

Appendix-F
FORESTRY

**THE STUDY
ON
CRITICAL LAND
AND
PROTECTIO FOREST REHABILITATIN
AT TONDANO WATERSHED
IN
THE REPUBLIC OF INDONESIA**

Volume II

APPENDIX-F

FORESTRY

Table of Contents

	<u>Page</u>
Chapter 1 INTRODUCTION	F-1
Chapter 2 GENERAL BACKGROUND	F-2
2.1 Forest Sector in Indonesia	F-2
2.2 Forest Sector in North Sulawesi Province	F-4
2.3 Forest Classification and Afforestation Program.....	F-5
2.3.1 Legal Definition and Classification of Forest	F-5
2.3.2 Afforestation and Social Forestry Program	F-7
Chapter 3 MASTER PLAN STUDY FOR THE STUDY AREA	F-9
3.1 Present Condition	F-9
3.1.1 Forest Management	F-9
3.1.1.1 Organization and Each Responsibility	F-9
3.1.1.2 Protection Forest Management and Reforestation (<i>Reboisasi</i>)	F-10
3.1.1.3 Regreening (<i>Penghijauan</i>)	F-13
3.1.1.4 Local Resident's Participation Program and Social Forestry...	F-13
3.1.1.5 Forestry Extension Services	F-15
3.1.1.6 Seeds and Seedlings Supply System	F-17
3.1.1.7 Fire Protection	F-17
3.1.2 Existing Forest Resources and their Usage	F-18
3.1.2.1 Forest Resources	F-18

	<u>Page</u>
3.1.2.2	Usage of Resources and Forest-related Industry F-19
3.1.2.3	Reclamation of Forest Area F-20
3.1.3	Implementation of Forest Management and Rehabilitation Plans in the Study Area F-20
3.1.4	Current Problem of Forestry in the Study Area F-23
3.2	Forest Management and Rehabilitation Plan F-24
3.2.1	Basic Approach F-24
3.2.2	Components of the Plan F-24
3.2.2.1	Protection Forests F-24
3.2.2.2	Forests in Private Lands F-25
Chapter 4	FEASIBILITY STUDY FOR THE INTENSIVE AREA F-27
4.1	Present Condition F-27
4.1.1	Protection Forest Management F-27
4.1.1.1	Distribution and Maintenance F-27
4.1.1.2	Condition of the Protection Forests F-28
4.1.1.3	Activities in Protection Forests F-29
4.1.1.4	Possibility of the Establishment of Community Forestry F-32
4.1.2	Forest in Private Lands F-32
4.1.2.1	Distribution and Usage of Resources F-32
4.1.2.2	Regreening (<i>Penghijauan</i>) and Private Forest (<i>Hutan Rakyat</i>) F-34
4.1.2.3	Extension Services F-34
4.1.3	Other Important Issues for Forest Management F-34
4.1.3.1	Nursery F-34
4.1.3.2	Useful Species F-36
4.1.3.3	Fire Protection F-36
4.1.4	Current Problem of Forestry in the Intensive Area F-36
4.2	Forest Management and Rehabilitation Plan for the Intensive Area F-39
4.2.1	Need of Watershed Conservation from Forestry Viewpoint F-39
4.2.2	Basic Approach F-39
4.2.4	Boundary Survey for Protection Forests F-40
4.2.3	Community Forestry Plan F-40
4.2.5	Reforestation Plan F-43
4.2.6	Strengthening Plan of Forest Patrol F-43
4.2.7	Research Plan for Non-wood Forest Products F-44
4.2.8	Fuel Wood Planting Plan F-44
4.2.9	Timber Tree Planting Plan F-45

	<u>Page</u>
4.2.10 Strengthening Plan of Extension Services	F-45
4.2.11 Conservation Plan for Each Zone	F-46
4.2.11.1 Conservation Plan for P Zone	F-46
4.2.11.2 Conservation Plan for Bm1 Zone	F-48
4.2.11.3 Conservation Plan for Bm2 Zone	F-49
4.2.11.4 Conservation Plan for Bm3 Zone	F-50
4.2.11.5 Conservation Plan for Bw Zone	F-50
4.2.12 Implementation Schedule	F-50
4.2.13 Cost Estimate	F-51
4.2.14 Recommendations	F-51

List of Tables

	<u>Page</u>
Table F.3.1 Distribution of Reforestation in and around the Study Area during 1976 - 1999	FT-1
Table F.3.2 Regreening Activities in the Study Area in FY 1999 / 2000	FT-2
Table F.4.1 Protection Forest Boundaries in the Study Area	FT-3
Table F.4.2 Price of Timber Woods	FT-4
Table F.4.3 Useful Tree Species in the Study Area	FT-5
Table F.4.4 Cost Estimation for Forestry Program	FT-6

List of Figures

	<u>Page</u>
Figure F.3.1 Distribution of Protection Forests	FF-1
Figure F.4.1 Encroached Area in Soputan Protection Forest	FF-2
Figure F.4.2 Legal Procedure of Community Forestry	FF-3
Figure F.4.3 Cross Section of Proposed Community Forestry	FF-4

Attachment

- Attachment-F.1 Interview Survey for Industry Consuming Forest Products
- Attachment-F.2 Interview Survey for Forest Reclamation
- Attachment-F.3 Informal Meeting with Encroached Farmers

**THE STUDY
ON
CRITICAL LAND
AND
PROTECTION FOREST REHABILITATION
AT TONDANO WATERSHED
IN
THE REPUBLIC OF INDONESIA**

**Volume-II
APPENDIX-F**

FORESTRY

CHAPTER 1 INTRODUCTION

In Appendix-F, analysis of present condition of forestry for both the master plan of the Study Area and the feasibility study of the Intensive Area are described.

In the master plan, present condition of forest management and usage of forest resources are analyzed. Then, existing forest management and rehabilitation plans such as Working Plan of Regional Forestry Office, Provincial Forestry Service Office are reviewed. After examined the current problem of forestry in the Study Area, basic approach and component of conservation plan are presented. The component of conservation plan is considered in accordance with two main forest types in the Study Area, those are protection forests and forests in private lands.

In the feasibility study, the present condition of protection forest and forests in private lands in the Intensive Area is detailed. Then the current problem of forestry in the Intensive Area is selected respectively. In the planning section, plans needed for forest management and rehabilitation for the Intensive Area are suggested. Those plans include boundary survey of the protection forests, community forestry, reforestation, forest patrol, fuel wood planting, timber wood planting, extension services, and etc. Finally, cost estimation and implementation schedules are described.

CHAPTER 2 GENERAL BACKGROUND

2.1 Forest Sector in Indonesia

MOFEC sets forth a vision to actualize management of forest and estate crop resources for the prosperity of people. In this vision, an emphasis was thus put upon development of community capacity and distribution of benefits of forest and estate crops in a fair, efficient and sustainable manner through a participatory, integrated, transparent and responsible management system.

In order to realize this vision, MOFEC has prepared the strategies in a way that working and development investment should move in the direction of increasing of community capacity and institutions, efficiency of use of resources, fair distribution of benefits and sustainability of development. With these strategies, MOFEC states the following development policies for forestry and estate crops. MOFEC was reorganized in the year 2000 and these policies are succeeded in present MOF.

- (1) Core Policy
 - (a) Develop the forestry and estate crops sector in a sustainable way.
 - (b) Realize integrity and synergism in the implementation of forestry and estate crops principled on ecological, economic and social sustainability, aiming at realizing forests and estate crops for people.
 - (c) Carry out a shift in development policy from concentration on timber management to concentration on multipurpose forest management.
 - (d) Strengthen the competitive power of forest and estate crops commodities through increasing product quality and efficiency with support to co-operative or other community economic institutions, and partnership businesses that promote the increase of manufactured goods for foreign exchange.
 - (e) Organize forest and estate crop lands utilization to increase growth through even distribution, increasing investment and the competitive power for small and medium businesses and co-operatives.
 - (f) Perfect institutions, regulations and laws that reflect the communities' rights as well as developing a forest and estate crops management information system.
 - (g) Intensify and integrate the implementation, supervision and close guidance, and structural supervision including community supervision that is supported by giving consistent guidance and a legal framework as well as national discipline.

(2) Operational Policy

- (a) Accelerate the fixing of permanent forest areas, and the availability of land for the development of estate crops and other non-forestry sectors.
- (b) Improve the quality and productivity of national forest areas, private forests and community forests, estates, and improve the management of conservation areas and nature reserves, protection forest, hunting parks as well as the ecosystem.
- (c) Continue the increase in development of industrial forest plantations, forest rehabilitation, especially in burnt areas.
- (d) Consolidate products and continue development of forestry and estate crops which have been achieved so that assets which have already been developed can produce optimally, which is directed towards actualizing a complete agribusiness and forest business of an economic scale. Support the ability to handle processing and marketing of forest and estate crop products through carrying out intensification, rehabilitation, diversification and extensification.
- (e) Reinforce and increase community institutional capacity as well as giving opportunity and role to communities, co-operatives, small and medium businesses in the forestry and estate crop sector, amongst others activities to utilize flora, fauna and natural tourism places.
- (f) Create sustainable farmers groups, that is through supporting local farmers to establish co-operatives or other community economic institutions, with a supportive business climate and the availability of credit funds, as well as equal partnership, so that local community have access to capital, production, distribution and markets.
- (g) Increase the ability of provincial governments, the role of youth and women in developing forestry and estate crops.
- (h) Protect forests and estate areas, forest and estate products and other natural resources from fire danger, encroachment and stealing of forest and estate crop products, through participation of communities (prosperity approach), in the form of formal, non formal and local NGO empowerment.
- (i) Improve the role of research and development as well as increasing human resource abilities for development of forest and estate crops, through giving importance to adoption of local technology, which is environmentally friendly and easy to use.
- (j) Create community industrial estate areas in each development location and create estate crop production centers that are carried out with the

principle of economic co-operation, in order to support the development of integrated economic areas.

- (k) Adopt a sustainable forestry system with priority to use eco-labeling for forest and estate crop products.
- (l) Increase the implementation of supervision and guidance, especially in the framework of accelerating the creation of a clean and authoritative government that is free from influence of collusion, corruption and nepotism, as well as improving the way of working and openness.

As the quantitative targets for the two years of 1999/2000 and 2000/2001, MOF gave development of 110,000ha for private forests and rehabilitation of 200,000ha for forests and critical lands.

2.2 Forest Sector in North Sulawesi Province

The Regional Forestry Office and Provincial Forestry Office have prepared the working plans of land and forest rehabilitation, following the said development policies. The details of these working plans are given below. As decentralization is now undergoing in this country, the function of Regional Forestry Office is transferred to Provincial Forestry Office. The policy and responsibility are succeeded in Provincial Forestry Office.

(1) Working Plan of Regional Forestry Office

This office has prepared a working plan of rehabilitation of Tondano watershed 1997/1998 - 2001/2002. This plan includes such components mentioned below.

(a) Main activities

- Watershed rehabilitation

Project plan, community forest design, seed supply, planting multipurpose tree species, terrace construction and rehabilitation, planting in critical land and demonstration plot of Cempaka tree.

- Regreening (*Penghijauan*)

Demonstration plot for conservation of natural resources and/or sustainable farming system (*UP-UPSA/UPM*), village nursery (*Kebun Bibit Desa, KBD*), private forest/garden (*Hutan/kebun Rakyat*), terrace rehabilitation (*Rehabilitasi Teras*), and constructing soil conservation measure such as check dam, gully plug and absorption well.

- Reforestation (*Reboisasi*)

(b) Supporting activities

- Institution building: building and training of farmer group, village cooperation, student, boy scouts, NGOs, and field/technical staff.
- Spreading method of information: spread of information by TV, radio, mass media, leaflet, brochure and integrated extension.
- Planning: preparation of 5-years activity plan and annual activity plan.
- Monitoring and evaluation: monitoring of the monthly, three-monthly and annual activities, evaluation and reporting.
- Supervision and controlling: coordinating meeting, field supervision, and project controlling.

(2) Working Plan of Provincial Forestry Service

The Provincial Forestry Service has worked out a work plan for 2000/2001. The activities to be implemented in the Study Area in this plan are:

- Inventory of reforestation achievement
- Development of protection forest of Mahawu for ecotourism
- Planting of bamboo trees in protection forest of Mt. Soputan
- Maintaining of a protection forest boundary of Mt. Klabat by planting hibiscus (*Hibiscus Rosasinensis*) in hedge grow.

There is also a cooperation program between governor of North Sulawesi and governor of Jakarta, which will probably be started this year. Activities of the program include the development of a bamboo forest (1,000ha a year), rattan forest (500ha a year), apiculture (honey bee cultivation for 200 unit), and eco-tourism.

2.3 Forest Classification and Afforestation Program

2.3.1 Legal Definition and Classification of Forest

The New Forest Law (RI Law No. 41/1999) defines “forests” as follows.

According to its status, two kinds of forests are determined:

- 1) **State Forest (*Hutan Negara*)**: which is located on land bearing no ownership right. Customary Forest (*Hutan Adat*) located in the traditional jurisdiction area is also classified into State Forest.
- 2) **Right Forest (*Hutan Hak*)**: which is located on lands bearing ownership right.

Based on its function, State Forest is divided into three categories.

- 1) **Conservation Forest (*Hutan Konservasi*)**: which has main function of preserving specific characteristics of flora and fauna diversity and its ecosystem.
- 2) **Protection Forest (*Hutan Lindung*)**: which has main function of protecting life supporting system such as water supply, preventing floods, controlling soil erosion, sea water intrusion, and maintaining soil fertility.
- 3) **Production Forest (*Hutan Produksi*)**: which has main function of producing forest products.

At present, only Protection Forest among State Forest is distributed within the Study Area.

The President decision No. 32/1990 states the criteria of protection forests. Protection forests should be the forests those have:

- 1) The total score of slope gradient, soil type and rainfall are 175 or more, (refer Appendix-E Chapter 2.2) and/or
- 2) The slope gradient of 40 % or more, and/or
- 3) The altitude of 2,000 meter above sea level or more

According to the New Forestry Law, protection forest could be used for specific purposes without disturbing the main function of the protection forests. Those are:

- 1) Utilization of its area
- 2) Environmental utilization
- 3) Collection of non-timber forest products

The permission for the **utilization of its area** and the **collection of non-timber forest products** can be given to individuals or cooperative organizations. While the permission for the **environmental utilization** can be given to individuals, cooperative organizations, Indonesian private enterprises (*badan usaha milik swasta indonesia*), state enterprises (*badan usaha milik nasional*), and regional enterprises (*badan usaha milik daerah*).

Draft of government regulation concerning forest arrangement, design of forest management plan, and forest and forest zone utilization is still under preparation. In the draft, acceptable activities for the specific purposes in the protection forests are listed.

The **utilization of its area** is an effort to utilize growing space for some plants under forest trees. It consists of following activities:

- 1) Medicinal plants cultivation,

- 2) Decorating plants cultivation,
- 3) Mushroom cultivation,
- 4) Rattan cultivation,
- 5) Bee cultivation,
- 6) Eco-tourism,
- 7) Other similar activities, without disturbing the main function of protected forest.

Environmental utilization consists of following activities:

- 1) Eco-tourism,
- 2) Challenged sports,
- 3) Outward bound building,
- 4) Water use,
- 5) Other similar activities without disturbing the main function of protected forest.

Collection of non-timber forest products consists of following activities:

- 1) Rattan collection
- 2) Honey bee collection
- 3) Sap collection,
- 4) Fruit/seed collection,
- 5) Leaf collection,
- 6) Mushroom collection,
- 7) Under trees plant collection,
- 8) Bird's nest collection,
- 9) Insect collection,
- 10) Other similar commodities, without disturbing the main function of protected forest.

2.3.2 Afforestation and Social Forestry Program

In the New forestry law (law No. 41/1999), land and forest rehabilitation is the aspect of the forest management. Rehabilitation activity could be done in all forest except in nature reserves and the core zone of national parks. Rehabilitation is carried out through following activities.

- 1) Reforestation (*Reboisasi*)
- 2) Regreening (*Penghijauan*)
- 3) Tending (*Pemeliharaan*)
- 4) Enrichment Planting (*Pengayaan tanaman*)

5) Application of soil conservation through vegetative and mechanical means on critical and non-productive lands

The rehabilitation activities that can be carried out in State Forest are called as Reforestation (*reboisasi*), while outside of State Forest is Regreening (*penghijauan*). Regreening is an effort to recover and to improve the productivity of critical lands, especially in the non-forest upper watershed area, and also to improve the efficiency of land in relation to its suitability for specific use.

Tending (*Pemeliharaan*) is the activities to maintain and to improve the quality of plantation with proper silvicultural treatment. On the other hand Enrichment Planting (*Pengayaan tanaman*) is for improving land and forest productivity by means of the optimal use of growing space with tree species enrichment. Both of them are considered as important parts of Reforestation and Regreening activities. In addition, Reforestation and Regreening include not only planting method but also non-vegetative method such as check dams and terracing.

From a viewpoint of social forestry, there are two kinds of official activities. Those are Private Forest (*Hutan Rakyat*) and Community Forest (*Hutan Kemasyarakatan*).

Private Forest is undertaken outside of state forest and considered as a part of Regreening. The main difference between them is that Regreening (in narrow sense) aims critical land rehabilitation, while Private Forest aims improving local residents' welfare through planting economically valuable trees. (The critical land is defined as the land that has damaged and its function has lost and decreased up to the established limitations (Decree of the General Director of the Land Rehabilitation and Reforestation No.41/Kpts/V/1998)).

On the other hand, Community Forest is established inside of state forest area, which is decided by The Ministry to be managed by local resident (Decision of Ministry of Forestry and Estate Crops No. 677/Kpts-II/1998). The policy was formulated for improving community participation in forestry development. This program puts emphasis on community welfare, too.

CHAPTER 3 MASTER PLAN STUDY FOR THE STUDY AREA

3.1 Present Condition

3.1.1 Forest Management

3.1.1.1 Organization and Each Responsibility

The forest organization of Indonesia consists of three levels. Those are national level (Regional Forestry Office), provincial level (Provincial Forestry Service), and district level (District Forestry Service). Their Responsibility and organization are summarized below on a basis of the information in August 2000. Decentralization is now undergoing in this country, so the organization of forestry sector is also changed. Main change is that the function of Regional Forestry Office is transferred to Provincial Forestry Office. New organization after this restructuring is described in Appendix-I.

(1) Regional Forestry Office (*Kantor Wilayah Kehutanan dan Perkebunan, KANWIL*)

This office is an executing office of Department of Forestry and estate crops in implementing its program. The main responsibility is to plan and to regulate the whole activities concerning forestry in the province. The office consists of several divisions and unit of technical executor (UPT), i.e.

- a) Division of Administration/management
- b) Division of Program
- c) Division of Forest Exertion
- d) Division of Reforestation and Land Rehabilitation
- e) Division of Forest Tenacity and Nature Conservation
- f) Unit of Technical Executors
 - f-1) Land Rehabilitation and Soil Conservation of Tondano (Sub BRLKT Tondano)
 - f-2) Bogani Nani Wartabone National park Office
 - f-3) Bunaken National park Office
 - f-4) Natural Resources Conservation Office (BKSDA)
 - f-5) Forest Inventory and Mapping Office (BIPHUT)

(2) Provincial Forestry Service (*Dinas Kehutanan Tingkat I*)

According to Regional Regulation PERDA No.8/1980, Provincial Forestry Service (*Dinas Kehutanan Tingkat I*) is an executing office of regional government.

Different from KANWIL, this office is an office to execute a concrete program on forestry. Provincial Forestry Service has divisions of:

- a) Division of Program Building:
- b) Division of Production
- c) Division of Farming
- d) Division of Forest Building
- e) Division of Security and Extension

(3) District Forestry Service (*Dinas Kehutanan Tingkat II*)

This office is also an office to execute a concrete program on forestry. According to Governor of Minahasa Decision No.161/ 1996, District Forestry Service (*Dinas Kehutanan Tingkat II*) consists of:

- a) Section of Forest Product Circulation
- b) Section of Community Forest Development
- c) Section of extension service and soil conservation
- d) Branch office of *Dinas Kehutanan Dati II* Minahasa
- e) Unit of technical executor

This office has its task as follows:

- a) Selling and circulation of forest product
- b) Forest protection
- c) Planting and soil conservation
- d) Sericulture
- e) Apiculture
- f) Community and property forest
- g) Forest extension
- h) Other task that assigned by government

3.1.1.2 Protection Forest Management and Reforestation (*Reboisasi*)

(1) Distribution of protection forest

The distribution of the protection forest is shown in Figure F.3.1. All of them are distributed on top of mountains in fringe of the Study Area. Approximate area of the protection forest in the Study Area is 3,207ha that correspond to 5.6% of the Study Area.

The area and condition of the protection forest in and around the Study Area is shown in the table below (the area includes outside of the Study Area). The table

shows that certain area of the protection forest is recognized as damaged forests. According to the Provincial Forestry Service, damaged condition means that the forest has disturbed by people in their several activities such as illegal cutting, shifting cultivation, and others. But the survey method for determining the forest condition is uncertain. Then the precise survey is required for determining the actual condition of the protection forests.

Protected Forest Condition in and around the Tondano Watershed in 1998/1999

No	Location	Area (ha)	Good Condition (ha)		Damaged Condition (ha)	
			Primary forest	Secondary forest	Bush	Dry land/ Other use
1	Mt.Klabat	5,670.00	3,939.40	1,100.00	0.00	630.60
2	Mt Mahawu	550.00	230.00	320.00	0.00	0.00
3	Mt.Masarang	144.79	86.23	58.56	0,00	0.00
4	Mt.Tampusu	309.00	309.00	0.00	0.00	0.00
5	Mt.Lengkoan	351.00	351.00	0.00	0.00	0.00
6	Mt.Lembean	2,700.00	1,884.00	0.00	210.00	605.52
7	Mt.Kawatak	980.00	124.12	0.00	441.26	414.62
8	Mt.Soputan	13,440.0	6,236.06	4,400.80	1,650.00	1,153.14
9	Mt. Kaweng	417.86	-	-	-	-

Source: Statistics of Dinas Kehutanan Dati I Sulawesi Utara, 1999. Sub BIPHUT Manado, 2000.

(2) Procedure for determining the boundary

The boundary of the protection forests in the Study Area has determined by following procedure (personal contact with Mr. Sitorus, the head of *Sub-BIPHUT*). At first, all forestry office concerned (Provincial Forestry Service, District Forestry Service, and *BIPHUT*) and Regional Development Planning Agency (*BAPPEDA*) had a discussion and defined that which area would be proposed for protection forest. Then the Governor proposed the areas to the Ministry of Forestry. After the approval by the ministry, the areas were surveyed and mapped by a working committee. The chairman of the committee is the Governor of the District (*Bupati*). The members consist of the heads of District Forestry Service (*DINAS Kehutanan II*), Head of *BAPPEDA II, sub-BIPHIT*, National Land Agency (*Badan Pertanahan Nasional, BPN*), Regional Service of Food Crops (*Dinas Pertanian Tanaman Pangan*), Regional Service of Public Works (*Dinas PU*), and Sub-district (*Kecamatan*).

The construction of the boundary has two stages. At first the boundary is temporary constructed in a field with the consultation of the Governor of the District (*Bupati*), the Head of Sub-district (*Camat*), and village chiefs (*Hukum Tua*). Then, after the result of the first stage is approved by the working committee, permanent boundary monuments are constructed.

Now, restructuring of the boundaries is going on as shown in the table below.

Restructuring of Protection Forest Boundaries in the Study Area

No.	Location	Years of restructuring
1.	Mt. Klabat	1996/1997
2.	Mt. Mahawu	1986/1987
3.	Mt. Masarang	1996/1997 (Newly established)
4.	Mt. Tampusu	1985/1986
5.	Mt. Lengkoan	-
6.	Mt. Lembean	1977/1978
7.	Mt. Kawatak	-
8.	Mt. Soputan	-
9.	Mt. Kaweng	1996/1997 (Newly established)

Source : Sub-BIPHUT Manado, 2000

(3) Management of protection forest

According to the decision of Ministry of Forestry No. 464/Kpts-II/95, the management of protection forest is delegated to the regional government.

A reforestation program of the protection forest (*Reboisasi*) was carried out by Provincial Forestry Service Office (*Dinas Kehutanan Tingkat I*). The results that have been achieved during the period from 1976 to 1999 in and around the Study Area are presented in Table F.3.1. In 70's and 80's pine (possibly *Pinus merkusii*) was the main species, but from the late 80's nantu (*Palaquium oblongifolium*) then gmelina (*Gmelina spp.*) became the main species.

The latest planting activity of reforestation project in Tondano watershed was conducted in fiscal year of 1998/1999. The area of 100ha was planted. At present, there is no more reforestation program persecuted by Provincial Forestry Service in this area except tending of 100ha of planted trees mentioned above. The reforestation is united with the other rehabilitation projects and handed over to District Forestry Service Office (*Dinas Kehutanan Tingkat II*) in the current of the autonomy.

District Forestry Service Office (*Dinas Kehutanan Tingkat II*) has begun to implement some management program of protection forest in Tondano watershed. In fiscal year 1999/2000, the office has conducted a project of protected forest arrangement. An area of 150ha in the protection forest of Mt. Lembean had been assessed and the area was divided into protection zone and utilization zones. There is no afforestation activity by the office by this time.

3.1.1.3 Regreening (*Penghijauan*)

This program is conducted by District Forestry Service Office (*Dinas Kehutanan Tingkat II*). The result of Regreening program in Tondano Watershed in fiscal year of 1999/2000 is shown in Table F.3.2. The activities are Private garden/forest (*Hutan/Kebun Rakyat*) for 40 places, Village nursery (*Kebun Bibit Desa, KBD*) for 6 places, and Demonstration plot for conservation of natural resources (*Unit Percontohan Usaha Pelestarian Sumberdaya Alam, UP-UPSA*) for 3 places. Besides them, check dams were constructed for 5 places. The demonstration plot is for exhibiting how to implement soil conservation and how to apply the techniques in farmer's land. The applied techniques consist of physical one (terracing, bank, ridge) and vegetative one (planting trees).

Originally Regreening and Private forest are different programs in their purposes. Regreening aims critical land rehabilitation, while Private forest aims improving local residents' welfare through planting economically valuable trees. But practically it seems that Private forest is executed as a part of Regreening program by the office.

3.1.1.4 Local Resident's Participation Program and Social Forestry

(1) Community forest (*Hutan Kemasyarakatan, HKM*)

The policy that is formulated by the government for improving community participation in forestry development is community forest (*Hutan Kemasyarakatan, HKM*) (Decision of Ministry of Forestry and Estate Crops No. 677/Kpts-II/1998). The communities located close to the state forest are given concession rights to manage the forest based on their need, capability, and knowledge.

Basic principles of community forest are:

- a) Community as the main subject in benefit obtaining
- b) Community as the decision maker in defining management system
- c) Government as facilitator and activities observer
- d) The certainty of rights and duties for all groups
- e) Entrepreneur institution is determined by the community
- f) The approach based on bio-diversity and cultural diversity

State Forests that could be used as community forests are production forests, protection forest, and a part of nature conservation area. Criteria used to preserve the areas for community forests are the areas:

- a) not in other uses like concession forests (*Hak Pengusahaan Hutan, HPH*),

concession forests for industrial trees (*Hak Pengusahaan Hutan Tanaman Industri*, HPHTI)

- b) in use but will be terminated
- c) sensitive to forest disturbance (cleared off, illegal cutting, forest fire, conflict of land)
- d) close to the settlements
- e) occupied by people for a long time
- f) managed traditionally
- g) claimed as a customary land

The Regional Forestry Service Office (KANWIL) and other forestry office conduct inventory survey and identification of State Forest for community forest. Based on them and governor's recommendation, the head of KANWIL proposes to the Ministry to define the area of community forest.

The development of community forest shall be conducted parallel to the development of local community institution through cooperation unit (*koperasi*). Government provides associate staff who may come from NGOs, universities, or extension agent.

Community forests have not been established in the Study Area because of the limited distribution of Protection Forest.

(2) Private forest/garden (*Hutan/Kebun Rakyat*)

Another local resident's participation program is Private forest/garden (*Hutan/Kebun Rakyat*). Private forest/garden aims improving local residents' welfare through planting economically valuable trees.

During field survey, some Private forest/garden sites are visited. At the sites, cempaka (*Elmerrillia spp.*), mahogany (*Swietenia macrophylla*) coffee and cacao are planted intermittently (about 4~5m in interval) in maize field. Cempaka trees have achieved 7m in height for 7 years after planting. The planted trees have grown 1.5 ~ 3.0m in height for 3years in another site. Achievement of Private forest/garden in the fiscal year of 1999/2000 is already mentioned in the previous section.

(3) Regreening Assistance funds

Directorate general of regional development in Ministry of Internal Affairs designed Regreening Assistance Funds for planting to the farmer. Local people can be involved in Regreening (*Penghijauan*) and Reforestation (*Reboisasi*) program.

Government provides funds for helping farmers who wish and capable in implementing planting program. The farmers have to be an active participant in all process such as planning, executing, and supervising through method of Village Regreening Participatory Study (*Pengkajian Partisipatif Penghijauan Desa, P3D*). The participants have to organize regreening farmers group (*kelompok tani penghijauan, KTP*) and the funds will be given to the KTP directly. Assistants of the forestry office will supervise the KTP technically and administratively.

The funds are given to two activities groups. They are named as physical input group and supporting group. The physical input group carries out direct input regreening (*penghijauan input langsung, PIL*), regreening for impact area (*penghijauan daerah dampak, PDD*), and self supporting regreening (*Penghijauan swadaya, PS*). While the fund for supporting group is used for honorarium of extension staffs, supervisor, and etc. The groups which can get the fund are selected by District Forestry Service Office.

In the Study Area, the funds are used for *PIL* in Regreening (*Penghijauan*) program in which Private garden/forest (*Hutan/Kebun Rakyat*), Village nursery (*Kebun Bibit Desa, KBD*), Demonstration plot for conservation of natural resources (*Unit Percontohan Usaha Pelestarian Sumberdaya Alam, UP-UPSA*), and terrace rehabilitation are implemented. In addition, as there is no community forest established in the Study Area, the activity using the funds is concentrated in regreening activity in the area.

3.1.1.5 Forestry Extension Services

(1) History of forestry extension services

Based on President of RI Decision No. 58/1993 and Ministry of Forestry decision No. 677/Kpts-II/1993, Center for Forest Extension was formed for conducting extension in all managing and technical aspects of forestry development.

Based on Government regulation, PP No. 62/1998 concerning a delegation of government affairs in forestry to district government, forestry extension service was fully delegated to district government (*Dinas Kehutanan Tingkat II; Dinas TK II*).

(2) Responsibility of each office

There is three level of extension service organization. The main task of regional forestry extension staff is as follows:

- a) Provincial level:
 - a-1 Conducting extension and demonstration to community groups
 - a-2 Preparing a forestry extension program in provincial level
 - a-3 Training and supervising subordinate forest extension staff
 - a-4 Helping to prepare technical guidelines for an extension program
 - a-5 Conducting examination, supervision, survey and evaluation
 - a-6 Training a group of people in a field level forestry training program
 - a-7 Developing community self-supporting

- b) District level:
 - b-1 Conducting extension and demonstration to community group
 - b-2 Motivating self-supporting efforts of community
 - b-3 Preparing forestry extension program in field level
 - b-4 Training a group of people in a field level forestry training program
 - b-5 Training and supervising subordinate forest extension staff
 - b-6 Helping conducting examination, supervision, survey and evaluation

- c) Sub-district (*Kecamatan*) level:
 - c-1 Conducting extension and demonstration to community group
 - c-2 Motivating self-supporting efforts of community
 - c-3 Preparing forestry extension program

(3) Extension method

The approaches, which used in implementing the extension services, are personal approach, group approach, and mass approach. The personal approach is by letter, telephone, apprentice, and home visit. The group approach is by seminar, dialog/discussion, demonstration, training, and study tour. The mass approach is by lecture, exhibition, radio and TV broadcasting, and poster distribution.

In the Study Area, extension services are mainly carried out by senior forestry extension staff (*Penyuluh Kehutanan Madya, PKM*, 8 people) and junior forestry extension staff (*Penyuluh Kehutanan Lapangan, PKL*, 56 people) who belong to District Forestry Service. Among them, 59 staffs receive salary from the government and 5 staffs are funded by individual project. The staff conduct extension service about greening and reforestation activities. They applied *LAKU* method (*LAKU* is formed by training and visiting in which the staffs are trained and then visit the farmers group). Training for the extension staffs is mainly conducted by Forestry Training Office (*Balai Latihan Kehutanan*).

3.1.1.6 Seeds and Seedlings Supply System

Government nurseries are mainly prepared for supplying seedlings for Reforestation (*Reboisasi*) and Regreening (*Penghijauan*) program. There is no permanent nursery prepared by government in the Study Area. A temporary nursery is prepared in a place close to the planting site each time within each planting program instead. Main species grown in the nursery are gmelina (*Gmelina sp.*), nantu (*Palaquium oblongifolium*), and other multi purposes species (MPTS) such as jack-fruits tree (*Artocarpus heterophyllus*), and durian (*Durio Zebethinus*).

Usually 2.400 seedlings are required for the planting area of one hectare. 1.650 seedlings for first planting, 350 for replacing dead trees in first year, and 400 for replacing dead trees in second year.

Private enterprises also run several units of nurseries. Generally, the species grown in these private nurseries are cempaka (*Elmerrillia spp.*), mahogany (*Swietenia macrophylla*), sengon (*Albizia sp.*), and, nantu (*Palaquium oblongifolium*). The seeds for the nurseries are collected from the mother trees by local farmers and sold to the nursery owners. The price of the seeds is Rp.200,000 - 300,000/kg. The price of seedling grown in the nursery is around Rp.700 - 1,000 per single seedling. The seedlings are grown in the nurseries for between 6 months and 1 year, then sold to the local farmers directly. They also supply seedlings to government by its request.

In addition, the nursery of *BRLKT* is placed in Kota Mobagu south to the Study Area, where is the one of the producing districts of timber woods which are consumed in and around the Study Area.

3.1.1.7 Fire Protection

Forest fire that occurred in and around the Study Area in 1997 is shown in the table below. Although the evidences of the forest fire such as burned stamps and chard ground are not observed during the field survey, it seems that certain areas in and around the Study Area are affected by fire. It is assumed that the most possible cause of the fire is a spreading fire from farming lands where farmers burn the ground as a preparation for planting crops.

Forest fire occurred in and around the Study Area in 1997

No	Location	Area (ha)	
1.	Mt. Mahawu	75.00	Secondary forest
		96.00	Primary forest
2.	Mt. Sopotan	95.41	Pine forest
		425.00	Reforestation area
		1,711.18	Primary forest
		1,108.77	Alang-alang grass

Source: Statistics of *Dinas Kehutanan Dati I Sulawesi Utara*, 1999.

Fire protection and control follow the guidelines prepared by Directorate General of Forest Protection and Natural Conservation (No.243/Kpts/DJ-VI/1994~No. 248/Kpts/DJ-VI/1994). These guidelines are as follows:

- a) Technical guidelines for protection and controlling forest fire in concession forest area and non-forest area (No.243)
- b) Guidelines for forest fire extinguishing (No.244)
- c) Permanently procedure in using tools of forest fire extinguisher (No.245)
- d) Guidelines for designing and installing forest fire sign (No.246)
- e) Guidelines for standardization of tools for forest fire protection and control (No.247)
- f) Permanently procedure in protection and control forest fire (No.248)

District Forestry Service Office (*Dinas Kehutanan Tingkat II, Dinas TKII*) conducts an activity for forest fire protection. The office trained local people near the forest how to prevent forest fire. When forest fire occurred in this area, people are asked to give their assistance in controlling forest fire. Tools for extinguishing fire are supplied by the government.

3.1.2 Existing Forest Resources and their Usage

3.1.2.1 Forest Resources

As shown in the present land use map (Appendix-E), distribution of forests in the Study Area is very limited mostly on top of the mountains with steep slopes and most of them are designated as protection forest. Firewood plantations are found in private lands. Main species are kaliandra (*Calliandra calothyrsus*) and gamar (*Gliricidia sepium*). There is no extensive timber plantation in the area. Small plantations or individual planting among agricultural land are commonly found. cempaka (*Elmerrillia spp.*) is the most preferable species for timbers.

Besides forest products, forest area is one of the important areas from a viewpoint of conserving bio-diversity. In cooperation with University of Sam Ratulangi, the

forestry office conducted some inventory researches of the protection forest. The result is compiled in a report “Identification of Potency and Data of Bio-diversity in Minahasa District and Municipality of Bitung, Research Team of Post Graduated Program University of Sam Ratulangi”. Inventory of flora and fauna of the protection forest is listed in this report. But some lists seem to be insufficient as a complete inventory. Then more precise research on bio-diversity seems to be required.

3.1.2.2 Usage of Resources and Forest-related Industry

In the Study Area, there are some industries consuming forest products, mainly wood products. Most of them are relatively small enterprises of housing factories, furniture factories, pottery makers, brick makers, and etc. Interview survey for them was carried out and the result is shown in Attachment F.1. According to the survey result, the most timber woods seem to come from outside of the area such as Bolaang Mongondow District. On the other hand, firewood for the industry can be obtained within the Study Area. Old coconut trees and dead clove trees are main sources for the firewood. This fact shows that timber resources of the Study Area are limited, but firewood resources for the industry can be supplied from agricultural lands at present.

Moreover many local people still rely on firewood for their daily life. The present condition of the consumption of firewood is surveyed in The Farmers Survey and the result is analyzed in Appendix-G.

In addition, Lundstrom and Burghorn mentioned some usage of forest resources as following. The small forest area provides rattan, resin, firewood, bamboo and many kinds of valuable hard woods. The most valuable timber is black ebony (*Diospyros sp.* or *kayu hitam*) which has been scarce since the forced deliveries of the woods to the Dutch Government in the 17th century. Among wild growing plants, the most useful is bamboo. Next to bamboo, the most desirable plant is the sugar palm (*Arenga pinnata*). Its sap provides the famous palm wine and brown sugar is also made from the sap. Hairy fibers made of the leaf-stalks are used for making ropes and strings. The leaves are traditionally thought the very best material for roofing and the stems provide a hard and useful timber. (Lundstrom and Burghorn; 1981, Minahasa Civilization, a tradition change. Acta University, Sweden).

3.1.2.3 Reclamation of Forest Area

Comparing the two maps in scale of 1/50,000 for present land use (distribution of forest area) and the latest boundary of Protection forest, serious encroachment in the protection forest is not observed.

But past Reforestation (*Reboisasi*) activities, which is executed for a rehabilitation of protection forest, indicate there was some disturbance in the protection forest. Existence of damaged condition forest (see table in section 3.1.1.2) also implies existence of forest disturbance. Moreover the fact of restructuring of the protection forest boundary implies an existence of some encroachment. It is assumed that the new boundary was made to confirm rights for encroached local people.

The result of some interviews for local farmers on forest reclamation is shown in Attachment F.2. The interviewees also tell that there is some encroachment in the protection forest for reclaiming new cultivation lands and also illegal tree cutting.

Although extensive encroachment is not observed during this study, these facts above show the encroachment pressure such as illegal forest reclamation and tree cutting is rather high in the Study Area.

3.1.3 Implementation of Forest Management and Rehabilitation Plans in the Study Area

(1) Working Plan of Regional Forestry Office (*Kantor Wilayah Kehutanan dan Perkebunan Propinsi Sulawesi Utara. KANWIL*)

This program should be implemented in fiscal year 1997/1998 - 2001/2002. This plan contains a number of activities that will be implemented by the whole forestry office and other related offices. The implementation of Reforestation (*Reboisasi*) and Regreening (*Penghijauan*) is reviewed in section 3.1.1.

Planning and Evaluation Project of Tondano Watershed (*Proyek Evaluasi dan Perencanaan DAS Tondano, PEPDAS Tondano*)” is an operational plan of the working plan, which is implemented by *BRLKT. PEPDAS Tondano* consists of several activities, i.e. institution



Rattan Planting in Noongan

development, demonstration plot construction, training and extension services on land rehabilitation and soil conservation, and development of program of land rehabilitation and soil conservation of watershed (*RLKT-UKT DAS*).

In fiscal year 2000, *BRLKT* has implemented several programs in the Study Area such as development of diversified initiative forestry (establishing of model area of fruits and rattan cultivation), food reserved forest, private forestry development, and agroforestry.

Achievement of those programs in the Study Area in fiscal year 2000 is presented in the table below.

The Activities of Land and Forest Rehabilitation in the Study Area in Fiscal Year 2000 (implemented by *BRLKT*)

No	Activities	Location (village/sub-district)	Area (ha)
1.	Development of diversified forestry activities		
	• Establishing of model area of fruits cultivation	Koka / Pineleng	10
	• Establishing of model area of rattan cultivation	Noongan / Langoan	10
2.	Food Reserved Forest (<i>Hutan Cadangan Pangan, HCP</i>)	Koka / Pineleng	10
		Kuwil / Airmadidi	10
		Talikuran/Kawangkoan	10
3.	Development of Private Forest	Sukur / Airmadidi	25
4.	Agroforestry (under trees cultivation development)	Roong / Tondano	10
		Talikuran / Remboken	20
		Uner / Kawangkoan	10
		Teep / Langoan	15
5.	Planning and Evaluation Project of Tondano Watershed (<i>Proyek Evaluasi dan Perencanaan DAS – PEPDAS Tondano</i>)		
	• Institution development:		09
	- Tending of agroforestry model area	Paslaten / Remboken	
	- Preparing extension service material (leaflets) and training of extension workers		
	• Controlling/ construction supervision		
	- Monitoring of hydrology and land use.	Marawas	
	- Monitoring of <i>RLKT/UTLK DAS</i>	(location of <i>SPAS</i>)	

(2) Provincial Forestry Service (*Dinas Kehutanan Tingkat I; Dinas TK I*)

Provincial Forestry Service has designed a work plan for fiscal year of 2000. Implementation on forest conservation in and around the Study Area by Provincial Forestry Services is listed below.

- Forest inventory, especially for specific local species in Mt. Kawatak, will be implemented by December 2000 for support of natural nursery development.
- Eco-tourism development: observation tower (1 unit), recreation facilities (2 units), and inspection road will be constructed in Mt. Mahawu.
- Bamboo nursery (20,000 stems) has been provided. Bamboo trees will be planted in critical lands of Mt. Soputan in an area of 50 ha near Kanonang village in

Kawangkoan (This area is outside of the Study Area).

- Maintaining the boundary of the Mt. Klabat Protection Forest by planting trees in hedgerow has been implemented (planting trees along the boundary of protection forest for about 20 km long).
- The program of Provincial Forestry Services Office in cooperation with regional government of Capital City of Jakarta (*Daerah khusus Ibukota Jakarta, DKI Jakarta*) has not been implemented yet. Provincial office has provided supporting fund.

(3) District Forestry Service (Dinas Kehutanan Tingkat II ; Dinas TK II)

According to the annual report Office in fiscal year 1999/2000, District Forestry Service has conducted area arrangement for protection and utilization zones in Mt. Soputan and Mt. Lembean, growing land rehabilitation crops in Mt. Soputan, and construction of shelters (recreation facilities) in Mt. Mahawu.

This office has formulated working plan for fiscal year 2000. The following programs and activities are included.

- a) To supervise and control forest product circulation:
 - by controlling forest product circulation
 - by analyzing and monitoring data of forest product selling and circulation
- b) To control and to protection forest:
 - by conducting forestry extension service
 - by maintaining forest boundary
- c) To execute and to develop apiculture and natural silk cultivation:
 - by taking inventory the location for apiculture, natural silk cultivation, and honey bee's woof
 - by training forestry extension staffs in apiculture and natural silk cultivation
- d) To conduct regreening, and water and soil conservation program:
 - by using schemes of Private forest (*Hutan/Kebun Rakyat*), Village nursery (*Kebun Bibit Desa, KBD*), and Demonstration plot for conservation of natural resources (*Unit Percontohan Usaha Pelestarian Sumberdaya Alam, UP-UPSA*)
 - by constructing some check dams, gully plugs
- e) To upgrade extension staff skill

3.1.4 Current Problem of Forestry in the Study Area

(1) Organization and human resources

- Many tasks are handed over to District Forestry Office in current autonomy, but the District Forestry Office does not have enough human resources to execute newly handed over duties. The organization of District Forestry Office has not been established yet as it is required in the regulation e.g. District Regulation No.11/1995; Decision of Ministry of Internal Affairs No.44/1995. Lack of the number of forestry extension staff makes it difficult to conduct extension services. Each sub-district (*kecamatan*) has only two forestry extension staff. Lack of skill and knowledge of the staff in implementing forestry development program is also an important problem. In the same time, the number of forest guards that carry out forest conservation is insufficient.

(2) Management of Protection Forests

- Reclamation of forest seems to be carried out in some areas of protection forest. Local farmers need lands to be cultivated for food crops but there is no more available land in private lands. Because of lack of human resources, forestry office cannot control this phenomenon well.
- The other problem at present is how to prevent the reforestation areas from local people's inconsiderate activities. The grown trees are cut down for firewood, while the planted areas are re-occupied for cultivation.
- Natural phenomena of unusually long dry season causes drought and then tree death. A certain area of reforestation has been lost by fire.

(3) Forests in Private Lands, and Other Issues

- Shortage of the number and knowledge of extension staffs results insufficient development of farmer's skill and knowledge in forestry sector through greening activities.
- Timber resources is limited in the Study Area, though there are some demands for them from an industry within the area. It is not desirable situation for local economy.
- In preventing and protecting forest against fire, there are some constraints such as lack of tools and forest fire extinguisher and low community initiative.
- According to the District Forestry Office, the potency of development of nature silk cultivation and apiculture in the area has not been assessed yet.
- Fuel wood supply seems to be enough at present. Further trend of the

supply is not predictable. The balance of demands and supplies should be carefully observed.

3.2 Forest Management and Rehabilitation Plan

3.2.1 Basic Approach

In the Study Area, forest is largely classified into two types, those are protection forests and forests in private lands. Those two types of forests have different problems each other and require different approach for the management.

Although the protection forests in the Study Area are limited to small areas, they are located in crucial areas for soil conservation such as on the steep slopes of the mountains. Therefore it is important to maintain and improve the condition of existing forest areas, and to prevent further deforestation. Reforestation, enforcement of regulations, and planting with people's participation such as community forestry (*Hutan Kemasyarakatan*) are possible strategies.

On the other hand most areas in the Study Area are private lands. Since the potential critical land is located in the private lands, the means to promote proper land use should not be limited to reforestation but should also include technologies to enhance "forest function" in agricultural lands. Forest function means to provide the land with the capacity to hold water, prevent soil erosion, and increase soil fertility. Regreening with people's participation is possible strategy. Timber and fuel wood supply can be included among this regreening activity.

3.2.2 Components of the Plan

Based on the current problems and basic approach mentioned above, the following schemes are proposed.

3.2.2.1 Protection Forests

1) Reforestation

There is a scheme for rehabilitating protection forests called reforestation (*Reboisasi*). The responsibility of this program is now handed over to the District Forestry Service (*Dinas Kehutanan Tingkat II*). A review of the past activities of reforestation (*Reboisasi*) shows that a certain area of the planted forest is already lost by fire, cut down by farmers, and others. It seems that reforestation activities should be continued with some extension services in which education of local residents and capacity building for the staffs of District Forestry Service are

achieved.

2) Enforcement of Regulations

All protection forests are strictly protected for the purpose against any kind of deforestation activities in principle. Enforcement of laws and regulation concerning protection forests should be intended such as patrolling by forest guard. Another approach is to educate the local residents not to disturb the protection forests with their understanding of the importance of the forest.

3) Community forest (*Hutan Kemasyarakatan*)

There is no community forest (*Hutan Kenasyarakatan*) established in the Study Area because the area of the protection forests is very limited and most of them seem to be distributed on steep slopes where is not suitable for social forestry activity. But this scheme may be adapted to some reclamation area in the protection forests and prevent further destruction of the forests. As inhabitants expect some returns from social forestry, it is recommended to employ the agroforestry system, which has the same function of forestry for the prevention of soil erosion and moisture keeping. As the area is situated in the steep slope area, the tree dominant agroforestry system, which is highly resistance to soil erosion is recommended.

Education of local residents should be carried out in parallel with the community forest, and technical assistance by the government is also expected.

3.2.2.2 Forests in Private Lands

1) Private forest (*Hutan Rakyat*)

Regreening (*Penghijauan*) and private forest (*Hutan Rakyat*) are government schemes for planting in private lands. These programs include not only planting itself but also civil engineering methods such as check dam. This program is a very good occasion for the education of local residents for propagating the importance of sustainable land use and reducing critical lands, because it can show the good effect by planting in the land of local residents. Extension serviced has important roll in educating local residents on forest function in private lands through regreening activity. The supply of timber wood and fuel wood is also considered in this scheme.

2) Green belt along waterfront

Riversides and lakeshores usually have high bio-diversity and also play an

important role in the daily life of local people. The method for creating green belt should be carried out with a people's participation approach because these areas of riversides and lakeshores are one of the most intensively used areas in the Study Area.

CHAPTER 4 FEASIBILITY STUDY FOR THE INTENSIVE AREA

4.1 Present Condition

4.1.1 Protection Forest Management

4.1.1.1 Distribution and Maintenance

(1) Boundary

There are 9 protection forest areas in the Study Area, and 6 of them are distributed within the Intensive Area. The names and the locations of the protection forests are shown in Figure F.3.1. The maintenance of boundary of the protection forest, and preparation of the boundary maps are made by BIHUP at present. Table F.4.1 shows the information on the establishment of the 9 protection forests in the Study Area. Five protection forests are established before World War II, and boundaries of the 3 forests out of them have been not changed since then. The boundary maps have been produced for each protection forest, but the scale varied from 1/2,500 to 1/50,000. Moreover, these maps usually have only boundary line with little topographic information on white background. Contour lines are normally not indicated. It leads to difficulty in confirmation of actual location of the boundary and in possession of the information by all stakeholders.

Then, mapping of the boundary of the protection forest in the Intensive Area has been carried out on topographic maps in a scale of 1/10,000 which has been newly produced in this Study. The mapping has been made using the existing boundary maps mentioned above, field observation, and hearing from forestry workers and local residents. As a result, each boundary has been interpreted and drawn on the maps. Although the estimated boundary is rather vague in some protection forests because of lack and confusion of the data, this estimated boundary is used only for the Study. It has been agreed by *BRLKT*, *BIHUP*, Provincial Forestry Services, and District Forestry Services Offices.

The area and length of boundary of each protection forest in the Intensive Area is shown in the right table. 1,014ha (8.5% of the Intensive Area) is assigned as protection forests. Total length of protection boundary in the area is 29.8km.

Area of Protection Forest			
No.	Name of Protection Forest	Area (ha)	Length of Boundary (km)
1	Tampusu	28	1.8
2	Lengkoan	19	1.2
3	Lembean	101	5.3
4	Kawatak	91	6.1
5	Soputan	701	10.8
6	Kaweng	74	4.6
	Total	1,014	29.8

(2) Management

The responsibility on management of protection forest has been handed over to District Forestry Service. Forest Guards (*Satuan Polisi Kehutanan*) consisting of 53 forest guards are posted in all sub-districts to conduct supervision of forest and forest products. Besides them, a mobile forest guard unit is organized in Provincial Forestry Service. The main task for them is to control and to inspect the circulation of forest products in Manado and its surroundings. 4 four-wheel drive vehicles and some pistols and rifles are equipped. Unfortunately, it seems that the protection forests in the Intensive Area are not well managed by them because of the shortage of human resources (see Appendix-I for detailed information).

Provincial Forestry Service conducted a monitoring for reforestation in fiscal year 2000, which is named *Identifikasi Tanaman Reboisasi di Kabupaten Minahasa* (The Evaluation of Reforestation in Minahasa). Four locations of reforestation areas are selected in the Intensive Area. The survey result is shown in the table below. All of them were planted in 90th but the ratio of surviving trees is very low. Lack of tending after planted and disturbance by local residents are possible cause of the damages.

The Condition of Assessed Reforestation Areas

No	Locations	Planted Trees	Area of Sample Plot (ha)	Number of Remaining Plants	Ratio of Remaining Plants (%)
1	Mt Soputan (A)	Gmelina, Nantu, etc.	3.0	687	13.9
2	Mt.Soputan (B)	Gmelina, Nantu, etc.	2.0	464	6.0
3	Mt.Lembean (A)	Gmelina, Nantu, etc.	6.0	1,044	11.4
4	Mt.Lembean (B)	Gmelina, Nantu, etc.	2.0	427	12.8

Source: Final report of Identifikasi Tanaman Reboisasi di Minahasa, Dinas Kehutanan Propinsi Sulawesi Utara. 2000

4.1.1.2 Condition of the Protection Forests

Most of the 6 protection forest areas are still covered with forest stands, but their condition differs. Comparatively high and dense tree stands are distributed in Soputan, Lembean, and Tampusu Protection Forest. On the other hand, forest stands with rather sparse crown are found in other protection forests such as Kawatak and Kaweng.

Botanical survey for protection forests was carried out in November 2000. Survey plots was chosen in the Sopotan Protection Forest, Lembean Protection Forest, and Tampusu Protection Forest, where typical forest stands of this area exist. Each plot has 10m wide and 100m long. The right table

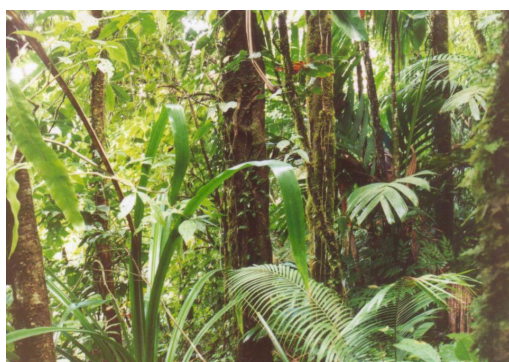
The number of Species in the Survey Plots

	Sopotan	Lembean	Tampusu
Seedling	62	30	60
Sapling	40	26	38
Pole	25	27	22
Tree	22	21	28

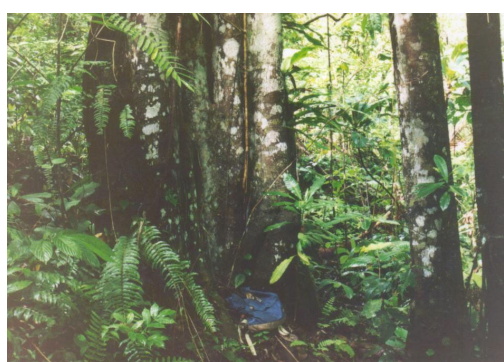
The number of Individuals in the Survey Plots

	Sopotan	Lembean	Tampusu
Seedling	522	78	612
Sapling	74	80	183
Pole	54	93	64
Tree	35	63	48

shows the number of species and individuals appeared in the survey plots. Although the species diversity of these forests is not so high, multi layer structure in good condition is formed. The height of canopy layer does not exceed 30m because of sloping topographic features on which those forest stand. Photographs below show views inside the forests.



Forest in Tampusu Protection Forest



Forest in Sopotan Protection Forest

4.1.1.3 Activities in Protection Forests

There have been confirmed several human activities in the protection forests during the Study. Although some activities in the protection forests are approved by the government, some illegal activities have been also confirmed. Main activities confirmed are reclamation for cultivation, logging of timber wood, collecting of fuel woods, and collecting of non-wood products. As a nature of illegal activities, quantitative analysis is sometimes difficult for them.

(1) Reclamation

Comparing the two maps in a scale of 1/10,000 for present land use and the boundary of protection forest, some encroachment has been found in the Sopotan protection forest. Figure F.4.1 shows the estimated encroached area in the

protection forest. The total area of encroachment has been estimated at about 30ha. In most of the areas, trees have been clearly felled.

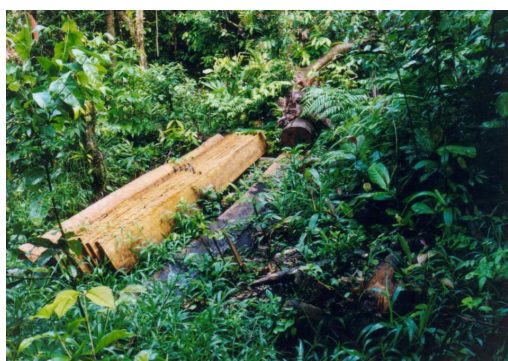
The encroached area is roughly classified into 3 parts in terms of intensity of cultivation activities. Lower part seems to be permanently used as dry uplands. Tomato, maize, and beans were cultivated during the field visit. Upper part seems to be more or less temporarily used. Middle part is located between the lower and upper parts.

About 40 residents of Ampreng, Tumaratas, and Raringis Villages seemed to be involved in the event. Most of the encroachers come from Ampreng Village. Socio-economic survey has been carried out to get further information to clarify the social and economic background of the encroachment. Most of the encroached farmers are subsistence cultivators. But their relation with the encroached lands varies. Some areas in the lower part have been cultivated for nearly 20 years, on the other hand, just few years in the upper part of the encroached area.

In June 2000, the District Forest Service Office organized a meeting with local leaders and about 40 illegal cultivators from the 3 villages to solve the illegal condition. Twenty one out of these encroachers signed the agreement to quit cultivation in the protection forest by December 2000. But many of them still remain cultivating crops in the encroached area.

(2) Logging

Illegal logging has been often observed especially in the lower part of the Sopotan Protection Forest and around the dividing ridge in the Lembean Protection Forest, where good forest stands still exist. The affected area by logging is difficult to determine, but it is roughly estimated on a basis of the distribution of logged sites and bullock paths as about 130ha for Sopotan Protection Forest and 70ha for Lembean Protection Forest. Logging activities have been little observed in other protection forests. Its reason might be that the other forests with steep slopes have originally little good timber resources, or that the resources have already been cut over because of their small extent.



Sawn Timber at Sopotan Protection Forest

As logging in the protection forest is an illegal activity, quantitative data of extract amount is not available. The field observation found that trees with over 40cm in diameter were targets for felling. Logs are sawn into timber in the location by chainsaws and dragged out by bullock (see the photographs). One timber has about 30cm x 4m long with 3cm or 4cm thickness. One bullock can drag 3 or 4 timbers at a time. Only thick parts of stem with good quality are sawn into timbers and rests of them with rather small diameter are just left there.



Bullock Path for Dragging Timber

In terms of soil conservation, damage on ground surface is limited around the felled trees and along the bullock path because selective cutting is performed and machinery is not used for transportation. The main point of this problem is sustainability of timber resources and bio-diversity of the forests.

(3) Other activities

Fuel woods are still important energy resource for local residents. There are several sources to supply fuel woods such as dead clove and coconut trees from estate, fuel wood plantation, as well as extraction from the protection forests. Its ratio varies depending on the land use distribution in each area. People in the East Area seem to much rely on dead clove trees or other trees from estates for the supply. Residents in the West Area tend to use fuel woods from planted forests or various dead trees from estates in private lands. On the other hand, people in the South Area seem to use trees from protection forest for fuel woods other than trees from private lands. In this area, fuel woods resources seem to lack in private lands.

Some non-wood forest products are collected by local residents. Natural honey is the most preferable harvest from the forest (see photo). A honey collector says the amount of honey products is so small that most of the harvest is consumed locally and little appears in markets in urban areas. Some kinds of mushroom are also harvested in some village of the Intensive Area but the species and amount is unclear. There is no evidence found on products of natural silk in the Intensive Area.

Small forest mammals such as rats and bats provide some income for the villagers. They say, because of over-hunting, big mammals such as wild pigs and monkeys have almost disappeared in the areas. Today, wild pigs sold in markets are mostly carried from neighboring districts.



Honey Collector below Mt. Soputan

4.1.1.4 Possibility of the Establishment of Community Forestry

Community forestry was decided by the Ministry with Decision of Ministry of Forestry and Estate Crops No. 677/Kpts-II/1998.

Government officers say it is legally possible to establish community forestry in a protection forest. There is the precedent of community forestry in a protection forest in Sumatra Island. But there are some confrontations among several sectors of the officials of Forestry Services Offices on establishment of community forestry in a protection forest. It seems that District Forestry Services Office and KANWIL Office is rather negative for the establishment. They are afraid of accelerating further encroachment if community forestry in protection forests is approved.

On the other hand, encroached farmers worry if they are asked to go out from the occupied lands immediately. It seems that they are positive to be included in a community forestry program if their right of cultivation is admitted. On 11th January 2001, informal meeting with those farmers who have encroached into Soputan Protection Forest was held at the village office of Ampreng. They are very positive for the idea of JICA Study Team on people's participatory approach on the rehabilitation of the encroached area. They express their strong willingness to be involved in the program (see Attachment-3).

4.1.2 Forest in Private Lands

4.1.2.1 Distribution and Usage of Forest Resources

The present land use maps (see Appendix-E) show distribution of forest in private lands (outside of protection forest).

Most of the forests in private lands are fuel wood plantation. Main species are kaliandra (*Calliandra calothyrsus*) and gamar (*Gliricidia sepium*). These trees are planted in 1m x 1m in interval normally. Growth amount of kaliandra is 5-20

m³/ha/year.

There are some timber plantations of pine trees in south to Kakas Village of the East Area. Most of the forests are at harvest stage and cutting operation is undertaken in some lots.

Besides them, there is no extensive timber plantation in the Intensive Area.

Small plantations or individual planting among arable uplands or estates are commonly performed (see photo). Cempaka (*Elmerrillia spp.*) is the most preferable species.

Some secondary forests have been found outside of protection forests along the boundary.

The main usage of forest resources in private lands is for production of fuel woods and timbers.

The trees of fuel wood forests are cut once 2 or 3 years by the needs of local residents, and new shoots regenerate from stumps.

Most of the fuel woods produced from fuel wood plantations are domestically consumed. As it is mentioned in the previous section, people in the West Area tend to use woods from planted forest for their fuel. Besides the domestic use, fuel woods are consumed by pottery industry in West Area, but those people normally purchase fuel wood from outside of the Intensive Area. Some entrepreneurs said the price of fuel woods most of which are carried from outside of the area is increasing recently.

Distribution of extensive timber plantation in the Intensive Area is limited. Small plantations or individual planting among farming land have been commonly found as mentioned before. Price of sawn timber by species is shown in the Table F.4.2. In case of cempaka, it costs Rp. 800,000 – 1,000,000 /m³ in shops and Rp. 700,000 / m³ for farmers to sell. But other farmer told that selling price for them is only Rp. 350,000 – 400,000 / m³. In general, it takes 20~50 years for cempaka trees to grow up to commercial size (40 – 50cm in diameter). In the field observation, it grows to 12m in height and 19cm in diameter of breast height in maximum in 8 years after planted. It also grows to 7m in height and 10 –13cm in diameter in 5 years after



Fuel Wood Plantation of Kaliandra



Cempaka in Cultivating Lands

planted.

4.1.2.2 Re-greening (*Penghijauan*) and Private Forest (*Hutan Rakyat*)

Private Forest / Garden (*Hutan / Kebun Rakyat*) is controlled by District Forestry Office. In Minahasa District, it is carried out under Re-greening (*Penghijauan*) program with UP-UPSA (Demonstration plot for conservation of natural resources) and Village nursery. Farmer groups who were involved in this activity received assistance funds from government for preparation, buying seeds, planting and first year maintenance.

To confirm the actual implementation of regreening activities, 14 villages in and around the Intensive Area have been visited for interviews with local leaders. According to the results of the interview, about 25 – 50 % of initially planned number of trees have been planted in each private forest location. In several locations, farmers did not agree that their fertile land was shared for growing trees. They therefore planted only on the edge of their lands or on the steep slopes. Lack of extension services has been also pointed out. Farmers are not well informed of the benefit of private forest in terms of economical and conservation aspects.

According to the interviewee, about less than 20 % of the planted trees still remain. Causes of the death varied from drought and damage by domestic animals to no tending. Besides them, trees were also disturbed when the farmer was plowing their land. Farmers also use the planted tree as binding trees for cows or horses damaging on their stems.

4.1.2.3 Extension Services

There are about 60 extension forest workers in Minahasa District and some 15 staffs concerning the Intensive Area. The activity of the extension workers are mainly implemented through regreening program such as Private Forest / Garden (*Hutan / Kebun Rakyat*), UP-UPSA (Demonstration plot for conservation of natural resources), and Village nursery. Unfortunately these extension workers are not active. Many local residents who have been interviewed mentioned that forest extension workers have rarely visited (see Appendix-I for detailed information).

4.1.3 Other Important Issues for Forest Management

4.1.3.1 Nursery

There are 3 nursery systems: government nursery, community or farmer group

nursery, and private nursery.

Government nursery is mainly prepared for supplying seedling for the planting program of the government. Most of them are temporarily constructed for certain planting program and abolished when it has supplied all seedlings for the program. In this year (2000), Provincial Forestry Service provides temporary bamboo nursery (20,000 seedlings) in Kanonang Village (Kawangkoan Sub-district) (see photo right).



Bamboo Nursery (Kanonang Village)

Community or farmer group nursery is managed by community or farmer group and subsidized by the government through village nursery program (*KBD, Kebun Bibit Desa*) which is one of Regreening (*Penghijauan*) program. Photo (see photo right) shows works in a nursery. They are engaged in filling up earth in plastic bags.



Works in a Nursery

There are 3 people confirmed who are conducting private nursery in and around the Tondano Watershed. According to the interview to Mr. Wolter Tudju, one of owners of private nurseries, he buys seeds of cempaka (*Elmerrillia sp.*) for Rp.250,000/kg. Mr. Franky Runtuwarouw, another owner, buys seeds of cempaka for Rp. 50,000/liter from local farmers. Grown seedlings are sold for Rp. 500 – 600/seedling. The average number of seedlings in Mr. Wolter Tudju's nursery are 30,000 – 40,000. On the other hand, Mr. Franky Runtuwarouw grew 80,000 seedlings of cempaka (*Elmerrillia sp.*), nantu (*Palaquium sp.*), cinnamon (*Cinnamomum Zeylanicum*), and fruit trees in total. Normally, seedlings are grown in the nursery for three months to one year.

Comparing these three nursery systems, government nursery and private nursery are managed better than community or farmer group nursery at present. Community or farmer group nursery is a part of Regreening Program, and it has a problem in efficiency as it is mentioned in previous section. On the other hand the entrepreneur of private nursery has to provide the fund for the business at his own

risk. Fund is required for employing labors and purchasing materials such as seeds and plastic bags. It is concluded that, if extension services are enhanced, community or farmer group nursery is the best way for managing nurseries in terms of stability, people's participation, and technology transfer in a forestry field.

4.1.3.2 Useful Species

The useful tree species in and around the Tondano Watershed is listed in Table F.4.3. The table is made on the basis of the list of flora in Minahasa District provided by District Forestry Services. According to the table, this area already has enough tree species with varieties of usage from timbers to fruits and edible leaves. Introduction of new species does not seem to be necessary. Some alien species such as teaks cannot adjust themselves to the climate of this region which has very short dry season. In fact teaks flourishes where there are four to seven dry months a year.

4.1.3.3 Fire Protection

There are some records of forest fire in and around the Intensive Area. Fire occurs only in years with unusually long dry season but the data is not available on the frequency of fire. The latest fire in and around the Intensive Area occurred on Mt. Soputan in 1997.

Fire protection is the task of all forestry offices but there is no particular organization for handling fire protection. There are only two forestry staffs who have been trained on forest fire in District Forestry Service.

In fiscal year 2000, Regional Forestry Office receives some tools for fire protection and those will be distributed to District Forestry Service. Those are 5 units of water pumps and hoses, 4 backpack pumps, 5 global positioning systems, 5 binoculars, 40 extinguish dresses, and 5 small chain saws.

4.1.4 Current Problem of Forestry in the Intensive Area

(1) Protection Forest

1) Maintenance of forest boundary

As it is mentioned in previous section, the maintenance of the protection forest boundary is not well executed in a field and the data (survey result and maps) is also not well stocked. To maintain the boundary, re-survey and restructuring of boundary monuments are required. Footpath along the boundary is useful for patrolling the boundary and common recognition of the

boundary by local residents. In addition, accountability of the information of the boundary is required.

2) Encroachment

There are some encroached areas in the protection forest. To recover the function as a protection forest, it is required that the encroached area is covered with forest as much as possible with an agreement of all stakeholders.

3) Illegal logging

Illegal logging is seen in some protection forests. It must be prohibited by enforcement of forest patrol. Cut over places should be replanted. As the logging is executed in a selective cutting form, extensive replanting scheme is not possible. Replanting individual trees in cut over places is possible measure.

4) Forest guards

The present system of forest guards does not function well. Re-structuring of new effective system is required with some additional training for forest guards.

(2) Forest in Private Lands

1) Fuel wood supply

Fuel wood supply seems to be in shortage in the South Area. Establishment of fuel wood plantation in private lands of the South Area is required. The West Area has presently less problem of fuel wood supply in terms of domestic usage because of abundant resources of fuel wood plantation. But it might have problem in the near future because the demand of fuel wood by pottery makers is recently increasing. In the East Area, certain ration of fuel wood is supplied from dead estate trees. It is not sure that fuel wood will be supplied from estate trees in a long term. Plantation of fuel wood might be necessary in the East Area in case of shortage in future.

2) Timber wood supply

Timber resources are limited in the Intensive Area, though there are demands for timber from a wood industry in and around the area. One of the backgrounds of illegal logging might be the high demand of timber and a shortage of supply. Encouraging of timber trees planting is recommended. It

could contribute local economy. It may also contribute to discourage illegal logging in the protection forest.

3) Private forest (*Hutan Rakyat*) program and extension services

Private forest (*Hutan Rakyat*) program is executed yearly by District Forestry Office. Sometimes it is not fully accomplished. Some administrative development seems to be necessary. In addition, shortage of the number and knowledge of extension staffs results in insufficient development of farmer's skill and knowledge in forestry sector through the activities. Restructuring of the organization and training system of extension workers is necessary.

(3) Others

1) Nursery

Seeds and seedling supply system seems to be well established. Nurseries are run both by the government sector and private sector depending on their purposes. On the other hand, some farmers claim that they cannot obtain enough seedlings of trees even if they are willing to plant trees in their farming lands. Establishment of additional nurseries (even temporary one) with tight cooperation with Private forest (*Hutan Rakyat*) program might be worth to meet the farmer's demands. Publicity activity for how to obtain seedlings from the existing nurseries is also required.

2) Non-wood forest products

According to the District Forestry Services Office, the potency of development of sericulture and apiculture in the area has not been assessed yet. Apiculture seems to have high possibility in the Intensive Area. Some research and a pilot project might be worthy.

3) Fire protection

Once fire has been extended, it is very difficult to extinguish it by manpower. One important measure is an education program within extension services. An alarm system in the early stage of the fire with cooperation of forest guards is also useful. Some manual tools to extinguish fire could be useful in the early stage of the fire.

4.2 Forest Management and Rehabilitation Plan for the Intensive Area

4.2.1 Need of Watershed Conservation from Forestry Viewpoint

In general, forests play a very important roll in a watershed in terms of soil conservation and water resources circulation. Moreover the forest products are directly utilized for domestic or commercial purposes to improve the livelihood and welfare of local residents. Even in the Intensive Area forests cover on steep slopes to prevent intensive soil erosion from the areas and possibly play an important roll for stabilizing water flow. Local residents in the area rely on the forest resources for certain parts of their lives, for example fuel woods and timber supply. In addition, forests are one of very important core areas for maintaining bio-diversity in the Intensive Area.

By the way, some factors indicating the degradation of forest function have been observed in the Intensive Area during this study period. Illegal logging and encroachment in the protection forests are good examples. If these devastating forest usage are continuously made, an important forest function mentioned above might be easily lost in near future.

Both government side and local resident side are aware of the importance of forest function. It seems that local residents are also aware to some extent that the careless usage of the forest resources affects their life in future. But their subsistence level of life sometimes makes it difficult for them to think long term usage of resources. The government side also has not put effective and integrated countermeasures into practice to meet with these situations by several reasons, for example lack of human resources.

Then, to keep the forest function for proper watershed conservation in the Intensive Area, it is essential to establish effective and integrated watershed conservation plan putting emphasis on forest function.

4.2.2 Basic Approach

From a viewpoint of forestry, there are two approaches in the Intensive Area. One is an approach to the protection forest in P Zone. P Zone includes all protection forest areas and forested areas on steep slopes. Therefore the main strategy is how to maintain present forest and how to improve forest condition if degraded. In consideration of the exist of encroachment and illegal cuttings in the protection forests, the encroached area should be rehabilitated by appropriate measures like community forestry in accordance with relevant laws and regulations, to recover forest functions and also to keep people's welfare. As well, illegal cutting areas should be re-planted using the rehabilitation program.

The other is an approach to the forestry areas in the remaining zones. Bm1 Zone, Bm2 Zone, and Bm3 Zone is mainly used for cultivation with various farming activities. Supporting activities for land conservation is necessary. The supporting activities have two sides. One is direct contribution for land conservation by planting trees in these zones, which is mainly considered within agroforestry scheme. The other is indirect contribution for decreasing deforestation in present forest areas by supplying new resources outside of the forest. Forest conservation program in private lands is mainly considered from the latter point of view. Since Bw Zone has special characteristics as a waterfront close to dwelling areas, careful conservation measure of land use is required.

4.2.3 Boundary Survey for Protection Forests

Since the information of protection forest boundary is not well maintained, confirmation of the present boundary of six protection forests is required as a basic information for any conservation activity. The boundary is re-surveyed on a basis of survey data maintained by forestry office such as *BIPHUT*. The total length of the boundary in the Intensive Area is estimated as about 29.8km. Field survey (confirmation of present boundary in a field), mapping, and reconstruction of boundary monuments are main items. At first, working committee should be organized for managing the whole procedure. Both the forestry office and local residents should be presented during the field survey to get a consensus on the location of the boundary. Boundary monuments made of concrete are constructed about 100m in intervals and the boundary is drawn on latest topographic maps. A surveyor and assistants are temporarily employed and all the works are completed within two years at the beginning of the project.

4.2.4 Community Forestry Plan

Some countermeasure on encroached areas for about 30ha in the Soputan Protection Forest is required for recovering the function of forest. There are several alternatives to tackle the situation as follows.

1) Alternative1: Drive out all farmers

Under the agreement between the District Forestry Services Office and encroachers, all encroached farmers are driven out from the protection forest. Some compensation for their livelihood should be provided.

2) Alternative2: Restructuring of the boundary

The District Forestry Services Office restructures the boundary of the protection forest to meet the present land use. The new boundary will be established between present cultivating area and forested area. Field survey and mapping are required under the agreement between the government side and encroacher side.

3) Alternative3: Community Forestry in encroached area

To maintain forest function, community forestry (*Hutan Kemasyarakatan*) is to be established. Land use plan is planned considering both land rehabilitation and livelihood of cultivators.

Considering forest function and encroacher's condition examined through a socio-economic survey, Alternative 3 is proposed as a good compromise. Procedure for the establishment of community forestry is shown in Figure F.4.2. After receiving recommendation from the governor, the area for community forestry should be assigned by the minister. Although the establishment of community forestry requires long process of legal approvals, it is deemed that this program is the best way to solve the problem with minimum conflict between all the stakeholders.

Component of the program is as follows.

1) Formulation of community and Incentives

Before starting the plan, all encroachers should be requested for quitting individual farming activities and agreeing to follow the plan. With a cooperation of the government, farmer's group of encroachers should be organized as a community. District Forestry Office must perform a leading part with a cooperation of village leaders in this stage.

As a result of an informal meeting with the encroached farmers, it is found that those farmers are eager to be involved in this program because they feel uneasy about present "illegal" status of themselves. During the process of formulating the community, their rights of activity in the protection forest should be guaranteed. In addition to the assurance of their rights, other direct economic benefits (see the following section) are also presented to the farmers to promote their incentive for the participation to the program.

2) Socio-economic Approach

According to the socio-economic survey, it is revealed that most of the encroachers are subsistence farmers and there is few other mean to acquire

income. Therefore income-generating approach is required in accordance with the planting activity. It is also revealed that the encroached farmers are strongly interested in planting trees and perennial crops in the encroached areas as long as they can benefit from the trees.

Then both long term and short term approaches are considered to benefit their economic situation and obtain their support on the program. In a short run, working place as manual labors is provided in surveying, nursery construction, and other preparatory works. In a long run, trees and perennial crops are allowed to plant in the encroached areas for their income generation in exchange for their voluntary participation for conserving the areas.

3) Boundary survey

Besides the survey of the protection forest boundary, encroached area must be decided for common recognition of the extent of the areas. It is estimated that the total area of the encroachment is about 30ha.

4) Arrangement of lands

After the boundary is confirmed, the target lands will be classified along with planting program which considers both of land conservation and the income generation of the encroached farmers. It would be possibly divided into three areas of Upper part, Middle part and Lower part, according to their topographic feature and intensity of usage. Each area would be estimated to be evenly about 10 ha.

Upper part where the slope gradient is rather steep is an area for tree plantation with pine and multipurpose tree species such as durian and jack-fruit. Middle part with less steep slopes is aimed for tree dominant agroforestry. Lower part where slopes are less steep and has been used for cultivation for long years is also area for agroforestry but annual crops has an important roll for ensuring income for encroached farmers (see Figure F.4.3). In order to attain the final shape, it would take about 20 years considering living cost of encroachers and possible full products from trees.

5) Planting and treating activities

Budget and technical assistance for the initiation should be provided. Labor forces are arranged from the community using this budget for supplementing a part of their living costs. The community is requested to plant trees and to treat them along the plan. Seeds and other materials will also be supplied. Considering a lack of human resources in District Forestry Office, Regional

and Provincial Forestry Office are expected to provide a technical support for them.

An informal meeting was held on 11th January 2001 and these idea mentioned above was basically approved by encroached farmers (see section 4.1.1.4). In the program, District Forestry Office must play a leading roll in organizing those farmers and forming a consensus about this program. On the other hand, Regional and Provincial Forestry Office are expected to have a roll for technical support and supervising. In the current situation of decentralization, it is rather difficult to say which organization can prepare a monetary support for this program.

4.2.5 Reforestation Plan

Reforesation (enrichment planting) is required in the protection forests to recover illegally logged spots for about 130ha in Soputan Protection Forest and about 70ha in Lembean Protection Forest. Enrichment planting is also executed in other four protection forests for about 140ha because the resources of those forests have been declined.

Field survey for a planting plan, construction and maintenance of five nurseries, planting activities, tending of planted trees, and monitoring are the main items of reforestation. Each nursery is constructed with local materials and manual labors. The required number of seedlings to be produced at the nurseries would be about 100,000 in 4 years which corresponds to about 300 seedlings per ha. Nantu (*Palaquium oblongitilium*), Pine (*Pinus spp.*) are suitable for planting in protection forest. Other indigenous tree species are also recommended to enhance bio-diversity. Local residents are temporarily employed for nursery construction and maintenance, planting of trees, and tending of planted trees. In accordance with strengthening plan of forest patrol and extension services, local people are even encouraged to take care of planted trees voluntarily on a basis of the understanding of the necessity of forest protection.

Field survey is executed in the 1st year. Five nurseries are constructed in 2nd year and they are maintained for 4 years. Planting activities from 2nd year to 5th year for 25,000 trees each year. Tending planted trees from 3rd year to 10th year, and monitoring for all periods for 10 years.

4.2.6 Strengthening Plan of Forest Patrol

Six teams of forest patrol are located for six protection forests. As Soputan protection Forest has the largest area and the longest boundary in these protection

forests, two teams are located at northern part and southern part respectively. On the other hand, Tampusu protection forest and Lengkoan protection forest is controlled by one team because of their comparatively small area and their vicinity. Each team consists of two forest guards. They have responsibility for maintaining protection forest boundary and monitoring activities of local residents in the forests inside and outside of protection forest in P Zone. Fire protection with educating local people is also a responsibility of the forest guards.

Six small stations for the teams are constructed at convenient location between protection forests and villages on foot of the protection forests at the beginning of the program. A motor cycle is also provided for each team to move around.

4.2.7 Research Plan for Non-wood Forest Products

According to the District Forestry Office, although they have an intention to develop some non-wood forest products in this area, the potency of development of non-wood forest products such as nature silk cultivation and apiculture in the area has not been assessed yet.

Some research is required to promote non-wood forest products. Possibility of apiculture, sericulture, and other usage could be identified. Researchers team of three experts, those are an expert of vegetative products, animal products, and non-biological products respectively, are assigned for 2 years.

4.2.8 Fuel Wood Planting Plan

Fuel wood planting is planned to prevent over usage of present resources. Construction of seven delivery stations and repletion of extension services are main items of this plan. Three delivery stations of scions are required at village side in East and South Area respectively, and those are constructed from the 1st to 3rd year. One station is required in West Area which is constructed in the 1st year.

Fast growing legume species such as kaliandra (*Calliandra calothyrsus*) and gamar (*Gliricidia sepium*) are used for the purpose, because it takes only 2 or 3 years for harvest and those species can fertilize soil. Scions of those species can be easily collected from existing plantation around villages and those can be stored at delivery stations. About 10,000 scions/ha are necessary for planting.

150ha of fuel wood plantation (50ha for each area) could be established in less utilized lots of private lands. The location of the plantations is selected in accordance with the approval of landowners. Planting activity itself is executed by

landowners or local residents. Extension workers play an important roll for encouraging local residents to planting fuel woods in their lands through their extension activities as same as a technical support for the planting. It is expected that those plantations are established for 10 years (15ha per year).

4.2.9 Timber Tree Planting Plan

Timber tree planting as same as multi purpose trees planting will be carried out in private lands within agroforestry system as most of these zones are utilized for farming purpose. Construction of nine nurseries and dissemination of extension services are main items of this plan.

The nurseries are located near villages to where local residents are easy to access. Their construction is executed from the 1st to 3rd year (three nurseries per year). The construction work is executed by temporarily employed workers, and those are maintained until 10th year. Each nursery should have a capacity for producing 10,000 seedlings a year.

Seedlings are planted in agricultural lands within agroforestry system. Planting activity itself is executed by landowners or local residents with technical support of extension workers. The same extension workers with fuel wood plantation are to be stationed (ten workers for each area). Extension workers play an important roll for encouraging local farmers to plant trees in their agricultural lands and teaching them how to treat those planted trees through their extension activities. This program can be executed with tight relation to fuel wood planting mentioned above.

4.2.10 Strengthening Plan of Extension Services

30 extension workers (10 workers for each area) are required for executing forestry conservation program. In order to strengthen the extension services for forestry, it is essential to enhance ability of the workers. It is expected that the training program is repeatedly held for 5 years.

(1) Extension Worker Training

Extension workers need training to meet farmer's needs and problems. Five training topics for extension worker are suggested as follows.

- Review of current policies, forest laws and regulations which might limit the practice in planting activity,
- Proper knowledge for ecology, pedology, and hydrology of tropical area,
- Tree growing technique (selection of species for particular purposes, planting

and treating),

- Knowledge of organizing a farmer's group for collective works such as nursery management, and
- Understanding the marketing.

Besides lecturing, participatory methods such as group discussion, workshops, field visits and exercises are recommended to improve ability of trainees.

One-week training course for extension workers is proposed to open once a year for 5 years. The combination of participatory training and traditional method are proposed as training measure for extension workers. Teaching staffs are invited from universities, research institutes, specialists of Forestry Services, and NGO.

(2) Training of Farmers

The objective of training farmers is to make them realize the direct and indirect benefit of tree planting. Proposed training topics are as follows.

- Basic ecology and hydrology,
- Private nursery development,
- Selection of tree species for different purposes
- Treatment of planted trees,
- Market system for wood products

Training for farmers is practiced in two different ways. The first one is on the job training through tree growing practices and verbal communication. Second one is one-week training course, which is held for key farmers once a year for 5 years. Specialists of District Forestry Service, extension workers, expert of university and NGO staff are proposed as trainer.

4.2.11 Conservation Plan for Each Zone

4.2.11.1 Conservation Plan for P Zone

(1) East Area

There are two protection forests in this area. These are Lembean Protection Forest and Kaweng Protection Forest. Forest boundary survey for 9.9km is required for them.

Reforestation (enrichment planting) is required in illegally logged spots and degraded areas of Lembean Protection Forest for 70ha and Kaweng Protection Forest for 50ha. The required number of seedlings would be estimated at 21,000

and 15000 respectively. Two nurseries are placed near forest guard station mentioned below.

Two teams of forest patrol are located for the two protection forests. Two small stations for the teams are located to the east of Makalonsow and south to Kawen below the protection forests. For fire protection, forest patrol with educating local people is necessary. Some research is executed to promote non-wood forest products.

(2) South Area

The Soputan Protection Forest and the Kawatek Protection Forest are located in this area. Forest boundary survey for 16.9km will be needed for them.

There is encroached area of about 30ha in the Soputan Protection Forest. This encroached area is recommended to serve as a community forestry, to recover forest function.

Reforestation (enrichment planting) is required in illegally logged spots and degraded areas of Soputan Protection Forest for 130ha and the Kawatek Protection Forest for 50ha. The required number of seedlings would be estimated at 37,000 and 15,000 respectively. Two nurseries are placed near forest guard station at Noongan and Tumaratas.

Three teams of forest patrol are located for the two protection forests. Three small stations for the teams are constructed at the south and west to Noongan and west to Tumaratas below the protection forests. Some research is executed to promote non-wood forest products.

(3) West Area

Two small protection forests, i.e. Tampusu Protection Forest and Lengkoan Protection Forest, are located in this area. Forest boundary survey for 30.km will be needed for them.

Reforestation (enrichment planting) is required in degraded areas of Tampusu Protection Forest and Lengkoan Protection Forest for 25ha and 15ha respectively. The required number of seedlings would be estimated at 12,000. One nursery is placed near forest guard station at Tampusu.

One teams of forest patrol is located at Tampusu village where approach to both protection forests is easy. Some research is executed to promote non-wood forest products.

4.2.11.2 Conservation Plan for Bm1 Zone

(1) East Area

Fuel wood planting and timber tree planting are executed.

Three delivery stations of scions are located near villages at Makalonsow in north, Eris in middle, and Kawen in south respectively. Three nurseries are also established at the same places of delivery stations. Ten extension workers are responsible for the extension works in East Area. Those delivery stations, nurseries, and extension workers are stationed to supply materials and services for both Bm1 Zone and Bm2 Zone.

50ha of fuel wood plantation (1ha x 50 locations) could be established mainly in less productive lots in this zone. 20 locations of them are established in Touliambot sub-district and Eris sub-district respectively as Bm1 Zone is larger in these two sub-districts. Lest of them (10 locations) are distributed in Bm1 Zone of Kakas sub-district.

Seedlings of timber trees and multi purpose trees are planted in this zone in accordance with agroforestry program. Those seedlings are planted in agricultural lands intermittently.

(2) South Area

Fuel wood planting and timber tree planting are planned here.

Three delivery stations of scions are located near the settlement of Noongan, Tumaratas, and Tonsewer respectively. Three nurseries are also established at the same places of delivery stations. Ten extension workers are responsible for the extension services in South Area.

15ha of fuel wood plantation (1.0ha x 15 locations) could be established in this zone. (As distribution of Bm1 Zone is limited in South Area, 70% of the fuel wood plantations in South Area are established in Bm2 Zone.) 10 locations of them are established in Langowan sub-district and 5 in Tompasso sub-district.

Seedlings of timber trees and multi purpose trees are planted in this zone in accordance with agroforestry program. Those seedlings are planted in agricultural lands intermittently.

(3) West Area

Fuel wood planting and timber tree planting are planned here. Three nurseries are

placed beside the villages of Tataaran, Pulutan, and Tondegesan. One delivery station of scions is located at the same place of the nursery in Pulutan. Ten extension workers are responsible for the extension works in West Area.

Seedlings of timber trees and multi purpose trees are planted in this zone in accordance with agroforestry program. Those seedlings are planted in agricultural lands intermittently.

4.2.11.3 Conservation Plan for Bm2 Zone

The delivery stations, nurseries, and extension workers are common with Bm1 Zone.

(1) East Area

Seedlings of timber trees and multi purpose trees are planted in this zone in accordance with agroforestry program. Those seedlings are planted in agricultural lands intermittently.

(2) South Area

35ha of fuel wood plantation (0.5ha x 70 locations) could be established in less utilized lots of Bm2 Zone such as fringe of farming lands. 50 locations of them are established in Langowan sub-district and 20 in Tompaso sub-district. The size of each plantation is smaller than those planned in Bm1 Zone, because it is more difficult to find vacant lots for fuel wood plantation in Bm2 Zone which is rather intensively used for agriculture.

Seedlings of timber trees and multi purpose trees are planted in this zone in accordance with agroforestry program. Those seedlings are planted in agricultural lands intermittently.

(3) West Area

50ha of fuel wood plantation (0.5ha x 100 locations) is established in less utilized lots around Pulutan village where demand of fuel wood for pottery making is rather high.

Seedlings of timber trees and multi purpose trees are planted in this zone in accordance with agroforestry program. Those seedlings are planted in agricultural lands intermittently.

4.2.11.4 Conservation Plan for Bm3 Zone

Bm3 Zone has low priority for tree planting because of its gentle topographic feature. Fuel wood planting and timber tree planting are possible planned for soil fertility increase and fuel wood supply for farmers' home consumption but not necessarily executed in this zone. This concept will be applied for the East, South and West Areas.

4.2.11.5 Conservation Plan for Bw Zone

(1) East Area

Most of Bw Zone is dedicated for green belt. As most of slope parts of the zone is now fairly covered with trees, tree planting at open lots are planned. Extension services are required for educate local residents to conserve sloping parts of the zone with planting or protecting trees.

(2) South Area

Bw Zone does not exist in this area.

(3) West Area

The same plan in the East Area is adapted. Most of Bw Zone is dedicated for green belt. As most of slope parts of the zone is now covered with trees, tree planting at open lots are planned. Extension services are required for educating local residents to conserve sloping parts of the zone with planting or protecting trees.

4.2.12 Implementation Schedule

Schedule for each program is as follows. All the programs are planned to fulfill within 10 years except community forestry.

- 1) Boundary survey for six protection forests: Field survey, mapping, and reconstruction of boundary monuments are main items. Field survey and mapping is executed in the 1st year, then reconstruction of boundary monuments for 1st and 2nd years.
- 2) Community forestry for 30 ha: Boundary survey and land arrangement are implemented in the 2nd year. Formulation of farmers group is also in 2nd year. Nursery construction in 3rd year and they are maintained for 9 years. Planting activities from 3rd year to 11th year. Treating activities from the 4th year to 21st year.
- 3) Reforestation in protection forests: Field survey for a planting plan in the 5th

year. Construction of five small nurseries in 6th year and they are maintained for 4 years. Planting activities from 6th year to 9th year for 50,000 trees each year. Tending planted trees from 7th year to 14th year, and monitoring for all periods for 10 years.

- 4) Forest patrol for six protection forests and surroundings: Six small stations to be constructed in the 5th year. 12 forest guards for 10 years.
- 5) Research for promoting non-wood forest products in and around protection forests: Researchers team of three experts for 2 years.
- 6) Fuel wood plantation: Construction of seven delivery stations within timber tree nursery from the 5th to 7th year. 150ha of firewood plantation for 10 year.
- 7) Timber tree planting: Construction of nine nurseries from the 5th to 7th year (three per year). 30 extension workers for 10 years.
- 8) Extension Services: training program for 5 years.

4.2.13 Cost Estimate

The cost of forestry management and rehabilitation plan is summed up in Table F.4.4. Total costs for these programs are Rp.9,710,150,000. The contents of expenditure is mainly divided into two items i.e. labors and materials. 92.9% of the total cost is used for employing labors including skilled and unskilled ones. The cost allocation to each program is also shown in the table. 55.8% of the cost is allocated to the programs for forests in private lands in Bm1, Bm2, and Bm3 Zones. The rest of them is allocated to the programs in P Zone.

4.2.14 Recommendation

Forests in the Intensive area have very important roll for soil conservation and water resources circulation. In addition, the forests provide several produces directly used for domestic or commercial purposes. But now, the forest in the Area is now facing several problems as mentioned in a previous section.

Although various countermeasures have been proposed to tackle the problem, the key issue of the plan is how intensely local residents are involved in the implementation process of the plan. To achieve the involvement of them, accountability and a technical assistant are essential. Then extension services have a very important roll in it. Unfortunately, as it is already concerned, an organization of the forestry office especially extension services section have a problem in terms of human resources. Therefore the first priority should given to the improvement of the organization.

On the other hand, a monetary assist is required to encourage or promote the people's participation as same as a technical assistant. In general, local residents are aware of the necessity and importance of forest conservation, but they do not have enough funds to initiate any forest-related activity. It is recommended that some means for local residents to approach monetary assists are provided.