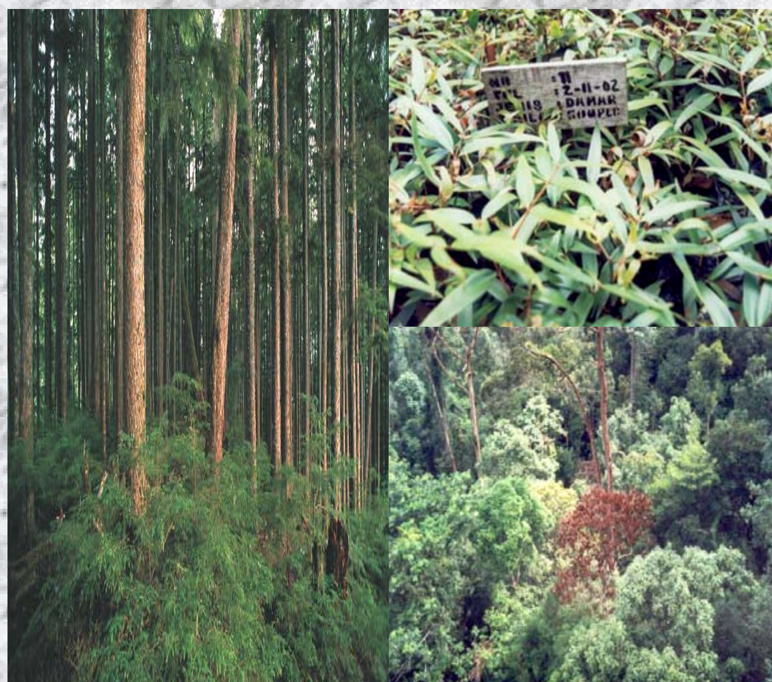
Demonstration Study on Carbon Fixing
Forest Management in Indonesia

Survey on Benefit Cost Analysis of Industrial Forest Plantation Prepared for CDM Scheme



Cooperation Project between
Forestry Research and Development Agency (FORDA),
Ministry of Forestry, Indonesia
Japan International Cooperation Agency (JICA)

Collaboration with Faculty of Forestry,
Bogor Agricultural University

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PREFACE

The Clean Development Mechanism (CDM) Scheme under Kyoto Protocol has opened up chances for developing countries, such as Indonesia, to take part in CER (Certified Emission Reduction) trading, in order to get financial assistance for sustainable development in forestry.

Since then this rising demand for participation in carbon trading has made both Indonesian and Japanese governments realized the importance of demonstration study to establish methods of forest management for carbon sequestration.

This progress report is written based on the contract between JICA Project at FORDA and the Faculty of Forestry, Bogor Agricultural University to conduct study on cost-benefit analysis of industrial forest plantation prepared for CDM scheme.

This final report contains Introduction, General Information Concerning Research Location, Methodology, Management of Forest Plantation, Benefit Cost Analysis of Forest Plantation, Conclusion and Recommendation with References used and partially analyzed data obtained as included in the Annexes. I hope this report fulfill the requirement of the project.

Bogor, September, 2003
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1. KPH Cepu, Perum Perhutani
2. KPH Kediri, Perum Perhutani
3. KPH Bandung Utara, Perum Perhutani
4. KPH Sukabumi, Perum Perhutani
5. PT. Inhutani I

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I. INTRODUCTION

A. Background

Traditionally forest as natural resource played important roles in the livelihood of local community in Indonesia. Up to now the role of forest and forestry in rural and national development is still significant as: a) source of foreign exchange, which improves macroeconomic performance, b) initial capital for development of other sectors, c) giving environmental and social services for local, national and international community.

However, mismanagement in the form of continuing over-exploitation of natural forest has resulted in severely degradation of the forest resource quality and declining forest area. Facing such problem, most solution offered is more technically sound, and rarely based on social, economical assessment aiming at understanding the social dimension of development. As pointed out elsewhere, the destruction of natural resources, especially forest is due to inadequate understanding of the true value of natural resources.

One attempt to better understand the role of forest and forestry both in rural and national growth and development is using macro and microeconomic tools, estimating the full value of forest and deriving incomes from the resources. The desire to evaluate contribution of forestry is due to desire to produce policy-relevant decisions in the utilization of forest resources. As gross changes, such as changes in land uses derived from national policy are often accompanying the process of growth and development at rural and national level, the value estimates are necessary to weigh the trade off.

One way to assess the advantages and disadvantages of a certain choice related to natural resources management is using cost-benefit information for economic decision-making framework. Cost-benefit analysis may not be perfect, but cost-benefit logic in assessing the positive and negative view of certain choices remains a powerful tool as general rational approach to public policy.

Recently forest, especially tropical forest has been recognized globally as having high value in mitigating the Green House Gases (GHG) effect due to its ability to absorb CO_2 in the atmosphere and becoming carbon sink. Inclusion of afforestation, reforestation, deforestation (ARD) and other land-use, land-use change and forestry (LULUCF) activities in Kyoto Protocol has opened up possibilities for developing countries to take part in trading CER (Certified Emission Reduction) under Clean Development Mechanism (CDM) scheme to get financial assistant for sustainable development.

While important issues under CDM scheme are still under international discussions, some guidance concerning definitions and accounting rules has been published. The accounting of changes in carbon stocks and net GHG emissions involve determination that certain forestry project activities lead to changes in carbon stocks and net GHG emissions that are additional to a with-out project baseline. Consequently forest management for carbon sequestration is different from conventional forest management.

Conventional forest management, referred as "business-as usual" or "baseline" includes activities starting with planting, maintenance until harvesting as one rotation. Planting and maintenance would be considered as "carbon sink" in the carbon cycle, while harvesting is "carbon source/emission". For a carbon sequestered forest, increase in carbon stocks above the baseline mentioned before must be obtained. Often attempt to get the net increase of carbon stocks means avoid harvesting, such decision in management surely would bring financial consequences, since it add up more cost. To compare the viability of the two management options, cost-benefit analysis can be applied to each option.

B. Objective

The objective of the study is to identify, evaluate and analyze key factors affecting cost and revenue of pure forest plantation in "bussiness as-usual" scheme or traditional one, as well as community forest, also to establish database on silvicultural operation for estimation of cost and revenue on CDM plantation.

II. GENERAL INFORMATION OF THE RESEARCH LOCATIONS

The study was conducted in two main islands of Indonesia, namely, Java and Kalimantan. In order to intensify the research, priority locations for data collection are areas, which have plantation forests and community forest at the same time. Those locations can also be categorized as large scale forest plantations. The selected companies are Perum Perhutani in Java and PT. Inhutani I in East Kalimantan.

Perum Perhutani is well known as large state-owned company, which traditionally focused on Teak, and operates only in Java Island. Although recent development indicates the possibility of expanding its area into outside Java, of which Kalimantan is possible candidate, the realization of the plan is not yet done. Several species are selected for each company, and the reason for this selection is the relative importance of those species to the company, for example Teak is the main commodity of Perum Perhutani, while Pine and Agathis are examples of species, which give two kinds of product, i.e. resin and timber. Sengon is the main species for most community forest plantations in Java, and Perum Perhutani is planting this species especially to accommodate its social engineering program. Recently with development of improved variety of Teak, which is called Jati Plus Perhutani/JPP, and encouragement of social forestry program by Ministry of Forestry, the community started to plant Teak as well in their forest plantation.

PT. Inhutani I is also state-owned company which operates only outside Java island. There are 5 companies of PT. Inhutani, of which cover Sumatra, Kalimantan and Sulawesi, however, PT. Inhutani I operates in Kalimantan and Sulawesi. Companies which operate outside Java have traditionally only logged natural forests, and only started getting encouraged to established plantation in the 80's, as people begin to realize that natural forest resources is rapidly diminishing. In the forest plantation establishment for industrial supply, which is known as Hutan Tanaman Industri/HTI, priority species are fast growing tree species, and whenever possible an indigenous species. Therefore for PT. Inhutani I case, the selected species are *Shorea leprosula* and *Acacia mangium* . The *Shorea leprosula* is one of the member of Dipterocarpaceae family, an important, indigenous and fast growing species, while *Acacia mangium* is well known, suitable fast growing species for supplying raw material to pulp and paper industries. The exact locations where data were collected and the species investigated can be seen in **Table 2.1** .

Table 2.1. The location and species selected in this study for data collection

No.	Company	Area	Species
A.	**Perum Perhutani**		
	Unit I (Central Java):	KPH Cepu	Teak (*Tectona grandis*)
	Unit II (East Java):	KPH Kediri	Sengon (*Paraserianthes falcataria*)
	Unit III (West Java):	KPH Sukabumi	Agathis (*Agathis lorantifolia*) Pine (*Pinus merkusii*)
		KPH Bandung Utara	Agathis (*Agathis lorantifolia*) Pine (*Pinus merkusii*)
B.	**PT. Inhutani I**	East Kalimantan	*Acacia mangium* Dipterocarp *(Shorea leprosula)*

A.1. General Information on Perum Perhutani

Perum Perhutani started forest plantation mainly on Teak (*Tectona grandis*) when Dutch still colonized Indonesia in 19 century. Total area of Perum Perhutani in Java covers 2,948,983, ha, of which the production forest is 1,922,816, Ha. Other area are classify as protective forests (606,367 ha) and nature sanctuary area (419,800 ha). Although up till now Teak is still their main commodity and occupies much of their production forest, Perum Perhutani also cultivates other forest species, such as Pine (*Pinus merkusii*), Mahogany (*Swietenia mahogany* and *Swietenia macrophylla*), Sengon (*Paraserianthes falcataria*), Agathis (*Agathis bornensis* and *Agathis lorantifolia*), Johar (*Cassia siamea*), Sonokeling (Dalbergia latifolia) etc, of which they collectively classify as "Rimba" (*forest species*). **Table 2.2** shows list of selected species and the area planted by Perum Perhutani. Besides timber as their main product Perum Perhutani also produce other non timber forest products such as, Pine resin (Gondorukem), Agathis (copal gum), medicinal plants, lak, cocoon for silk, rattan, bamboo etc.

Table 2.2. List of selected species and the area planted by Perum Perhutani (ha).

Species	Unit I	Unit II	Unit III		Total
	KPH Cepu	KPH Kediri	KPH Sukabumi	KPH Bandung Utara	
A.mangium	0	0	696	0	696
Agathis	0	0	196	12	208
Pine	0	88,073	13,030	5,170	106,273
Teak	33,110	18,602	7,956	2,200	61,869
Sengon	0	10,010	69	0	10,079
Other	0	2,185	0	13,178	15,363
Total	**33,110**	**118,870**	**21,947**	**20,560**	**194,488**

Source: Annual report KPH Cepu, KPH Kediri, KPH Sukabumi and KPH Bandung Utara, 2003.

Meanwhile **Figure 2.1** shows the condition of Agathis plantation after twenty years old. The crown of the plantation is overlapped each other. However, recently Perum Perhutani is not allowed to conduct thinning process because it is prohibited by Ministry of Forestry since year 2003.

Figure 2.1. The condition of Agathis plantation at 20 years of age

Corresponding to the existing provinces in Java, Perum Perhutani consists of three Units. The first unit established is Unit I which is located in Central Java province, followed by Unit II of East Java province, and the last Unit III located in West Java province. Each Unit is then divided into tens of Kesatuan Pemangkuan Hutan/KPH meaning *Forest Management Unit*, which corresponds to the numbers of regency (Kabupaten) in the province. Subsequently each KPH is broken down into smaller implementation unit (Bagian Kesatuan Pemangkuan Hutan/BKPH) and then divided again into yet smaller unit (Resort Pemangkuan Hutan/RPH) until smallest forest plots (Petak).

In order to intensify income generating from the forest, Perum Perhutani is promoting non-wood forest products such as copal (from Agathis), Gondorukem (from Pine), rattan, eco-tourism and others.

Figure 2.2 shows a conventional technique of copal harvesting from a mature Agathis in Perum Perhutani plantation. The frequency of harvesting in average is three times a month. The result of copal in average is 0.75 kg/tree/month. The price of copal for local quality in average is Rp. 4,000/kg and Rp. 5,000/kg for export quality.

Figure 2.2. Copal harvesting in Perum Perhutani plantation

Figure 2.3 shows the condition of the tourism facilities which is owned and managed by Perum Perhutani in Cangkuang, KPH Sukabumi.

Figure 2.3. The condition of main building for recreation facilities in Cangkuang area KPH Sukabumi

A.2. Procedure of Operational Management at KPH

Changes on political situations in Indonesia have left mark on Perum Perhutani as well. Formerly state owned company with heavy duty on social engineering, in early "reformasi" era Perum Perhutani was changed into totally profit oriented company of PT Perhutani, but then, again it was converted to Perum Perhutani back. The KPH takes most initiatives such as planning, revision of plan, implementation etc. in the company. Upon approval from Main Headquarter, the initiatives is then transferred top-down from Unit to KPH and smaller unit.

There are several management arrangements in plantation area of Perum Perhutani, i.e. mostly managed by company, shared by both company and local community, and managed by local community with Perum Perhutani assistance. Even in plantation, which is purely managed by the company, workers are usually recruited from local community with permission to cultivate crops for some time in the forested area as compensation. This is due to high competition of land use in Java.

Administrative procedure for operational management at Perum Perhutani is standardized as follows:

1. Before any operational activity started each Unit must prepare a document containing management plan for 10 years, which is called Rencana Pengaturan Kelestarian Hutan/RPKH, and its breakdown into 5 years plan called Rencana Lima Tahun Perusahaan/RLPH, which are subjected to approval by Main Headquarter.
2. A more detail plan also must be prepared called Rencana Kerja Tahunan Perusahaan/RKPH, which is also must be approved by Main Headquarter.
3. After its implementation for 5 years, a review on the implementation must be submitted in order to monitor changes in forest potential, which is called Risalah Sela.
4. From this mid-term report, the Unit then prepares a guideline for the next remaining 5 years operation, which is supplied as Supplement of RPKH.
5. Based on those documents mentioned above, the KPH prepares annual working plan, containing yearly technical plan, called Rencana Teknik Tahunan/RTT and must be prepared two years in advance to this RTT implementation in the KPH.

Following the guideline above, the key operational activities in KPH are identified. Each key operational activity has distinct Account Number for the budget required and is organized within certain Section (Bagian). In general operational and administrative management within Perum Perhutani, starting from KPH level up to Unit and Main Headquarter, are divided and organized into 8 sections, as follow:

1. Finance

2. Silviculture

3. Public Relation

4. Production

5. Industry

6. Marketing

7. Administration

8. Technic/Machinery

Every year each section, starting at the KPH level, has to make budget plan, which is then compiled together within KPH. The document is then sent to Unit Headquarter in Provincial capital city (Unit) for further processing. From each Unit, compilation of budget plans from the whole Unit area (all KPH of the respective Unit) will be sent to Main Headquarters in Jakarta to get approval. Usually approval is obtained after several changes in the plan are made, and the revision of the budget plan is then accepted as approved operational budget.

Implementation of approved plan and accompanying budget is done within each Section starting from Unit down to KPH, BKPH and so on. Since the implementation is within each Section, the reports of progressive works being done are also compiled and prepared by each Section. All Sections except Finance, reports physical achievements of its progressive works without attaching information on the budget required or spent for those activities. On the other hand the Finance Section reports only the financial situation from each other Sections without mentioning the physical achievements of the works being done by each Section. This reporting system has posed difficulty in tracing back and matching each item under physical achievements with each item in the financial report.

Another problem is grouping together of all species other than Teak into "Rimba" group. All reports on those species are also grouped together, and therefore, often data of one species can not be separated from others.

Below on **Figure 2.4.**, which was taken during the research survey in the Perum Perhutani area, shows the condition of the mixed plantation forest in Cangkuang area of KPH Sukabumi.

Figure 2.4. The condition of the mixed plantation forest in Cangkuang of KPH Sukabumi.

A.3. Overview on Community/Social Forestry at Perum Perhutani

The social function of forest, especially in a dense populated island such as Java is very important, however, only starting with the Reform Era (1997) local community has become more aware of this function. Perum Perhutani had initiated its program of local community empowerment as early as 70's by giving aids to rural community surrounding the forest area, and involving local community in its some forestry activity. This type of social engineering has developed and evolved since then into a participative or community based forest management type, until latest development of policy on community/social forestry in 2002, which is the issue of Director Board Decree on sharing scheme of forest product. The total area which has developed for community forest in whole Java until 1999 has reached 236,036 ha, involving 945,751 households.

There are three available schemes from Perum Perhutani in handling community forest, as follows:

1. Community only works as workers and does not have share for the product of forest plantations. In return community is given assess to cultivate the land while the commodity is still at young age. In this case the land is owned by Perum Perhutani.
2. Community share several plantation costs, and therefore has share on the product of forest plantations. In this case the land is owned by community.
3. Community owns the land and carries all cost of its plantations, while Perum Perhutani only gives guidance. Consequently the forest plantations and the accompanying forest product belong to the community.

The amount of sharing is determined by the amount of shared plantation cost, for example when community shares 40% of plantation cost, then community will get 40% of total income from the forest product. In the case where community only owns the land

and could not share any plantation cost, community will get small share according to the following formula:

$$\textbf{Share (\%)} = \frac{\textbf{(U – Ut) x 25 \%}}{\textbf{U}}$$

Where:

U = Plantation age on final cutting

Ut = Plantation age when agreement is made

25% = Highest proportion belonged to community on final cutting

A.4. Community forest at KPH Cepu in Central Java

Community at KPH Cepu is very interested in planting Teak, especially the improved varieties. Similar to the other community in forest, minimum investment is given to the Teak plantation. In order to obtain some revenue from the land while waiting for the trees growing, usually community plants teak mixed with other crops, which has shorter rotations, or some fruit trees. Selection on the crops is depending on each farmer's need, and wide range of species was found, such as maize (annual crop), Banana (fruit tree) or legume tree for animal fodder called "Lamtoro" (*Leucaena leucocephala*). Harvesting pattern in community forest is quite different from Perum Perhutani. Community usually will cut several trees whenever they need cash regardless of the age of the trees. The selling price of timber is not standardized and therefore, for simplicity in benefit cost analysis, it was used Perum Perhutani standard price. The price range from Rp. 400,000 – Rp. 2,000,000 per m^3. This price is based on the size of timber logged, the bigger size of timber log would be higher the price. Example of pure Teak plantation in community forest at KPH Cepu can be seen in **Figure 2.5**.

Figure 2.5. Pure Teak plantation in community forest at KPH Cepu

Due to the limited available land, in some area it was found out that Teak was planted only in the borderline of cultivation area as shown by **Figure 2.6 .**

Figure 2.6. Planting Teak in border line of cultivation area due to limited land available

A.5. Community Forest at KPH Kediri in East Java

In Kediri regency (Kabupaten Kediri) many local people grow tree species, mostly in the form of agro-forestry. Main tree species planted are mixture of fruit trees, such as Banana, Mango, Jack fruit and others, and multipurpose species (usually legumes), but the most found tree species grown for economical purpose is Sengon (*Paraserianthes falcataria*). Basically Sengon, which is a legume, can be mixed with any agricultural crops, however, in Kediri people usually mix it with Pineapple. This combination is preferred, because both species can grow relatively well under minimum maintenance. During the visit to Sengon community forest in Kediri interviews has been made on the standard practice and the cost associated with it. Most people give minimum investment for their plantation, i.e. they only require budget for buying seedlings and first land preparation. If tending are necessary for example applying fertilizers, it is for the pineapple and not for the trees. **Figures 2.7** and **2.8** show the condition of community forest at KPH Kediri.

Figure 2.7. Shows pure Sengon stand as one type of community forest plantation in KPH Kediri

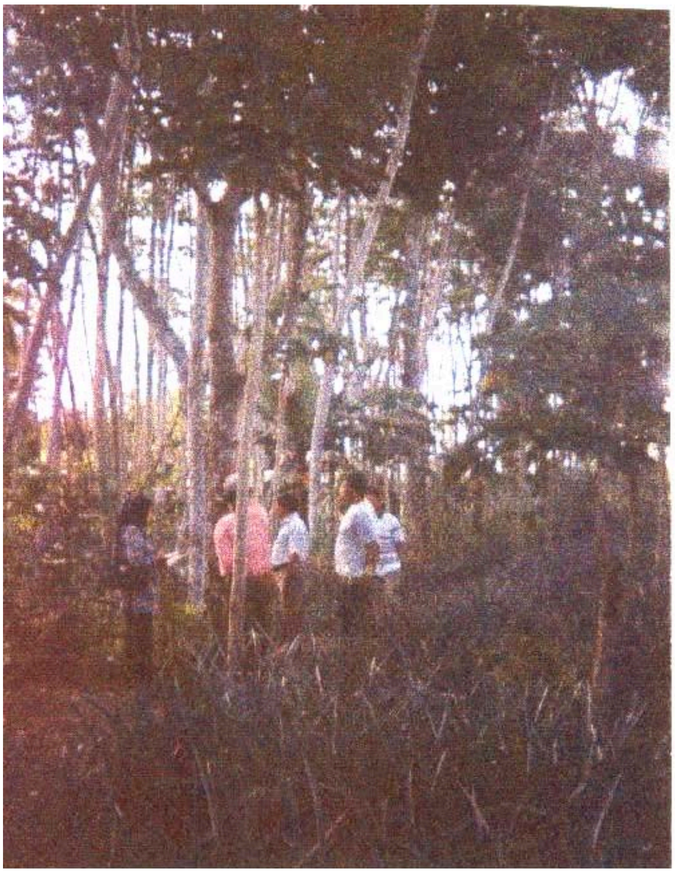

Figure 2.8. Shows a mixture of Sengon and Pineapple in community forest at KPH Kediri

A. 6. Community Forest in West Java

Figure 2.9 shows the condition of community forest in West Java. The local community in West Java is also interested in planting Sengon mixed with other agricultural plant such as banana. In West Java community mostly plants Sengon with all cost on their own account, and therefore they possess all the forest product. Almost similar to community forest in Kediri, mixture plantation is calculated as giving highest benefit to the local people due to the minimum cost of maintenance and the yield selling price is quite high, which is ranging from Rp. 35,000 - Rp. 140,000 per m^3. During the study visit to West Java, however, data on cost and revenue was not taken, due to similarity with community forest at KPH Kediri.

Figure 2.9. The condition of community forest in West Java

B.1. Short Overview on PT. Inhutani I

PT. Inhutani I is a state company, which runs forestry business mainly in other island than Java. Total area of PT. Inhutani I in East Kalimantan is 2,338,200 ha based on the Ministry of Agriculture Decree No. 352/Kpts/Um/1976 and Ministry of Forestry Decree No. 39/Kpts-IV/1987. The internal administrative management of PT. Inhutani I in East Kalimantan is divided into two unit managements, namely: Balikpapan unit and Tarakan unit. Balikpapan Unit is again divided into two smaller administrative unit managements, namely Berau (located in Kabupaten Berau) and Samarinda (located in Kabupaten Kutai) administrative unit managements. Tarakan unit is also divided into three smaller administrative unit managements, namely: Tarakan, Tidung Pala and Nunukan administrative unit managements. All of the Tarakan unit management is located in Kabupaten Bulungan. Forest plantation area of PT. Inhutani I were focused in unit administrative of Long Nah and Batu Ampar for Unit Management Balikpapan and in Sesayap for Unit Management Tarakan. Total area of the selected species planted in PT. Inhutani I for every unit management can be shown in **Table 2.3**.

Table 2.3. List of selected species and the area planted by PT. Inhutani I.

No	Species	Unit Management Balikpapan		Unit Management Tarakan	Total (ha)
		Unit Administrative Long Nah (ha)	Unit Administrative Batuampar (ha)	Unit Administrative Sesayap (ha)	
1	*A. mangium*	2,374	805	6,166	9,345
2	*S. leprosula*	21,284	3,879	0	25,163
3	Pine	0	0	0	0
4	Teak	63	0	0	63
5	Sengon	1,917	0	277	2,194
6	Other	2,890	3,890	1,526	8,306
	Total (ha)	**28,528**	**8,574**	**7,969**	**45,071**

Source : PT. Inhutani I, 2003

The research location of the study is at Berau administrative unit management. Berau administrative unit management total area is 418,537 ha. The geographical position of the area is 1°55'00" – 2°45'00" North Latitude and 116°52'00" – 117°38'30" East Longitude. The Berau Administrative Unit management border with PT. ITCI, PT. Sumber Mas in the North, PT. Dwi Warya Timber in the East, PT. Gema Mulya Raya, Alas Helau in the South, and PT. Bina Lestari in the West. All area of PT. Inhutani I in the Berau administrative unit management is under the authority of Berau Sub Forest Service, East Kalimantan Forest Service, Ministry of Forestry.

List of forest type in Berau administrative unit management can be seen in **Table 2.4**.

Table 2.4. List of forest types in Berau administrative unit management.

No	Forest Type	Camp Sambarata	Camp Labanan dan Tepian buah	Camp Mera` ang	Total
		Area (ha)	Area (ha)	Area (ha)	Area (ha)
1	**Limited productive forest area**	**84,726**	**68,788**	**24,644**	**178,158**
	a) Productive forest area	32,364	51,734	9,735	93,833
	b) Non productive forest area	51,576	16,899	14,767	83,242
	C) Cloud cover	786	155	142	1,083
2	**Productive forest area**	**18,138**	**53,802**	**34,845**	**106,785**
	a) Productive forest area	714	16,466	8,439	25,619
	b) Non productive forest area or non forest area	16,475	31,332	19,618	67,425
	C) Cloud cover	949	6,004	6,788	13,741
3	**Conversion forest**	**29,921**	**16,650**	**14,645**	**61,216**
4	**Protected area**	**0**	**4,402**	**1,494**	**5,896**
	Total (ha)	**132,785**	**143,642**	**75,628**	**352,055**

Source : Citra landsat image interpretation, PT Inhutani I. 2002.

The condition of all protected forest in the research location is very good. This is because the surrounding local people have a good perception concerning forest sustainability, as well as that the accessibility of the protected forest is quite low.

The condition of the tree canopy in the protected forest can be seen in **Figure 2.10**.

Figure 2.10. The condition of the tree canopy in the protected forest

The most interesting facilities in the research location is the Tree Canopy Bridge designed to promote ecotourism. This canopy bridge is very popular and help the Berau administrative unit management improves their financial condition, especially nowadays, when logging activities is stopped by the Unit Management as a consequence of Minister of Forestry latest decree. Recently, as an effort to save Indonesia forest resources, which is degraded severely, logging activities on natural forest by forest concession companies has been prohibited by Ministry of Forestry. This new policy, however, does not necessarily stopped illegal logging, which happened everywhere in Indonesia.

The condition of Tree Canopy Bridge and surrounding guest-houses facilities can be seen in **Figures 2.11**., **2.12**., and **2.13**.

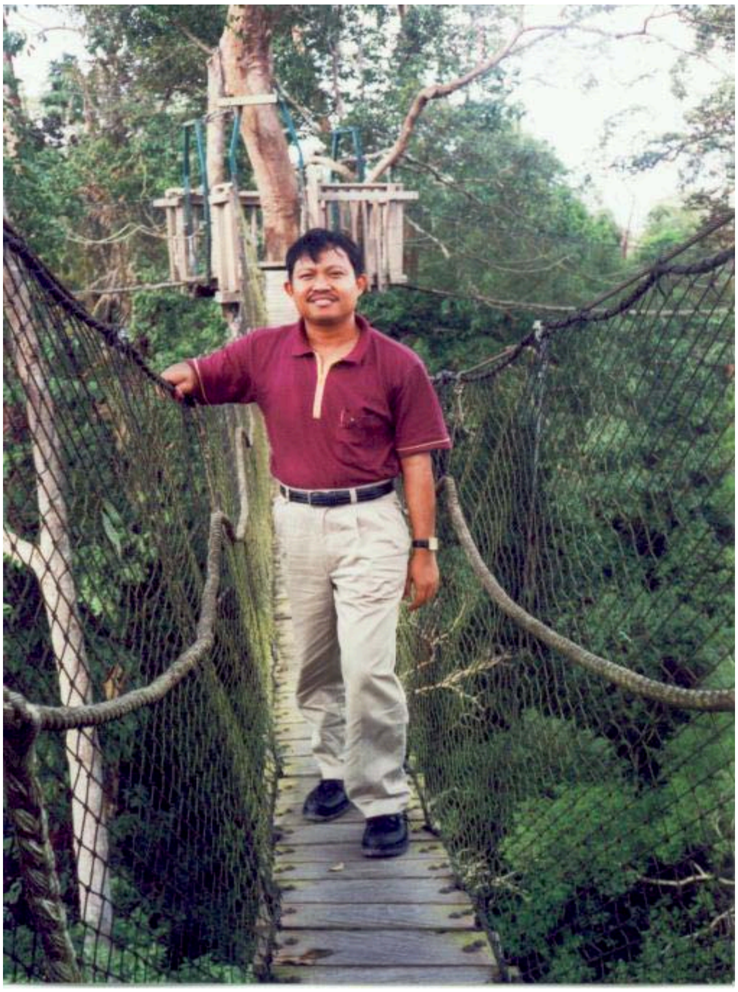

Figure 2.11. The Condition of tree canopy bridge

Figure 2.12. The condition of Guest-Houses in the research location

Figure 2.13. The condition of the restaurant and sport field in the research location

B.2. Community forest in East Kalimantan

The Unit Management has initiated collaboration with the local people to develop agroforestry in the suitable area near the base camp in the research location. The agroforestry system was developed together and tends to change pattern from time to time, especially on the planted commodities. At present the most favorite commodity is Pineapple. The agroforestry found in the research location can be seen in **Figures 2.14** and **2.15**.

Figure 2.14. Land preparation for agroforestry in research location

Figure 2.15. Agroforestry progress in research location

In order to help local people surrounding the forest location, PT. Inhutani I is facilitating collaborative business among the local communities, and plans to establish a cooperation which will benefit the local people. This activity helps very much the Unit

Management to control forest fire and forest encroachment by local people.

There are several planted forests by the local people border on the PT. Inhutani I location. However, most of the planted forest were cut down by the owner, and changed to the other commodities, especially pineapple. According to our private interview with the local people, forest plantation in the area is not profitable anymore due to the very low wood price. Sengon price at the wood industry in average is Rp. 220,000/m^3 (July 2003) while logging cost, transportation cost and administration cost in average is Rp. 200,000/ m^3. According to the local people the benefit margin Rp. 20,000/ m^3 is very low for the 8 years of waiting, land utilization and other business opportunity. The local people change their planted forest to pineapple because pineapple is more profitable compared to those of Sengon or *Acacia mangium* .

Figure 2.16 shows the wood waste of log conversion by local people who plant forest in the field. The area was planted by pineapple to replace Sengon and Acacia tree.

Figure 2.16. The wood waste of log conversion in the field

Figure 2.17 shows the stump of the sengon tree after logging activities and the new pineapple crops which is believed by local people more profitable compared to those of Sengon or *Acacia mangium*. According to the local people information, most of local people who plant forest were changed to Pineapple.

Figure 2.17. Pineapple plantation of the local people

III. METHODOLOGY

Within month of June 2003 until mid-July 2003 focus of study on Perum Perhutani was in Central/East Java. Upon receipt of official letter from Perum Perhutani Headquarter in Jakarta, which approved the study on their area in Java, confirmation on specific location to be visited has been done. As previously stated in the proposal, location for studying Teak (*Tectona grandis*) was KPH Cepu in Central Java. However, due to changes in land-use, only Teak (*Tectona grandis*) plantation is now available at KPH Cepu, Central Java. The community also mostly plants Teak. At the same time it was found out that KPH Kediri has wide Sengon (*Paraserianthes falcataria*) plantation, as well as Sengon community forest. Perum Perhutani Reports collected from those KPH are listed in **Annex 1**.

From mid-July until August 2003 data collection were made from KPH Sukabumi and KPH Bandung Utara of Perum Perhutani Unit III in West Java, as well as from PT. Inhutani I in East Kalimantan. From the two KPH in West Java, data on Agathis (*Agathis lorantifolia*) and Pine (*Pinus merkusii*) were obtained. Meanwhile from PT. Inhutani I in East Kalimantan only data on plantation cost is available. This is due to force major risks happened in East Kalimantan, i.e. forest fire, which has destroyed all plantations. Because of recurrent forest fire, which happened almost every year in Kalimantan, PT. Inhutani I has never harvested the forest plantations ever since it started. The whole reports collected, out of which data were extracted for subsequent analysis, are listed in **Annex 1**.

A. Estimating cost per hectare

The cost of all activities per hectare is calculated from available total expenditure for the activities, which is reported at the end of certain year, divided by total area of the activities done in that same year. For example: the cost for nursery and/or transplanting per hectare is obtained from the total cost spent for those activities divided by total area achieved for the same activities

$$\text{Cost of one activity/ha} = \frac{\text{Total cost spent on the activity}}{\text{Total physical achievement of the activity}}$$

This estimation might not reflect the exact value, especially for those species grouped together as "Rimba" species, namely, Pine, Agathis and Sengon. The limitation of the approach taken to estimate the cost lies in the fact that financial reports for these species is available only as one group, and it is impossible to separate one by one the real cost of each species. Therefore, for almost all of each activity of those species would have similar estimates, because the total cost is divided by total area of those species.

Differences will only be found when in certain case the total cost of each species is used instead of cost per hectare, because in this case the cost is obtained in proportion of the area occupied by each species.

The joint cost which is weighed on all kind of timber product is calculated from total other costs than production cost of the respective commodity divided by total area of production forest of respective KPH, and therefore, for all kind of species in the same KPH studied is the same. Examples of these kind of costs are staffs salaries, infrastructure maintenance, workers welfare etc.