the cash flow point of view, kadam plantation provides revenue after relatively long period, i.e. 15 years when the first thinning is applied.

In Gunungkidul district, teak plantation in kitren system provided BCR and NPV values of 2.35 and Rp 15 million (US $ 1,585) per hectare respectively. The establishment cost for teak plantation was relatively similar with kadam, except that the maintenance cost was higher, i.e. about Rp 1 million (US $ 105) per year per hectare in average during the rotation period. Unlike kadam, teak plantation requires routine maintenance, such as through weeding and fertilizing. Teak also requires pruning if the aim is to produce quality wood. Compared to kadam, teak plantation was more profitable as the price of teak wood was much higher than of kadam.

High variation of financial performances of food crop planting (the tegalan system) was found at Gunungkidul district. Financial analyses of five respondents resulted diverse BCR and NPV values. The BCR varied from 1.59 to 6.21 and the NPV from Rp 73 million (US $ 7,690) to Rp 220 million (US $ 23,203) per hectare. This high variation was caused by different levels of land productivity and the types of crops. Table 2 shows that the lowest BCR was produced by the respondent number 2 whose land was located in Dadapayu village at the southern part of Gunungkidul, where the soil fertility was relatively lower than the northern areas. The highest BCR was produced in the land of the respondent number 3 located in fertile soil in Candirejo. Growing food crops activities was the first option chosen by most farmers at Gunungkidul district, in particular at more fertile soils in the northern part of the district. This activity was also chosen as it provided direct financial benefit every year, even though the annual revenue levels varied between the years. In these examples, monthly revenue varied from Rp 436,000 (US $ 47) to Rp 4.89 million (US $ 515) per hectare.

2. Household perceptions on timber plantations

The financial analyses which are summarized on the Table 2 showed the available financial incentive for planting timber compared to other farm-based activities. The analyses showed that planting timber was not financially the best option for farmers at both case studies. On Gunungkidul case, the household data analyses showed that farmers’ cash income was mainly (60.51%) originated from off farm activities, such as laboring, trading or service provider activities (see Figure 2). The Figure 2 shows that the share of teak selling to household income is only around 11.62%. The share is significantly greater than the selling of other tree species such as mahogany and sengon (2.98%), but far below the income share of food crops and animal husbandry (24.89%).

Despite selling teak wood contributed relatively small share to the total household income, most of the farmers still allocated land for teak planting. Even the farmers with limited land ownership (< 0.5 ha) allocated approximately 9% of their land for growing teak through kitren system (see the Figure 3). In average, farmers allocate about 10% of their land area for growing teak through kitren system.

More than half (54%) of the farmers stated that their main reason for planting teak was that the trees acted as saving accounts and safety nets (see the Figure 4). Teak trees acted as saving accounts and safety nets as the trees could be easily sold to fulfill farmers’ urgent needs, such as during the hard times, wedding ceremonies, building new houses or sending their kids to a new school. At Candirejo village, for example, the head of the village and his staff stated during the
key informant interview that teak is very important as the last resource to provide cash income when the other household assets such as motorcycle, electronic goods or livestock were not anymore available. Other reasons for growing teak included cultural reasons (23%), for example several of the farmers had inherited the teak plantation from their parents and planting teak was already a long family tradition. Small percentage of the respondents (9%) grew teak due to their neighbor’s influence or other reasons. Only about 15% of farmers grew teak due to market influence, such as considering high demand of teak or relatively high price of teak compared to other tree species.

Similar with the Gunungkidul case study, the case study at Tanah Laut district showed that the main household income came from off farm activities. Most of the farmers (55%) relied their household income on off farm labor or fix employee professions (see the Figure 5). Only 30% of the respondents’ main income came from farm-based activities, in particular from providing farm labor (12%) or producing farm products (12%). Respondents who relied their main income on livestock and timber production were only 4% and 2% respectively. None of the interviewed farmers planted rubber or oil palm as their main source of income. This might be the case as these plantations were relatively newly established.
Unlike the case of teak plantation, timber plantations at Asem Jaya village were more influenced by the outside intervention. As mentioned previously (see section II.1), kadam plantations in this village were initiated by support provided by a plywood company in 2003. Data analyses on the household land use allocation of the tree planters (32 respondents) and non tree planters (17 respondents) are presented on the Figures 6 and 7. The Figure 6 shows that among the kadam planters, about 40% of their land is allocated for timber plantation. In addition, both groups, tree planters and non tree planters allocated significant land areas for planting rubber.
Data analyses on 30 kadam planters in Asem Jaya village indicated that most of them (83%) grew kadam as saving accounts for the oldies (see the Table 3). Other than for saving account, kadam was also planted for environmental reasons, such as prevent soil erosion. Small amount of respondents (30%) planted kadam due to influence from the company, their neighbors or farmers’ groups. It is somewhat unpredicted that the farmers did not state the company to have more influence on their decision to plant kadam, as all the kadam plantations in this region were initiated by seedling distribution provided free of charge from the plywood company.

Table 3. The main reasons for planting kadam according to household perceptions at Asem Jaya village

<table>
<thead>
<tr>
<th>Reason for planting (%)</th>
<th>% of farmer's responds (n=30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Savings for the oldies/investment/ future income</td>
<td>83</td>
</tr>
<tr>
<td>Environmental reason (prevent erosion or deforestation/ greening)</td>
<td>23</td>
</tr>
<tr>
<td>Influenced by the company/participate the program/ follow the other farmers/ social pressure</td>
<td>30</td>
</tr>
<tr>
<td>For future generation (savings, house, education)</td>
<td>10</td>
</tr>
<tr>
<td>For subsistence/ daily use/collect fruits</td>
<td>10</td>
</tr>
</tbody>
</table>

Remarks: The total percentage of farmer’s responds is more than 100% as each farmer was allowed to give more than one reason.

Both case studies indicated that timber trees were mainly planted as they acted as saving accounts for the farmers, not as the main source of income. At the case study in Gunungkidul, farmers generally had long experience on growing teak. Most of the interviewed farmers (80%) had more than 10 years of experience on growing the teak. Only small number of teak growers (9%) had grown teak less than 5 years. Farmers also had a long experience on selling teak wood, and their motivation on planting teak had already been influenced by market conditions and price of teak wood. In Tanah Laut, farmers were still at the initial stage of timber plantation business and had limited experience on the potential benefits of their plantations. Farmer’s motivations were then very much depended on the outside interventions, such as available markets and information on wood price.

3. Challenges and policy intervention options

The case studies showed that timber plantations were not financially the best land use option. Nevertheless, timber plantations played a role as farmer’s saving accounts. Interventions should be directed to improve the future economic benefits of farmers’ investments in timber plantations. Deeper understanding on how farmers view their timber plantation businesses as well as their obstacles on doing the business is required for proper interventions.

In the teak plantations in Gunungkidul the importance of proper silviculture management was not well understood. Most farmers had not used the improved teak seedlings on their plantations; despite they had an access to these seedlings from the state owned company, Perum Perhutani located relatively near the villages. In addition, thinning was seen by the farmers as unprofitable practice, and was not conducted even though several of the stands grew with too high densities. Similarly pruning if conducted was mainly done in order to collect fuel wood, not in order to improve the quality of the timber. Pruning was done by cutting teak
branches, leaving 10 cm to 15 cm branch stubs that potentially reduced future teak timber quality as it developed dead knots.

Most farmers (80%) did not have a clear plan when to harvest their teak trees, but they harvested when they faced an urgent need for cash. Harvesting was done when there were no other household assets available to sell. This harvesting behavior is locally known as “tebang butuh”. While harvesting, the number of trees cut was depended on the amount of cash needed. Most farmers did not even know the optimal rotation length for harvesting and selling their teak trees. Small number of the respondents (14%) believed that teak was best to be harvested after the trees reached at least a 30 years in order to gain good price. However, most cases, farmers were forced to cut their trees under the optimal size due to their urgent need for cash.

Farmers in Gunungkidul had a relatively good access to market their teak. In most situations however, the farmers were the price takers and the selling price was determined by the middlemen. Farmers also did not understand the timber grading system applied by the industries, leading to their ignorance with the effort to improve their teak quality. Their unawareness with teak quality may also caused by insignificant better price of a better quality of teak.

Collective action on teak marketing could potentially improve farmers’ bargaining position. However, among the 275 interviewed respondents, only small number (35%) believed that the collective action could improve the selling price. Most of the farmers (64%) were not sure if collective action would improve the wood price. Two main reasons were identified by the farmers to unmotivated for collective action. Firstly, harvesting was technically difficult to apply as the time for teak harvesting was unpredictable and varied significantly among the farmers, Secondly, the commitment of the farmers to follow the collective marketing agreement was low.

In Tanah Laut district, most of the farmers planted kadam in mono cropping systems with uniform land sizes (0.75 ha and 1 ha). In general farmers applied standard silviculture practices which included land preparation, planting and replanting, weeding and fertilizing. Replanting was done only by half of the respondents, but this could be due to relatively low mortality rates during the initial planting (see the Table 4). Based on our observation, only about 4% of the total kadam stands needed more than 20% of seedling replanted. Pruning was not necessary as kadam belongs to the self pruning species (Soerianegara and Lemmens 1993), although about 6% of the respondents pruned their plantation. Thinning had not been applied yet as the stands were still young (about 5 years old). In addition, most farmers seemed not to completely understand the benefits of thinning.

Kadam plantations were initially designed to supply to plywood industry who distributed the seedlings free of charge to the farmers. However, as the company was not in operation anymore, the future market of the trees was unclear. Most of the farmers still believed that their kadam plantation will provide economical benefit and kept their plantations. However their interest for maintaining their plantation quality was low. There were also limitations in the availability of production inputs limiting farmers’ ability to maintain their plantations intensively. In particular fertilizers were expensive and difficult to get. In few cases farmers were not motivated to keep their kadam plantations and young kadam plantations had been replaced by rubber. The replacements were usually applied by the farmers with better capital capabilities.
Table 4. Silviculture practices applied by kadam planters at Asem Jaya village, District of Tanah Laut, South Kalimantan

<table>
<thead>
<tr>
<th>No.</th>
<th>Management activities</th>
<th>Percentage of farmers conducting management activities (responds from 34 sampled respondents)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Land preparation</td>
<td>94</td>
</tr>
<tr>
<td>2</td>
<td>Fertilizing</td>
<td>91</td>
</tr>
<tr>
<td>3</td>
<td>Replanting</td>
<td>50</td>
</tr>
<tr>
<td>4</td>
<td>Weeding</td>
<td>97</td>
</tr>
<tr>
<td>5</td>
<td>Pruning</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>Protection</td>
<td>35</td>
</tr>
<tr>
<td>7</td>
<td>Thinning</td>
<td>0</td>
</tr>
</tbody>
</table>

Some implications can be drawn from the case studies on measures to improve the interventions for the development of smallholder timber plantation programs in Indonesia. Firstly, technical assistance should be provided for the farmers on silvicultural practices. Guidance would be needed to motivate farmers to apply practices that improve their plantation quality, such as encourage them to use high quality seedlings, and applying thinning and pruning on their timber stands. This does not mean that all of the silviculture practices should be applied in all stand conditions, but should be considered based on the need and available resources. In our case study examples, thinning may be needed, to stimulate the growth of tree diameter. It is also important that farmers understand the potential benefits of conducting specific practices. For example, farmers need to be trained about the concept of pruning and its effect to timber quality and the selling price. In order to provide adequate technical assistant to the farmers, regular extension services from the proper resource persons is needed.

Farmers often lack cash to purchase required production inputs, such as fertilizers or other material needed to establish plantation. On the teak case study, farmers were often forced to cut and sell their teak trees under the optimal size due to their urgent need for cash. In order to avoid the immature selling of the wood, government’s or other development agencies’ support on micro finance is needed to provide farmers easy access to soft loan while waiting the benefits from timber. The appropriate micro finance schemes that match with smallholder requirements need to be developed.

In general, farmers often have difficulties on the marketing aspects. Better understanding on the market information, such as knowing where to sell, standard of quality and the selling prices of teak are required to motivate farmers to improve their teak management practices. Farmers often have low bargaining power when dealing with middlemen. Collective action on marketing could help to improve farmers’ bargaining power. However, in order to improve farmers’ collective action capacity of local institutions, such as the farmers’ groups should first be improved with assistance from the extension officers or agencies. Government rules causing high transaction costs to farmers’ collective action and timber trade should be removed. The case studies showed that even without any complicated timber trading rules, farmers were faced with difficulties on marketing their timber.

On the teak case study, the limited land ownership by farmers was a serious constraint that prevented farmers from increasing their economic scale of the timber plantation. On the
contrary at Tanah Laut district, land size was not the constraining factor as large areas of farm land currently were still unmanaged. The new government initiative on smallholder timber plantation, namely HTR program, can potentially offer farmers a better access to state land outside Java. Policies need to be revised by offering more access to state land for farmers in Java, while outside Java more assistance should be directed on the wood marketing aspects.

IV. Conclusions and recommendations

Smallholder timber plantation development in Indonesia currently receives attentions from several forestry stakeholders at least for two reasons. Firstly, for increasing the wood supply to fulfill wood based industrial capacities, and secondly as one pathway for alleviating poverty, in particular at the rural areas. Government of Indonesia is directing its effort to support this development through various forestry programs, such as through the HTR and farm forest programs. However, the success of these programs will be very much determined by the main actors, i.e. the smallholder timber growers and their views on this timber business.

The analyses on the two case studies of smallholder timber plantations in Gunungkidul and Tanah Laut districts showed that timber plantations, although in general are economically feasible, may not be the best option for farmers’ source of income. From the economical point of view, there were many better options for farmers to gain their income, such as by growing food crops, rubber or oil palm. Timber plantations also need a long investment period, and thus the farmers need in most cases other activities to be their main source of household income. One comparative advantage of timber plantation business however is their relatively low establishment costs.

Even timber was not mainly planted due to its capability to provide for regular income, still timber planting remained an important land use option for the farmers, such as in Gunungkidul district. Reasons for the farmers to be interested to plant timber were mainly that the trees acted as saving accounts and safety nets.

Farmers’ investment on timber plantations is often determined by their ability to get productions inputs, such as seedling and fertilizers. Support is required to maintain farmers’ motivation on timber planting activity by helping them to improve timber productivity and market access.

For developing farmers’ investment on timber plantations, some interventions are recommended. These interventions would include: (a) providing regular extension services of best practices in timber plantation management; (b) providing better market information and assist farmers’ collective action to improve market access and bargaining power and (c) providing micro finance supports through soft loan programs which are carefully designed to meet farmers’ needs. Government also needs to find more suitable timber trade regulation, specifically for timber coming from smallholder plantations. The current regulation tends to generate high transaction costs that may hinder farmer access to better markets. Providing farmers with more access to the state land would be a good intervention, in particular at the regions where farmers’ land occupation is very limited, as is happening now in Gunungkidul and possibly in some other parts in Java. More access for farmers to the state land would increase the economic scale of smallholder plantations and at the same time potentially reduce unproductive land areas.

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VI. References


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