3.2.5 Village organizations and their activities

(1) Main village organizations

The main village organizations are listed in Table II-3.2.14. Most of the existing village organizations and groups have been established under the instruction of higher authorities, except for the self-help group of households set up by neighbors and/or relatives mainly for labor exchange in agricultural production.

The Venn diagram exercise revealed that the main organizations contributing to village development were mostly the organizations at commune and district levels. Out of the 7 villages in which the RRA survey was conducted, 6 villages identified the commune people's committee as one of the main organizations that has a high influence on the socio-economic development of the village

Table II-3.2.14 Main village organizations

Type of Organization	Name
Political and governmental organizations	• Communist party committee
Unions	• Farmers' association • Women's union • Youth union • Father front • Veteran's association
Other	• Militia • Conflict settlement board • Self-help group of households (labor exchange group)

Source: RRA Survey, Feb – March 2002

Commune communist party committee and the district ED-DARD were also identified in 5 villages as important organizations with high influence on village development. The village organizations listed in Table II-3.2.15 and the village leaders (village chief and traditional leader) also appeared in the Venn diagram, however the relative importance of these institutions on socio-economic development was perceived to be weak.

There are many village level organizations and positions identified by local people as having roles in forest management, development and utilization (Table II-3.2.15). These organizations are mostly involved in forest protection, as per the instruction of higher authorities. There is no specific organization involved in forest development or utilization.

Table II-3.2.15 Organizations/positions involved in forest management, development and utilization

Main village organizations / positions involved	
• Village chief	• Youth Union
• Traditional leader	• Women's Union
• Militia	• Veteran's association
• Conflict settlement board	• Communist party committee
Most important organizations (both village and external)	
• Mang La FE	• Commune PC
• Forest rangers	• Communist party committee
• Village militia	• Village chief

Source: RRA Survey, Feb – March 2002.

(2) Decision making structure of the villages

There exists a dual structure of village leadership in the 2 communes. The village chief and his deputy serve as local administrative leaders, whose main roles are to deliver instructions from the higher authorities, and to encourage and guide local people to follow government policies. Each village also has a traditional leader (*Gia Lang*: village patriarch). The traditional leader plays an important role in unifying the villagers, and in solving problems in the village in collaboration with the village chief. As indicated in Table II-3.2.15, the village chief and traditional leader also play an important role in forest management and protection.

All the villages surveyed have mechanisms of regular village meetings. However, the meeting is not the main forum for decision-making. Rather, the village meeting is where instructions and information from the commune are shared, and where discussions are held on how to implement the tasks assigned by the commune. Normally, important decisions are made by the village chief and the traditional leader (with the head of village unions in some cases), before the issue is brought to the village meeting.

(3) Resource management

1) Village boundary

In Vietnam, the smallest unit of the government administrative structure is the commune. As such, the official administrative boundary, as drawn in government documents, only exists down to the commune level. However, village boundaries do exist, according to the interviews at the district, commune and village levels. These boundaries, defined by the villages concerned, mostly run along the streams, mountain ridges, and roads. Except for newly divided villages where sense of village boundary is vague, there seems to be no overlap of village boundaries, nor are there any gaps in between. However, there are some areas, especially in the mountains and forests, where the exact boarder line is unclear. As explained in the following sections, resource use is not confined within one's village boundary.

2) Forests

According to the RRA Survey, villages have simple verbal rules regarding villagers' responsibilities in the community. However, they do not have specific rules regarding the use of forest resources. Traditionally, forest resources have not belonged to individuals or households. Rather, people were allowed to utilize forest resources within or outside the village boundary, as they desired. The only exception is the NTFPs planted by individuals (e.g., bamboo), which belong to specific owners. As the forest resources have been abundant in this area, there appears to have been no conflicts between villages or individuals in the past regarding resource use.

Since when the forest protection contract (FPC) was introduced, local people have identified forests under the name of the villages of the households to whom FPC contracts have been issued. The responsibilities, benefits, and punishments on households involved in forest protection are stipulated in the Forest Protection Contract (Table II-3.2.16).

Table II-3.2.16 Responsibility of households as stipulated in the Forest Protection Contract

Responsibilities	• Regularly patrol and guard the forest area allocated. • Prevent destruction of forest by others. • Prevent forest fire. • Protect forest from slash and burn cultivation.
Benefits	• Allowed to collect and develop by-products under forest canopy.
Punishments	• If slash and burn cultivation is found, ➢ The household must compensate for the damage of the forest. ➢ The household will be withdrawn from the FPC.

Source: Kon Tum Provincial DARD (1999). *Economic contract on allocation of forest for management and protection.*

The contract clearly specifies households' responsibility and tasks on *forest protection* within the area allocated. However, it appears that local people's perception of *forest utilization* is not confined to their own FPC area, as they believe they are allowed to collect NTFPs and fuelwood from any location. They also perceive that they are allowed to collect timber for housing and rice storage construction (for self-utilization only) from any location without requiring any permission[21].

3) Agricultural land

Agricultural land is inherited by children equally among male and female siblings. While it is legally allowed, no selling of agricultural land is practiced in the 2 communes. Exchange of agricultural land is practiced occasionally both within and between villages. Opening and expansion of new paddy fields are practiced both within and outside the village boundary, in areas suitable for agricultural production. According to the commune interview, households must report to the village chief for opening or expanding paddy fields, and the village chief in turn reports to the Commune PC. RRA survey results indicate, however, that this reporting requirement is not

[21] In principle, local people must obtain permission from the Chairman of the District People's Committee even if timber were to be harvested for self-utilization. This rule is not strictly observed in practice.

strictly followed in all villages.

Legally, it is not permitted to open or expand upland farms or paddy fields in the forest area, except in the forestland categorized as 'existing upland farm,' which includes areas that have been used for cultivation for a long time period (both the areas currently cultivated, and those areas in fallow). As a result of intensive effort by the government, local people's awareness is high on the prohibition of slash and burn cultivation. However, they tend to believe that the regulation is only applied to the 'old forest' area. Their understanding is that cultivation in 'old forest' is strictly prohibited, and that they must obtain a permit from the Commune PC if they wish to open new agricultural land (paddy field or upland farm) in the 'old forest.' On the other hand, they believe that they are allowed to open or expand agricultural land in 'young forests' or at the edge of the forest, while they must inform and/or seek permission from village authorities such as the traditional leader or village chief[22].

Traditional understanding on the ownership of upland farms varies among the villages. In some villages, any villager can use an area left fallow for a certain period, while in other villages, the land ownership remains with the previous owner. It appears that this difference is related to the availability of land suitable for cultivation in the respective villages.

No serious land conflicts were reported either within or between the villages. However, there have been some disputes related to user rights of the paddy fields among the local people. After the war, the paddy fields were taken over by the co-operatives for collective cultivation. Later when the co-operative was dissolved and land was reallocated to households, the land was not necessarily allocated reflecting the prior ownership. Hence, there are some households who claim that the land of others (new owners) should have been inherited by them from their forefathers. Conflicts among local people are settled by those directly involved. In cases difficult to settle by themselves, the issues are brought to the village chief or the traditional leader. When the village authorities cannot settle the conflict, the case is brought to the Commune PC.

4) Irrigation water

Local people use simple irrigation systems consisting of small dams, normally by piling up rocks, and earth or bamboo canals, to collect and direct water to the paddy fields. These dams are impermanent and must be re-built every year after the rainy season. Dam construction and maintenance are normally done collectively by the households whose paddy fields receive water. In addition to these small local irrigation systems, some villages have small concrete dams constructed by Program 135, mostly within the past 1 to 2 years. While management and maintenance responsibility of these dams have been handed over to the villages, there has not been any specific group formed for managing irrigation system. Cases of severe damage are reported to the district for repair.

[22] Local people's understanding of 'old forest' and 'young forest' is not the same as the official technical definition.

3.2.6 Perceived needs

(1) Constraints on and needs in daily lives

In the household survey, 65% of households responded that they do not have enough food for their family. Lack of electricity, fresh water, and poor road condition were also identified as major constraints by a high proportion of households interviewed.

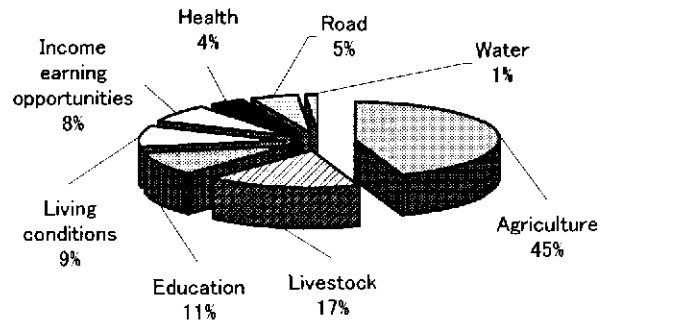

Figure II-3.2.4 Problems identified by the local people (RRA)

Source: RRA Survey, Feb – March 2002

Food shortage can be attributed to the low performance of the agricultural sector in the context of the 2 communes. According to the problem ranking exercise conducted as part of the RRA survey, 45% of the problems identified by the local people was related to agriculture (Figure II-3.2.4). This reflects the wide range and significance of the difficulties local people face in their agricultural activities.

(2) Constraints on and needs in agriculture

The problems identified by local people concerning agricultural production can be categorized into 6 areas (Table II-3.2.17).

Table II-3.2.17 Main problems identified by local people related to agriculture

①	Irrigation
	● Efficiency and coverage
	● Management and maintenance
	● Water for home garden
②	Crop diseases and damages
③	Lack of high yield variety
④	Shortage of material input / capital
⑤	Technical knowledge and training
⑥	Land
	● Quality of land
	● Quantity of land

Source: RRA Survey, Feb – March 2002

According to the household survey, crop diseases and damage were the most widely observed problem, identified by 85% of those interviewed. Reponses on land issues varied among the villages. Poor quality of land was identified as one of the priority problems in 10 out of 18 villages, while lack of land was ranked likewise only by one village. While 65% of households responded that they suffer

food shortage, only 26% of households responded that they lack sufficient area of agricultural land. Village interview findings support the above result, as many villagers commented that they feel the land they have is sufficient in view of their labor force availability. This implies that land shortage is a problem perceived by a relatively small proportion of total households, although the issue is a serious hindrance for livelihood advancement for those who suffer.

3.2.7 Summary analysis

(1) Comparison of the villages in Hieu and PoE commune

1) Agricultural production patterns

Agricultural production activities are primarily focused on lowland rice cultivation in all villages. There is also no significant difference in production techniques. In terms of land shortage, villagers in Vi G Long (village 2 of Hieu) and Kon K Tau (village 3 of PoE) indicated the highest concern, while the problem was expressed in all villages. Total area of upland farm (including shifting cultivation area) varied among the villages, indicating the different level of reliance. However, upland farming is of secondary importance in all villages, as the products do not serve as main staple food.

2) Dependency on forest resources

Forest resources play an important role in supporting local livelihoods, as NTFPs are collected for consumption or sales, timber for house construction, fuelwood for household energy, etc. Level of reliance on forest resources does not seem to have significant correlations with the village's location. In the 2 communes, Kon Pieng (village 8 of Hieu) relies the most on forest resources[23].

3) Food shortage

In the 2 communes, food shortage is experienced during the months of May, June and July, prior to the harvesting period of low land rice. Sixty five percent of all households interviewed responded that they do not have enough food for the family. There were 10 villages with more than 65% of households expressing shortage of food. Proportion of households that lack sufficient food was highest in Kon Roa (village 6 of PoE), followed by Tu Can (village 9 of Hieu) and Kon Klang 1 (Village 1 of PoE).

4) Economic situation

As explained in section 3.2.4.(2), the average cash income level of the villages is related to the number of government employees and the number of livestock owned. The level of average cash equivalent income appears to be influenced by average land holding. Villages with low average cash equivalent income tended to have smaller average land holding per household, which

[23] In 2001, households in Kon Pieng collected more than 2 times the commune average of NTFPs.

implies low level of agricultural production. Pattern of wealth distribution is also different among the villages. Dak Xo (village 6 of Hieu) has the highest proportion of most disadvantaged households (30%), followed by Dak Lom (village 3 of Hieu, 29%) and Dak Lieu (village 4 of Hieu, 27%).

5) Community cohesion and village leadership

The level of community cohesion and organizational capacity varied, despite the fact that the administrative structure and the type of village organizations were similar among the villages. One of the key factors that determine this aspect appeared to be the capacity and enthusiasm of key leaders. Villagers who have been exposed to the outside world, such as ex-soldiers, retired government officials, etc., seem to serve as important channels of information and knowledge to local people, as well as the driving force of improving local livelihoods. A good example is Vi O Lak (village 7 of PoE), where they have strong and enthusiastic village leadership.

6) Social infrastructure

The government has placed intensive effort on infrastructure development in the 2 communes, through national programs such as Program 135 and the Fixed Cultivation and Resettlement Program. The level of investment has been significant during the past 5 years (Table II-3.2.18). However, some of the villages still lack basic social infrastructure. The 2 remote villages, Kon Pling and Kon Pieng (villages 7 & 8 of Hieu), are the most disadvantaged in terms of accessibility. Kon Plong (village 1 of Hieu), PoE 1, PoE 2, and Kon Roa (villages 4, 5 & 6 of PoE) also face difficulties in transportation, especially during the rainy season. As explained under section 3.2.1 (6), access to clean water also remains to be a problem in several villages.

Table II-3.2.18 Infrastructure development in the 7 villages from 1997-2001

	Village	Commune
Type of infrastructure	• Village school (3 villages) • Concrete dam (4 villages) • Rural clean water (3 villages) • Rural access road (2 villages)	• Secondary school (PoE) • Healthcare station (PoE and Hieu) • Asphalt pavement of national road 24 • People's Committee office (PoE) • Post Office (Hieu)

Source: RRA Survey, Feb – March 2002

Table II-3.2.19 Summary of the main characteristics of the villages in Hieu and PoE commune

	Size of paddy field	Perceived shortage of Agric. land	Size of upland farm	Food shortage	Average Income	% of disadv. household
PoE						
1. Kon Klang 1			++	++	-	+
2. Kon Klang 2			++			+
3. Kon K Tau	++	++		-+	+	+
4. PoE 1			-			+
5. PoE 2		-	+	+		
6. Kon Roa	+	-	++	-+		
7. Vi O Lak			++			
Hieu						
1. Kon Plong		+	+			+
2. Vi G Long	+	++	-+	+		
3. Dak Lom	++	+		+		-+
4. Dak Lieu	+				+	--
5. Vi Chiring	++	+	+			+
6. Dak Xo	++	+	+		+	+-
7. Kon Pling			++	+		+
8. Kon Pieng		+	+	++		+
9. Tu Can	+	+	+	++	+	+
10. Vi Chong		+	+			
11. Kon Klung		+		++		+

Source: Village Profile and Household Survey, Feb – March 2002

Notes:

Area of paddy field

+: villages with lower than average land per household than the commune average.

++: villages with the average land per household below 6 sao.

Perceived shortage of agricultural land

+: villages with more than 20% of households expressing shortage of land.

+-: villages with the highest % of households expressing shortage of land in both communes.

Area of upland farm

+: villages with an average of 500 to 1,000 m^2 upland farm per household.

++: villages with 1,000 m^2 or more upland farm per household on average.

Food shortage

+: villages with more than 65% of households expressing shortage of food.

++: villages with the most severe food shortage, assessing from the various survey results.

Income

-: villages with average cash equivalent income per capita less than 7 million/year (Hieu) and 8 million/year (PoE).

High % of disadvantaged households

-: villages with 11-20% households below 55,000 VND/capita/month (cash equivalent income).

++: villages with 21% or more households in the above category.

(2) Forest degradation and the underlying causes

Analysis of the survey findings and the outcomes of the participatory workshops suggest that there are 3 important factors affecting the situation of forest resources in the 2 communes: illegal logging in the provincial boarders; encroachment by local people; and slash and burn cultivation. While the current level of forest degradation is not as severe in these 2 communes compared to other parts of the district,

these factors may have serious impact on forest resources in the long term unless properly addressed.

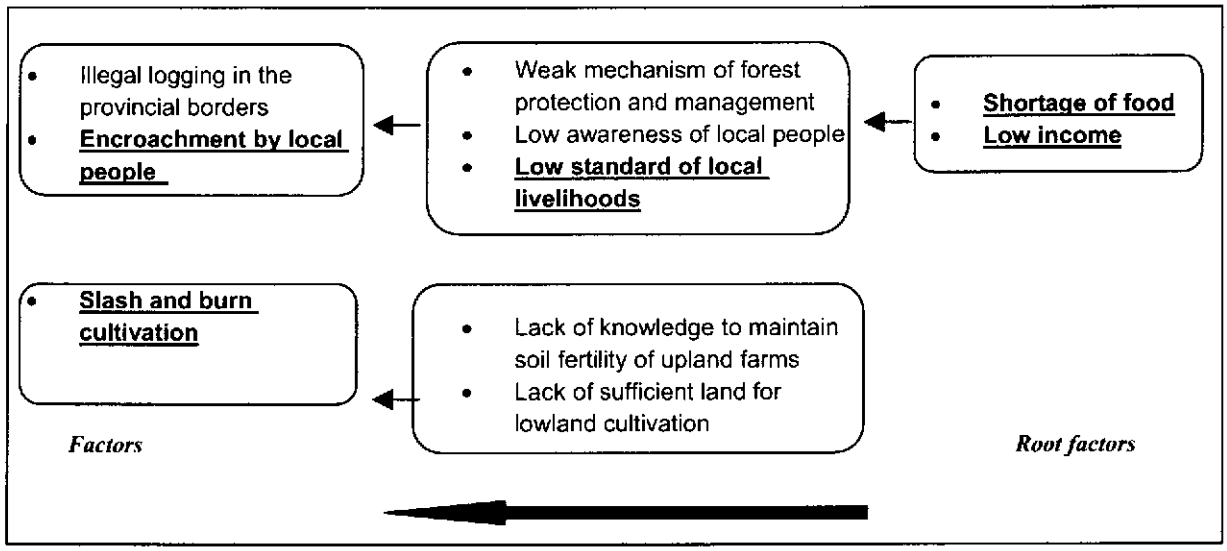

Figure II-3.2.5 Main factors influencing the situation of forests in Hieu and PoE commune

Source: Analysis based on the Village Profile and Household Survey, RRA Survey, and Participatory Workshops, Feb – May 2002.

(3) Critical problems on local livelihoods and the underlying causes

As shown above, low standard of livelihoods is one of the reasons why local people must rely on forest resources heavily. Further analysis indicates that food shortage and low income are the two common and most critical constraints that result in low living standards in the 2 communes. Figure II-3.2.5, II-3.2.6 and II-3.2.7 present the main underlying causes of these 2 problems.

(4) Feed-in to the villager support program

The Master Plan highlights that improvement of local livelihoods, which will lead to reduction of human pressure on forest resources, is one of the necessary elements of the sustainable forest management plan. Hence, the underlying causes presented in this section serve as an important input for developing the villager support program for Mang La FE, which is presented in section 5.4.

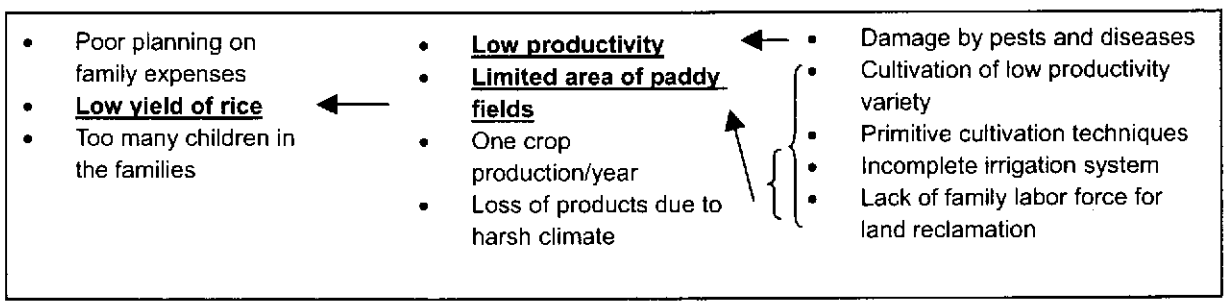

Figure II-3.2.6 Main underlying causes of food shortage

Source: Analysis based on the Village Profile and Household Survey, RRA Survey, and Participatory Workshops, Feb – May 2002.

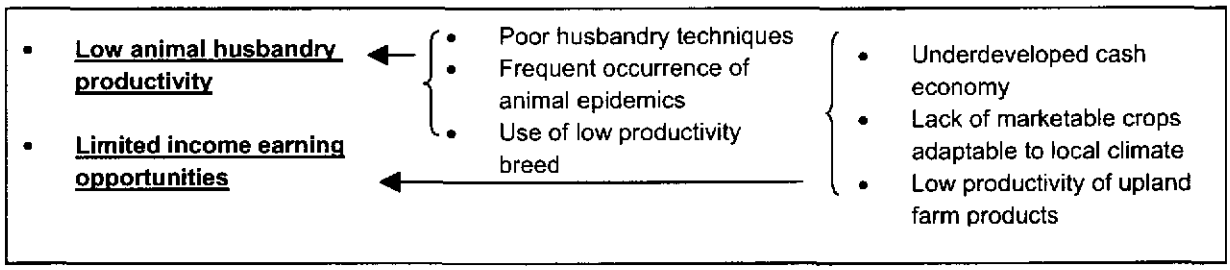

Figure II-3.2.7 Main underlying causes of low income
Source: Analysis based on the Village Profile and Household Survey, RRA Survey, and Participatory Workshops, Feb – May 2002.

3.3 Forest conditions in the Model Area

Forest related surveys in the study comprise of forest sample plot survey, aerial photograph interpretation and preparation of forest inventory book including accumulation of forest areas by forest type. In this phase (the 3rd year), the aerial photograph interpretation was mainly carried out following the forest sample plot survey including natural forest regeneration survey in the logged-over area in the Model Area. With the implementation of the surveys, two botanists were involved in identification of tree species. The details of the surveys are described below.

3.3.1 Forest sample plot survey

The survey was organized to find out the current natural forest condition and accumulate the stocking volume required for the forest management plan in the Model Area, and carried out in the Protection Forest (Block: 439, 440, 493, 500) and Production Forest (Block: 495, 496, 497, 498, 499, 501, 502, 503).

The sample plots were selected applying the aerial photographs to enhance the efficiency and effectiveness. The specification of the survey plots was basically arranged with squares of 50 m by 20 m and the number of the surveyed sample plots was 24. The survey items in each plot were as follows.

- Physical conditions: location (by GPS), altitude, micro-topography, inclination, slope direction
- Ecological conditions: forest classification by satellite imagery and aerial photographs, forest classification by the FIPI definition, dominant tree species, undergrowth species
- Forest conditions: both scientific and local tree species names, DBH and height of each standing tree with DBH 10 cm and above

The index of the surveyed plots is indicated in Table II-3.3.1.

Table II-3.3.1 Index of sample plot in the Model Area

Plot No.	Location		Block No.	Forest status	Stocking volume (m^3/ha)	Aerial photo No.
	N	E				
2	14°39.18	108°25.98	497	IIIA2	323	15A-30
3	14°43.96	108°29.18	440	IIIA2	196	12A-34
25	14°35.19	108°25.28	499	IIIA2	374	17A-06
26	14°37.43	108°24.59	496	IIIA2 / 3	317	16A-03
29	14°42.18	108°28.36	440	IIIA2	200	13A-34
31	14°36.93	108°27.68	500	IIIA2	351	17A-08
32	14°36.27	108°27.05	499	IVB	467	17A-08
35	14°36.11	108°25.15	499	IIB	241	17A-06
36	14°34.60	108°25.32	502	IIIA2	274	18A-05
37	14°38.12	108°26.96	498	IIIA2/IIIA3	397	16A-07
38	14°38.32	108°26.66	497	IIIA3/IIIB	390	16A-05
39	14°39.99	108°27.40	493	IIIA2	207	15A-32
40	14°39.14	108°26.06	497	IIIA2	329	15A-30
41	14°38.77	108°24.65	496	IIIA3	439	15B-05
42	14°38.73	108°24.77	496	IIIA3	356	15B-05
43	14°36.60	108°26.87	499	IIIA2	313	17A-08
44	14°38.86	108°26.88	499	IIB	167	17A-08
45	14°34.10	108°26.76	502	IIIA2/IVC	289	18A-08
46	14°33.70	108°26.16	502	IVC	130	18A-06
47	14°34.14	108°25.57	502	IVC	264	18A-06
48	14°34.05	108°25.58	502	IIIA3	324	18A-06
49	14°34.17	108°25.94	502	IVC	182	18A-06
50	14°44.71	108°30.53	459	IIIA1	166	12A-36
51	14°43.76	108°30.25	459	IIIA3	481	12A-36
52	14°36.15	108°26.71	499	IIIA1	397	17A-08
53	14°35.38	108°26.46	502	IIIA1	192	17A-07
54	14°35.38	108°26.46	502	IIIA1	292	17A-07
55	14°35.38	108°26.46	502	IIIA1	486	17A-07
56	14°35.38	108°26.46	502	IIIA1	360	17A-07
57	14°35.38	108°26.46	502	IIIA1	165	17A-07
58	14°38.47	108°25.21	497	IVC	199	16A-04
59	14°38.57	108°25.23	497	IIIA2	299	16A-04
60	14°38.10	108°26.70	497	IIB	218	16A-06
61	14°44.06	108°30.30	459	IIB	241	12A-36
62	14°39.54	108°26.60	497	Open forest	26	15A-32
63	14°37.80	108°28.12	498	IIIA3	268	16A-07

3.3.2 Logged-over natural forest survey

This survey aimed at assuming the volume, ratio and species of logged trees and damaged trees, and recognizing the conditions of natural regeneration in the logged-over natural forests. The survey was implemented in a forest plot of 0.5 ha in Forest Block no. 502 where the logging operation was done in 2001.

(1) Volume and ratio of logged trees and damaged trees

According to the survey results, the following aspects were found (Table II-3.3.2):

Table II-3.3.2 Conditions in logged-over area

(per ha)

a	Stocking volume (present, 2002)		299.00 m^3
b	Stocking volume (just after logging, 2001)	Growth rate (1.5019%/yr) is considered	294.58 m^3
c	Logged volume		73.28 m^3
d	Damaged tree volume		39.71 m^3
e	Total (stocking volume before logging)	b+c+d	407.57 m^3
	Logging ratio	c/e*100	17.98 %
	Damaged tree volume ratio	d/e*100	9.74 %

1) Stocking volume (except for the logged volume and damaged tree volume) with consideration of an annual average growth rate of 1.5019 % is estimated at approximately 295 m^3 just after logging in 2001 and the total stocking volume including the logged volume and damaged tree volume before the logging is estimated at approximately 408 m^3.
2) 16 stumps of logged trees were identified per ha and the volume of the logged trees is approximately estimated at 73 m^3 from the stump diameter, and the volume rate for the total stocking volume before logging (408 m^3) is calculated at 18 %. Thus, it is judged that the appropriate selective cutting method is applied with slightly lower ratio of the standard.
3) The volume of the damaged trees is estimated at approximately 40 m^3 which is 10 % of the total stocking volume, and this ratio is within the maximum allowable level.

(2) Natural regeneration condition

In order to foresee the future stand growth, the sample plot was compared with another 4 plots (Plot no. 37, 38, 41 and 52) whose stocking volumes are almost the same as the one in the logged plot before the logging (Table II-3.3.3).

Table II-3.3.3 Stocking volume and number of standing trees compared in logged-over and unlogged forests

	Stocking volume (m^3/ha)		Number of standing trees (per ha)
	2002	2001	
Logged over plot	299	408 (stocking volume before logging)	354
Compared plot	406	400 (with consideration of growth rate)	340

As the results show, the current stocking volume (2002) of the logged-over area is lower than that in the compared plots, whilst the standing tree number is more in the logged-over area. This is derived from the fact that the tree number with DBH less than 40 cm is more in the logged plot (Table II-3.3.1), indicating that the distribution of the tree number and DBH would be organized similar to that of the compared plots in the future. Accordingly, it is envisaged that the operated logging was followed by a proper method, and another logging would be adaptable in this plot after 35 years though a sophisticated calculation is not applied.

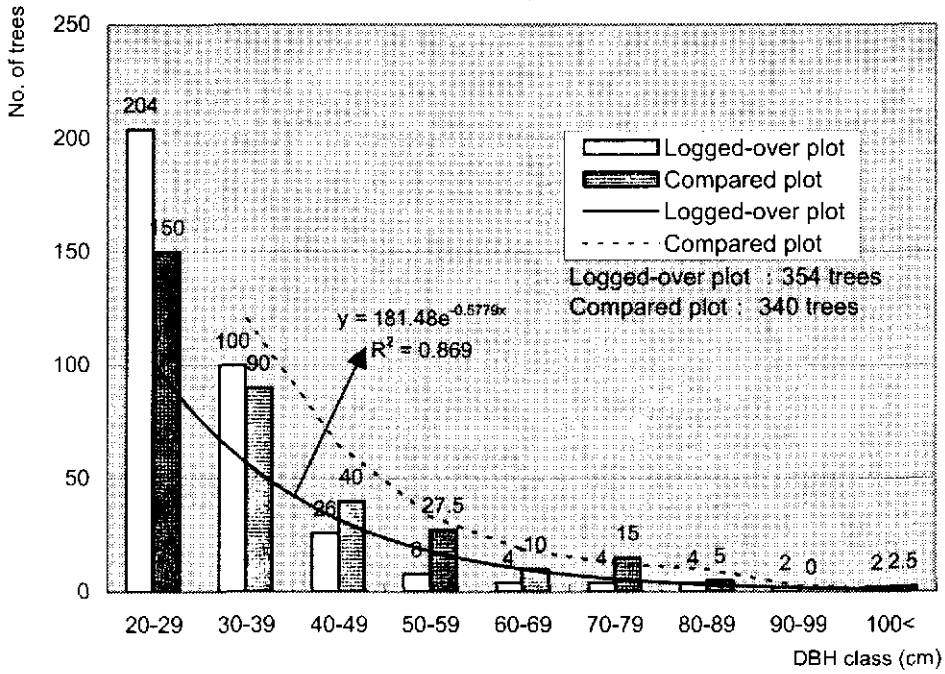

Figure II-3.3.1 Stand structure compared in logged-over and unlogged forests

Regarding the growth condition of saplings on the forest floor as an indicator for natural regeneration, since the forests are composed of multi-storeyed crowns, remarkable gaps were not observed and the number of saplings does not differ from the other plots according to the field observation. Also there is no disturbance from thick growth of grasses. Thus, as the saplings grow in a quite suitable condition and the growth condition and composition are also appropriate, it is judged that there are no extraordinary issues for natural regeneration in the logged-over area.

(3) Change in tree species composition

All the identified logged tree species, diameters of stumps and their estimated volume in the sample plot (0.5 ha) are shown by the Wood Group (see Table I-2.5.1) in the table below.

Table II-3.3.4 Estimated stem volume of logged trees

Group	Species	Stump diameter (cm)	Estimated volume (m^3)
4	*Podocarpus imbricatus*	70	3.88
5	*Schima crenata*	67	3.46
	Schima crenata	60	2.56
6	*Betula alnoides*	52	1.75
	Betula alnoides	56	2.13
	Betula alnoides	96	9.28
	Betula alnoides	100	10.40
Others	*Michelia braianensis*	65	3.18

From the above table, it is clear that 7 logged trees were of Group 4-6 and 1 tree was of another group. The tree composition after logging in the sample plot indicates that the remained tree species do not belong to the Wood Group 1-4 (Table II-3.3.5). Judging from the change in species composition (or wood group composition) after logging from the current situation, significant changes are not anticipated in the logged forest because there are a number of species belonging to Group 5 and 6. Therefore, it is concluded that the scale and method of logging are properly managed even from the viewpoint of tree species composition.

Table II-3.3.5 Number of trees by Wood Group and DBH class in the logged-over area (per ha)

Group / DBH class	1	2	3	4	5	6	7	8	Others	Total
20-29	0	0	0	0	34	4	2	0	164	204
30-39	0	0	0	0	26	4	0	2	68	100
40-49	0	0	0	0	8	0	0	0	18	26
50-59	0	0	0	0	4	0	0	0	4	8
60-69	0	0	0	0	0	0	0	0	4	4
70-79	0	0	0	0	0	0	0	0	4	4
80-89	0	0	0	0	2	0	0	0	2	4
90-99	0	0	0	0	0	0	0	0	2	2
100<	0	0	0	0	0	0	0	0	2	2
Total	0	0	0	0	74	8	2	2	268	354
Ratio (%)	0	0	0	0	20.9	2.3	0.6	0.6	75.7	100.0

3.3.3 Aerial photograph interpretation

The forest type categorised into 'A' to 'E' by forest crown density and forest crown diameter in the previous work period was further classified based on the data on the forest sample plot survey and observation. The detailed classification of forest types (including tree-covered area with less than 10% of crown density) is as indicated below.

Crown size	Crown density			
	scarce	low	medium	dense
	0-10%	10-40%	40-70%	70-100%
Small	E	E	D1	C1
Medium	E	D2	C2	B1
Large	D3	C3	B2	A

Note : The 'Forest type A' belongs to the single category and 'Forest type E' has no sub-classification.

The above classification is supplementary categorization with a factor of degree of combination with coniferous tree species particularly Podocarpus species. Therefore, some forests would be indicated with the below coniferous species density as well as the above general forest type.

	Coniferous species density
P1	70 - 100%
P2	30 - 70%

The descriptions of each forest type are as follows:

1) Forest type A

This category is extremely close to primary forest with dense crown density and large crown size. Accordingly, the forest is classified as the richest forest with high bio-diversity in Mang La Forest Enterprise area. In the area, this type of forest distributes chiefly in the Forest Blocks of 495, 498, 502, 503 (production forest) and 500 (protection forest). Regarding the tree height, it has a tendency to be high in the southern and south-eastern parts of the area compared with the northern part. As the stocking volume is quite high, this forest type in the production forests would be included in the harvest plan.

2) Forest type B1

This forest is also close to primary conditions with dense crown density but medium crown size. The forests generally exist combining with the forest type A in the Forest Blocks of, 496, 497, 499 (production forest) and 439, 440, 493 (protection forest). The stocking volume is high enough and the forest in the production forest would also be included in the harvest plan.

3) Forest type B2

This category is also close to primary forest with medium crown density and large crown size. The forests generally exist combining with the forest type A mainly in slope areas of the mountain ridges. The forest in the production forest would also be included in the harvest plan.

4) Forest type C1

This forest is also close to primary conditions with dense crown density but small crown diameter. The forests distribute in almost the whole area particularly on the ridges and around mountain summits and are the significant forest type in the Forest Block 502 around the border to Quang Ngai Province. The forests are equivalent to 'Young Forest' which is a category applied in Vietnam and there seems to be a few trees for harvest. Coniferous (Podocarpus species) forests on the ridge are classified into this category. The coniferous species are included in the harvest plan.

5) Forest type C2

This forest is categorized into primary forest and secondary forest after harvesting and slash-and-burn cultivation and is particularly significant along National Road 24. The Forest's crown density is medium and crown diameter is medium as well. The forests exist around villages and/or agricultural lands and are generally used by local people. The forests are left for the future harvest plan but not earlier rotation. The majority of the forest stand is under regulated size because of poor soil condition and long-time use by villagers.

6) Forest type C3

This forest is classified into secondary forest after harvesting and slash-and-burn cultivation and is still used by local people. The medium-large size trees are already logged and the crown density is scarce. This classification of forest is not included in the harvest plan because it seems natural generation takes a long time.

7) Forest type D1

This type of forest covers rather poor vegetation with small-sized trees, presumably recovered from logging and slash-and-burn cultivation. The forest also includes patches of stands that remain from agricultural use along valleys and steep ridges. As the forests are severely degraded, it will take a long time for natural regeneration and until harvest can be applied.

8) Forest type D2

The forest has some medium-sized trees remaining in abandoned agricultural lands because of being unsuitable geographical land and is being used by local people. The forest also mainly distributes around villages and cultivation. Natural regeneration in the forests seems to take a long time until forest cover is sufficient for the harvest.

9) Forest type D3

The forests are scattered around villages and agricultural lands and categorized into areas that are being over-used by local people the same as Forest Type D2 and/or agricultural fallow. Accordingly, this category of forest is considered to be difficult for natural regeneration.

10) Forest type E

The forests are close to bush with small-sized trees and had been utilized as cultivation until recently by local farmers. As the soil condition is also poor, natural regeneration will be very hard and take a very long time.

11) Forest type P1

This type of forest typically distributes along ridges and around the top of mountains consisting of a high ratio of coniferous trees (70% or more with Podocarpus species) around National Road 24 and the Forest Blocks 496, 497, 498, 499, and 502. However, the majority of stand sizes are medium and small because of poor soil condition in such areas. The forests would be considered as the target area of the harvest plan.

12) Forest type P2

This forest presents mixed forests with coniferous and broad-leaved species (30-70% of Podocarpus species) and exists around the Forest Type P1 in mid-slope areas. The size of the Podocarpus species is rather large. The forest can be seen in the Forest Blocks 496, 497, 498, 499 and 502. This forest is included in the harvest plan.

The classified forest types on the aerial photographs were applied into GIS and the area of each forest type in the Model Area was recognized. The stocking volume of each forest type would be assumed based on the results of forest sample plot survey and data from Sub-FIPI Qui Nhon.

The model area (area of the Mang La Forest Enterprise) is estimated at 18,292.48 ha. This area is a little different to the estimation of the master plan (18,255 ha), because of the different topographic map. All area calculation of the Management planning is carried out using GIS maps based on a new topographic map 1/10,000 (made from 2002 aerial photographs).

For forest area, the team categorized and divided forest areas into 10 groups (if the forest had mixed conifer species the area was marked with P1, P2) by crown density and crown size. Closed forest (A1, B1, B2, C1, C2, and D1) is estimated at 14,387 ha. Other forest is 1884 ha. Plantation (pine and eucalyptus) is estimated at 291 ha. And 321 ha of bush, 250 ha of grassland is estimated (Table II-3.3.6). Forest situation by block is shown in Table II-3.3.11.

Table 3.3.6 Land use and forest type in the Model area

Forest

Closed forest		Other forest	
A	6585.12	C3	423.02
B1	2809.23	D2	686.26
B2	1601.58	D3	43.75
C1	956.93	E	731.34
C2	2026.62	Sub Total	1884.37
D1	407.33	Prantation	291.25
Total	14386.81	Total	2175.62

Non-forest

	Protect	Product	Total
ategor	Forest	forest	
Paddy	229	245	474
Farm	234	336	570
Bush	182	139	321
Grass	170	81	250
Water	8	3	11
Garden	40	63	103
Total	863	867	1730

This forest and land use condition had been recorded on a 1/10,000 topographic map, and stored into a GIS data base. Figure II-3.3.2 below is a sample of the map. Forest and land use condition of total area is shown in Figure II-3.3.3.

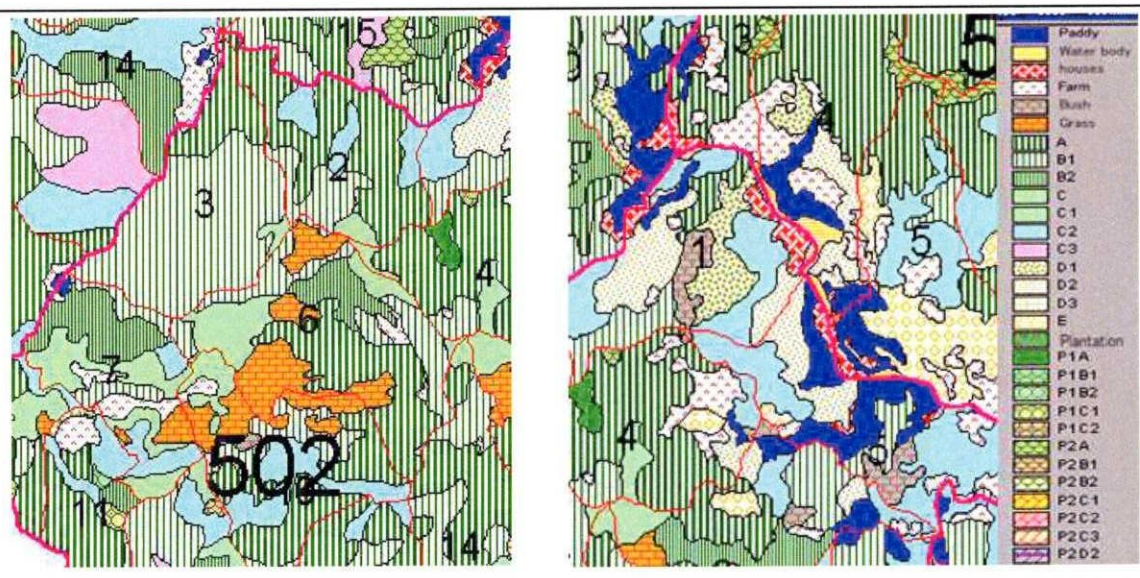

Figure 3.3.2 Samples for Forest type and land use map on GIS

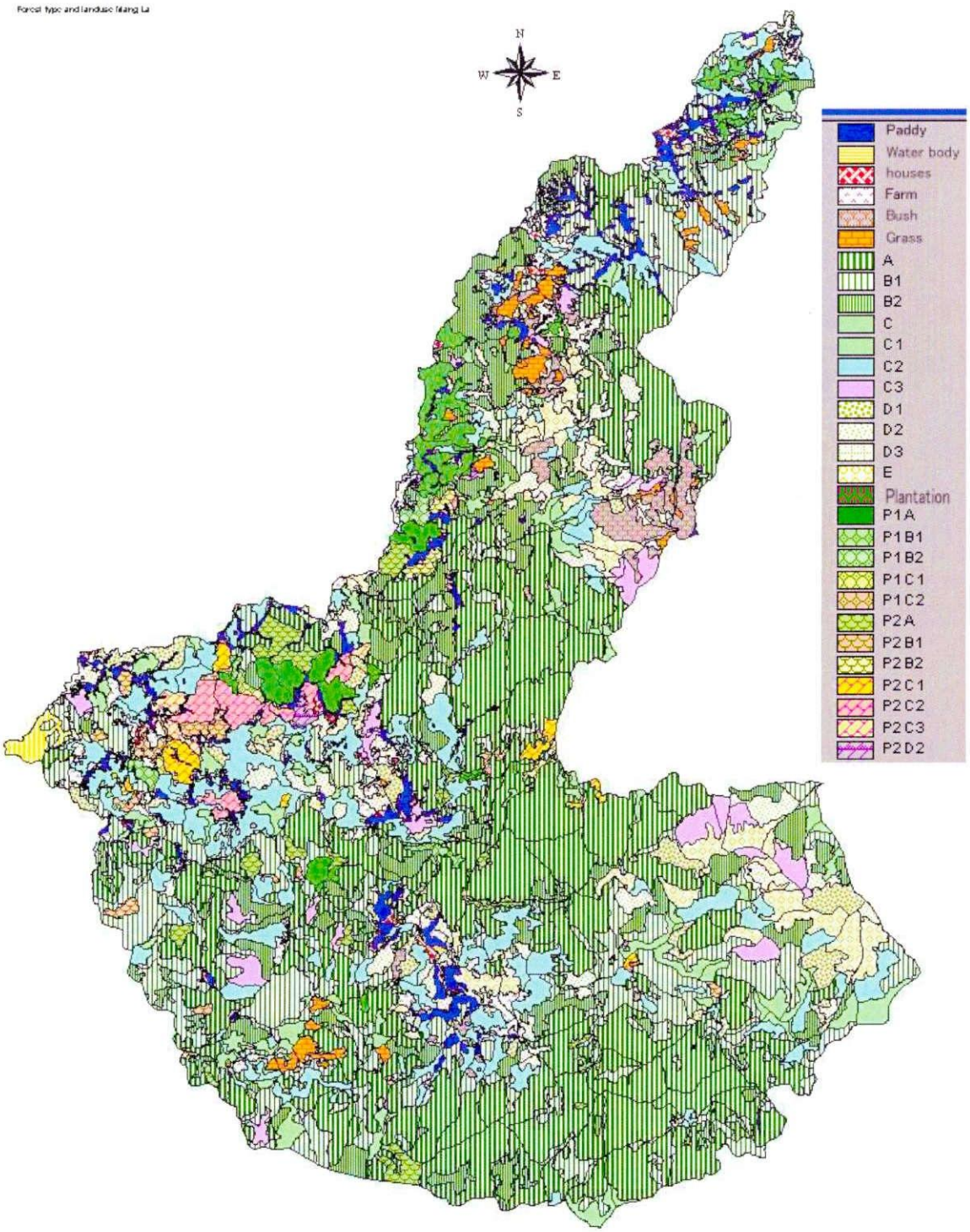

Figure II-3.3.3 Forest type and land use in Model area

3.3.4 Estimation for forest resource (Stand volume)

Volume of stand by sub compartment was calculated based on the plot survey, and field observation; then typical imagery from the aerial photographs was used to interpret aerial photographs. The forest type was divided into A to E based on the crown size and density.

The volume of forest stands by sub-compartment was calculated by multiplying the estimated average volume per hectare of each type of forest by the area of each sub-compartment calculated using GIS. This calculation excluded plantation forests in the model area since the stand volume of such forests had not reached the age for substantial volume calculation. Moreover, although there are stands in other types of land besides forests (bush and grassland), the volume of such stands was excluded.

The average volume of each type of forest per hectare, which had been calculated based on the findings of the plot survey, was adjusted for practical application in light of both the existing records and the following considerations:

(1) Since the forest stands that were likely to be logged were given priority, there was a tendency for the survey plots to be concentrated in areas with a high crown density.

(2) Experience shows that a plot survey tends to be conducted in areas with a relatively large volume of forest stands since survey plots are established on the basis of the large trees. Such a tendency cannot be ruled out in this particular plot survey, although this study selected the survey areas that had a forest physiognomy that was characteristic of each type of forest discussed above, based on the aerial photographs.

(3) A plot survey tends to be conducted in the upper part of the hillside slopes where the trees vary little in height rather than in steeply sloping land or summit areas. It is therefore necessary to note the proportion of land where the volume of forest stands is generally low (and the trees are relatively short) when calculating the average stand volume of a forest compartment as a whole, based on the average stand volume of the plots concerned.

Based on these considerations, the study estimated the average volume of stands for each forest type as shown in Table II-3.3.7. The study then calculated the stand volume of each sub-compartment by applying the relevant coefficients shown in Table II-3.3.9 and II-3.3.10 for each block. This calculation factored in the proportion of stands of tall trees, which varies according to altitude and topographic complexity, for each type of forest to which the survey plots in question belong.

Table II-3.3.7 Estimation on Averaged Volume per hectare (m^3)

Forest type	Plot Data Average	FIPI Average	Adjusted Average	Rounded Average
A	308	210	259	260
B1	232	210	221	220
B2	200	210	205	200
C1	228	210	219	220
C2	200	210	205	200
c3	180	150	165	160
d1	150	150	155	150
d2	120	150	135	130
d3	80	60	70	70
e	60	60	60	60

Notes: 1. The figure for forest stands classified as type A, in which the largest number of plots had been established, was adjusted with reference to the plot data average (excluding the figures for the top three plots and bottom three plots in terms of stand volume) and the average figures adopted by FIPI. In the actual figures, the plot data average is 308 m^3/ha, the average figure for IIIA3, A2 and IIIB under the FIPI classification is 210 m^3/ha, and the average of the two is about 260 m^3/ha. IIIA3, A2 and IIIB correspond to forest type A.

2. The relationship between forest types under this forest management plan, those under the master plan, and those under FIPI is shown in Table II-3.3.4 below. A, B, C1 and C2 are the forest types that are covered by logging operations in the foreseeable future.

Table II-3.3.8 Comparison of Forest type demarcation

Management plan	Master plan	FIPI
A	Primary	Rich (IIIA3, IIIB)
B1	Secondary I	
B2		
C1		
C2		
C3	Secondary II	Medium (IIIA2)
D1	Secondary III	
D2		
D3		Poor (IIIA1)
E	Open	Young (IIA, IIB)

Table II-3.3.9 Coefficient for elevation effects

	Elevation (m)					Difference	Adjust	Difference	Coefficient
Block	E	W	S	N	Average	from center	Volume	from Ave.	(%)
439	940	1,005	900	685	883	-168	-39	-0.15	0.85
440	1,105	875	245	1,120	836	-214	-49	-0.19	0.81
493	640	1,285	1,275	1,105	1,076	26	6	0.02	1.02
495	255	1,270	1,140	590	814	-236	-54	-0.21	0.79
498	1,295	1,085	1,085	1,015	1,120	70	16	0.06	1.06
497	1,210	1,210	1,005	1,285	1,178	128	29	0.11	1.11
496	1,140	1,295	1,175	1,210	1,205	155	36	0.14	1.14
499	970	1,275	1,240	1,145	1,158	108	25	0.10	1.1
500	995	1,050	940	1,355	1,085	35	8	0.03	1.03
501	1,030	1,035	1,055	1,040	1,040	-10	-2	-0.01	0.99
502	940	1,240	1,240	955	1,094	44	10	0.04	1.04
503	1,080	1,215	1,420	775	1,123	73	17	0.06	1.06

Note: The relationship between the volume of forest stands and the altitude is analyzed after arranging the plots in areas classified as type A in order of altitude and then noting the average stand volumes for the three plots at the lowest, middle, and highest altitudes. In Mang La, the plots in type A forest stands are distributed at an altitude of between 800 m and 1,300 m, with the average stand volume ranging from 250 m^3/ha to 400 m^3/ha. The stand volume increases by 30 m^3/ha for every 100 m increase in altitude on the assumption that the stand volume and the altitude are directly proportional. Based on the median value of 325 m^3/ha at an altitude of 1,050 m, the stand volumes are adjusted in relation to the average figure of 260 m^3/ha (by 26 m^3/ha for every 100 m change in altitude). A different adjustment coefficient is applied for each block. The altitude is represented by the average of the altitudes at the east, west, south and north ends of a block.

Table II-3.3.10 Coefficient for topography

Block	Total number of cross points of streams by Mesh	Difference from average	Coefficient
439	89	-103	1.10
440	205	13	0.99
493	132	-60	1.06
495	187	-5	1.01
496	190	-2	1.00
497	198	6	0.99
498	169	-23	1.02
499	282	90	0.91
500	229	37	0.96
501	108	-84	1.08
502	247	55	0.94
503	263	71	0.93

Note: Trees are generally shorter around mountain summits and along mountain ridges than on hillside equilibrium slopes and along ravines. If

the proportion of such areas with shorter trees is significant in a given region, the stand volume should be adjusted downward in accordance with the proportion. It should be noted that a large proportion of ridge areas translates into a large proportion of valley areas. In this forest management plan, the topographic complexity (the proportion of valley areas) of each block is estimated using the data from the geographical analysis carried out for the master plan. Based on this estimate, the average stand volume in each block is adjusted in the range of plus or minus 10% of the average volume. To this end, a mesh analysis is conducted. Specifically, the number of valleys in each mesh is added together to calculate the total number of valleys in each block. Then the difference between the number of valleys in a given block and the average is converted into a coefficient that is used to adjust the average stand volume in the given block in the range of plus or minus 10% of the average volume. In this case, the coefficient for a block with a larger number of valleys than the average is negative, and vice versa.

The result for volume estimation is shown in Table II-3.3.12. Total estimated volume of the Model area is 3,368,000 m^3, and 2,507,000 m^3 is recognized in the production forest. Total volume of the matured forest (A-C2) within the production forest is estimated at 2,132,000 m^3. To exclude areas to be set aside from logging operation from this matured forest, 7,878 ha and 1,786,000 m^3 is recognized as the initial yielding target area and volume. Figure II-3.3.4 shows distribution condition of these matured forests.

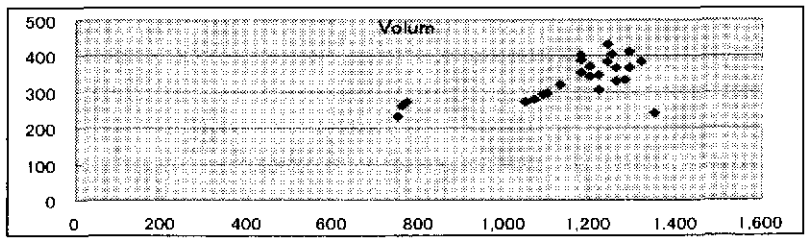

Figure II-3.3.4 Distribution of matured forests

Table II-3.3.11 Area by Forest type and Land use (ha)

	Protection forest					Production Forest									
Category	439	440	493	500	Sub total	495	496	497	498	499	501	502	503	Sub Total	Total
A	95.20	536.65	60.81	1,024.11	1,716.77	602.47	65.67	132.31	524.41	556.28	240.87	661.68	1,615.57	4,399.26	6,116.03
B1	411.49	148.23	40.06	32.92	632.70	37.52	122.93	76.57	76.23	518.90	432.89	391.40	345.93	2,002.37	2,635.07
B2	53.03	300.83	150.48	115.74	620.08	99.34	6.82	70.35	109.13	174.08	193.61	115.59	151.16	920.08	1,540.16
C1	74.56	28.05	39.39	22.83	164.83	80.78	61.43	60.88	6.60	45.39	216.44	137.48	39.44	648.44	978.10
C2	145.64	109.34	36.56	126.65	418.19	80.70	182.52	237.00	120.74	284.38	184.06	196.51	131.51	1,417.42	1,835.61
C3		21.19	7.09	90.91	119.19	60.34	15.44	25.99	4.05	64.80	74.00	13.59		258.21	377.40
D1	14.09	23.60	7.86	38.98	84.53	9.41	62.26	82.08		12.53	128.14	19.98	8.40	322.80	407.33
D2	2.39	93.16	50.87	66.49	212.91	75.88	28.33	119.26	17.60	11.16	88.71	60.13	47.01	448.08	660.99
D3		18.97			18.97			24.78						24.78	43.75
E	20.43	112.12	32.73	162.26	327.54	102.62	9.27	28.04		5.44	247.65	8.71	2.07	403.80	731.34
P1A			33.55	1.88	35.43			122.14	6.51	25.74		4.30		158.69	194.12
P1B1				27.11	27.11		19.59	6.80				1.12		27.51	54.62
P1B2			22.66		22.66									0.00	22.66
P1C1			2.69	12.74	15.43		6.69	13.47				2.06		22.22	37.65
P1C2					0.00	0.58	19.42							20.00	20.00
P2A			32.00	28.46	60.46			77.86	15.56	58.18		47.29	15.62	214.51	274.97
P2B1					0.00		46.61	18.16	10.62	31.82	5.88	6.45		119.54	119.54
P2B2			38.76		38.76									0.00	38.76
P2C1				10.45	10.45	23.18	49.22	13.98		3.81	5.37			95.56	106.01
P2C2			2.18		2.18		45.44	97.29		26.10				168.83	171.01
P2C3					0.00		38.61	7.01						45.62	45.62
P2D2			5.64		5.64			19.63						19.63	25.27
Planted	81.78	15.98	193.49		291.25									0.00	291.25
Paddy	96.90	70.79	33.79	27.89	229.37	1.90	51.68	71.64	25.12	46.88	0.59	41.93	5.24	244.98	474.35
Farm	63.28	77.31	25.06	68.05	233.70	21.81	104.04	70.62	17.76	47.64	1.77	55.15	17.16	335.95	569.65
Bush	5.81	147.06	29.56		182.43	106.59	0.62				1.92	23.39	6.04	138.56	320.99
Grass	51.02	104.42	14.25		169.69	13.16		1.63			1.52	63.74	0.69	80.74	250.43
Water				8.15	8.15			1.07				2.25		3.32	11.47
Garden	11.16	12.98	6.96	8.69	39.79		11.51	19.90	9.26	10.00		12.70		63.37	103.16
Total	1,126.78	1,820.68	866.44	1,874.31	5,688.21	1,316.28	948.10	1,398.46	943.59	1,923.13	1,823.42	1,865.45	2,385.84	12604.27	18,292.48

Table II-3.3.12 Wood resource stock by forest type (m^3)

	Protection forest					Production forest									Total
Type	439	440	493	500	Sub tot	495	496	497	498	499	501	502	503	Sub tot	
A	27,224	137,915	16,783	183,316	365,238	158,441	17,077	33,998	138,972	131,838	68,160	161,446	390,973	1,100,905	1,466,143
B1	99,587	32,316	9,335	5,004	146,242	8,327	27,043	16,696	17,077	103,786	103,899	81,024	70,909	428,761	575,003
B2	11,663	59,567	31,900	15,972	119,102	20,068	1,364	13,927	22,262	31,677	42,209	21,729	28,119	181,355	300,457
C1	18,039	6,115	9,175	3,469	36,798	17,929	13,512	13,274	1,478	9,078	51,952	28,459	8,085	143,767	180,565
C2	32,040	21,642	7,750	17,479	78,911	16,303	36,502	46,921	24,632	51,752	40,127	36,493	24,466	277,196	356,107
														2,131,984	2,878,275
C3		3,348	1,205	10,000	14,553	9,774	2,471	4,105	657	9,461	12,876	2,041		41,385	55,938
D1	2,323	3,516	1,249	4,015	11,103	1,430	9,343	12,230		1,715	21,013	2,817	1,176	49,724	60,827
D2	342	12,018	7,023	5,984	25,367	9,939	3,684	15,380	2,341	1,318	12,597	7,337	5,689	58,285	83,652
D3		1,309			1,309			1,710						1,710	3,019
E	1,349	6,616	2,095	6,650	16,710	6,258	556	1,655		299	16,097	487	116	25,468	42,178
Plant	0	0	0		0									0	0
P1A			9,259	337	9,596			31,389	1,728	6,101		1,049		40,267	49,863
P1B1				4,121	4,121		4,313	1,483				232		6,028	10,149
P1B2			4,804		4,804									0	4,804
P1C1			627	1,936	2,563		1,472	2,937				426		4,835	7,398
P1C2					0	117	3,884							4,001	4,001
P2A			8,832	5,095	13,927			20,012	4,123	13,786		11,542	3,778	53,241	67,168
P2B1					0		10,255	3,959	2,378	6,362	1,413	1,333		25,700	25,700
P2B2			8,217		8,217									0	8,217
P2C1				1,588	1,588	5,146	10,828	3,048		762	1,289			21,073	22,661
P2C2			462		462		9,086	19,264		4,750				33,100	33,562
P2C3					0		6,179	1,108						7,287	7,287
P2D2			778		778			2,533						2,533	3,311
Total	192,567	284,362	119,494	264,966	861,389	253,732	157,569	245,629	215,648	372,685	371,632	356,415	533,311	2,506,621	3,368,010