Gunung Lumut Biodiversity Assessment
Socio-economic Study

Final Report

How Important Forest and Landscape Resource for Community Living In and Around Gunung Lumut Protection Forest?

By Murniati, Michael Padmanaba, Imam Basuki and Jan van der Ploeg

TROPENBOS INTERNATIONAL INDONESIA
(MoF – TROPENBOS KALIMANTAN PROGRAMME)
BALIKPAPAN 2006

ABSTRACT

Forest of Gunung Lumut in Pasir District, East Kalimantan was appointed as a Protection Forest since 1983. It surrounded by about 15 villages and even one settlement lies inside it. Communities in those villages highly depend on the forest resources mainly for non timber forest products. The socio-economic study of communities living in and around the protection area is a part of the Gunung Lumut Biodiversity Assessment (GLBA) activity that focused on the social and economic condition of the communities, including utilization and conservation of the protection forest resources by them as well as their perception on landscape and forest importance. The study was conducted in two settlements, each located in and outside (near) the protection forest area, namely Mului sub village and Rantau Layung village. The data collection was undertaken through general field observations, community meetings, focus group discussions and personal interviews. Mului people, who live inside the Gunung Lumut Protection Forest (GLPF) area, have higher positive perception on forest and conservation (80.3%) as well as on legal status of GLPF (74.2%) than Rantau Layung people (76% and 53.3%), who live outside the protection area. Economic contribution of GLPF resources, mainly non timber forest products, to the communities is significant, namely seven to eight million rupiah per household per year. Flora resources contribute two to three times of fauna resources to the communities. However, most of the non timber forest products gathered from forest area sold in formed of raw materials. Communities living in and near GLPF consider forest as the most important landscape among others in the future. They also suggest that payau (*Cervus unicolor*) and telaus (*Muntiacus muntjak*) are the most important animals of forest for them while sungkai (*Peronema canescens*) and telien (*Eusideroxylon zwageri*) are the most important plants. People use that important wildlife mainly for food and source of income. No post harvesting technology applied to gain an added value of the NTFP products and no proper development done for potential features in the area i.e. objects of ecotourism and hydro-power for electric generator. Several potential and actual threats to sustainability of GLPF area were identified, namely existing of several big concessions (HPHs) around the protection area, small-scale logging activities, shifting cultivation practices and boom of oil palm plantation. All GLPF related stakeholders should follow and obey the regional spatial planning of Pasir District in accordance to Forest Land Use Agreement (*Tata Guna Hutan Kesepakatan*).

Key words: biodiversity, shifting cultivation, non timber forest product, participatory, customary law, gathering and hunting

LIST OF CONTENTS

I. INTRODUCTION

A. Background

Forest area of Gunung Lumut was appointed as a protection forest by central government through Ministry of Forestry Decree No. 24/Kpts/Um/1983. Before the appointment, the area was a production forest since 1970's and used as a concession area of PT. Telaga Mas. Gunung Lumut Protection Forest (GLPF) lies between 116º02'57" and 116º50'41" East Longitude; 01º19'08" and 01º49'33" South Latitude with area of 35,350 ha. It stretches from the north to the south about 56.3 km length and 8.3 km wide, surrounded by about 15 villages, and even one settlement is located inside the protection forest (Map of GLPF in Anonymous, 2005). Saragih (2004) reported that there were 74,037 people living in and around the protection area that highly depended on forest resource mainly non timber forest products and its environmental services. Administratively, GLPF belongs to Pasir District and covers four sub districts i.e. Long Kali, Muara Komam, Long Ikis and Batu Sopang.

The GLPF area is mainly covered by dipterocarp lowland forest, apart of the area are dominated by trees of meranti (*Shorea* spp.) and kapur (*Dryobalanops lanceolata*). From 12,800 ha or 1/3 of the protection area surveyed in 2004, the forested area was around 90% and the remaining 10% covered by shrubs (UPTD Planologi Kehutanan Balikpapan, 2004). Another source stated that currently only about 60% of the forest is still in pristine condition with a complete flora and fauna (Anonymous, 2005).

Buffer zones of the GLPF are production and limited production forest areas with degraded condition, where no more trees with big diameter can be found (UPTD Planologi Kehutanan Balikpapan, 2004). These buffer zones are inhabited by thousands of forest dependent people. Based on Forest Land Use Agreement (*Tata Guna Hutan Kesepakatan*) and Regional Spatial Planning of Pasir District, the buffer zones of GLPF is classified as a forestry plantation area (*Kawasan Budidaya Kehutanan*).

Although forest in Gunung Lumut has been designated as protection area, logging activities have continued and even worsened in the last five years when large number of small concessions (IUPHHK = *Ijin Usaha Pemanfaatan Hasil Hutan Kayu*)

were granted by the *Bupati* (Head of the District) around the protection forest. Fortunately, the issuing of these IUPHHK has stopped based on instruction from the Minister of Forestry decree No. 541/Kpts-II/2002. Recently the protection forest was still under heavy pressure from various activities. Several big forest concessions (HPH = Hak Pengusahaan Hutan) such as PT. Telaga Mas, PT. RKR (Rizki Kacida Reana) and PT. Mentari still operate around the protection forest. In addition, forest encroachments are still taking place around the area.

There is no proper management plan or board has been made since designation of GLPF in 1983. Recently, TBI Indonesia conducted stakeholder survey and defined the main needs of the District Pasir with regard to the GLPF such as land use and management plan, boundary demarcation and database development. Concerning the needs to conserve biodiversity within and around GLPF as well as to apply for the status of a World Heritage Site, three districts (Pasir, Tagalong and Barito Selatan) have signed an MoU for the proper management and protection of the remaining protection forests in the borders of these districts. A working group of local government, local community, NGOs and universities has been proposed in order to prepare the GLPF management plan.

B. Objectives

Gunung Lumut Biodiversity Assessment (GLBA) is an activity to contribute to the establishment of a World Heritage Site and to improve the management plan of the Gunung Lumut Protection Forest. This research is conducted within the framework of the Tropenbos International (TBI) - Indonesia (MoF-Tropenbos Kalimantan Program) involving various institutions in Indonesia and Netherlands, such as Forestry Research and Development Agency (FORDA), Indonesian Institute of Science, Center for International Forestry Research (CIFOR), Environmental Institute of Leiden (CML), National Herbarium Netherlands, Bogor Institute of Agriculture (IPB), Mulawarman University of Samarinda and a local NGO, PeMA (Persatuan Masyarakat Adat) Paser. The research activities include an inventory of fauna and flora; identification of unique features in the area that have potential for eco-tourism; collection of socio-economic and ethno-botanical data; increase of awareness among local people and citizens in general about their natural heritage; identification of issues for further studies and follow-up action; formulation of approaches and strategies to ensure the meaningful and beneficial involvement of local communities

in various activities for the management of the Gunung Lumut Protection Forest; and development of database that is acceptable in Indonesia and Netherlands.

The socio-economic study focuses on social and economic conditions of the communities living in and around the protection forest, including interaction between the communities and the surrounding natural resources. Objectives of the study are:
1) to obtain data on socio-cultural and socio-economy condition of the communities
2) to identify natural resources and local utilization
3) to conduct participatory natural resources mapping
4) to identify landscape type, management, and dynamic
5) to identify specific resources including ecotourism and its potential options

II. METHODS

During research period, there are two types of data collected, the primary and the secondary data. The primary data are related to:

1. Natural resources:
    - Flora and fauna being used by the local community
    - Landscape type
    - Specific resources (including ecotourism).
2. Human resources and their livelihoods
    - History of villages
    - Socio-cultural
    - Land use and land tenure
    - Economic contribution of GLPF resources to the local community income and expenditures pattern
3. Legal status of the GLPF and threats
    - Local perception on conservation and the legal status of GLPF as well as local investment in the area
    - Identification of threats and opportunities

The primary data are collected through general observation, focus group discussions (FGD) and personal interviews. General observation helps to describe the landscape before the interviews take place. It is also important to cross check the information

collected from the communities. FGD is carried out basically to obtain general data from various people representing the different groups in the community. Personal interviews are supposed to collect detailed information on local perception on forest and conservation and GLPF as well as household income/expenditures, land ownership, the usage of natural resources, and local investment. The methods of data collection are initialized by a community meeting in the each research site.

The secondary data consists of demographic (population and ethnic composition), education level, public facilities, land use systems and topography. The literatures are collected from several sources e.g. local government, research institutions and mass media.

A. Community Meeting

Community meeting was carried out in Rantau Layung on 13th November 2005 and attended by about thirty people. In Mului, it was on 15th November 2005 and attended by more than forty representatives. Both meetings involved old men and women, young men and women and customary leaders. We introduced our research team members and purposes in detail to have their understanding and ideas on our activities. In addition, we asked participants to discuss how they recognized landscapes around them and categorized different land uses. Seasonal activities of the villagers were the other topic discussed during the meeting. In this meeting, four groups of villagers were proposed in each research site to participate to the Focus Group Discussion.

B. Personal Interview

We interviewed 15 of 50 households in Rantau Layung and 11 of 18 households in Mului using semi-structured questionnaires. It took two to three hours for each respondent. We discussed on local resource utilization e.g. flora and fauna, perspectives on conservation and protection area, and personal expenditure as an approach to have information on local revenue. In addition we interviewed some key-informants both in Rantau Layung and Mului in order to get description on the history of the settlement and how people manage their land use. They were including head of the village, customary leader, old woman, informal community leaders like teacher and *ustadz* (Islamic teacher).

C. Focus Group Discussion

Four groups of villagers, based on gender and age (old men, old women, young men and young women), were proposed in the community meeting. Each group was composed by five to seven members selected during the meeting. They were all participating to focus group discussion facilitated by the researchers. Several topics discussed included specific information of useful natural resources, landscapes and land uses, specific resources including for ecotourism.

Using Pebble Distribution Method (PDM) scoring exercise (Sheil D. et. al, 2003), we explored a number of methods to assess people's judgment of the relative importance of various products and landscape units. In each stage of the exercise, informants were asked to distribute 100 counters (buttons, seeds or pebbles) between labeled and illustrated cards in proportion to their 'importance'. Interviewers also ensured that the comparative nature of the exercise was understood by giving at least three examples at the start of each exercise.

III. RESEARCH SITE

A. Location

The socio-economic study was conducted in two settlements around and within the protection forest: Rantau Layung Village and Mului sub Village (Swan Slutung Village).

Surrounded by forest, fallow and upland rice field with steep topography, Rantau Layung Village is administratively managed by Batu Sopang sub District, Pasir District. The total village area is 18,913 ha or 17% of the total sub district area (Batu Sopang Sub District in Figure, 2004). The village is located about 150 km from Tanah Grogot (Capital of Pasir District) and can be reached only by double guard (4 WD) vehicle after four hours from Tanah Grogot or six hours from Balikpapan City.

River and earth-road are the main transportation infrastructures in Rantau Layung. To travel to Batu Kajang, capital of Batu Sopang sub District, villagers can only use motor boat through Kesunge River during six hours. Apart from its use as

transportation media, the river is important for drinking water, bathing and washing. The earth road was built in 2003 with support from a small scale logging company (PT. Telaga Mas). The road is the only ground access from Rantau Layung to the main road (actually logging road), and is frequently used by villagers to go to other places in order to sell their products such as fruits, rattan and honey, buy household's tools or to find medical treatment

Meanwhile, Mului is part of Swan Slutung village and belongs to Muara Komam Sub District, Pasir District. Separated from the other villagers, Mului people live inside the area of Gunung Lumut Protection Forest from which they gather many types of products (Figure 1). The settlement can be reached by car six hours from Balikpapan city. The Swan Slutung village covers area of 12,636 ha (Anonimous, 2002) and it takes about half an hour by motorbike from Mului settlement.

Figure 1. Mului settlement within GLPF (photo by Imam Basuki)

There is a logging road lies on the north of the Mount Lumut connecting Mului to the nearest town in Simpang Lombok and it dominates the view (Figure 2). During 1999 – 2000, Social District Services of Pasir built as many as 50 on stilt houses made of wood blocks, planks and zinc on the left and right side of the road.

Home garden with fruits and rattan plantation can bee seen around the village and a bit further, Mului is surrounded mostly by forests and some agriculture fields including

fallows in the southern part. Mului and Lelam Rivers flow about two kilometers away from the settlement and are the main source of drinking water.

Figure 2. Logging road in between Mului settlement (photo by Imam Basuki)

B. History of Villages

1. Rantau Layung

Initially, Rantau Layung people lived in Long Sai located in the mouth of Prayan River in early 1800s (Table 1). After living in the area for more than a century, the Dutch Colonial conducted a resettlement program in 1940s and pushed them to move from Long Sai to another settlement in Old Rantau Layung village which was a bit downstream further than current village.

A few years after Indonesian Independence Day, there were some chaos in different regions around the country including in the District of Pasir. In 1957, the situation was even getting worse for people in Old Rantau Layung as a rebellion to the government of Indonesia undertaken by separatist movement took place in the area (see also CIFOR, 2001) so that people decided to move to Temborong area nearby Batu Kajang. Several years later, after times of chaos ended, their life was back to normal.

Then in 1969, people abandoned Temborong and moved to recent settlement in Rantau Layung which is not so far from the old village.

Table 1. History of settlement of Rantau Layung people

Place	Location	Year abandoned	Reason to move from the place
Long Sai	Mouth of Prayan River	1940s	Resettlement program conducted by Dutch Colonial
Old Rantau Layung	Kesunge River	1957	chaos; rebellion
Batu Kajang	Temborong (mouth of Kesunge River)	1969	back to the previous village as the situation was already under control
Rantau Layung	Kesunge River	until recently	

2. Mului

Mului people originally lived in the upstream of Kuaro and Mului River, named Utok Mului and moved to Lenong Lomu in the area of Gunung Berani (Table 2). At that time the ancestors of the Mului were living separately, each household living near its agricultural field. They often moved to a new place to find a good agricultural land and forest products. They kept moving around this area until Indonesia' independence when they moved again to downstream area of Kuaro River.

Table 2. Historical background of Mului people

No	Place	Location	Year of moving	Reason to move from the place
1	Utok Mului	Upper area of Kuaro and Mului River	Before 1900	Suggested by old people
2	Lenong Lomu, Gunung Berani	Mount Penempa (later known as *Trans HTI* location)	1900-1945	Suggested by old people
3	Swan Slutung	Mouth of Slutung River in Kuaro River	About 1945	To find agriculture area
4	Tanjung Teleng	Near mouth of Mului River in Kuaro River	1971	For road facilities; to protect Gn. Lumut area (old village); to find area for rice field

No	Place	Location	Year of moving	Reason to move from the place
5	Lolo Pangan	Mouth of Serari River	1993	To join HTI project; to make rice field on Gn. Janas; for road facilities
6	Gunung Janas	Mount Janas	1999	To response suggestion from the Governor and *Bupati*; Social District Service built houses and other village facilities. They moved to current settlement in Tanah Rian, Lelam River.
7	Mului settlement	Tanah Rian		

They joined with Swan Slutung people and lived in the area for a long time and cultivated agriculture, horticulture and rattan garden. Many fruits trees were planted and according to the Mului people they can still be found in their old village. In 1945 they moved together to Tanjung Teleng and found a better agricultural land.

Following a conflict between Mului people and the Slutung inhabitants and when a logging company started to build a road for timber extraction, Mului people moved to the riverbank of Serari River. The area was nearby current Mului settlement, named Lolo Pangan.

In 1993, most people moved from Lolo Pangan to two different places. Some of them joined Indonesian transmigration project to live in Swan Slutung area where they could start developing industrial forest plantation (or *HTI = Hutan Tanaman Industri*). The others moved to Gunung Janas area to find new agricultural area and better road facilities. These people had to survive with water shortage since this new area was far from rivers or springs. This was also the reason why there were a few people stayed in Lolo Pangan.

It was an idea of the government of Pasir District to join Mului people living in those two different locations in 1999. It will be easier for the government to take care of them if they stayed together. Mului people moved to the current settlement soon after

the Social District Service of Pasir finished building houses and other facilities for them.

C. Socio-cultural

1. Rantau Layung

There are 50 households or 217 people live in Rantau Layung which population density is ± 1.15 people/km^2 (Daftar Isian Potensi Desa). In the last five years (2000 to 2004), the population increased by annual rate of 2.34% (Batu Sopang Sub district in Figures, 2004). The dominant ethnic is Paser and most of them are indigenous people. It is noted that six people came from outside, i.e. Banjar and Kapuas and married with Rantau Layung people.

Public facilities in the village are only a *masjid* (Islamic praying building) and an elementary school. Only 30 villagers have completed their elementary school (SD), 10 villagers have finished secondary school (SMP) and three people have accomplished high school (SMU). The others have not finished elementary school and even some of them never went to school at all. There is no *Puskesmas* (Centre for Public Health) available in the settlement. When getting sick, people still depend on their customary leader to whom they believe in dealing with health and medicinal things.

As most of Paser people, villagers in Rantau Layung were following cult of the ancestors. They had changed into Moslem since 1970s although former belief is still widely practised. A customary leader (*kepala adat*) plays an important role in integrating those two different aspects of the culture into harmony and so far people did not find any problem at all. Some rituals still exist such as new baby born and *belian* (Figure 3), a ritual led by the customary leader for asking help from spirits to recover a sick person.

Figure 3. Customary leader of Rantau Layung during ritual of *Belian* (photo by M. Padmanaba)

Apart from Indonesian modern law, customary law is also applied in the daily life as traditional guideline and rules to define what is right or wrong for the whole community. Especially in managing natural resource, it is used to classify forest (*alas*) into categories according to its function i.e. *Alas Tuo, Alas Adat, Alas Nareng and Alas Mori.* Definitions of these forest categories are explained in the discussion of landscape in the other part of this report.

2. Mului

There are 18 households of 121 people in Mului, almost 1/6 of all population in Swan Slutung Village (Anonymous, 2002). Most of them belong to Paser Mului ethnic group and only a few come from outside and married with Mului people. Many young generations are not married even when they are 40 years old; this is uncommon situation in the district. Children and young people dominate the population and the old people are the key persons in the community including customary leader and head of village.

Children have just started going to school less than two years ago. Previously, there was no formal school in the area. The older people never went to school except some outsiders who married with Mului people. Currently, in the primary school, there are two teachers hired by the local government and they are staying with the local people.

People of Mului interact with outsiders using the logging road by motorbikes or sometimes by public cars. Logging trucks are also important for villager to go to and return from nearest town e.g. Simpang Lombok. At least once a month they go to Swan Slutung or Simpang Lombok for grinding paddy, shopping etc. Rivers seems not to be important for local transportation since there are many rapids and big stones. People used to travel by boat when they lived downstream but there is no boat available in Mului at this moment.

Mului people welcomed Tropenbos International and other researchers with a lot of enthusiasm and contributed in the research, especially for the young and old men. They actively helped the work both in the forests and village. So far, they have been interacting with a lot of outsiders e.g. employee of HTI (*Hutan Tanaman Industri* = industrial forest plantation), logging company, social and forestry district services, NGO and researchers. They hope for a better livelihood by cooperating with outsiders.

From their experiences and with the help of some NGOs, the local people were trying to develop and write their village customs and rules. This document was supposed to control their members and outsiders in term of matters that will influence the village condition, including all landscapes in the region. For example, no one is allowed to cut and sell timber from the forest, both inhabitants and outsiders.

Everybody in Mului speak one common language, called ‘Paser’. Even some outsiders who live in Mului have learnt Paser language. Only some young people and children speak Indonesian that they learnt from teacher and local NGO.

Mului people are all Moslem but we discover that they still follow traditional activities e.g. healing sick people, delivering babies, agriculture activities, cutting big trees and collecting honey. This is still strongly influencing their livelihoods.

There are three types/scales of ritual ceremony regarding those activities exist in Mului. *Belian* is the biggest ritual ceremony characterized by very long magical spells

and applied in any customary occasion. *Timbu* and *babas* are the medium scale and only carried out to heal people from disease. *Besoyong* is the smallest one characterized by short magical spells and undertaken on many occasion (Figure 4). No one except a few old people in Mului have practiced *belian* or *timbu* recently.

Figure 4. Rite ceremony held in Mului after some villagers survive from an accident (Photo by Imam Basuki)

Customary rules concerning management of natural resources are still important in Mului. Some key informants explained that it is forbidden to cut down trees in forest of Mount Lumut and honey trees (*Koompassia excelsa (Becc.) Taub*). The rules also protect Mount Lumut and Pulau Ulin (iron wood area) from any disturbances. These areas including all forest in Mului can only be used by Mului people through agreement in community meeting. Tanah Mori and Tukok Sipumori are the areas where everybody is forbidden to cut trees but still allowed to hunt animals. Another rule forbids outsiders to disturb Suong Bosa (gold mine) and the grave yard of old villages.

Local people believed that any activities breaking those customary rules would bring hazard for the actors and they should get punishments e.g. to pay the penalty of money or goods.

D. People and Livelihoods

1. Rantau Layung

Most of the villagers cultivate upland rice fields by shifting cultivation system for their daily household consumption. They go for hunting and fishing and collecting non timber forest products (NTFP) such as rattan, fruits, vegetables and honey and usually sell them to Batu Kajang town. Among those NTFP products, fruits and rattan are the main source of income for the households in Rantau Layung. Apart from rice field, local people plant rattan in their gardens which are easily found along Kesunge River.

Another important source of income for households in this village is timber (small-scale logging). During 1995 to June 2005, most of the villagers were cutting trees in the surrounding forest and sometimes even inside the Gunung Lumut Protection Forest. Recently, about 20 people in Rantau Layung own a chainsaw. The villagers go for logging in teams, generally 4 to 5 people in one team, but some people just work with a single companion. Each team collect 8 to 12 cubic meter a month and drag it to the river. People mainly cut meranti (*Shorea* spp.) and kapur (*Dryobalanops* spp.). Market prices vary between Rp. 300,000 and 400,000 per cubic meter square logs (already sawn timber); Rp. 200,000 for round logs. However, since Wana Lestari operation took place in this area in July 2005 to combat illegal logging, the small-scale timber extraction stopped. The banned of this logging by government made a lot of frustration among the villagers and caused some children in Rantau Layung have to stop their formal education as their parents could not pay the school fee anymore. Table 3 describes number of household involved at each activity, coverage area, distance from the village and starting time of the activities.

Table 3. Activities of Rantau Layung community in forest area

No.	Activities	Number of households	Coverage area (ha)	Distance from the village (km)	Starting time	Remark
1.	Shifting cultivation	43	56	0.5 to 4	ancient time (1800s)	The cycle was 6 to 10 years
2.	Gathering NTFP	48	not applicable	2 to 15	ancient time (1800s)	-
3.	Hunting	14	not applicable	2 to 20	ancient time (1800s)	Since 1990's starting used spear, arrow, snare, dogs
4.	Timber production	17	not applicable	1 to 8	1987	Until 1995 it was only sold in the village, after that it was also sold outside

2. Mului

Most Mului people cultivate rice field in a small area near their houses which provide insufficient yield per year for their consumption. Each household has approximately one hectare of rice field maintained at least using herbicide and weeding treatment (Table 4). We observed that people mix their rice cultivation with vegetables and fruits trees. It seems that after people left for a new rice field it will become a fruit garden or agro-forests in the future.

With guidance from the local government and some NGOs, each household in Mului has one hectare of mix fruit trees in their home yard and three hectares of rattan plantation in their garden located a bit further from the settlement. They go hunting at least once a month usually with snare and a few air-rifles. At the same occasion they collect young sprouts and mushrooms as well for vegetables. Fishes are also important for local source of protein.

Selling fruits, animal, and honey are the main source of income for Mului people. All of these sources are very important for them since they need the money to buy more rice; clothes etc. and they are only available seasonally. *Gaharu* (eagle wood) and gold used to be very important but currently they are getting rare. Only one family plays the role of seller of manufactured goods like instant noodle, candies, soap, sugar, etc. in their house.

Table 4. Activities of Mului communities in forest areas

No.	Activities	Number of households	Coverage area (ha)	Distance from the village (walking hours)	Starting time	Remark
1.	Shifting cultivation	16	16	0.5	1999	Move each year, two years at most
2.	Home garden	21	4.2		1999	Fruit trees
3.	Rattan garden	21	50	0.5	2004	50 people
4.	Hunting	21	not applicable	6	Ancient time	Deer, barking deer and birds
5.	Gathering NTFP	21	not applicable	6	Ancient time	Fruit, Honey, Young leaves, etc.
6.	Timber collection	21	not applicable	1	Ancient time	Not for sale

3. Seasonal Calendar

Communities in Rantau Layung and Mului distribute their activities along the year. The main activities are shifting cultivation, collecting non timber forest products, hunting, timber production, fishing, rattan harvesting and other activities (gold mining, rubber tapping). Shifting cultivation consume a lot of time and labor. In Rantau Layung, the activities start in July and continue to January of the next year, then it stops for three months (February, March and April), before harvesting activity in May and June. Hunting, timber production, fishing and rattan harvesting were usually undertaken over times (Table 5).

Table 5. Seasonal Calendar of Rantau Layung community activities

Activities	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Shifting cultivation: - slashing - tree cutting - burning - clearing/collect waste material - crop planting/dibble with a pointed stick in order to sow seeds - weeding - harvesting	xxx				xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx
Hunting	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	Xxx
Timber production	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx
Fruits gathering	xxx											
Honey gathering	xxx	xxx										
Fishing	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx
Rattan harvesting	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx
Other activities (gold mining, eaglewood gathering, rubber tapping)	xxx	xxx	xxx	xxx	xxx	xxx						

In Mului, villagers use most of their time along the year in their rice field. Some villagers usually have a group meeting in May to define which field they should work on. Then they will start cultivating and slashing the shrubs (Table 6). The next activities up to November are cutting trees, burning, building hut and planting. After a long rest during December, people continue working on weeding and, at last, harvesting in March and April.

Other activities such as hunting while collecting NTFP, and gold mining are undertaken when Mului people have time available within their cultivation practice. During fruit season (especially durian), most people go to the forest almost everyday to collect fruit. Gold mining is carried out only in dry season (June to August) using traditional and unsophisticated tools. Most men do hunting and gold mining activities and they work together with women in collecting fruit and honey and fishing.

Activities conducted by villagers in Mului that may affect GLPF are shifting cultivation and hunting. Key informants explain that shifting cultivation system in Mului occupies the same field for planting rice for at most two years continuously before moving to another field. It means that each people have to cut and clear either primary or secondary forest including those inside the GLPF every two years. This should be taken into account and anticipated by the workgroup/board of the GLPF to minimize the negative impact to the forest.

Mului people frequently go for hunting within a year (Table 6). They use snare and gum to catch animal particularly mammals and birds. Since they live inside the protection forest, this activity will directly affect animal population and diversity. According to local people, there is no sufficient socialization effort on GLPF and its biodiversity conservation has been undertaken in Mului. People need to be involved in the management of hunting activities within the GLPF.

Table 6. Seasonal Calendar of Mului community activities

Activities	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Shifting Cultivation: - selecting rice field - slashing - tree cutting - burning - building hut - rite on planting; a day before planting - crop planting/dibble with a pointed stick in order to sow seeds - weeding - harvesting	xxx	xxx	xxx	xxx	xxx xxx	xxx	xxx	xxx	xxx	xxx xxx xxx	xxx xxx	
Hunting	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx
Fruits gathering	Villagers only do this activity on the fruit seasons (no exact timing)											
Honey gathering; once in three years						xxx	xxx	xxx	xxx			
Gold mining						xxx	xxx	xxx				
Fishing	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx

E. Biodiversity and natural resources distribution

Participatory mapping of land-types and natural resources was started in the first few days in the village and continued during the research period. Before going to the

field, a 1:50,000 base map was printed out from an already existing digital layer of rivers and village locations, provided by Tropenbos International-Indonesia. Rather than a common formal map showing boundaries, topography and some attributes, this map was developed to describe biodiversity resources distribution in the two villages, where they occur and how many they are available in some types of landscape. To avoid sensitive issues from which a horizontal conflict might probably occur, we did not talk about village boundaries during this activity.

We start making the map by drawing the main river and its tributaries. Several key informants provided information on natural resources, important trees and animals, cultural sites, potential sites for ecotourism etc (Table 7).

Table 7. List of features drawn on the map by local people in Rantau Layung and Mului

--- Land type/special feature ---		**--- Resource ---**	
Rt. Layung	**Mului**	**Rt. Layung**	**Mului**
Village	Village/Settlement	Honey trees	Big trees
Former village	Old village	Rattan garden	Agathis
Mountain	Mountain top	Iron wood	Iron wood
River/tributary	River	Sun bear	Sungkai/Peronema
Rice field	Rice field	Clouded leopard	Albizzia
Salt spring	Salt spring	Monkey/gibbon	Eaglewood
Spring	Water spring	Porcupine	Rattan
Cave	Cave (with bats)	Birds	Plant shoot
Water fall	Waterfall	Snake	Honey tree
Logging road	Small stream	Fish	Sun bear
	Old fallow	Deer, barking deer, mouse deer	Gold
	Wild games area		Mushroom
	Birds area		
	Garden		
	Road		
	Big stone		

1. Rantau Layung

In Rantau Layung, although most informants have good knowledge on what natural resources are important for them, only a few including the customary leader and hunters can mention where the resources are usually found and put their input to the map. The main resources and special features drawn in the map (Figure 5) were: honey trees, eaglewood, cave, waterfall, salt spring, fallow, rattan garden, and old villages. Hunters are experts mainly in wildlife resources such as deer, sun bear, monkey, snake, birds and fish.

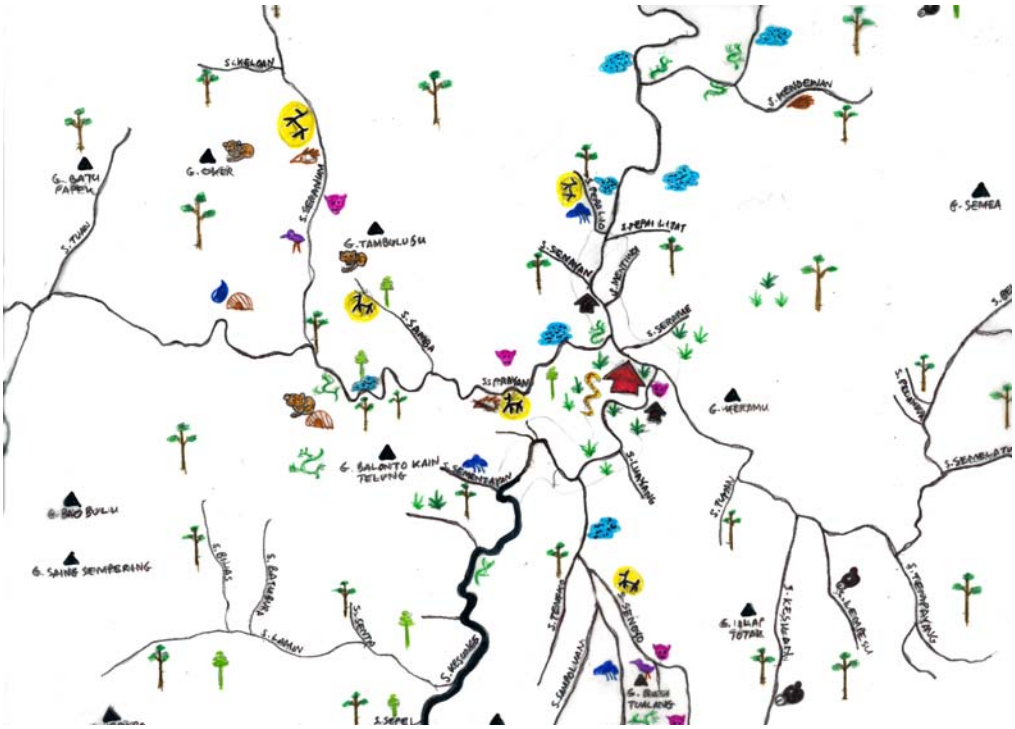

Figure 5. Part of biodiversity and natural resources map of Rantau Layung village

2. Mului

In Mului, people were familiar with maps and very helpful in showing information on their territory. Young informants were knowledgeable on hunting sites and natural resources. The old informants were helpful providing their knowledge on cultural and historical sites

They started by providing names for the main tributaries of the Mului, Kuaro, Sempangen and Payang rivers (already included on the base map), and drew many additional

tributaries with their names. Young informants were surprisingly knowledgeable about this. We found that they learnt it from their parents and from their hunting experiences.

After most of the main river tributaries were added to the map, it seemed that more people were eager to give other information. One by one, the informants told us many things that should be included to the map. At last we collected information such as important trees (honey tree, *Agathis, Shorea*), hunted animals, birds, bear, mountains, lakes, agriculture fields, fruit garden etc. (Figure 6)

Villagers recognized specific sites that seem to be habitat for some endangered species of wildlife e.g. sun bear, deer, and horn bills. GLPF management may consider these sites as key biodiversity areas since most of them are located within and around protected area. Springs, mountain and riverbanks are among of these special areas.

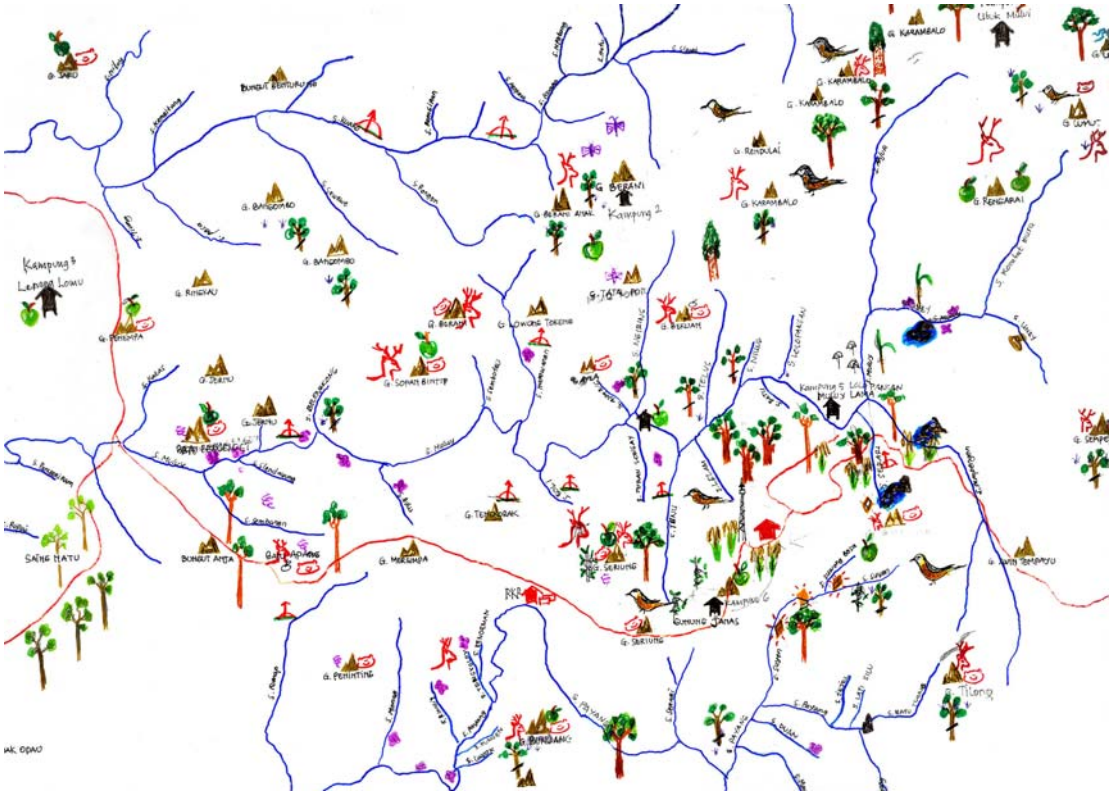

Figure 6. Part of the final Mului community resource and biodiversity drawing

IV. RESULTS AND DISCUSSION

A. Characteristic of informants

During the socio-economic survey, we conducted personal interviews (including key informants), focus group discussion (FGD) and field observation both in Rantau Layung and Mului communities. In personal interviews, we have 15 respondents of Rantau Layung people and 11 respondents of Mului people representing the different households, looking for a reasonable coverage by age and other significant background. More details about our respondents are described in Table 8.

We also interviewed some key informants: customary leaders, village head, teachers and informal community leader. FGD involved four groups of villagers by age and gender, i.e. old men, old women, young men and young women. Each group consisted of four to seven persons.

Table 8. Characteristic of Respondents (Personal interview)

Category		Rt. Layung (n=15)	Mului (n=11)
Age class (years old)	21 - 30	5	3
	31 - 40	4	1
	41 - 50	5	7
	51 - 60	1	0
Gender	Female	4	0
	Male	11	11
Occupation	Farmer	12	8
	Company worker	0	2
	Others	3	1
Educational background	never went to school	2	8
	un-accomplished elementary school	6	1
	accomplished elementary school	5	1
	accomplished secondary school	0	0
	accomplished high school	2	1
Ethnic	Paser	14	11
	Other(s)	1	0

In addition, we gauged 'nature resource reliance' as follows: we counted the people who 'go to the forest more than once a month' (score ½) and those who 'use river water for their basic needs' (½). 'Good access to mass media' was defined as 'people owning a television and/or radio' (½) and stating that 'they often watch or listen to the news' (½). In each case, population summaries were calculated by adding the scores, dividing by the number of respondents, and then multiplying by 100 to make it a 0-100 scale (Figure 7).

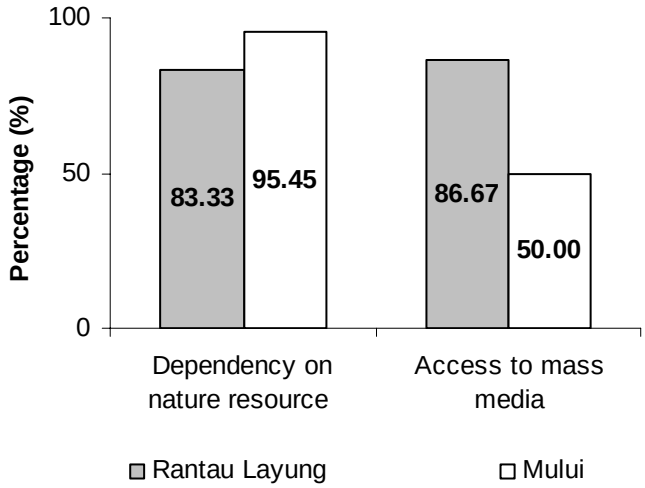

Figure 7. Local dependency on nature resource and access to mass media

All respondents in both villages are highly depended on natural resources including forest. However, this dependency on the resources is slightly higher in Mului (95%) than those in Rantau Layung (83%). This is related to the fact that Mului people live inside the protection area and go to the forest for collecting useful products more frequently. Compared with Mului (50%), higher proportion respondents in Rantau Layung (87%) own TV or radio as media from which they obtain information.

B. Community perception

1. Perception on forest and conservation

We asked respondents directly some questions and statements concerning their perception on protection forest and conservation. When asking them a question, we repeated it carefully at least twice to make sure that they clearly understood.

Respondents had choices: 'agree'; 'disagree'; and 'don't know'. We scored responses as 'correct' if they confirmed conservation principles: i.e. 'agree' for

confirming statement and ‘disagree’ for a contradictory statement. Score 1 was given to every ‘correct’ answer and score 0 was given to every ‘don’t know’ or ‘incorrect’ answer. The total score was then divided by the maximum possible score and expressed as a percentage, representing our ‘measure of agreement’ (Figure 8). This term refers to the number of ‘agreements’ or ‘disagreements’, which were correct according to the common principles of conservation.

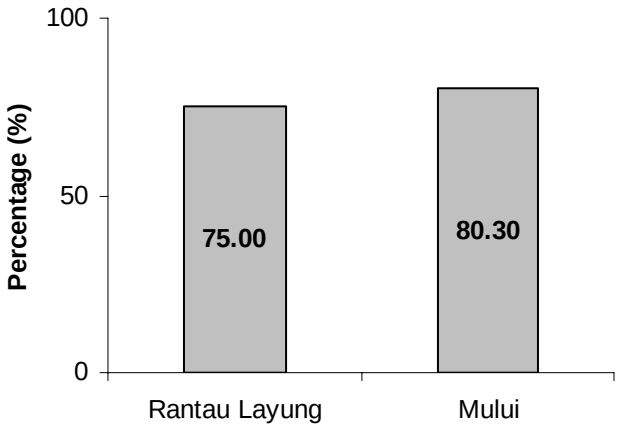

Figure 8. Measure of Agreement showing local perception on forest and conservation

In general, the ‘measure of agreement’ of local community is high although the difference between two villages is relatively small (80.3% vs. 75%). People in Rantau Layung and Mului experience that forest provides many resources for their daily livelihoods from which they highly depend on as shown in Figure xx (*dependency on nat. resources*). Therefore, they convince that forest needs to be conserved.

All (100%) respondents in Mului and 67% respondents in Rantau Layung agree with forest conservation. It is also interesting to note that more than half, 63% in Mului and 53% in Rantau Layung, respondents do not think that their hunting activity will lead to animal extinction.

According to all respondents in both villages, investors such as logging and plantation companies have to take local views on important plants and animals into consideration. As many as 82% respondents in Mului and 60% in Rantau Layung suggest that most of lands in GLPF are not suitable for permanent and commercial

crops including oil palm. In addition, 81% respondents in Mului and only 47% respondents in Rantau Layung consider that logging and plantation companies are threats for GLPF sustainability.

2. Perception on legal status of the Gunung Lumut Protection Forest

Local knowledge and community perception on the legal status of Gunung Lumut Protection Forest were recorded from the same respondents representing households in Rantau Layung and Mului. In Rantau Layung, only four (27%) respondents knew about the decree mentioning Gunung Lumut as a protection forest and only two respondents (13%) knew about borders of the forest. For those who did not know either the decree or the borders, we told them the actual information concerning those issues and asked for their agreement. Most of the respondents (87%) agreed with the decree and only three respondents (20%) agreed with the borders. Most respondents could not answer whether they agreed with the borders of the protection forest or not since they did not clearly know where the borders. In Mului, four (36%) respondents knew about the decree and 9 respondents (82%) knew about borders of the forest. Seven (64%) respondents agreed with the decree and the border.

By calculating positive responses in each research site and dividing them with the total positive answers of all questions, we obtain relative level of knowledge and perception of the respondent on the legal status of the GLPF (see Figure 9).

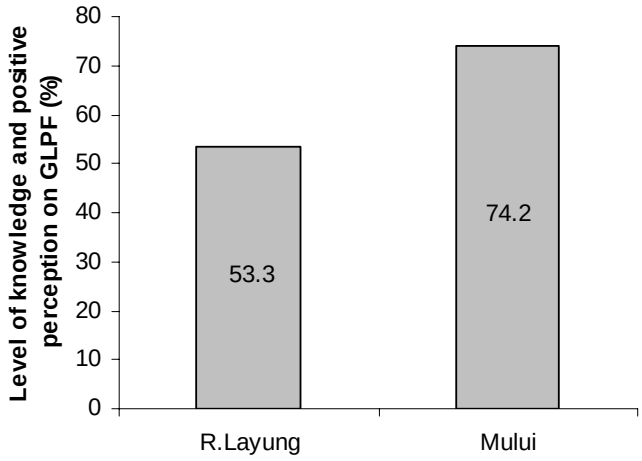

Figure 9. Level of knowledge and positive perception on the GLPF of the community at Rantau Layung and Mului Villages

Community in Mului had higher knowledge and positive perception on the legal status of GLPF compared with community in Rantau Layung. This might be caused by local dependency on nature resources and the accessibility of those two villages to information from outsiders. Mului people, who live inside the protection area, spent more times in the forest and collect products for their daily needs. With their higher dependency on natural resources, they experienced better informal knowledge on the protection forest.

In addition, there is logging road connecting Mului to other places so that villagers has better opportunity to interact with outsiders and improve their knowledge on any issues concerning protection forest. In contrast, Rantau Layung village has very limited access and is connected to outsiders only by a poor constructed road.

Discussing socialization and/or extension of the legal status of GLPF conducted by related institution, four respondents (27%) in Rantau Layung mentioned that they rarely obtained the extension, 11 respondents (73%) stated never and none of the respondent got the extension frequently. In Mului, five respondents (45%) stated that they got the extension rarely, six respondents (55%) answered never and none of the respondent obtained the extension frequently. The description above indicated that the community in Rantau Layung was less reached by the outsider extension worker. Involvement of the both communities in creating the borders for the protection forest was low. There were only three respondents (20%) in Rantau Layung and one respondent (9%) in Mului that once involved in the activity.

C. Natural resources and local utilization

As the Mului and Rantau Layung settlements are located inside and near the Gunung Lumut Protection Forest, communities in both villages have high dependency on the surrounding forest resources which cover wood and non wood forest products including animals. The uses of forest resources are direct (home consumption) and indirect (cash earning) which can be calculated using approach to the market prices at community level.

1. Resources of flora

Types of plants used by local community in Rantau Layung and Mului are classified into four groups: timber, non timber (rattan, *gaharu*, bamboo), fruits and vegetables such as young sprout of bamboo, *fern*, etc. Timber is important for some uses such

as heavy construction including houses, light construction and fire wood. Especially in Rantau Layung, it is also used as source of income which is usually sold either inside or outside the village during the period of 1995 to mid of 2005.

Non timber forest product particularly rattan and bamboo are used for light construction and/or furniture/tools and also as a source of household income. Most of forest fruits such as durian (*Durio zibethinus*), *cempedak* (*Artocarpus integer*) and *lei* (*Durio kutejensis*) are sold to the nearest market (Batu Sopang for Rantau Layung and Swan Slutung for Mului). Vegetables are only used for household consumption in both research sites. Average value of the flora used by community in Rantau Layung and Mului can be seen in Table 9.

Table 9. Average value of the forest flora used by community in Rantau Layung and Mului

Community	Average value of flora used per household per year					Total (Rp.)
	Wood		Non wood (Rp.)	Fruits (Rp.)	Vegetables (Rp.)	
	Volume (m^3)	Value (Rp.)				
Rantau Layung (n=14)	8.3	1,888,214	411,786	2,621,714	216,861	5,138,536
Mului (n=11)	na	na	74,432	5,159,864	na	5,234,295

Community in Mului do not sell wood from the forest so they could not predict the price. They use wood to maintain their houses that were built with the help of the social district services since the sub village was established as a settlement area in 1999 (see history of Mului). However, they used small volume of timber for light construction including hut in their fields but could not predict the price. Communities in both settlement areas also consumed vegetables gathered from the forest but people in Mului could not quantify their volume and price.

The most valuable product of plants used by the community in both villages is fruits. Mului people consume more forest fruits and recognize more plant species than people in Rantau Layung. This may be influenced by the accessibility in Mului which is easier to market their non timber forest products than Rantau Layung village. Location of the settlement inside the forest area also contributes to the more non timber forest product gathered by the Mului community.

Apart from those marketable resources of forest plants gathered by the community in Rantau Layung and Mului, there are other important utilizations (though people never

consider them to sell and buy) such as traditional medicine, tools, basketry, ornament/ritual, hunting place and hunting tools. Detail description of those useful plants in detail including species, category of use, habitat preference, parts being used and availability in the nature is very important for the plants species conservation. Habitat of certain species is reflected by the specific place where the species gathered by the community. The important plants availability is influenced by method of harvesting, regeneration as well as growth rate of the species. Destructive way in harvesting of certain fruit bearing trees, for instance by cutting the branch and even the tree, will decrease the species population.

List of useful plants, uses, preference sites, parts being used, and availability in nature is presented in Appendix 1 and 2, each for Rantau Layung and Mului.

Appendix 1 shows that 104 identified species of plants (from total of 126) are widely used by community in Rantau Layung. It consists of 44 family and 6 types of flora. The family of Palmae has the highest number of species (20 species) used by the community, followed by Moraceae (10 species) and Leguminosae (7 species). The plants are used mostly for food, medicine and construction including heavy, light and boat constructions, either for subsistence uses or commercial (as source of income). Parts of the plants that most frequently used are stem, fruit and root. We note many species have two or more useful parts, for example *walor* or *Nauclea subdita* (the root, the bark, the leave and the sap).

Data on dynamic of availability of the useful plants indicates that population of several species which tend to decrease are *bekokal* (*Saraca declinata*), *gaharu* (*Aquilaria malaccensis*), *kapur/sintuk* (*Dryobalanops lanceolata*), *keramu* (*Dacryodes rostrata*), *keranji* (*Dialium spp*.), *perari* (*Neolitsea sp*.), and *suro/ulin* (*Eusideroxylon zwageri*). Decrease of population of *gaharu* and *keranji* is closely related to the local harvesting system. So far, a traditional way in collecting *gaharu/*eagle wood is by cutting down the stump whenever people found the tree since none of them knows exactly which tree contains the *gaharu*. Fruits of *keranji* are small and abundant so the villagers usually cut the tree to make fruits gathering easier. However, the villagers are aware of the impact and try to stop the destructive harvesting method through customary regulation. It is said that when cutting the *keranji* tree, someone has to share 50% of the yield with the community through customary leader. If it happens for the second time, 2/3 of the yield will be given to the community and for the third time, the customary leader will take them all away.

There are many species of plants identified and used by Mului people. Most of them are edible and the others are used for medicine, construction, hunting tools, cash income etc. Many of them have more than one category of use for local people. Overall we record 511 plants species used in daily life. As many as 162 out of all recognized plants were collected and identified. People collect those plants and animals mainly from the forest while a few were collected from home garden, agricultural field, rattan garden and bushes.

Availability of the flora used by Mului people was reported as numerous for most species. There were only some species of flora found in small number of population in periods of past, present, and future. *Botung* (bamboo), *jombu* and *luyan* trees, for example, were reported as decreasing recently but will increase again. In addition, local people believed that the number of new domesticated species of flora e.g. *we* (rattan) and *balo* (bamboo) will increase.

2. Resources of fauna

Forest animals or their products utilized by community in Rantau Layung and Mului villages can be distinguished into four categories, i.e. mammal, bird, fish and others (mainly honey as a product of bees). Species of mammals frequently utilized by most villagers are *payau* (*Cervus unicolor*), *kijang* (*Muntiacus muntjak*), *kanci*l (*Tragulus napu*) and *trenggiling* (*Manis javanica*), while species of birds are *sakan* (*Lophura ignita*), *lembukon* (*Chalcophaps indica*), merak/jue (*Argusianus argus*) and lensio (*Rollulus rouloul*). River fishes are gathered by most villagers in Rantau Layung since the settlement area is very close to the river. Some species of mammals, birds and honey are used for daily household consumption and some others are sold to the nearest market as a source of household income. Most of fishes are only used for food and rarely sold. Average value of fauna used by community in Rantau Layung and Mului can be seen in Table 10.

Table 10. Average value of the forest fauna used by community in Rantau Layung and Mului

Community	Average value of fauna used per household per year								Total (xRp. 1000)
	Mammal		Bird		Fish		Honey		
	Volume (ind.)	Value (xRp. 1000)	Volume (ind.)	Value (xRp. 1000)	Volume (kg)	Value (xRp. 1000)	Volume (L)	Value (xRp. 1000)	
Rantau Layung (n=14)	5.6	1,105.3	1.3	37.6	180.3	786.9	21.2	828	2,619.2
Mului (n=11)	10	573.8	30.5	943.5	141.5	367.9	0.45	22.7	1,902.4

Note: ind. = individu

Most people in Mului are good hunter and they catch more mammals and birds than Rantau Layung people. Each household uses 10 individual mammals and 30.5 birds in average per year or almost one mammal and 2.5 birds per month. Again, this can be understood as the Mului people are living inside the protection forest area so that they can easily get animals resource. However, they only collect honey approximately five liter in a year, which is much lower than those collected by Rantau Layung people.

Apart from those marketable resources of forest animals gathered by the community in Rantau Layung and Mului, there are other important utilizations (though people never consider them to sell) such as traditional medicine, rifle, ornament/ritual etc. Identification of those useful animals in detail including species, uses, parts being used, the way of catching, and availability in nature is very important as a point in developing and/or conserving the animal species. Preference site to stay for certain species is correlated with the the animal habits and reflected by specific place where the animals are often caught by the community. The important animal availability is influenced by method and number of harvesting and breeding rate of the species. Over catch of forest animals will lead to the species population decrease. List of useful animals, uses, parts being used, preference sites, and dynamic of availability in nature is presented in Appendix 3 and 4, each for Rantau Layung and Mului.

Appendix 3 shows dynamic of availability of several animals in Rantau Layung which tend to decrease in the next coming years. Some local people mention that fish population in Kasungai River is decreasing compared to 10 years ago and it is even going to be more decreased in the future. This may be affected by the harvesting method people used such as net and electric fish catcher which catches fish from the whole size including the small ones.

Honey production is also reported to decrease compared to the production of 10 years ago and it will continue decreasing. Production of honey is related to the availability of flower bearing trees as sources of food for the bees which is influenced by logging activity. In the period of 2001 to 2003, there was a small-scale concession (IUPHHK) around Rantau Layung village. In addition, logging activities conducted by local people in Rantau Layung during 1995 to 2005 also contributed to the decrease population of flower's tree. Other animal species which population are reported to decrease are pelanuk/mouse deer (*Tragulus* sp.) and rusa/sambar deer (*Cervus unicolor*).

People in Mului identified 90 animal species used in their livelihood. They were mostly birds and mammals although reptiles and fishes were also recorded. People eat most of them except reptiles and sell big mammals such as payau/*Cervus unicolor* and birds e.g. Tiong/*Gracula religiosa* (Appendix 4). Some animals are used as ornament e.g. munin/*Arctictis binturong* and medicine e.g. biwang/*Helarctos malayanus* and pawing (bats).

Mului villagers hunt mammals, birds and reptiles in the forest, specifically in salt springs, and shrubs near their settlement. Fish and mollusk are caught in Suong Bosa and Mului Rivers. Specific animal such as pawing/bats is collected in few caves of Mount Tekedey.

As discussed earlier, Mului people are good hunters and they live inside GLPF. This fact should be taken into consideration in the management of GLPF. People should be aware that there are many animal species which are endangered and protected by Indonesian law. Species such as sun bear (*Helarctos malayanus*) is an example of the endangered animals (Saleh, 2003) but at the same time remain important for livelihood in Mului.

Total value of flora and fauna utilized by communities in Rantau Layung and Mului per household per year is presented in Fig. 10.

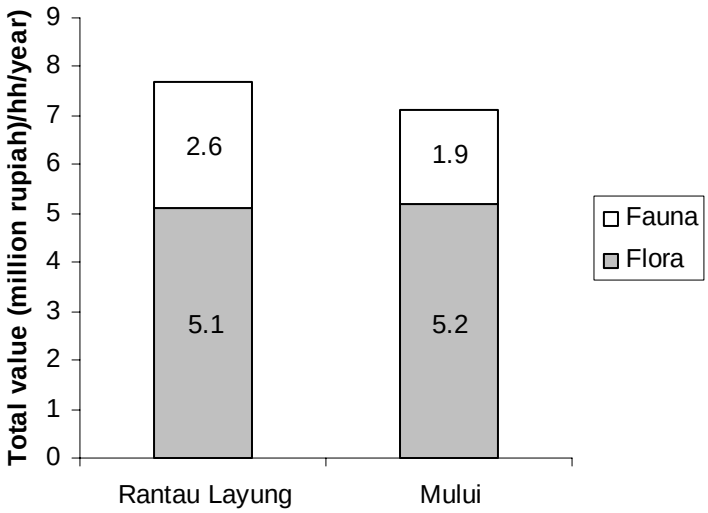

Figure 10. Total value of flora and fauna utilized by the communities in Rantau Layung and Mului per household per year

Figure 10 indicates that Rantau Layung people living around Gunung Lumut Protection Forest collect forest resource which value is as much as 7.7 million rupiahs per household per year. It is higher, although the difference is not significant, than those in Mului (7.1 million rupiahs) which people are living inside the protection forest. In both settlements, the value of flora used by the community is higher than the value of fauna. These amounts (almost 2 million rupiahs per capita in Rantau Layung and 1.2 million rupiahs per capita in Mului) are considered as economic contribution of forest resources (particularly Gunung Lumut resources for Mului people) to the local community. The contribution does not include intangible benefit yet such as clean water and fresh air useful for the community for their daily life. These benefits of Gunung Lumut Protection Forest should be taken into account by policy maker in managing the area. If the area is damaged and the forest becomes degraded, some important uses will be diminished and the community and/or the local government have to look for other sources to substitute the loss benefit. Categories of fauna used by community in Rantau Layung and Mului including number of useful fauna of each category are described in Table 11.

Table 11. Categories of natural resource used by community in Rantau Layung and Mului including number of useful flora and fauna of each category

Rantau Layung			Mului		
Category of uses	Number of flora	Number of fauna	Category of uses	Number of flora	Number of fauna
Food	44	14	Food	133	59
Medicine	26	5	Medicine	37	14
Light construction	16	-	Light construction	23	-
Heavy construction	22	-	Heavy construction	14	-
Boat construction	9	-	Transportation construction	5	-
Firewood	4	-	Firewood	26	-
Basketry	7	-	Basketry	15	-
Ornament/Ritual	5	7	Ornament	37	21
Hunting place	8	-	Hunting place	14	-
Hunting material	4	-	Hunting tools and material	23	-
Tools	12	3	Tools	18	2
Source of revenue	27	14	Source of revenue	29	25
Future	n.a.	n.a.	Future	10	n.a.

Note: n.a. = not available

3. Importance of the source of products

a. Rantau Layung

Scoring exercise using Pebble Distribution Methods (PDM) among sources of products aims to compare the importance of the wild, cultivated/farmed and bought products. Figure 11 shows that in general, local communities in Rantau Layung rank plants more important than animals. People also consider products from wild resource are more important than those from cultivated/farmed and bought resource. Wild plants (score 32) are important as source of food (vegetables, fruits) and provide valuable products as source of income and other daily needs (basketry, construction, etc.).

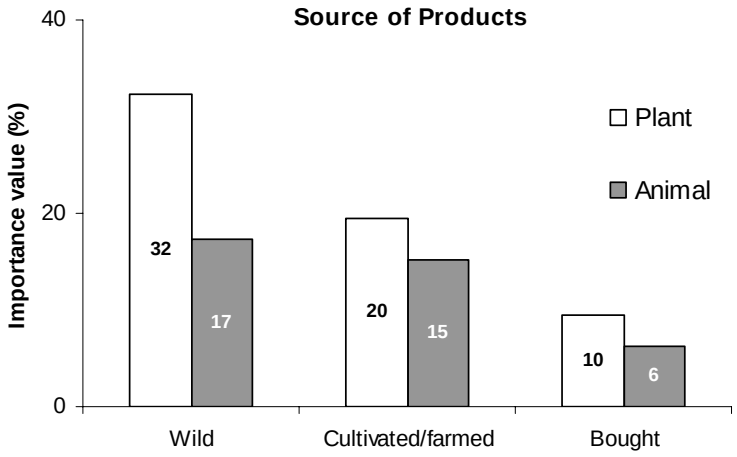

Figure 11. Scoring exercise for important product resources by all groups in Rantau Layung village

The second most important category is cultivated/farmed products especially rice as the main source of food and rattan as the major source of income. Bought resources are less important as people can still easily find what they need from the wild and from those they planted and farmed.

b. Mului

Domesticated and wild plants from the forest are perceived as the most important source for Mului people (Figure 12). Domesticated plant, taken from both wild and bought sources, is important because it provides villagers food. Wild plant from the forest is also important because there are more species of plants available than the cultivated source. Wild animal either from the forest or other land types is the most important because they are the most available and free source.

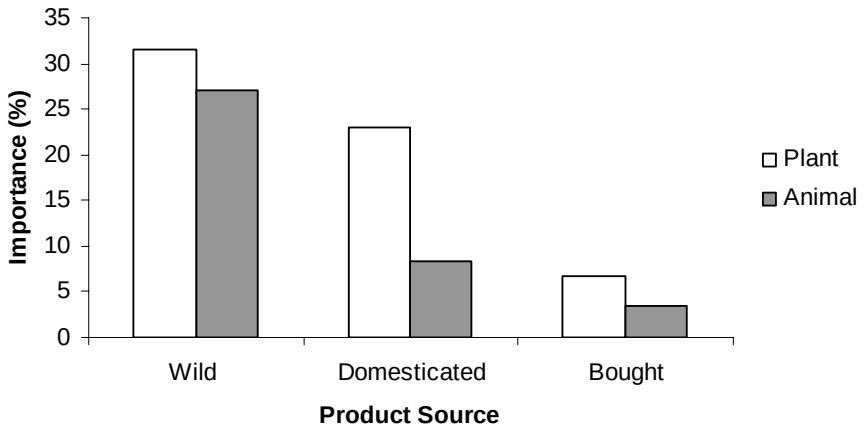

Figure 12. Average importance of product sources for plant and animal by all groups in Mului

D. Household income and expenditure pattern

Household income should be approached through earn generated from both major and minor livelihood. However, this method usually results lower figure since the respondents often give lower estimation for their income. Therefore, in this case, household income is approached through household expenditures. The expenditures are classified into three groups, i.e. food, non-food and production means. If the expenditures are added by saving, we will have an estimated income for each household. Average household expenditures and saving of community at Rantau Layung and Mului is described in Table 12.

Table 12. Average household expenditures, saving and an estimated income per year

Community at	Expenditures (Rp./year)			Saving (Rp/year)	Estimated Income (Rp./year)
	Food	Non-food	Production means		
Rantau Layung (n=14)	6,040,854	5,248,185	289,538	273,846	11,852,423
Mului (n=11)	3,715,164	2,487,295	34,091	472,727	6,709,277

In general, household expenditures in Rantau Layung village are significantly higher than those in Mului sub village. However, households in Mului save their money much higher than households in Rantau Layung. This indicates that households in Rantau Layung more consumptive than in Mului. For both communities, food is the highest expenditure and production means is the lowest expenditure. Even in Mului, expenditure for production means is less than for saving. It explains that the shifting cultivation system carried out in those two areas uses very low input. They never buy, for example, good quality seeds or seedlings, fertilizer and/or pesticide except a small volume of herbicide. Natural fertility of forest land is the dominant input for their agricultural crops.

Comparison between expenditures for food and non-food by those two communities is quite similar. People spend their money to buy non-food necessities a bit fewer than a number of money for food. So, they have considered and allocated a proportional amount of money to buy clothes, medicines, tolls, etc.

In addition, those two communities generate their cash income mostly from selling forest product mainly non timber forest products. In Rantau Layung, community's cash income is much higher than the value of total forest product gathered, while in

Mului it is slightly fewer (see Figure 13). Although the total value of forest product gathered by those communities comprises of direct (the material used directly) and indirect used (the material sold for cash income), this figure shows that community in Rantau Layung have other important source of income such as rattan, rubber and timber.

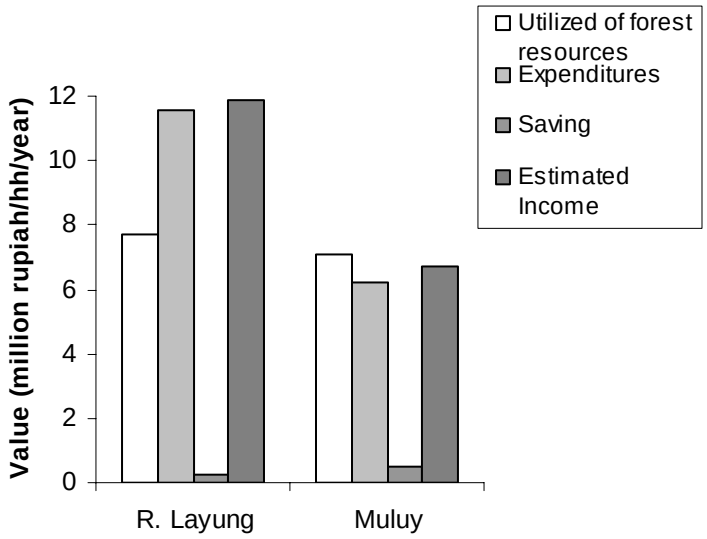

Figure 13. Comparison between value of forest product utilized and cash income of communities in Rantau Layung and Mului

Table 12 shows that estimated community income in Rantau Layung and Mului are 11.85 and 6.71 million rupiahs per household per year, respectively. Each household in Rantau Layung and Mului consists of approximately four and six people so that we can assume the average income per capita of Rantau Layung people is 2.96 million rupiahs and 1.12 million rupiahs for Mului people. The income per capita is lower than GDRP (Gross Domestic Regional Product) per capita of Pasir District 2004 based on a constant price as much as Rp. 4.5 million. It is much lower than GDRP per capita of Pasir District based on a valid price, i.e. Rp. 13.1 million (Pasir Regency in Figures, 2004).

An alternative way to improve these low community incomes both in Rantau Layung and Mului is by creating an added value of non timber forest products (NTFP) such as fruits, rattan and honey. Added value of those NTFP will be gained through application of post harvesting technologies. The raw materials should be processed into a half or a ready made good. Rattan can be made and sold as mats while honey should be sold in a desired packed. Durian and *lei*, for example should be processed become *lempo* and sold it in a nice packet. To realize this matter, the local

communities need a specific training to improve their skill. Sardjono, et al (2005) also suggest to improve the NTFP gathering method and to develop the post harvesting technology.

Although many villagers interested, oil palm plantation development in these areas are not suitable since the areas are mountain and hilly sloping and reserved for forestry commodities.

E. Landscape

There are several types of landscape in Rantau Layung and Mului where communities do their daily activities and collect products as sources of revenue. Identified landscape in Rantau Layung and Mului including their characteristics, management and utilization as well as existing constraints are described in Table 13 and Table 14.

Seven types of landscape are identified by Rantau Layung community. Cultivation is carried out in rice fields *(ladang)* and garden *(kebon)* by planting seeds or seedlings with limited input and technology. Fruit garden *(sipung bua)* is traditionally planted by throwing fruit seeds surrounding the field when the *ladang* is still cultivated. Fallow (lati) is abandoned rice field, invaded by abundant pioneer plants that can be used as fire wood. In Rantau Layung, forest (*Alas*) is classified into four sub types of landscape, i.e. *Alas Tuo, Alas Adat, Alas Nareng and Alas Mori. Alas tuo* is a forest which usage is not organized by customary law yet, located far from the settlement with a steep topography. *Alas Adat* (customary forest) is a forest area which usage has been organized according to customary law, located far from the village with a steep topography. It can not be exploited and converted to rice fields (*ladang*). *Alas nareng* is a forest reserved for *ladang* area, located close to the village with gently slope. Meanwhile, *Alas mori* is a forest that is believed to be a dangerous place or haunted area, so that the area can not be utilized.

Table 13. Identified landscape in Rantau Layung, characteristics, management and utilization as well as constrains

No	Landscape type	Landscape characteristics		Management and utilization	Constraints
		topography	Main vegetation		
1	Umo/ladang (rice field)	flat, gently slope, steep	paddy, maize, rubber, oil palm	shifting cultivation, no tillage, no technology, used of herbicide, self seedlings	pig attack, monkey
2	Strat (Kampong/Village)	flat, undulating	fruit trees, coconut	settlement, village maintaining by means of *gotong royong*, managed by Village's Head and Adat's Head, structured organization	very limited transportation facilities to outside of settlement
3	Kebon (Garden)	flat to steep, undulating	rubber, rattan, coffee, coconut	no tillage, directly planted from the seed and/or natural seedlings, and for few cases nursery seedlings, herbicide application	drop of coffee price, marketing products from garden is difficult (very limited transport facilities), pig attack and rats, no skill in sap tapping
4	Lati (fallow)	flat to gently slope	Trees of *Peronema, Vitex, Arthocarpus*, and bamboo	abandoned, shifting cultivation area (fallow), will be back after 10 years	none
5	Alas (forest)	slope to steep and undulating	Mixed of dipterocarps trees	the forest product can be gathered through permission and deliberation to customary leader, subsistence-way, selective cutting, and contribute to the village	the government prohibit to cut the trees; the regulation is not properly applied
6	Sunge (River)	gently slope to steep	Ferns, trees of *Ficus, Litsea*, and *Kleinhovia*	used for bathing, washing, toilet and drinking water, place to gather fish and transportation facility, keep the function as it is	the water become turbid after rain
7	Sipung bua (fruit garden)	flat to steep	fruit trees and rattan	former village or cultivation, private owner, traditionally planting, the fruits are free for the village community	none

Trees in customary forest can only be cut for subsistence or self-usage. When people cut the tree for income sources (sell the wood), the logger have to contribute to the community through customary leader by paying a kind of tax: Rp. 25,000,- per cubic meter for meranti (*Shorea* spp.) and kapur (*Dryobalanops* spp.); Rp. 50,000,- for iron wood (*Eusideroxylon zwageri*) and Rp. 15,000,- for other species. Nowadays, this customary regulation was not valid anymore since the timber production activity was stopped.

Table 14. Identified landscape in Mului, characteristics, management, utilization and constraints

Landscape	Characteristics	Management	Constraints
Kampong (Village)	Vegetation: banana, *rambutan*, coconut, *durian*, jack fruit; Topography: Gentle.	Weeding for home garden	-
Umo (Rice field)	Vegetation: paddy, banana, cassava, sugarcane, corn, vegetables, *durian*, *lai*, *tudak*; Topography: steep	Weeding	Scarcity of plain area and many disturbances from pest (pigs, monkeys, rats)
Lati burok (Young Fallow)	Vegetation: Trees, Shrubs; Topography: steep	-	-
Lati tuo (Old Fallow)	Vegetation: Trees, Shrubs; Topography: steep	-	-
Kebon (Garden)	Vegetation: Rattan, Coffee, *rambutan*, *durian*, other fruit trees; Topography: Flat – steep	Weeding	-
Suong Bosa (Gold mine and river)	Vegetation: Trees Topography: steep	-	-
Alas Burok (young forest)	Vegetation: *Shorea*, *Peronema* Topography: steep	-	-
Alas Tuo (Old Forest)	Vegetation: *Shorea*, *iron wood* ; Topography: steep	Checking for the forests condition and violation	-

Mului area is surrounded by hills and mountain slopes. People use their land for agriculture, horticulture and small scale mining activities. There is almost no flat area available for these activities, therefore rice fields, rattan and coffee gardens are all developed on the slopes (Figure 14).

Figure 14. Mului people are working together in a rice field on slope (Photo by Imam Basuki)

There are eight land types around Mului settlement recognized by people from where they collect many resources for their daily livelihoods (Table 14). These resources are important for fourteen categories of uses. Mului people spend time mostly in their agricultural field but most resources are taken from forests. They believe that surrounding forests are theirs and highly important to support their livelihoods.

People divide forest (Alas) landscape into old and young. Old forest means an area dominated by big trees which condition is still relatively intact while young forest means an area re-grown by some naturally regenerated trees. Suong Bosa is sites along river where people used to gather gold and fish. Village is defined as the settlement where people live, including home gardens surrounding their houses. Rice field is a land type where people cultivate paddy mixed with corn, cassava, vegetables and fruits. Fallow is abandoned rice field and usually full of small trees and bushes.

All landscapes in Mului are mainly characterized with a steep topography, only a few parts of the settlement including home garden and coffee garden are flat or gentle slope. People believe that total area of all landscapes they developed will increase as the effect of population growth. Both old and young forest will also increase naturally with time. It means that young forest will grow and become the old forest and there will be more logged over land will become young forest.

1. Landscape dynamic

Landscape dynamic is important to predict the tendency of the landscapes in the future. Change of landscape in Rantau Layung in term of area and distance is described in three time periods: at present, 10 years ago and 10 years later. In Mului, landscapes have been changing by the effect of several activities such as shifting cultivation and gold mining. The change of landscape in term of area and distance are compared among three periods of time; at present, six years ago and 10 years later. We assume that significant changes have occurred in Mului landscapes since six years ago (1999), when Mului people moved from Gn. Janas area to current settlement. Changes are also predicted to occur in the next 10 years.

Dynamic of identified landscape and land tenure in Rantau Layung and Mului are summarized in Table 15 and 16.

Table 15. Landscape dynamic and land tenure in Rantau Layung

Landscape	Changed of size (ha)			Land tenure			Distance from the village		
	10 years ago	At present	10 years later	State	Customary/collective	Private	10 years ago	At present	10 years later
Strat/village	smaller	10-20	Bigger			50 hh	0	0	0
Umo/ rice field	smaller	30-45	Bigger			35-49 hh	nearer	0.5-4km	same
Kebon/ Garden	smaller	49-150	Bigger			42-50 hh	nearer	0.5-10 km	same
Sunge/River	same	Do not know	same		V		same	10-50 m	same
Alas/ forest	bigger	600-1630	Smaller		V		nearer	1-4 km	Same with or farther
Lati/ fallow	smaller	90-350	Bigger		V		nearer	0.5-3km	Farther
Sipung Bua/fruit garden	smaller	90-100	Bigger			50 hh	nearer	0.5-10km	Same with or farther

Total area covered by village, rice fields, garden, fallow, fruits garden increases together with population density growth of Rantau Layung village. In contrast, *alas* (forest) area tends to decrease due to conversion into rice fields and gardens so that the distance from the village to the forest becomes farther. This will affect the capacity of villager to collect forest products and therefore, volume and/or the number of forest resources gathered will decrease too.

Table 16. Dynamic of landscapes around Mului settlement by area and distance

Land uses	---------Area (ha)----------			-------Distance from settlement------		
	6 years ago	At present	10 years later	6 years ago	At present	10 years later
Settlement	Less	± 20 ha	fixed	2 km	0	fixed
Garden	5 - 18 ha	50 - 54 ha	50 ha - increase	2 - 4 km	1 - 1.5 km	0.5 - 1.5 km
Rice field	16 - 18 ha	16 - 21 ha	increase	1.5 - 12 km	1 - 2 km	3 - 4 km
Young fallow	18 - 30 ha	16 - 84 ha	increase	1 - 1.5 km	1 - 2 km	3 km
Old Fallow	0 - 16 ha	16 - 18 ha	increase	0 - 12 km	1 - 10 km	1 - 3 km
Young forest	less	fixed - 8000 ha	fixed - increase	100 m - 1 km	100 m - 1.5 km	fixed - further
Old forest	less	> 8000 ha	increase	0 - 12 km	100 m - 12 km	300 m - 12 km
Suong bosa	same	84 - 168 ha	fixed - increase	500 m - 3 km	500 m - 3 km	500 m - 3 km

Table 16 shows that land tenure at village, rice fields, garden, fallow, fruits garden is claimed as private own of the community. All households own home-lands and fruit garden areas while rice field and garden are possessed by most households. River, forest and fallow are possessed by customary or collective property. The villager can gather the resource after asking permission and deliberation to the customary leader.

People believe that forests areas 6 years ago are smaller than in the present. They explain that logging activities that took place several years ago have reduced the forest. After some time, the logged over area will grow again to form a new forest.

2. Landscape importance by use categories

There are differences in term of importance among several landscapes. People perspectives on the importance of each landscape are recorded through Pebble Distribution Method (PDM). These perspectives point on overall benefit and individual use of each landscape for the people.

PDM exercises with all community groups (old men, old women, young men and young women) in Rantau Layung and Mului result an average of the importance of landscape types for all use categories. Then, all landscape types are ranked to describe which is more important than the others (Figure 15 and 17).

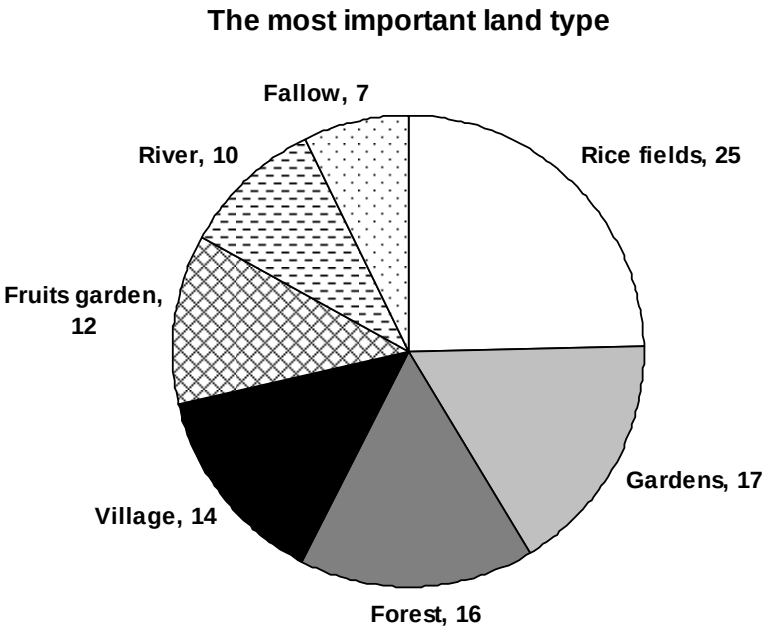

Figure 15. Average of importance of landscape types for all groups in Rantau Layung

In addition, the means of scoring exercises of land and forest types in Rantau Layung village is described in Table 17. Except old women group that values 'forest *(alas)*' as the most important, all groups rank 'rice fields (*ladang*)' with the highest score (25%) particularly because of its role as the main source of food. Garden is considered as the second most important (17%) landscape as most of villagers plant rattan in their garden and it becomes a valuable source of income.

Table 17. PDM exercise summary; means per land and forest type, by use classes for all groups in Rantau Layung

Landscape	Food	Medicine	Light construction	Heavy construction	Boat construction	Tools	Firewood	Basketry/cordage	Ornament/ritual	Source of income	Hunting tools	Hunting places	Future
Village	6	9	2	2	3	0	1	0	17	1	1	0	3
River	15	7	4	7	10	1	2	1	0	12	1	8	2
Rice fields	**29**	23	3	2	1	3	15	0	1	14	0	0	10
Forest	19	**35**	**30**	**55**	**61**	**50**	16	25	**27**	20	**43**	**54**	**32**
Fallow	3	11	41	20	13	25	**41**	**38**	23	1	41	17	8
Fruits garden	15	8	5	4	3	3	17	3	10	23	8	20	17
Garden	15	9	15	11	11	19	8	34	24	**30**	7	2	29
Total	100	100	100	100	100	100	100	100	100	100	100	100	100
Forest type													
Sacred forest	8	7	3	1	1	1	0	0	1	0	1	1	5
Customary forest	25	26	23	22	20	22	25	28	35	22	20	22	38
Old forest	32	42	38	56	54	42	36	33	39	46	50	49	29
Reserved forest	35	26	37	22	25	36	39	39	25	32	29	29	29
Total	100	100	100	100	100	100	100	100	100	100	100	100	100

Forest provides main resources for some uses i.e. medicine, house/building as well as boat materials, tools, ornament/ritual, hunting tools and hunting place. It is even considered as the most important land types in the future. Among all forest types, old forest is considered as the most important for all groups (Figure 16).

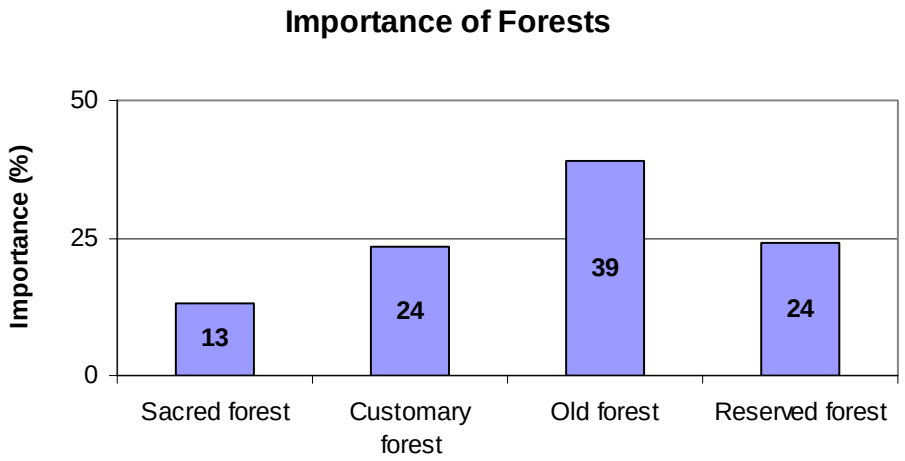

Figure 16. Average of importance of forest types for all groups in Rantau Layung

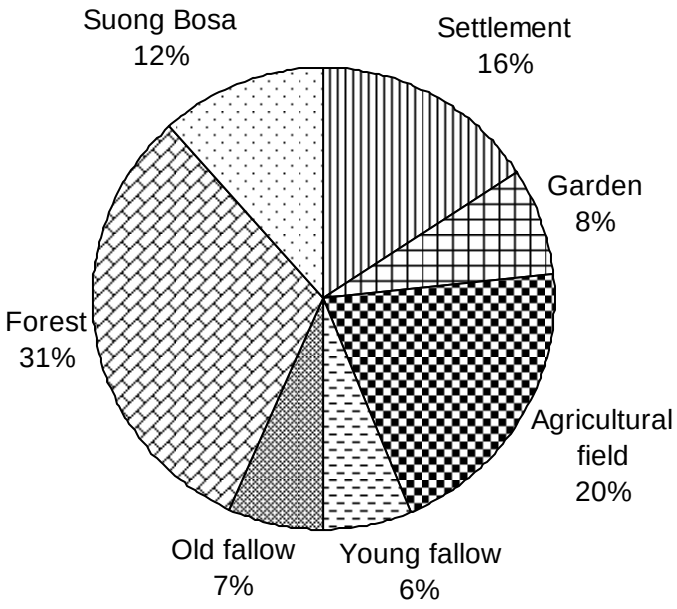

Figure 17. Forest importance among other landscapes by Mului people

Forest is the most important landscape in Mului compared to the other types (Figure 17) as it provides all use categories for people. Moreover, people have open access since logging company which used to strictly limit them to collect forest products stopped its activities. Rice field is the second most important landscape for food, future, customary, firewood and source of income.

Table 18 shows that settlement is important landscape in Mului since it provides a place for people to rest and socialize with others. Garden is also more important in the future because it gives cash income to the people when they harvest rattan and coffee from it. Young fallow is the least important landscape since it brings fewer benefits than the others.

Table 18. Average value of local perspectives on landscapes importance by category of use (four groups by age and gender) in Mului

Landscape	Category of use													
	Food	Medicine	Light construction	Heavy construction	Bike construction	Tools	Firewood	Basketry	Ornament	Income source	Hunting material	Hunting place	Customary	Future
Settlement	9.00	6.25	0.50	0.00	0.00	0.00	2.50	0.00	1.00	2.75	2.50	0.00	8.00	7.50
Garden	11.50	8.75	2.00	0.00	0.00	2.25	4.50	0.00	1.50	10.00	0.00	5.00	12.50	11.50
Rice field	23.25	9.50	2.50	4.75	3.75	6.25	36.25	0.00	2.50	13.25	0.00	0.00	14.25	16.25
Young fallow	6.25	11.00	5.00	5.25	0.00	2.75	6.00	8.00	3.75	5.25	5.00	6.25	8.75	8.00
Old fallow	10.00	13.25	23.75	10.00	13.75	13.75	12.75	26.25	20.00	9.75	21.25	12.50	10.50	9.25
Forest	**31.75**	**45.50**	**59.25**	**80.00**	**82.5**	**75.00**	**38.00**	**65.75**	**67.50**	**43.00**	**70.00**	**65.00**	**37.00**	**32.50**
Suong Bosa	8.25	5.75	7.00	0.00	0.00	0.00	0.00	0.00	3.75	16.00	1.25	11.25	9.00	15.00

As explained previously, forests are divided by the villagers into two categories, e.g. old and young forest. Old forest is perceived by both men and women groups as more important (70% and 67.5%; Figure 18) than young forest. This forest provides people with secure source of food and income either today or in the future.

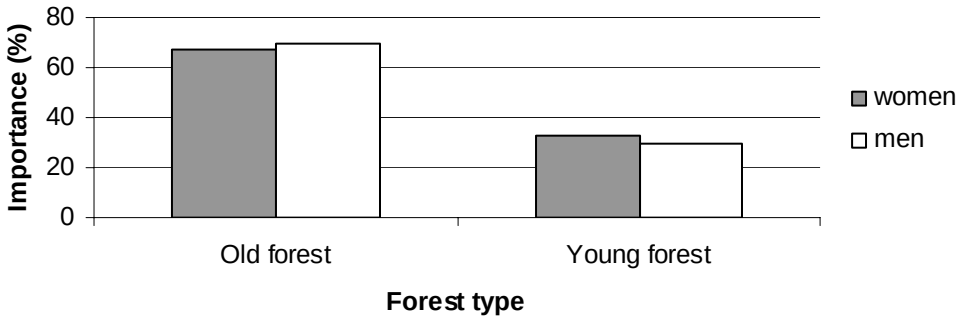

Figure 18. Men and women group perceptions on forest type in Mului

Young forest is less important (30% and 32.5%) because less products come from this forest at present, but it is considered to be more important in the future. Some uses people gathered more from this forest than the old one are light construction, bike construction and tools (Table 19).

Table 19. Forest types importance by category of uses (Four groups by age and gender) in Mului

Forest type	Category of use													
	Food	Medicines	Light construction	Heavy construction	Bike construction	Tools	Firewood	Basketry	Ornament	Marketable items	Hunting function	Hunting place	Recreation	The future
Old forest	64.50	55.00	47.75	55.25	46.50	45.00	37.50	54.75	58.75	57.50	56.25	51.25	52.50	47.50
Young forest	35.50	45.00	52.25	44.75	53.50	55.00	62.50	45.25	41.25	42.50	43.75	48.75	47.50	52.50

3. Landscape importance by distance

a. Rantau Layung

Using scoring exercises, we assess how important each landscape is compared to the others according to the distance from Rantau Layung village. Figure 19 shows that either near (half an hour walk) or far (more than 2 hours walk) from the village, rice fields is considered as the most important land type as it provides the main source of food to the whole community.

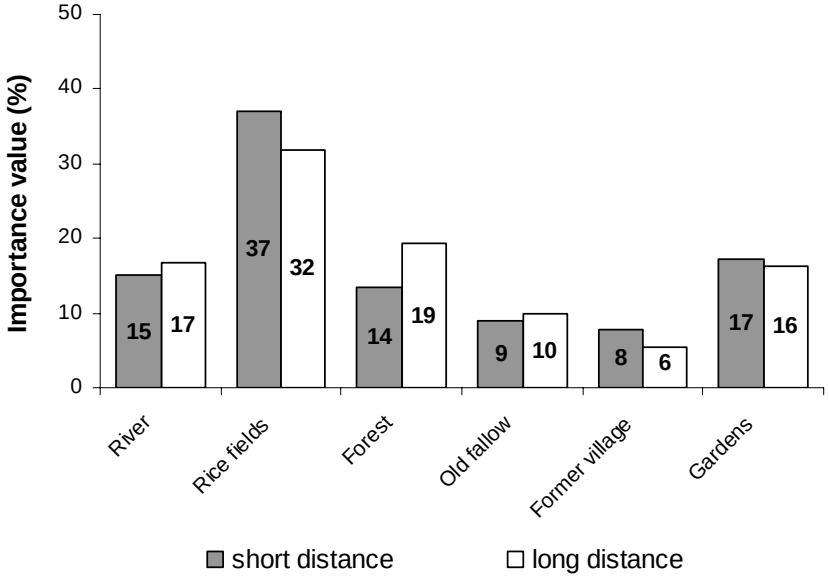

Figure 19. Average importance of landscapes by distance categories for all groups in Rantau Layung

Garden is the second most important if it is located nearby the village so that people can cultivate fruits and rattan to be sold. If it is far from the village, then people suggest forest as the second most important which plays a significant role in

providing many kinds of products such as materials for houses and building as well as boat construction.

b. Mului

In condition that all landscapes have the similar number of total area, rice field is considered as the most important land type for most people in Mului (Figure 20). This perspective remains the same for both short and long distance. People describe that there are more food from rice field than from the forest when they have the same size of area. Rice field also provides other daily needs for food e.g. cassava, vegetables, etc.

However, it is interesting to know that the young men perceive forest as the most important landscape even though it has the same total area as others. They argue that either in short or long distance the forest will provide them more food and income such as fruits, meat and honey. It seems that their strength and ability to walk and work in the forest which more than other groups convince them with this view.

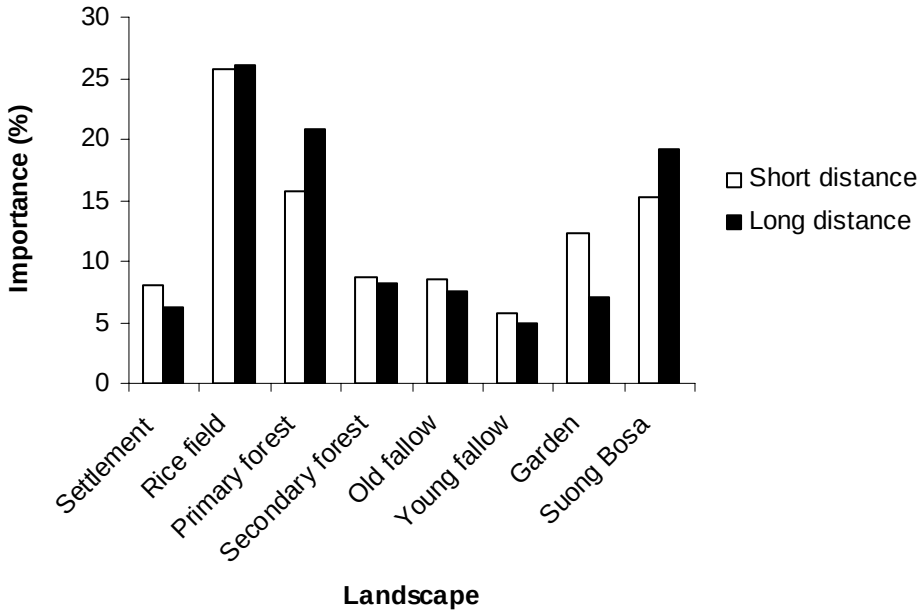

Figure 20. Average importance of local landscapes by two distance categories (Four groups by age and gender) in Mului

F. Forest

1. Forest importance: past-present-future

a. Rantau Layung

Scoring exercise helps to compare the importance of forest 10 years ago, at present, and in the next 10 years. For all categories of uses, local people consider forest in the future as the most important for them as it is the period when useful plants and animals will be more difficult to find (Figure 21). According to the people, the less number of resources available in the forest, the more difficult they can be found and the more important they are for local daily needs.

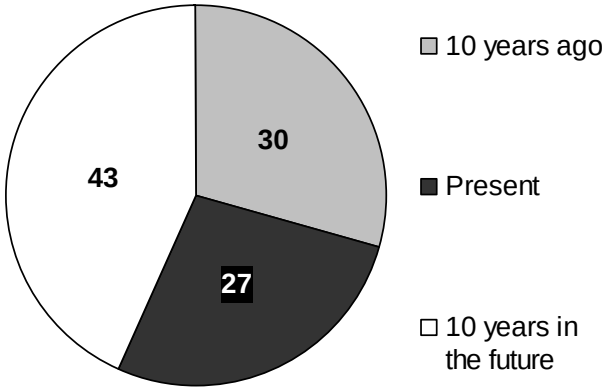

Figure 21. Average of importance of forest for all groups in Rantau Layung

Indeed, forest is considered to be more important in 10 years to provide the main needs as identified by local people such as food, medicine, heavy construction, ornament/ritual and source of income. However, local people think forest was more important in the past as source of materials for boat, tools, basketry, hunting tools and hunting places (Table 20).

People argue that in the future when road construction is well developed, they will less depend on boat for river transport. In addition, more tools and other household equipments are made from plastic materials, and more people prefer using them. People believe that animal resource is decreasing so that hunting will be more difficult to be done in the future and people tend to depend more on domesticated animals.

Table 20. Local perspective in Rantau Layung on forest importance by use category in the past, present and future

Category of uses	10 years ago	At present	10 years in the future
All uses	30	27	43
Food	26	32	**42**
Medicine	28	35	**37**
Light construction	27	**37**	36
Heavy construction	35	29	**36**
Boat construction	**37**	30	33
Tools	**41**	31	28
Firewood	32	**34**	**34**
Basketry/cordage	**40**	27	33
Ornament/ritual	26	36	**38**
Source of income	33	31	**36**
Hunting tools	**44**	33	23
Hunting places	**41**	34	25
Future	28	32	**40**

b. Mului

In Mului, we use period of 6 years to mark the past condition when people moved from Gn. Janas to current settlement in Tana Rian so that they will easily remember how important the forest.

Forest is the most important landscape in Mului (see previous chapter on land type importance) and it will be more important in the future (49% vs. 33%; Figure 22). People describe that in the future there will be more benefit from the forest. People believe that if no logging company disturbs their forest, it will grow larger in the future and they will have more access to use it. Forest developed from their old fallow planted with fruit trees will also gives them more food and income.

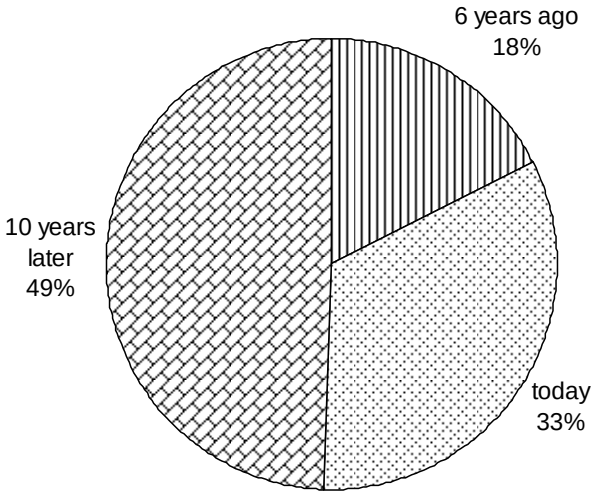

Figure 22. Forest importance on the past, present and future by Mului people

Table 21 shows that forest will provide the people with more food, medicine, construction material, tools, ornament and income in the future. In the past villagers had limited access to forest products because of restriction from logging company. At present, with no company in their territory they have more access to forest and to manage forest products.

Table 21. Local perspective in Mului on forest importance by use category on the past, present and future (Four groups by age and gender)

Category of use	6 years ago	At present	10 years later
Food	17.50	36.25	46.25
Medicine	17.50	31.25	51.25
Light construction	19.50	34.50	46.00
Heavy construction	30.00	33.75	36.25
Bike construction	43.75	30.00	26.25
Tools	32.50	28.75	38.75
Firewood	33.25	33.75	33.00
Basketry	36.25	33.75	30.00
Ornament	27.50	30.00	42.50
Income source	28.75	31.25	40.00
Hunting materials	33.25	30.75	36.00
Customary	34.50	30.75	34.75
Hunting place	33.75	27.50	38.75

2. The most important plants and animals

a. Rantau Layung

Working with 4 groups of local people (old men, old women, young men and young women) in Rantau Layung, we use PDM exercise to score 13 use categories of forest recognized by people and find out the most important one among the others. The result is presented in Figure 23.

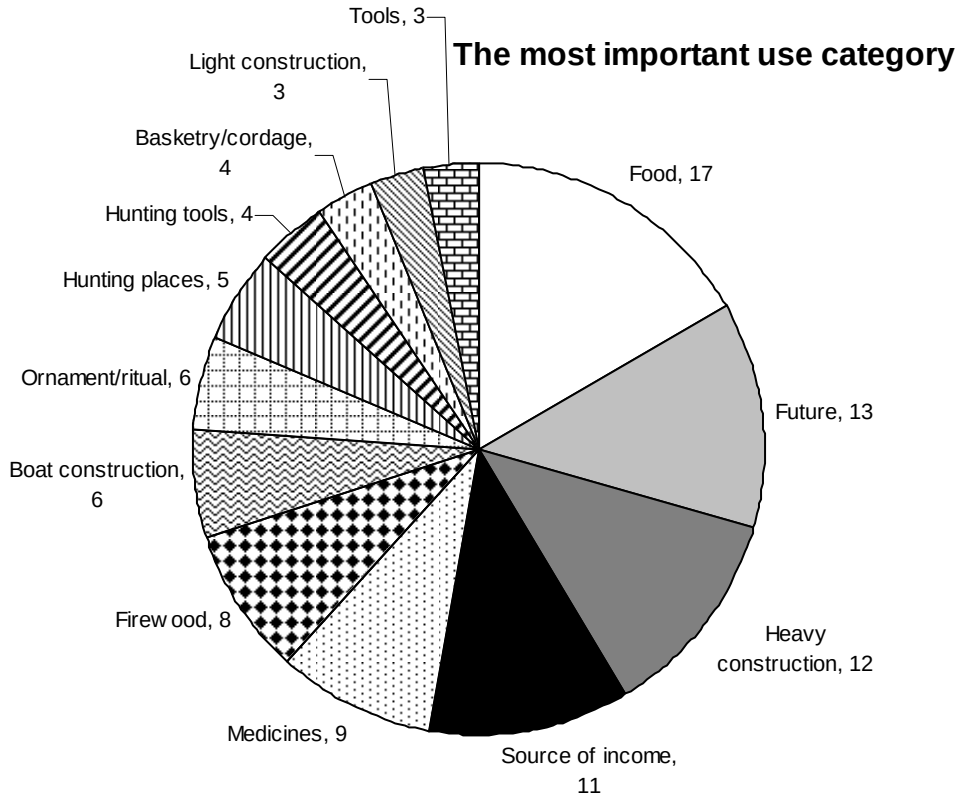

Figure 23. Average of importance of forest per use category in Rantau Layung

The figure shows that local community in Rantau Layung consider 'food' (17%) as the most important use they gain from forest since it is a basic need for people to live. The second most important use is 'future' (13%) as people think forest provides many plants and animals can be used for the next generation. People suggest 'heavy construction' (12%) as the third most important use since there are a lot of wood they can take from forest for houses and other buildings. 'Tools' and 'light construction' (both are 3%) are the least important as people usually get resources for those uses from other land types.

For each use, people prepare a list of 10 most important both plants and, if there are any, animals. We then ask them to rank the importance of one certain species compared to the others for all use categories which results are described in Table 22 and 23.

Table 22. Most important species of plant for all use categories in Rantau Layung

Local Name (Plant)	Scientific Name	Category of use												
		Food	Medicine	Light construction	Heavy construction	Boat construction	Tools	Firewood	Basketry	Ornament/ritual	Income source	Hunting tools	Hunting place	Future
Sungkai	*Peronema canescens*			■	■		■	■						■
Ulin/telion	*Eusideroxylon zwageri*				■		■				■	■		■
Rotan	*Calamus sp.*			■			■		■	■	■			■
Meranti/putang	*Shorea spp.*				■	■					■	■		■
Durian	*Durio zibethinus*	■									■			■
Kapur/sintuk	*Dryobalanops sp.*				■	■	■				■			■
Perari	*Neolitsea sp.*			■		■	■				■	■		■
Nyarau	*Elmerrillia tsiampacca*				■	■					■	■		■
Bambu	*Fam. Poaceae*			■			■		■					
Sambu/mahlaban	*Vitex vestita*			■			■							

Local people in Rantau Layung rank Sungkai (*Peronema canescens Jack*) and telion (*Eusideroxylon zwageri*) as the two most important plant (Table 22) and used as resources for construction, tools, and living in the future. Among those ten species, sambu (*Vitex vestita*) is the least important plant which only used for light construction and tools.

Table 23. Most important species of animal for all use categories in Rantau Layung

Local Name (Animal)	Scientific Name	Category of use												
		Food	Medicine	Light construction	Heavy construction	Boat construction	Tools	Firewood	Basketry	Ornament/ritual	Income source	Hunting tools	Hunting place	Future
Rusa/payau	*Cervus unicolor*	■	■				■			■	■			■
Kijang/telaus	*Muntiacus muntjak*	■					■			■	■			■
Lebah	*Fam. Apidae*	■									■			■
Ikan	*Ichthyofauna*	■												■
Pelanduk/kancil	*Tragulus sp.*	■									■			■
Trenggiling/ayom	*Manis javanica*	■	■								■			■
Merak/jue	*Argusianus argus*	■								■				■
Beruang	*Helarctos malayanus*		■								■			■
Landak/tetung	*Hystrix brachyura*	■	■				■			■				■
Ayam hutan/sakan	*Lophura ignita*	■								■				

Local people in Rantau Layung rank payau (*Cervus unicolor*) and *telaus* (*Muntiacus muntjak*) as the two most important animals (Table 23) and used as resources mainly for food, source of income, and living in the future. Among those ten species, sakan (*Lophura ignita*) is the least important animal which only used for food and ornament.

b. Mului

Forest is ranked as the most important landscape among others because of its services and products for the people in Mului. Here we show how the forest provides people with products and what the most important plant and animal from the forest.

Figure 24 shows that the forest is important to provide better future (15%), cash income (11%), food (10%), heavy construction (9%) and customary (9%) for the people.

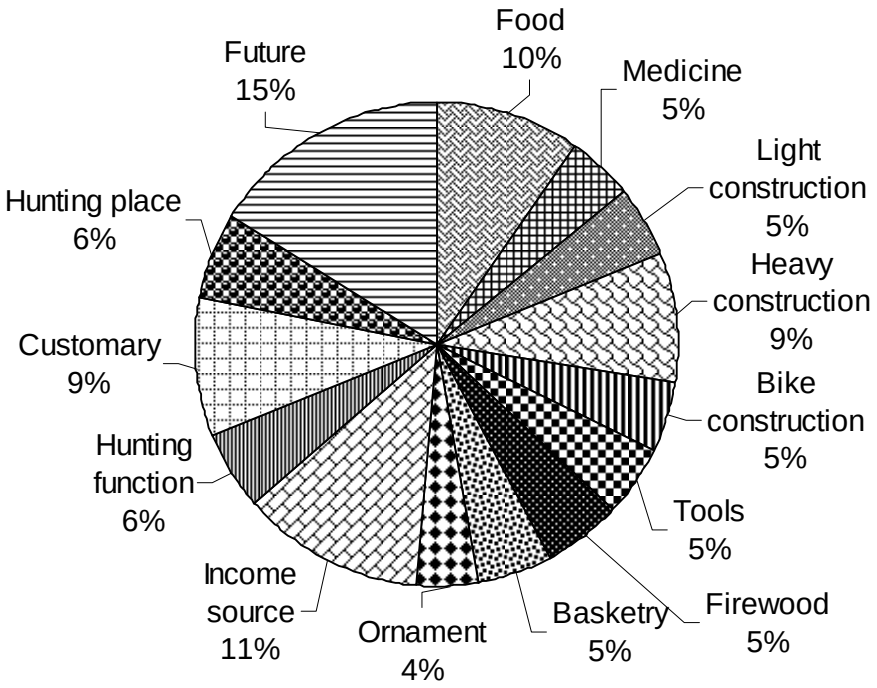

Figure 24. Forest importance by use categories (4 groups by age and gender) in Mului

People list and score the most important species of plant and animal which they gather from the forest. The list is made for each of all 14 use categories and then analyzed to find ten most important plants and animals used by the people. The summary result is shown in Table 24.

Table 24. Most important species of plant and animal (Four groups by age and gender) in Mului

	Plant		Animal	
	Local name	Scientific name	Local name	Scientific name
1	Sungkai	*Peronema canescens*	Payau	*Cervus unicolor*
2	Teliyen	*Eusideroxylon zwageri*	Telaus	*Muntiacus muntjak* and *M. atherodes*
3	Putang	*Dipterocarpaceae*	Juwe	*Argusianus argus*
4	We	*Korthalsia sp.*	Bilaomban	*Copsychus malabaricus*
5	Lomu	*Canarium littorale*	Pelanuk	*Tragulus javanicus*
6	Durian	*Durio zibethinus*	Sakan	*Lophura ignita*
7	Nyarau	*Elmerrillia tsiampacca*	Biwang	*Helarctos malayanus*
8	Puti	*Koompassia excelsa*	Lisio	*Rollulus rouloul*
9	Nunuk	*Ficus sp.*	Tetung	*Hystrix brachyura* and *H. crassispinis*
10	Perari	*Litsea sp.*	Pengulor	Aves

Sungkai (*Peronema canescens Jack*) and teliyen (*Eusideroxylon zwageri*) are perceived as the two most important plants in Mului (Table 25) and used by people

as resources for medicine, construction, tool, firewood etc. Among those ten species, perari (*Litsea sp.*) is the least important plant which only used for construction and tool.

Table 25. Most important plant for Mului people by use categories (Four groups by age and gender)

No.	Plant	Category of use														
		Food	Medicine	Light construction	Heavy construction	Bike construction	Tools	Firewood	Basketry	Ornament	Income source	Hunting material	Hunting place	Customary	Future
1	Sungkai		■	■	■	■	■	■		■		■			
2	Teliyen				■	■	■			■		■			■
3	Putang			■	■	■	■	■					■		■
4	We			■					■	■		■			■
5	Lomu						■				■		■		■
6	Durian	■									■		■		■
7	Nyarau				■	■	■								
8	Puti						■			■				■	■
9	Nunuk												■		■
10	Perari				■	■	■								

Payau (*Cervus unicolor*) and telaus (*Muntiacus muntjak* and *M. atherodes)* are perceived as the most important animals in Mului (Table 26). They are used by people for many uses mainly for food and cash income. Among those ten species, pengulor is the least important animal which only used for cash income..

Table 26. Most important animal for Mului people by use categories (4 groups by age and gender)

No.	Animal	Category of use													
		Food	Medicine	Light construction	Heavy construction	Bike construction	Tools	Firewood	Basketry	Ornament	Income source	Hunting material	Hunting place	Customary	Future
1	Payau	■	■				■			■	■	■			■
2	Telaus	■					■			■	■	■			■
3	Juwe	■								■	■				
4	Bilaomban										■				■
5	Sakan	■								■	■				■
6	Pelanuk	■									■				■
7	Biwang		■							■	■				
8	Lisio	■								■	■				■
9	Tetung	■	■				■			■				■	■
10	Pengulor										■				

G. Specific resources

Rantau Layung and Mului have many interesting features. We record several objects informed by local informants and believe that they can potentially be developed and managed for specific purposes such as for a source of drinking water, an electric generator and ecotourism which may attract outsiders (Table 27 and 28).

Table 27. Potential objects for ecotourism in Mului (Four groups by age and gender)

Special object	Accessibility from settlement	Current use	Strength of Object
Waterfall of Sempangen River	Two hours walk	Recreation, bath	Plain walking trail; high waterfall
Waterfall of Une River	5 km away or one hour walk	Recreation, bath	Beautiful waterfall with many pools for bathing
Mount Lumut	Six hours walk	Recreation, hiking	Beautiful scenery from the top
Bengenget stone of Mului River	Half an hour by motorbike	Hunting for animal and fruit, custom ceremony	Human like stone
Traditional dances and ceremonies	-	Whenever	Unique dances e.g. Selendang Mului; Most of villagers are able to dance
Caves with stalactite and bats	One hour walk	Hunting for animal and fruit	Caves with beautiful stalactite/stalagmite and thousands of bats
Legendary place of payo dale bale	Ten hours walk	-	Legendary place

Three objects i.e. waterfall, *bengenget* stone and cave are among the most potential sites for ecotourism attractions. They are located relatively near the settlement, save and easy to reach. They offer some interesting features to visitors such as scenery of waterfall, fresh water for bathing in natural pool, underground adventures/caving and experience to observe thousand of bats in their natural habitat.

People perceive that their traditional dances and custom ceremonies can attract many visitors. *Selendang Mului* is an example they thought has a potential for ecotourism. Most of the villagers are very familiar and able to practice this dance and its music (Figure 24).

Figure 24. Traditional dance called *Selendang Mului* is practiced in many occasions (photo by Imam Basuki)

Table 28. Special resources of the Rantau Layung Village

Object	Location	Distance from the village and accessibilities	Strength	Opportunities
Water fall	Sai River	1 km to the north, by water or pathway	Nice panorama, cold water	Potential for an ecotourism object
Water fall	Kepala Luayang, Semantayan	1 to 3 km through village path	beautiful site	Potential for an ecotourism object and a source of clean or drinking water
Water fall	Kuaro River	14 km	Near to the road	An electric generator
Riam	Near the village	1 km	The water resource is sustainable	A resource for drinking water
Riam	Lumbang, Ipu	8 km through forestpath	Beautiful panorama	Potential for a new tourism object
Cave and spring	Prayan and Nango Rivers	3 km through forest path	stalactite/ stalagmite, a water resource inside the cave	A resource for drinking water
Batu utok uwok	Sungai Prayan	4 km through forestpath	Beautiful stone, beautiful panorama	A tourism object

Four objects in Rantau Layung i.e water falls, *Riam (Lumbang)*, and *Batu utok uwok* are potential to be developed for ecotourism. The distances from the village are not far, however, path-ways still need to be established to reach them. Several objects that are potential to provide clean water and source of electricity for local community are waterfalls (Kuaro River and *Kepala Luayang*), *Riam* and cave or spring.

H. Threats and opportunities to GLPF

GLPF provides many benefits both for surrounding communities and outsiders, either tangible or intangible. To guarantee the sustainability of the benefits, the conservation area has to be maintained. In order to manage GLPF sustainable, actual and potential threats as well as opportunities to condition of the conservation area need to be identified.

a. Threats

Several big concessions (*HPH = Hak Pengusahaan Hutan*) around the GLPF could be considered as a potential threat to the sustainability of the protection area. Past experiences showed that many HPHs operated out of their concessions and the neighbor areas became their target. If the existing HPHs are not properly controlled, illegal logging by the HPHs will occur in the GLPF.

Small-scale logging, either by local community or by outsider is another threat to the protection area. Suppose, small-scale logging conducted by Rantau Layung community during period of 1995 to mid of 2005 with volume 8 to 12 cubic meter per team a month (there are about 20 teams), wood volume gathered in a year was 2,000 cubic meter (assumed the logging operated 10 months a year). If one tree produced 4 cubic meter of wood, there was 500 trees were cut a year or 5,000 trees had been cut in 10 years period with area about 12.5 ha. If 15 villages located around GLPF are carrying out the same activity, the negative impact to GLPF resources will be significant.

Shifting cultivation practices is a traditional agriculture system that would be sustainable as long as growth of population is low, since sufficient cycle length can be achieved. However, high population growth in villages around the GLPF area will causes to a shorter cycle length. This condition will also encourage the shifting cultivator to clear a new forest area in order to fulfill their need on cultivation land. They will probably utilize the GLPF area when no more forest outside GLPF is available for this traditional agriculture.

Boom of oil palm plantation in East Kalimantan reached the surrounding of GLPF area. Most of villagers in Rantau Layung and may be also communities in other villages around GLPF area want to develop oil palm trees. For Rantau Layung case, community has been proposed to develop this oil palm plantation to District Estate

Crop Services. So far they agreed, but District Forestry Services was not agreed, since the area is classified as forestry plantation area (*Kawasan Budidaya Kehutanan*) and near GLPF area. However, the community is still trying another effort to realize this commercial estate crop plantation. Once oil palm developed in surrounding the GLPF area, it can not be stopped; when the areas outside the GLPF area were full covered by the commercial trees, community will started to entry and plant oil palm in side the GLPF area.

Hunting activities is one of important income source for communities in the research sites. There has been no arrangement of hunting applied either within or surround GLPF. Since there are many endangered species living in GLPF and the surrounding forest, it is a must to start applying the regulation of hunting in the area.

Few people in research sites have knowledge on border of GLPF and most of them believe that the forest next to their settlement is their customary land. Lack of knowledge on GLPF status and the role of people living inside it may cause on conflict between stakeholders and thus will hurt the forests.

Logging road which has been very helpful for local people could also potentially harmful for the GLPF. Especially the road that crosscut the protection forest from Simpang to Swan Slutung village has open accessibility to GLPF, which could be easily use by any outsiders who want to extract any products from it. The use of this logging road should be well monitored in order to minimize it's threat.

All possible threats to sustainability of GLPF should be properly anticipated. In addition, all forestry related stakeholders in the area have to obey Regional Spatial Planning of Pasir District and Forest Land Use Agreement.

b. Opportunities

There are some customary rules people in both villages still follow which are closely related to conservation in the protection forest. In Rantau Layung, for example, people recognize in one forest category i.e. *Alas Mori* which is believed as sacred since ancient spirits still remain. Nobody may disturb this area. In Mului, people are prohibited to cut trees to be sold. It is only allowed for small construction (house repairing, etc.). These local wisdoms need to be maintained and can be integrated into the management plan of the protection area.

Natural resources in Rantau Layung and Mului are potentially high from which some alternatives of livelihoods can be developed to support local source of income. Apart from rattan, some people in Rantau Layung are trying to establish rubber plantation in their garden. Some others are collecting and selling honey in traditional ways. Local government and other institution related should take these into their account by trainings for local people to increase the added value of their products.

In addition, customary leader in Rantau Layung suggest that a potential spring near the mouth of Prayan River can be developed, if there are any helps, to provide clean and clear water for local people. In Mului, nature resources and local culture may be improved into ecotourism activities.

V. Conclusion and Recommendation

A. Conclusion

1. Mului settlement is located inside the Gunung Lumut Protection Forest (GLPF) and more accessible than Rantau Layung village outside the protection area. Education level of both communities is very low. Most people did not accomplish elementary school yet or even never went to school at all.
2. Mului people, who live inside GLPF area, have higher positive perception on forest and conservation as well as on legal status of GLPF compared to Rantau Layung people, who live outside the protection area.
3. Extension on utilization and conservation of natural resources in both research sites is rarely undertaken. Communities' involvement in forest management is low.
4. Economic contribution of GLPF resources, mainly non timber forest products, to the local livelihoods is significant. i.e. seven to eight million rupiahs per household per year. Plant resources contribute two to three times higher than animal resources.
5. Most non timber forest products gathered from forest are sold as raw materials. No post harvesting technology has been applied to gain an added value of the products.

6. Estimated income per capita of Rantau Layung and Mului people are 2.96 and 1.12 million rupiahs, respectively. It is much less than Gross Domestic Regional Product per capita of Pasir Regency.
7. More than 50% of expenditures of Rantau Layung and Mului people are allocated for food, while investment for production means is only 1.5% of the total expenditure. Shifting cultivation in those two settlements is managed with very low input and there is almost no technology applied.
8. Seven and eight landscape types are identified by Rantau Layung and Mului people, respectively in their settlements, from where they derive many resources that are categorized into 13 and 14 uses.
9. Communities living in and near GLPF consider forest as the most important landscape among others in the future. They also suggest that payau (*Cervus unicolor*) and telaus (*Muntiacus muntjak*) are the most important animals of forest for them while sungkai (*Peronema canescens*) and telien (*Eusideroxylon zwageri*) are the most important plants. People use that important wildlife mainly for food and source of income.
10. Several potential threats to sustainability of GLPF are identified: existing big concessions (HPHs) around the protection area, small-scale logging activities, boom of oil palm plantation, and shifting cultivation practices as well as hunting activities.
11. Natural resources in Rantau Layung and Mului such as plants and animals resources including culture and local wisdom can be potentially developed to support local livelihoods.

B. Recommendations

1. To improve accessibility to Rantau Layung village and increase knowledge for Rantau Layung and Mului people, it is necessary to develop infrastructure facilities covering road, education and health facilities. Community development on improving their income and skill to process NTFP should be undertaken in these settlements.
2. Extensions on utilization and conservation of natural resources as well as public awareness on GLPF, in both research sites need to be implemented.
3. To gain an added value of non timber forest product gathered by communities in Rantau Layung and Mului, it is necessary to introduce post harvesting technologies and packing systems.

4. Community-based forest management should proper be implemented. GLPF management should increase community involvement in their planning and activities
5. Socialization to local people on GLPF border and status should be increased to reduce conflicts.
6. To increase agriculture yields, farming system need to be improved: more input have to be invested and suitable technology should be implemented.
7. Several possible potential threats to sustainability of GLPF area should be minimized and control. GLPF stakeholders should follow and obey the regional spatial planning of Pasir District in accordance to forest classification of Forest Land Use Agreement (*Tata Guna Hutan Kesepakatan*).
8. Potensial resources that available in the areas need to be developed in order to improve local people welfare and at the same time may reduce the force on the resource of GLPF

References

Anonymous, 2002. 'Profil Desa Swan Selutung, Kecamatan Muara Komam, Kabupaten Pasir, Kalimantan Timur'. Departemen Dalam Negeri Republik Indonesia

Anonymous. 2005. 'Proposal of Gunung Lumut Biodiversity Assessment'. Loka Litbang Satwa Primata in cooperation with TBI Indonesia Programme. Balikpapan.

Batu Sopang Sub District in Figures. 2004. Pemerintah Kabupaten Pasir. Kecamatan Batu Sopang.

CIFOR, 2001. 'Context Study Report. Adaptive Collaborative Management Research in Lumut Mountain Forest (Rantau Layung and Rantau Buta) – Paser District East Kalimantan, Indonesia'. Historical Trends Report. CIFOR.

Daftar Isian Potensi Desa. 2005. Rantau Layung Village. Pemerintah Kabupaten Pasir.

Dirjen PHPA/WI-IP/ODA-UK/Depdikbud, 'Lembar Informasi untuk Masyarakat dan Pengunjung' in http://www.earthisland.org/borneo/danausentarum/tnds/masyarakat/masyarakat.html

Pasir Regency in Figures. 2004. Badan Pusat Statistik Kabupaten Pasir.

Saleh, Chairul, 2003. 'Panduan Identifikasi Jenis-jenis Satwa Dilindungi di Indonesia'. WWF-PHKA. Jakarta.

Saragih, B. 2004. 'Nilai Ekonomi Kawasan Hutan Lindung Gunung Lumut bagi masyarakat dan pemerintah Kabupaten Pasir'. A paper presented in Tropenbos Workshop in Balikpapan.

Sardjono, M.A., S. Soedirman, I. Kuncoro, Rujehan and Kamaruddin. 2005. 'Para Pihak Kehutanan di Kalimantan. Analisis Permasalahan dan Kebutuhan'. Kerjasama Tropenbos Indonesia dengan Kelompok Kajian Kebijakan Pembangunan Kehutanan.

Sheil, D. et. al. 2003. 'Exploring Biological Diversity, Environment and local people's perspectives in forest landscapes. Methods for a Multidisciplinary Landscape Assessment'. CIFOR. Bogor.

UPTD Planologi Kehutanan Balikpapan. 2004. 'Laporan Risalah Sebagian Hutan Lindung Gunung Lumut'. Dinas Kehutanan Propinsi Kalimantan Timur. Balikpapan