No.

Forest Department
Ministry of Forestry
The Union of Myanmar

Japan International
Cooperation Agency

THE STUDY ON INTEGRATED MANGROVE MANAGEMENT THROUGH COMMUNITY PARTICIPATION IN THE AYEYAWADY DELTA IN THE UNION OF MYANMAR

Final Report
Volume I: Summary

March 2005

NIPPON KOEI CO.,LTD.

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PREFACE

In response to a request from the Government of the Union of Myanmar, the Government of Japan decided to conduct The Study on Integrated Mangrove Management through Community Participation in the Ayeyawady Delta in the Union of Myanmar and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched a study team headed by Mr. Yoichi Iwai of Nippon Koei Co., LTD. between February, 2002 and February, 2005.

The team held discussions with the officials of the Government of the Union of Myanmar and conducted field surveys at the study area. Upon returning to Japan, the team conducted further studies and prepared this final report.

I hope that this report will contribute to the promotion of this project and to the enhancement of a friendly relationship between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of the Union of Myanmar for their close cooperation extended to the study.

March 2005

Etsuo KITAHARA ,
Vice-President
Japan International Cooperation Agency

March 2005

Mr. Etsuo KITAHARA
Vice-President
Japan International Cooperation Agency

Letter of Transmittal

Dear Sir,

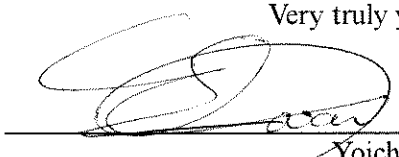
We are pleased to submit to your agency the Final Report on "The Study on Integrated Mangrove Management Through Community Participation in the Ayeyawady Delta in the Union of Myanmar". This report presents the results of all the studies conducted in both Myanmar and Japan over a three-year period from February 2002 to March 2005.

The study formulated an integrated mangrove management plan (IMMP), with a total project period of 40 years starting from 2005 with the overall goal of establishing "coexistence of vivid mangrove vegetation and people's lives" in the study area through the rehabilitation of degraded mangrove forests and livelihood improvement of the local people by various community forestry activities under the authorization of the Community Forestry Instruction . We believe that implementation of this holistic plan will contribute much to improve the natural environment and socio-economic situation in the study area.

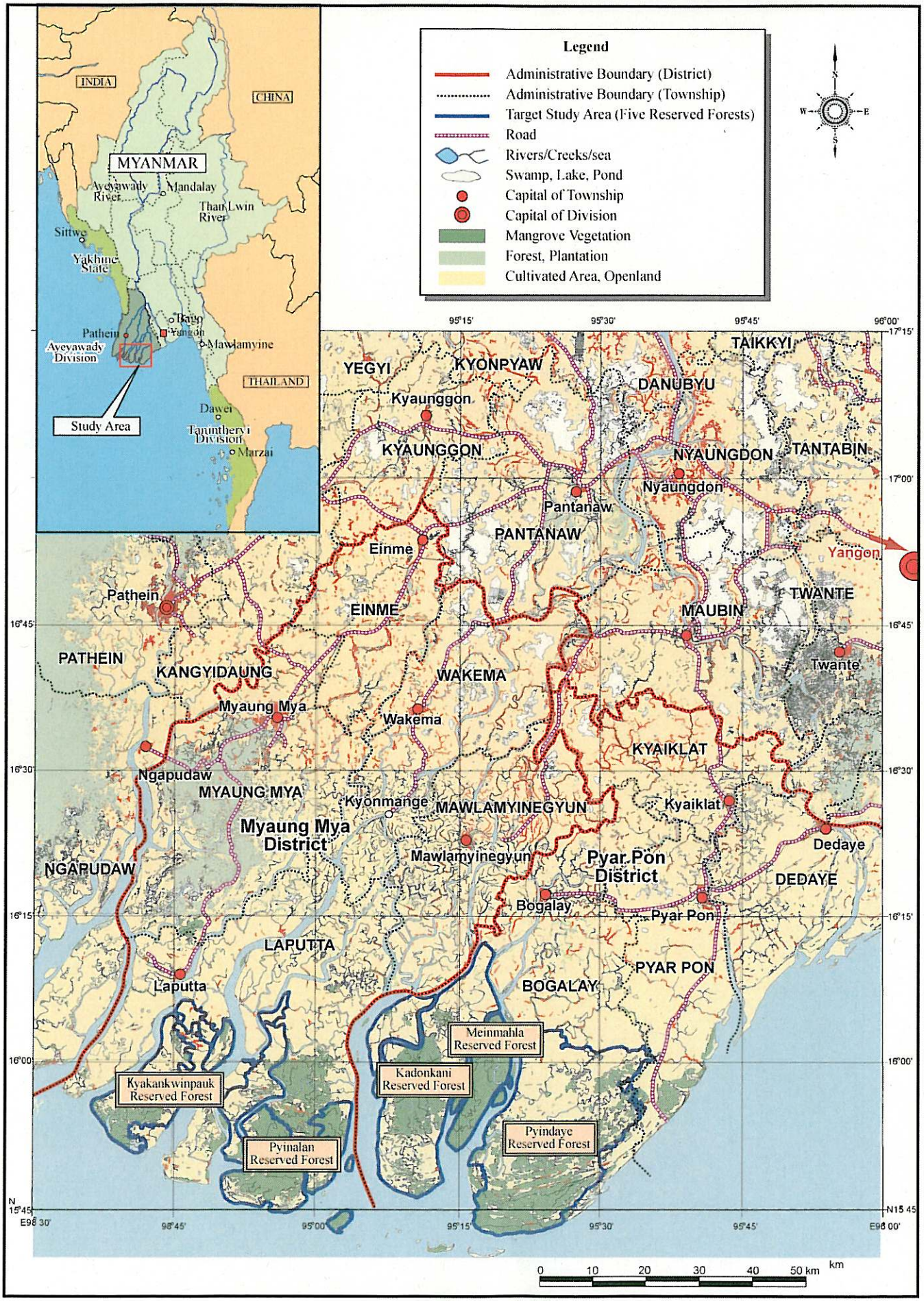
We, therefore, hope that the Myanmar government will soon commence implementing the integrated mangrove management plan and follow the implementation schedule presented in this report.

Finally, we wish to express our deep appreciation and sincere gratitude to your agency, the Advisory Committee, the Ministry of Agriculture, Forestry and Fisheries, the Embassy of Japan in Myanmar, the JICA Myanmar Office, and the Government of the Union of Myanmar for the close cooperation and assistance extended to us during our study.

Very truly yours,



Yoichi Iwai
Team Leader
The Study on Integrated Mangrove
Management through Community Participation
in the Ayeyawady Delta
Nippon Koei Co., LTD.



Location Map of Study Area

SUMMARY

1 SCOPE OF THE STUDY

1.1 Objectives of the Study

The objectives of the study are as follows:

1) To formulate the Integrated Mangrove Management Plan (IMMP), which aims at rehabilitation and sustainable use of mangrove resources by local communities;
2) To implement the pilot project in order to confirm practicability of the IMMP and to enhance capacity building of the stakeholders; and
3) To transfer relevant technology to the Myanmar counterpart personnel through on-the-job training in the course of the study.

1.2 Study Area

The study area covers the five reserved forests of Kyakankwinpauk, Pyinalan Reserved Forest in Laputta and Kadonkani, Meinmahla, and Pyindaye Reserved Forest in Bogalay Townships in Ayeyawady Division with a total area of approximately 206,127 ha.

1.3 Framework of the Study

The study consists of Phase I for survey and formulation of the draft IMMP and Phase II for implementation of pilot project and revision of the draft IMMP.

1.4 Pilot Project

The following components of the pilot project 2003 and 2004 were carried out during February 2003 to October 2004 by CF user groups and FD as the stakeholders at Thar Yar Kone and Nyaung Ta Pin villages in Laputta Township.

Components of the Pilot Project 2003 and 2004

Pilot Project	Period	Major Component
Pilot Project 2003	From 02.2003 to 02. 2004	Planning, implementation and evaluation for: - Thar Yar Kone Village Community Forestry - Nyaung Ta Pin Village Community Forestry - The Forest Department Integrated Mangrove Nursery - The Forest Department Frontline Staff Capacity Development
Pilot Project 2004	From 05.2004 to 10. 2004	Planning, implementation and evaluation for: - The Forest Department Capacity Development - Thar Yar Kone and Nyaung Ta Pin CF

1.5 Organization for the Study

FD formulated a counterpart team and assigned its staff during phases I and II of the study period respectively. For implementation of the pilot project 2003 and 2004, FD assigned 13 staff excluding deputy range officers and foresters at regional FD offices of the Ayeyawady Division, the Myaung Mya District, and the Laputta Township. Also Peace and Development Council, Myanma Agriculture Services, and the Fishrey Department at the same region contributed to implementation of the pilot projects.

2. PRESENT CONDITIONS IN THE STUDY AREA

2.1 Geography and Topography

The geological formation of the Ayeyawady Delta is relatively new and originates from the Cenozoic era. The majority of the delta, including the lower delta where the study area is located is of alluvial origin from the Holocene by the sedimentation action of the Ayeyawady River. However, the western central part of the delta, covering towns such as Pathein and Myaung Mya, is classified as the Ayeyawady Formation from the Miocene to the Pliocene. The parent material of the soils of the study area resulted mainly from recent sedimentation and bedrock formation of the area is immature. The Ayeyawady Delta covers an area of 33,670km^2. Most of the lower delta areas are generally flat and the altitude is not more than 3m.

The delta area has a large network of creeks, streams, and rivers, and is frequently flooded by tidal effects and/or rain during the rainy seasons. The land is intersected by rivers and creeks dividing it up into numerous islands. Basically, all of the rivers, creeks and channels are branched from the Ayeyawady River. The five reserved forests in the study area are intersected by major rivers in the north-south direction.

2.2 Soil

Under the present study, a soil survey, that includes soil physical/chemical analysis, was conducted at the candidate pilot project sites located in the Pyinalan Reserved Forest. The units identified were 1) sandy alluvium deposited soil (high ground), 2) silty alluvium deposited soil (high ground) 3) tidal saline silty soil (medium ground) 4) tidal saline clayey soil (medium ground), and 5) saline swampy soil (low ground). Soil acidity is also manifested in abandoned paddy fields. Thus it can have a negative effect on the yield of paddy rice.

2.3 Meteorology

There are three seasons recognized by the local people in Myanmar: rainy season ("Moe Yathi", from mid-May to mid-October), cold season ("Saung Yathi", from mid-October to mid-February) and dry (hot/summer) season ("New Yathi", from mid-February to mid-May). The seasonal change in the study area also follows this general pattern. The recorded mean maximum temperature is 35-37 ^{o}C in March and April and the mean minimum temperature is 11-15 ^{o}C in December and January. Humidity is between 60 % and 100% throughout the year. The recorded mean annual rainfalls (1998 to 2000) were; 2,477 mm in Bogalay Township and 3,354 mm in Laputta Township.

2.4 Tidal Action

Based on Kogo (1993)'s study[1], Pathein is observed to have a 1.2 – 1.6 m higher water level during the rainy season compared to the dry season. In most cases, tidal levels in the coastal areas are not necessarily affected by the discharge of freshwater or volume of rainfall even during the rainy season. Mangroves in the Ayeyawady Delta thrive best from 1.4 m to 2.6 m above sea level. It was also observed that mangroves do not thrive in areas lower than 1.4 m above sea level, where the seedlings are submerged for a long period of time. It is also not suitable for mangroves where there are shortages of water during the dry season. The study team also recognized growth patterns of mangroves similar to those observed by Kogo (1993).

[1] M. Kogo, 1993, "Final Report on Mangrove Reforestation Feasibility Study", Feasiblity Study on Mangrove Reforestation, MYA/90/003, FAO

2.5 Salinity

During the rainy season, the salinity level of rivers was around 1 ‰ throughout the research area. These can be considered as almost freshwater. But salinity conditions greatly changed in the dry season when there is less rain or no rain at all. During the dry season, a minimum salinity of 2 ‰ was observed at Pathein located more than 100 km from the river mouth. Salinity increased gradually towards the river mouth, and then the maximum salinity of 28 ‰ was observed at a point 25 km distance from the river mouth.

2.6 Classification of Land and Implications for Mangrove Management

From the environmental factors, it is suggested that mangrove plantations in Ayeyawady Delta can possibly be classified with respect to the following aspects (Kogo, 1993):

1) Light conditions (effects of aggressive species that shade out undergrowth),
2) Soil moisture conditions during the dry season,
3) Ground level related to tidal inundation (low, medium, high, and extremely high ground level).

Land Classification Relating to Tidal Inundation

Ground Level	Frequency of flood per month in dry season	Flooded by	Watson's Inundation Class*
Low ground level	62-45	all high tides/medium high tides	1-2
Medium ground level	45-2	normal high tides/spring high	3-4
High ground level	4 times in dry season	equinoctial tide	5
Extremely high ground	0	only in rainy season	6

Note: Watson, J.P. 1928. Mangrove Forest of Malay Peninsula, Singapore, Fraser and Neave. (Malayan Forest Record, No. 6)
Source: Kogo, 1993

The ground level and tidal conditions critically influence the survival and the growth of the vegetation in mangrove forests. Therefore, understanding ground levels and tidal conditions of concerned sites is indispensable for proper mangrove forest management in the delta. Since the delta is relatively flat but with complex micro-scale topography, it is physically difficult to identify precise ground level and tidal condition of a given site.

2.7 Diversity in Fauna and Flora

Fauna and flora in the study area are mostly identified by literature records. Information is very limited and surveys had been conducted mostly in the Meinmahla Reserved Forest. The number of identified species through the study in each taxonomical group is shown in the following table.

Number of Identified Species in each Taxonomical Group[1)]

Taxonomical group	Family	Species	Important Wildlife[2)]
Mammals	12	19	12
Birds	44	95	67
Reptiles	5	8	8
Plants	53	139	1

Note: 1) Each identified species is indicated in Tables 2.7 to 2.10 of the Volume II
2) Refer to 2.1.3 (2) of the Volume II for important wildlife.

2.8 Important Wildlife

Important wildlife species can be identified as the threatened species which are ecologically and economically precious in the country. These species usually play a key role in any chain in their ecosystem. In addition, most tropical species are highly valued

in bio-diversity. In this report, important wildlife species are determined based on "the Protected Animal List of the Myanmar" and "the Red List of the International Union for the Conservation of Nature and Natural Resources (IUCN)". Totally 88 important species were identified as shown in Table 2.11 of the Volume II main report. Macaque and otters listed in the table are indigenous in the mangrove environment in Myanmar. 67 birds listed in the table include many waterfowl and migratory birds for which habitats are endangered and decreasing in the world. As for important plants, only one species, *Intsia bijuga*, is listed.

2.9 Current Land Use and Mangrove Forest Area

Cultivated land, which is composed mainly of paddy fields, is the dominant land use in the study area, occupying 97,261ha (approximately 47%) of the total study area, exceeding the total mangrove area of 90,386ha (approximately 44%). Also at reserved forest level, of the four reserved forests with cultivated lands, the cultivated land is the dominant landscape in all of the reserved forest except for the Pyinalan Reserved Forest where the mangrove forest occupies larger areas than the cultivated land by 1,190ha.

2.10 Decrease of Mangrove Forest (1995 – 2001)

Following figure is a thematic map that shows a spatial distribution of the percentage loss of forest in the year 2001 compared to the year 1995 by forest compartment. In the Kadonkani Reserved Forest, forest compartments with more than 30% decrease of forest cover can be observed in the northeastern and western area. In the Pyindaye Reserved Forest, forest compartments situated in the central part of the Reserved Forest have already lost their forest cover.

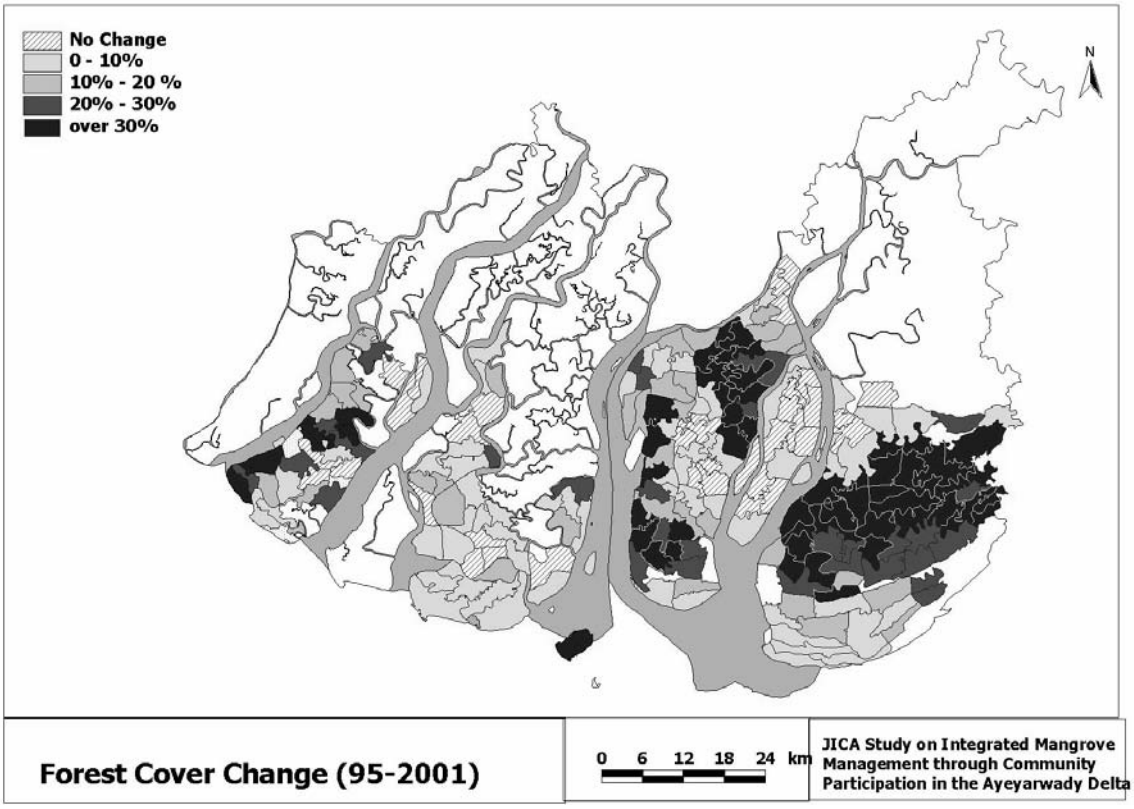


Figure 2.3 Forest Cover Change 1995 - 2001

2.11 Illegal Weirs

The present study revealed that illegal embankment and dike constructions, mainly for aquaculture and salt pans, are predominant in the Pyinalan and Pyindaye Reserved Forests. The GIS section of the Planning and Statistics Department, FD, and the study team identified those embankments and dikes recognizable in aerial photographs of the study area taken in 2002. Especially, the aerial photograph interpretation result revealed that in the Pyinalan Reserved Forest and the Pyindaye Reserved Forest, mangrove forests of approximately 5% and 3% of the total reserved forest area respectively, had been enclosed by embankments and/or dikes.

2.12 Villages in the Reserved Forest

The villages are scattered in and around the four reserved forests in the study area. According to the results of the village tract survey, conducted in the study, there are 359 villages in and adjacent to the reserved forests. Most of the villages are located at the outskirts of the reserved forests. More than 60% of the villages in and adjacent to the reserved forest were established after 1949. Of the 100 villages out of 359 villages surveyed in the village profile survey, more than 60% of villages were with population less than 500. According to 2004 topographical map, 221 villages are recorded inside the study area.

2.13 Demography

The total population in the study area in 2002 has been estimated at 206,939. Internal migration and mobility have been a common phenomenon in this country. A great number of inter- and intra-migrants have flocked to the reserved forest areas for temporary or permanent employment opportunities and settled within the forests. This is evidenced by the fact that the average annual rate of population growth for the period 1994 to 2002 in the study area averaged 3.33 percent (higher than the national average of 1.9 %).

2.14 Occupational Structure (Income Level)

The occupation in the village can be categorized: (a) agricultural people, (b) fishery people and (c) casual labour people. The large farmers sell their surplus paddy to local collectors/millers and earn cash income required for household necessities. Similarly, the medium farmers also sell a limited quantity of food grains during the harvesting period of paddy to solve the household cash crisis and buy some needed items. However, there are many cases in which farmers sell all harvested paddy and procure food requirements (inferior quality of rice or broken rice) for their livelihood from the local markets.

Farmers domesticate buffalo, duck, chicken, and fish. Larger farmers earn more income from raising livestock and poultry than small farmers, while farmers specializing in aquaculture earn more than those engaged only in paddy cultivation irrespective of land holding size.

There are two types of fishery people in the area: (a) full-time fishery households and (b) part-time fishery people. Full-time fishery people earned much more than the high income farm groups, while part-time fishery households (landless households) engaged in crab catching live on a subsistence basis.

Since the majority of small farmers and landless households suffer difficulties in maintaining their livelihood, they must work as agricultural laborers during the peak agricultural season at the average daily wage rate of 400-500 kyat. Thus, agricultural labor is particularly important for small households, which are able to earn more by providing agricultural labor than from actual crop production, a situation that applies to landless households as well.

2.15 Water

Water is one of the critical issues for living or economic activities in the study area, especially in the dry season. In dry seasons, people are obtaining water either from well and pond or buying from the sellers and merchant. The price for the water amounts 30 to 50 kyat per 25 litter (five gallons) is big burden of the villagers that including transportation cost, though it fluctuates depending on the distance from the original water sources the merchants buy from.

2.16 Poverty

The incidence of poverty in the study area is estimated on the assumption of a poverty line calculated at 100,000 kyat/year in reference to the UNDP poverty line definition of 8,000 kyat/month per household.

Poverty Incidence (2002)

Reserved Forest	Poverty Incidence (%)
Kyakankwinpauk	33.0
Pyinalan	35.3
Kadonkani	59.6
Pyindaye	54.5
Average	**48.3**

The overall poverty conditions by reserved forest have been evaluated based on the following six criteria: (i) occupation (% of casual labor households), (ii) land ownership (% of landless and farm households with less than three acres), (iii) housing condition (% of households with grass/nipa/palm thatch roofs), (iv) toilet use (% of households using open pit latrines or no latrine), (v) education (% of population with monastic or primary school education or no education), and (vi) income (% of households with annual incomes of less than 100,000 Kyat) as shown in the table below.

Overall Poverty Conditions

(Unit: %)

Reserved Forest	Occupation	Owing Land	Roofing	Toilet Use	Education	Income
	Casual Labour	Landless/ Farm HHs*	Grass/Nipa/ Palm	Open Pit/None	Primary/ None	<100,000 Kyat/year
Laputta Township:						
Kyakankwinpauk	59.6	60.1	99.4	66.8	92.7	33.0
Pyinalan	63.1	63.6	98.9	66.7	94.9	35.3
Bogalay Township:						
Kadonkani	63.2	65.1	95.4	62.6	82.4	59.6
Pyindaye	37.7	56.7	98.7	64.9	40.4	54.5
Average	54.2	61.1	97.9	64.9	72.1	48.3

Note: * shows farm households with less than 3 acres.
Source: Village profile site survey, 2002.

As a result of the overall evaluation of poverty conditions for each reserved forest, the Pyinalan Reserved Forest has been ranked to be the poorest area, followed by the Kyakankwinpauk, Kadonkani, and Pyindaye Reserved Forests.

2.17 Current Value of Mangrove Forest based on Its Functions

Function of mangrove forest is categorized as use and non-use values. The use values are production from mangrove forest and the non-use values are effects by various forest functions such as biodiversity conservation, erosion and flood control, and carbon

sequestration. The multifunctional roles of mangrove forests are able to be directly and indirectly converted into marketable goods and services to calculate the benefits in monetary terms with adoption of different valuation techniques. In this evaluation, however, the volume of socioeconomic value, which are limited due to quantitative difficulty in the valuation as well as non-availability of necessary data and information, can be broadly divided into two categories: 1) direct benefits comprising fuelwood production and fish/shellfish productivity, and 2) indirect benefits comprising biodiversity conservation (medicinal plant seeds use), coastal erosion and flood control, and carbon sequestration. The total value of the multiple roles of the present mangrove forest in the study area is estimated at 4,840 million kyat/year and 87,000 kyat/year/ha after dividing the annual value by 55,461 ha, i.e. the current area of mangrove forest (closed mangrove forest on aerial photo 2002) in the study area. The value of the present mangrove forest in the study area is summarized below.

Current Value of Mangrove Forest in the Study Area

Functions and Services	Total Value (million kyat/year)	Value per ha (kyat/ha/year)
Use Values		
Fuelwood production	219.8	3,963
Fishery productivity	3,033.5	54,696
Non-Use Values		
Medicinal plant seed production	83.7	1,509
Erosion and flood control	222.5	4,012
Carbon sequestration	1,280.5	23,088
Total	4,840.0	87,269

3 PRESENT INSTITUTIONAL FRAMEWORK FOR FOREST AND FORESTRY

3.1 Forest Law

According articles 4 and 6 of the Forest Law, the reserved forest is an area to conserve the environmental factors and to maintain a sustained yield of forest products. The Ministry of Forestry may, with the approval of the Government, constitute the following categories of reserved forest by demarcating land at the disposal of the Government:

1) commercial reserved forest;
2) local supply reserved forest;
3) watershed or catchment protection reserved forest;
4) environment and biodiversity conservation reserved forest;
5) other categories of reserved forest.

The Forest Law also defines that forest and forestry as the allowed land use and activities in the reserved forest. Any trespassing, felling, burning, settlement, etc in the reserved forest without permission of FD cannot be allowed, and the person who violates the act can be punished in accordance with the Forest Law.

3.2 Local Supply and Community Participation

In order to satisfy the increasing local demand for fuel wood, the Forest Law (Chapter V, Article 15) stipulates to legalize woodlots for the use of the villages on state-own land close to the villages. In accordance with this enactment, FD issued the Community Forestry Instructions (CFI) in 1995. As per instructions, local communities who systematically plan and establish woodlots are given a 30-year land use right for forest

management. The community owned woodlot can be planted and used even in the reserved forest areas.

3.3 The Mandate of Forest Department

The Forest Law mandates to FD following eight functions and responsibilities;

1) implementation of the forest policy of the Government,
2) implementation of the plans relating to conservation of water, soil, biodiversity and environment,
3) management of forestland in accordance with the provisions of the law,
4) submitting proposals to the Minister for the determination, alternation or cancellation of reserved forest, protected public forest and species of reserved trees,
5) establishing and managing schools and training courses relating to forestry and sending trainees abroad,
6) administering the forestry institute,
7) inventorying forest resources, and
8) carrying out forest research.

The forest lands under the management of FD subject to these mandates are reserved forests and public protected forests. Public protected forest is delineated on national land outside reserved forests for the following specified purposes.

1) protection of water and soil,
2) conservation of arid-zone forests,
3) conservation of mangrove forests,
4) conservation of environment and biodiversity, and
5) conservation of sustainable production.

3.4 Organization of the Forest Department

Organization of FD is composed of three types of organization: regular organization, ad-hoc organization, and special organizations. Regular organizations are: Director General's Office, and regional offices like FD divisional office, FD district office, FD township office. Routine operation of the regular organization is carried out by transmitting directives from the upper echelon of the structure to the lower.

Meanwhile, an ad hoc organization has been formulated by the Director General of FD for operating special projects. The ad hoc organization under the Director General Office of FD is set up based on the permission and instruction of the Ministry of Forestry. Special organization at the township FD office are set by order of the state/division FD office such as the forest camps.

3.5 State/Division and District Offices of the Forest Department

The study area is under the management of the following FD regional offices.

- The FD Ayeyawady Division Office,
- The Myaung Mya District FD Office, and
- The Laputta and Bogalay Township FD Offices.

In general, the FD offices at state/division, district and township are responsible for 1) the management of a reserved forest and a public protection forest, 2) plantation, 3) revenue collection and 4) greening activities of charged area in accordance with the instructions from the Directors-General Office of FD and the related peace and development council.

3.6 Frontline Management of the Forest Department

The reserved forest of the study area is divided into seven blocks of beats, and "beat offices", and "beat officers (in most cases deputy rangers and infrequently foresters)" are posted to each block. The beat office is the smallest management office unit of FD under the township FD office. The beat officer's mandatory responsibility is for forest management, revenue collection, plantations development, and CF management and support.

3.7 Budget of Forest Department

The annual budget of FD for the fiscal year 1996 to 2003 has increased almost four times. Though the budget has been increasing, the amount is insufficient for fulfillment for payment of salary or project implementation.

3.8 Community Forestry Instruction

The community forestry is defined by the CFI as "forestry operation in which the local community itself is involved; such as: 1) establishment of woodlots where there is insufficient fuelwood and other products for community use, and 2) planting of trees and exploiting forest products to obtain food supplies, consumer products and incomes at farmer level". The objectives of the CFI are: 1) supporting the economic development of the country, 2) regaining environmental stability, and 3) addressing the basic needs of local communities.

3.9 Role Sharing of CF Activity between FD and CF User Groups

Stakeholders of CF activity are principally FD and CF user groups that are formulated by dwelled villagers as an entity to undertake responsibility for implementation of CF activity. The responsibility of FD is management and support of the implementation of CF activities by the CF user groups. The CF user group has to implement the CF activity in accordance with the CF management plan that they prepared by themselves and had been permitted by FD.

The duties and responsibility regarding CFI is devolved to the assistant director at the district FD office by the director general of FD in compliance with article 15 of the Forest Law. Under the district FD office, CF activity is being implemented through collaboration between district and township FD offices and the CF user groups.

3.10 Institutional System of CF Activity

FD has already realized the importance of extension services to rehabilitate the degraded forests and to introduce CFI, the Forestry Extension Division, established in 1995, is working on the central level forestry extension activities such as development leaflets for public awareness and the Central Forest Development and Training Center (CFDTC) under the Training and Research Development Division is working on training government staff. Though the township FD office is the office charged with propelling the CF activity, the township office is not being allocated any kinds of budget for CF activity i.e. promotion of CF activity, support planning, granting CF certificates, technical or managerial support.

3.11 Mechanism of CFI

Mechanism of CFI is summarized as follow.

1) A CF certificate granted to a CF user group, not to individual member, for implementation and management of CF activity,

2) CF area is prohibited to change land use from forest,
3) Production from CF area belongs to only CF user group or the member,
4) CF area shall not be traded,
5) CF certificate is granted only to dwellers settled in the same area for over three years, and
6) The management of CF areas is limited to CF user groups who has user right of the area (Prohibited management by enterprise or big scale forestry like forest enterprise)

3.12 Incentives Induced by the CFI

An diversified CF activities would provide immediate, short-term, mid-term and long-term incentives and could be an economical foundation for the user group. Actual subjects to be an incentive for CF activities are listed in the following table.

Incentives Introduced by Community Forestry by Terms

Immediate	Short-Term	Mid-Term	Long-Term
Land use right	Production from - CF aqua-agroforestry - NFIO - Value added Production	Production from - NFIO - CF agroforestry - Value added production	Wood production from - CF plantation/public woodlot/ CF riverside plantation - Value added production
	Fish, Prawn, Crab	Vegetable, Root crop, Legumes	Fruits
	Firewood	Firewood	Multiple function of forest i.e. disaster prevention, land protection, grovel warming, etc.
	NTFP	NTFP	NTFP

Source: JICA Study Team

3.13 Ban of Charcoal Kiln Construction and Charcoal Production

The ban of charcoal production and destruction of charcoal kilns was orally instructed in 1993 by the chairman of Ayeyawady Division Peace and Development Council, the divisional FD office stopped the cutting of delta forests, particularly mangrove species for charcoal, posts, poles, and fuelwood through a written order in 1994. Based on the instructions, all of the charcoal kilns in Ayeyawady Division were destroyed. Currently charcoal production in Ayeyawady Division requires an application for permission and license from the divisional Peace and Development Council and the divisional FD Office.

3.14 CF Certificated Area in the Study Area

The following table summarizes the number of user groups and CF certified areas in the study area. At the year 2000, about 6,400 ha, which equals to 3.7 % of the study area was certified. Both townships had the same number of user groups granted CF certificates (including 10 CF user groups in the Kakayan Reserved Forest in the Laputta Township which is outside the study area). On the other hand, regarding CF certified area, the Laputta Township FD established twice that of Bogalay Township, because of the following different socioeconomic and natural conditions between the reserved forests:

- Population density of the reserved forests in the Bogalay Township is higher than the reserved forest of the Laputta Township.
- Because of low population density, the reserved forests of the Laputta Township have more land available to be allocated for CF.
- Vegetation of mangrove forest remains in the reserved forests of Laputta Township more than the Bogalay Township, so Laputta allocates more mangrove forest areas for CF.

No. of User Groups and CF Area in the Study Area (2000 and 2003)

(unit: ha)

Reserved Forest	No of UsG	No of Members	Avg. UsG members	Plantation Area	NFIO/RIF Area	Total Area	Area/ Member
March 2000							
Kyakankwinpauk	12	284	24	332	210	542	1.9
Pyinalan	25	1,918	77	1,663	2,115	3,778	2.0
Kadonkani	18	925	51	608	23	630	0.7
Pyindaye	29	693	24	1,372	54	1,426	2.1
Total	**84**	**3,820**	**44**	**3,975**	**2,402**	**6,377**	**1.7**
March 2004							
Kyakankwinpauk	12	284	24	361.8	230	592	2.1
Pyinalan	27	2,229	83	2,089	2,500	4589	2.1
Kadonkani	10	541	54	664	25	689	1.3
Pyindaye	7	259	37	712	577	1,289	5.0
Total	**56**	**3,103**	**49**	**3,828**	**3,332**	**7,159**	**2.7**

Source: PSD, Forest Department, 2004 and Myaung Mya District FD Office, November, 2004

Note: in the Kakayan reserved forest, 10 user groups (740 user group members) and in total 1,659 ha of CF area has been granted CF certificated.

3.15 Current Situation with CF Activities in the Study Area

The actual implementation areas of the certified CF area as of 2002 are 41 % in Laputta and 38 % in Bogalay respectively. In total, CF activities are actually only carried out in 36 % of the certified CF area. This is mainly due to the rotation of each CF management plan and insufficient forestry technology, shortage of seedling supply from FD and managerial reasons such as land disputes.

3.16 Relationship between Villagers and Mangrove Forest

The villagers' daily life in the study area totally depends on the mangrove forest for extraction of fuel wood, catching fish, crab, shrimp, or shells and processing mangrove products for their daily commodities or for market. Even farmers get part of their earnings by fishing or catching fish or prawn, which may account for a major part of their income. Human life in the area is closely linked with the mangroves or mangrove based products.

3.17 Constraints on CF

The constraints on the current CF activity in the study area are analyzed in the study and listed hereunder.

1) Delay of Certification
2) Insufficient Seedling Supply
3) Inappropriate Forestry Technologies
4) Misunderstanding of Villagers / FD about CF Activity
5) Insufficient Incentives for Local People
6) Difficulties related to Daily Livelihood
7) Shortage or Overlap of Working Time

3.18 Review of Kadonkani Reserved Forest Integrated Resource Management

The FD applied the zoning system for management of protected areas that is the Integrated Resource Management (IRM) in Kadonkani Reserved Forest. The IRM area is subdivided into four different management zones, namely, Protected Reserve Areas (PRORA), Special Management Areas (SMA), Buffer Strips (BS), and Multiple Use

Zones (MUZ). The goal of IRM in the Kadonkani Reserved Forest is to build a sustainable environment in the sphere of the regional development plan with active local participation, particularly local organizations and CF user groups. The IRM has the following broad objectives.

1) To integrate mangrove conservation with development needs of villagers,
2) To promote public awareness including mangrove protection techniques,
3) To rehabilitate degraded mangrove forests through effective management and community participation,
4) To reforest the denuded mangrove areas and marginal agricultural lands through community wood lots and CF plantations, and
5) To improve the welfare of local communities with provision of environmentally sound income and food production activities in forestry, agriculture, livestock and fishery.

3.19 The Process Involved in the IRM

FD is employing laborers to work in nurseries and in plantations, including maintenance and tending operations at a minimal wage of 500 kyat/day with fringe benefits such as fishing rights, collecting poles, etc. Through engagement with the FD work, the villagers understanding about mangrove forestry has been deepened.

FD commenced IRM in accordance with the permission of Bogalay TPDC on a proposal from FD, because of resettlement of villagers in the plan. Accordingly, the villagers were forced to move out from their cultivated paddies and villages/settlements without any compensation except the seedlings to be supplied after starting CF. According to FD, there were no conflicts on the resettlement. It is obvious that the understanding and participation of TPDC and VPDC are required for implementation of a plan of this nature.

4 PRESENT CONDITION OF NATURE AND RESOURCE OF THE STUDY AREA

4.1 Historical Review of Mangrove Forests

The reserved forests of the study area were designated for timber, fuelwood, and charcoal production by FD during the early 1900's.During that time, the reserved forests of the study area were prescribed as a fuelwood working circle and species such as *Bruguiera* and *Heritiera* were harvested with a certain girth limit. The reserved forests were divided into compartments as a basis for logging operations, control systems and cutting series.

The degradation of mangrove forests increased after the 1960s, by further exploitation of mangrove woods and conversion of mangrove areas to paddy fields and other land uses. In 1984, the mangrove forests in the delta working circle decreased to 181,065 ha (447,073 acres).

As of 2004, FD sets targets and collects permission fees and removal fees for phoenix poles and nipa products in the study area, but the FD has stopped collecting the removal fee for charcoal in the study area since charcoal was banned for production in the delta .

4.2 Current Situation of Mangrove Forests

Based on the results of the transect line vegetation survey, the study analyzed the following items; 1) species composition, dominances, and density, 2) growth structure, 3) stand stock, 4) land gradient and species distribution.

4.3 Species Composition and Distribution

There were at least 48 species of mangrove trees, creepers, shrubs and vines recorded during the vegetation transect survey in reserved forests of Bogalay and Laputta Townships. The importance value of mangrove species is noticeably decreasing towards the higher ground level because fewer tree species and decreasing basal areas are recorded. Mangrove tree species with large dimensions are mostly observed in low ground areas and become scarce and are of smaller size towards the extremely high ground areas. Large size mangrove tree species are fewer in high ground areas than in the middle ground areas because the high ground areas are seldom reached by brackish water. Also, creepers, grasses and vines tend to cover most of the area in the high ground levels.

4.4 The Growth Structure

The mangrove forests in the study area can be generally classified as secondary growth in the reproduction or regeneration stage which is mostly composed of pole size trees of dominant mangrove tree species preferably growing in low to middle ground level. Based on the vegetation transect survey, it is estimated that reserved forests of both townships had similar proportions of plots in terms of stand volume and stocking class, though plots in Laputta Township had higher values of mean stand volume and stocking class. For all species, accumulation of volume seems to be heavily influenced by site conditions, particularly of ground level and frequency of tidal inundation compared to plantation ages, depend on the transect vegetation survey. Stand stock also varied among plantation sites. This may be derived from the following factors: 1) multi-stem trees, natural regenerated seedlings and/or coppicing were also counted as individuals in the inventory, 2) patching and additional planting were conducted in some plantation sites, and 3) some plantations had higher planting density than 3,000 seedling/ha.

4.5 Stand and Stock Assessment

Stand volume and stocking were also analyzed according to diameter class and the result is summarized in the following table.

Stand Volume and Stocking by Diameter Class

Item	Bogalay		Laputta	
	Stand Volume	**Stocking**	**Stand Volume**	**Stocking**
Percentage by diameter class				
1. 5 cm (2.5 -7.5)	66.87%	80.48%	95.28%	97.54%
2. 10 cm (7.5-12.5)	25.48%	14.56%	4.20%	2.23%
3. 15 cm (12.5 -17.5)	5.65%	3.45%	0.31%	0.15%
4. Other classes	2.00%	1.51%	0.21%	0.08%
Top 10 species contributing to stand volume	*Rhizophora apiculata* *Heritiera fomes* *Bruguiera gymnorrhiza* *Brownlania tersa* *Bruguiera sexangula* *Xylocarpus granatum* *Avicennia officinalis* *Kandelia candle* *Sonneratia caseolaris* *Phoenix paludosa*		*Ceriops decandra* *Rhizophora apiculata* *Bruguiera gymnorrhiza* *Heritiera fomes* *Phoenix paludosa* *Brownlania tersa* *Hibiscus tiliaceus* *Excoecaria agallocha* *Bruguiera sexangula* *Avicennia officinalis*	

Source: JICA Study Team

More than 90% of individuals, in terms of both volume and stocking, recorded in the survey had a diameter smaller than 12.5 cm, and the majority of such recorded individuals were

smaller than 7.5 cm in diameter. Only very few individuals of *Avicennia* and *Sonneratia* were recorded in diameter classes above 15 cm which are classified as timber size trees. In general, mangrove forests of the study area can be characterized as in the recovery/regeneration stage, due to abundance and dominance of small diameter-class trees.

4.6 Natural Conditions and Species Distribution

The ground level, tide level, frequency of tidal inundation and species pattern of distribution under natural conditions will serve as a guide in species/site matching for selection of preferred or desired mangrove species suitable to site conditions for establishment of mangrove plantations and implementation of various natural forest operations. Based on findings and suggestions of Kogo (1993) and field obeservations by the study team, the ground level classification in relation to the tide level and frequency in the study area can be summaraized as follows.

Frequency of Tidal Inundation in Ayeyawady Delta

Mangrove land area class	Tide level (m) above sea level/ Admiralty datum	No. of days of tidal inundation per month during dry season	Tidal inundation class based on Watson Classification	Frequency of tidal inundation per month based on Watson Classification
Low Ground Level 1	0.1-1.7	all high tides (at least 20 days/month)	1	56-62
Low Ground Level 2	1.7-2.0	every medium high tide/every start of spring tides (10-19 days /month)	2	45-59
Medium Ground Level 1	2.0-2.3	every normal high tide/mid spring tides (3-9 days/month)	3	20-45
Medium Ground Level 2	2.3-2.6	every spring high tide (at least 2 days/month)	4	2-20
High Ground Level	2.6-2.7	4 times in dry season by equinoctial/ abnormal high tides	5	0-2
Extremely High Ground Level	2.7-3.3	only flooded by rain water during rainy season	6	none

Source: modified from Kogo, 1993

The species distribution of some important mangrove species has distinct patterns or zones as influenced by land ground level which determines the frequency of tidal inundation and soil type. Results of the vegetation analysis of mangroves in the study area show that the most common mangrove species form pure stands and in each ground level type. Dominant species distinctly exist. The mangrove species distribution based on ground level is summarized in the table below.

Mangrove Species Distribution by Ground Level Classification in the Study Area

Ground Level Glass	Common Mangrove Species	
Low Ground Level 1	High saline water *Avicennia alba* (Aa) *Avicennia marina* (Am) *Kandelia candle* (Kc) *Sonneratia apaetala* (Sa) *Aegiceras corniculutum* (Ac)	Low saline water *Kandelia candle* (Kc) *Nypa fruticans* (Nf) *Rhizophora apiculata* (Ra) *Sonneratia caseolaris* (Sc) *Avicennia officinalis* (Ao)
Low Ground Level 2	*Nypa fruticans* (Nf) *Rhizophora apiculata* (Ra) *Sonneratia qrifithi* (sg) *Sonneratia alba* (Sal) *Ceriops decandra* (Cd) *Bruguiera gymnorhizza* (Bg) *Brugiuera sexangula* (Bs) *Avicennia officinalis* (Ao) *Aegiceras corniculatum* (Ac)	*Brownlania tersa* (Bt) *Ceriops decandra* (Cd) *Bruguiera gymnorrhiza* (Bg) *Aegiceras corniculutum* (Ac) *Hiretiera fomes* (Hf) *Rhizophora apiculata* (Ra)
Medium Ground Level 1	*Ceriops decandra* (Cd), *Bruguiera spp* (Bspp), *Heritiera fomes* (Hf) *Amoora cucullata* (Amcu), *Xylocarpus granatum* (Xg) *Xylocarpus mollucensis* (Xm), *Aegilitis rotundifolia* (Ar)	
Medium Ground Level 2	*Heritiera fomes, Xylocarpus mollucensis, Xylocarpus granatum* *Excoecaria agallocha, Amoora cucullata, Phoenix paludosa*	
High Ground Level	*Phoenix paludosa, Cynometra ramiflora, Hibiscus tiliaceous* *Chlelodendrum inerme, Myet-kha grass*(Mn)	

Source: JICA Study Team

4.7 Non Timber Forest Products

Most non-timber forest products from mangrove forests in the study area have less demand from local communities compared to the wood products. However, some non-timber forest products are collected and utilized for both domestic and commercial purposes. Compared to other non-timber forest products, nipa thatches are produced widely throughout the study area. Especially, a commercial production of nipa thatch is common in Bogalay Township and annual production ranges around 15 - 20 million fronds. Because of large-scale production, the nipa thatch and phoenix poles are currently the only two forest products in the study area, levied for revenue by FD. Other non timber forest products are rather small-scale production and more concentrated to domestic uses.

4.8 On-going Operations related to Mangrove Forests

In the following clause, the FD direct operations which are highly relevant for the mangrove forest management in the study area are described.

(1) Plantation by FD Direct Operation

The total extent of mangrove reforestation between the fiscal years 1980 to 2003 was 13,718 ha, of which Bogalay and Laputta had 5,632 and 8,086 ha, respectively. It seems that FD has set its target of annual mangrove reforestation since 1996 with the approval of the 10-year Management Plan (1996-2006) and with the creation and funding of the National Mangrove Project which paved the way for the establishment of IRM in the Kadonkani Reserved Forest. The annual plantation target area after 1996 ranged 405-486 ha (1,000 -1,200 acres) in Bogalay and 527 -648 ha (1,300 -1,500 acres) in Laputta. The mangrove species used in the recent plantation were many. However in terms of quantity, *Avicennia officinalis* is the dominant species, followed by *Sonneratia apetala*, raised and planted in the FD plantations. Non-mangrove species such as *Acacia auriculiformis*, *Eucalyptus camaldulensis*, *Albizia lebbeck* and *Melaleuca* species were also planted in

highland areas but these are more for trials.

The majority of the FD plantations of the early years have already been destroyed or damaged severely. According to the Bogalay Township FD office, most plantations from 1980 to 1991 were destroyed by illegal cutting and paddy encroachment, and some died due to unsuitable planting techniques. On the other hand, plantations from 1980 to 1983 were burnt and some did not survive in Laputta Township.

(2) Nursery and Seedling Production

Primarily, nurseries are established for providing seedlings to the FD's direct plantation. Normally, surplus seedlings are provided for CF use. Nurseries in the two townships can be classified into the following three types: 1) township nursery, 2) large-scale permanent nursery and 3) temporary nursery. Large-scale nurseries in the study area, Byone Hmwe Nursery and Kwa Kwa Ka Lay Nursery produce bare root and potted seedlings at approximate ratios of 60% bare root and 40% potted seedlings. Normally, *Avicennia officinalis* account for approximately 90% and 70% of regular annual production of the Byone Hmwe Nursery and Kwa Kwa Ka Lay Nursery respectively.

4.9 Current Situation of Agricultural Resource Use in the Study Area

According to an agro-ecological zone designated by the land-use division of the Myanma Agriculture Service, the study area is categorized as the agro-ecological zone "R3S1" ("R3" indicates annual rainfall of above 100 inches (2,540mm) and with two continuous months of dry summer, and "S1" indicates soil of Fluvisols/Gleysols). The agro-ecological zone is normally regarded as poor drainage, low pH, and high salinity areas that are not always favorable for agriculture. However, agriculture is predominant land use in the study area.

In the study area, the dominant agricultural production is monsoon paddy, coconuts, and nipa palms. Other than these three products, some legume species, oil plants, betel nuts and betel leaves, and bananas are found. Vegetables, fruits, and flowers do not appear in the table because of the small cultivation area and yield, mostly being cultivated in home gardens. Such production is supplemental activities that support marginal villagers' income and nutrition.

4.10 Crop Calendar

There are two agricultural high seasons in the study area for the production of the predominant variety of rice. The first peak season starts from June to September for preparation of rice planting and the second active season begins from October to December.

4.11 Animal Husbandry

Livestock breeding is one of the income generation sources in reserved forests, especially for villagers who do not have land use rights, and mainly women undertake livestock farming activities. The circumstances for rearing livestock are not adequate because of i) no feasible grazing or pasture land, ii) no support by the veterinary/animal husbandry department, the Ministry of Livestock and Fisheries (MOLF) , iii) high cow rental cost, iv) no disease control, v) rapid increase of feed price (rice bran, broken rice, paddy). Outbreaks of livestock diseases occur sporadically in the study area. However the farmers cannot afford to apply vaccinations against the diseases because of the high cost of vaccinations, so the spread of diseases is a great threat in the study area.

4.12 Agroforestry

The existing agroforestry practice in the study area is designed with three layers of vegetation. The highest stratum of the structure is provided by coconut palms that form an alley. Under the coconut canopy, fruit trees such as lemon, guava, and banana, are planted. At the bottom layer, cucurbit varieties, leafy vegetables, and watercress, are cultivated. This type of agroforestry has been practiced for more than 20 years following exploitation of the coconut plantations in the study area. New agroforestry is being practiced along creeks. This uses a tidal area with a ridge and ditch. The height of the ridge is constructed to be higher than the water level of the spring high tide. The ditch is composed of a water body where enough area is available for raising fish, prawn, and crab. This type of agroforestry is composed of two layers of fruit trees and vegetables or bean legumes. Moreover, the study area has a high potential to introduce an aqua-agroforestry, agroforestry combined with aqua-culture.

4.13 Fisheries Production in Laputta and Bogalay Townships

Although no definite data were available in terms of quantitative landed volume of crab, fish or prawn at Laputta and Bogalay township, the catch from the rivers and creeks has been declining based on the results of rapid rural appraisal (RRA), and interview surveys conducted under the present study. For instance, in La Mu Oak Ywama village in Bogalay an average fish and other aquatic animals' catch of 32 kg/day/person in the 1980s dropped to 16 kg/day/person in the 1990s and continued to drop to the level of only 5 kg/day/person at the present. Another example was reported by some villagers in Htan Pin Kwin village in Bogalay that the catch rate of mud crab (*Scylla serrata*) in 1997 was an average of 30 kg/month/person, but it dropped to 10 kg/month/person in the same area.

4.14 Artisanal Fishery

Most artisanal fishermen in the study area appear to catch mud crab (*Scylla serrata*) as a main species of their catch throughout the whole year. There is a regulation regarding the minimum size limit of mud crabs of more than 8.15 cm, but they do not seem to comply with the regulation. When they sell those crabs including the ones less than the legal size to the middleman or the person holding the fishing license in the area, middlemen buying the crabs keep crabs in cages for a while until they grow to a legal size.

The fishermen in the study area are allocated fishing grounds in all creeks and streams except in the large rivers by the fishing lot system, which was introduced in the year 2000. Influential and wealthy people have the advantage of purchasing fishing lots and earn money from sub-leasing. As a result, many artisanal fishermen, who include most of the landless people, have been deprived of their traditional fishing grounds and lost their main income source unless they work for the people who get the fishing areas through the system.

4.15 Aquaculture

There are three types of aquaculture, namely extensive, semi-extensive, and intensive. The data of total area of aquaculture in the Ayeyawady Division indicated that there is no area used for intensive aquaculture in the study area as of March 2002. The extensive form of aquaculture is the most commonly practiced in the division, and in this case the seedlings of fish and crustaceans (shrimp and crabs) simply flow or swim into the water bodies. The water volume is controlled by a gate connecting to outside creeks and rivers. After closing the gate, the water bodies are left without feeding until harvesting the aquatic animals caught inside by drainage of the water. The production of shrimp (*Penaeus spp.*) in extensive aquaculture ponds in Thar Yar Kone village in Laputta is approximately 55 kg/ha/year.

In Laputta Township, 3,200 ha of fish and shrimp ponds are owned by 80 people. However, the break down of total area and its annual fluctuation in Laputta are not available. The total area of aquaculture of shrimp increased in the fiscal year 2000 by more than 20 times compared to the previous year 1999.

4.16 On-Going and Future Fishery Plan

Basically, on-going fishery activities in the study area are supervised and managed by the Fishery Department of the townships and at district levels in accordance with related laws, rules, and regulations. The major responsibility of the Fishery Department is to collect tender fees and license fees for fishery within their district/township. Also, as of November 2004, there are no specific fishery related plans covering the study area proposed or scheduled to be implemented. It is expected that the management set up by the fishery department is maintained more or less in accordance with related laws, rules, and regulations.

4.17 Fauna and Flora: On-Going Wildlife Conservation

Under "The Protection of Wildlife and Protected Areas Law", protected areas are mainly classified into the following three categories: national park, marine park, and wildlife/ bird sanctuary, and necessary conservation activities are performed for the protected area. In the study area, the Meinmahla Reserved Forest was set up as the Meinmahla Wildlife Sanctuary, especially as a protected area for estuarine crocodiles, in 1994.

4.18 Fauna and Flora: Implementation of Survey

In Myanmar, surveys of important species, such as tiger, asiatic elephant, marine turtles, Ayeyawady dolphin, and orchidaceous plants, were conducted. In the study area, a survey of crocodiles has been conducted along with the inventory survey of birds for the inclusion of different ecosystems, wilderness values, and conservation of endangered species in conservation sites.

4.19 Fauna and Flora: Legal Enforcement

"The Forest Law" and "The Protection of Wildlife and Protected Areas Law" state strong commitment to nature and bio-diversity conservation. Control of illegal logging and hunting is performed by the township FD offices and nature and wildlife conservation division staff under FD throughout the study area. Particular emphasis was given to the Meinmahla Wildlife Sanctuary and 7 forest camps were settled inside the wildlife sanctuary for protection activities. In the protected reserve area of IRM in Kadonkani Reserved Forests, arrangements for 13 forest camps have been carried out in order to control illegal felling.

5 PRESENT SITUATION OF PARTICIPATORY DEVELOPMENT FOR EXTENSION OF COMMUNITY FORESTRY INSTRUCTION

5.1 Participatory Development Projects in the Study Area

Since the issuance of CFI in 1995, more attention has been given to participatory development in Myanmar. In the study area, there are a couple of projects that adopt a participatory development such as UNDP-HDI projects, FREDA/ACTMAN/Tokyo Marine project and CF activities. The projects are, however, different in approach. In addition, the understanding of the concept of 'participatory development' varies among stakeholders as described in Sections 5.1 to 5.2, Volume II of this report.

5.2 UNDP-HDI

Since 1994, mangrove conservation-related projects have been implemented as a part of the Human Development Initiative (HDI) because after the UNDP Governing Council Decision of June 1993, all programs for Myanmar UNDP and related funds had to be clearly targeted towards programs having grassroots level impact in a sustainable manner, particularly in the areas of primary health care, the environment, HIV/AIDS, training and education and food security.

During the project implementation, the purpose of projects has shifted from mangrove resource protection and development of plantation techniques to livelihood improvement and capacity development of the community and community based organizations (CBO) based on the conservation and use of mangrove resources and also to the environment, food security, and income generating activities.

Therefore, major stakeholders of the HDI were the CBO and facilitators who were engaged in supporting of the CBO for planning, techniques and for management. The CBO and the member received various kinds of trainings and implemented projects planned by CBO. The facilitator supported or led the CBO throughout the project period.

While all projects were formulated based on villager's needs and decisions were made using participatory approach, feasibility was not emphasized. The HDI projects located in the pilot project area under the study area in 2004, it were observed that project activities had already become inactive by October 2002. It is analyzed that the reasons are: shortage of management and techniques of CBO and support, sudden suspension of the supporting activities by the facilitators and no continuing support to the CBO.

5.3 FREDA

Forest Resource and Environment Development and Conservation Association (FREDA) is an NGO specializing in forest/mangrove and environment conservation. Major members of the NGO are retired FD staff. FREDA started implementing a 5-year mangrove reforestation project in the Southern Pyindaye Reserved Forest in 1999. The project aimed at the establishment of mangrove plantations based on CFI is an "integrated type with continuous support to alleviate constraints and difficulties of CF user groups member" comprising 1) mangrove seedling production by CF user group for selling and self-plantation, 2) distribution of sewing machines to women's groups of the CF user groups, 3) fruit and vegetable production by agroforestry 4) school renovation, and 5) CF plantation and natural forest operation.

It is revealed the following facts on the participatory project of FREDA.

Excessive support: supports user groups in writing the application and the CF management plan, because FREDA recognizes these tasks are too difficult for villagers to prepare alone.

Support in-kind: regulated the quantity of rice to be distributed to user group members by each activity of the CF, and instructs the regulation to its field staff because of understanding about in-kind support is indispensable to promote the CF.

5.4 Forest Department

A support for CF user groups for implementation of CF activities was not a prioritized FD activity because revenue collection and establishment of FD plantations are considered as high priority duties of the township FD office. FD officers and field staff in the study area do not have sufficient opportunity to practice participatory development except when donors (UNDP, FREDA) give assistance. The main activities of the participatory development implemented by FD, especially under support of HDI projects, are the

introduction and explanation of CF and supporting villagers to formulate user groups for granting the CF certificate

At the preparation stage, information transfer (explanation of forest conservation and the CFI) from the FD officer or field staff to the community, and facilitation of decision making of community are applied. At the planning stage, mutual understanding and facilitation of decision making are also applied to formulate a user group and initiate CF activity. However, after starting the CF, participatory development was not continued, mainly because of the limited opportunity for visiting villages and insufficient knowledge by FD staff. The number of user groups and area certified for CF are generally used as indicators for evaluation of CF achievement, but the production from the CF area and increase in livelihood level through CF activity are seldom considered as indicators by FD.

5.5 Social Cohesiveness of the Community

Social groups are established inside villages for specific social functions such as Parent and Teacher Association (PTA) or Water and Sanitary Committee (a CBO established in the frame of UNDP- HDI). Regular meetings of household heads are held in every village to discuss village problems, though the main purpose is the transmission of government orders. Also, religious groups, both Buddhist and Christian, in all villages also serve a function for facilitating communication within the village. Through these social activities, villagers keep connected with important decision making in the village. As for economic relationship, cooperative work in production is not popular in the study area. Time sharing for helping paddy cultivation and fishing can be seen in all reserved forests, but it is basically by wage labor.

5.6 Participation in the CF

In order to grasp the level of participation of each social stratum such as farmers (main income comes from cultivation), fisherman, casual labour and others, the participation rate of each social stratum in CF user groups was compared. The participation rate for each stratum was significantly different among the strata and reserved forests. It was found that the participation rate of villagers engaged in casual labour was lower than that of those in agriculture, and the rate of villagers engaged in fishery varied from 0% to 100%. The results indicate that participation in CF is affordable even for casual labours.

5.7 Willingness to Participate in the CF Activities

Some villagers fear the confiscation of paddy land after establishment of forest plantation. In addition, they do not know so much about how to apply to register for CF. First impetus to participate in the CF is to get legal land use rights for 30 years. Second impetus is availability of poles, posts and fuelwood from mangrove plantations, and the third impetus is income generated from the mangrove plantations.

5.8 Villager's Needs

Villager's needs, for capital or investment, facilities, and drinking water, provide an impetus for mangrove management by villagers through which they can generate income. Income generating components integrated in the CF activity can be an incentive for participation and contributes to improvement of villagers' living standards and the financial success of the CF management.

5.9 Villager's Constraints to Participation

Villagers (current non-participant of CF) identified 1) the lack of time for CF activity, precedence of income generating activity, shortage of time for CF activity, 2) little knowledge/ technology, and 3) land scarcity as the reasons for non-participation to CF.

5.10 Constraints of Forest Department to Participation

Followings are constraints of FD about CFI

1) CFDTC started the training course of participatory development and the CFI, but it did not receive FD officers and field staff from the mangrove area in its training courses as trainees till 2003 except few trainees supported by UNDP.
2) In terms of CFI, FD has not prepared rules and regulations yet that defined its preparation on the CFI.
3) There is no special organization charged to CF in writing in the FD organization
4) No budget allocated to CF activity.
5) Incentives of FD regarding CFI is not clear for each staff of FD.

It is required an institutional development including capacity development of FD enabling management and support for implementation of CF activities.

6 PILOT PROJECT 2003 AND 2004

6.1 Background

Under the JICA Study (the study), a pilot project 2003 and 2004 were implemented to confirm practicability of the IMMP, for capacity building of the stakeholders and for contribution to the actual CF implementation by user groups and FD. Based on the objectives, following themes to be verified in the pilot project were set as follows:

- Effectiveness of the CF extension, and
- Possibility for diversification of the community forestry instruction (CFI).

FD and the study team selected the Pyinalan Reserved Forest as the target reserved forest for the pilot project implementation among the five reserved forests, because the reserved forest 1) still has a certain extent of mangrove forest which requires conservation by CF activities, and 2) is one of the priority areas as a candidate site for the Integrated Resource Management (IRM) by FD. Of the five villages in the southern Pyinalan Reserved Forest targeted in the RRA, Thar Yar Kone village and Nyaung Ta Pin village were selected for the target villages of the pilot project for the reasons indicated in the following table.

Reasons for Selection of Thar Yar Kone and Nyaung Ta Pin Villages

Thar Yar Kone Village
– Possesses strong unity as a group, and there is competent leadership – Possesses high interest for participating in CF – Already possesses experience in CF activities and thus can serve as a model to other villages – Possible to verify diversification of the CF activities, based on the previous CF experience – Adjacent to a candidate mangrove nursery site for the CF seedling production.
Nyaung Ta Pin Village
– No experience in the CF activities but possesses high interest and possible to verify effectiveness of the CF extension – Located inside the proposed IRM area, and there is high necessity for joint buffer management and patrolling against illegal activities with FD – Rapid increase in village population, and enlightenment and implementation of mangrove conservation through the CF activities are of urgent necessity.

6.2 Outputs of the Pilot Project 2003

In consideration of the pilot project purposes and goals, there were some improvements except for the diversification of the CF activities in the Thar Yar Kone user group through implementation of the pilot project 2003. Agroforestry and school woodlots were initially planned to be the certified activity under CF. However, the activity was not applied and certified as CF during the pilot project 2003 implementation period, due to misunderstandings by stakeholders.

Evaluation Result of the Pilot Project 2003

Project Purpose and Goal	Evaluation
The CF Activity is Diversified by Thar Yar Kone user group.	Not Achieved
CFI is understood by UsG and by Nyaung Ta Pin user group.	Satisfactorily Achieved
The FD Capacity for supporting the CF activity is improved by TYK FD Nursery and Training of the FD Frontline Staff.	Improved but not satisfactorily achieved
The Pilot Project attains Mangrove Rehabilitation.	Improved but not satisfactorily achieved
Participatory mangrove rehabilitation through CFI is accelerated (FD).	Improved but not satisfactorily achieved
Participatory mangrove rehabilitation through CFI is accelerated (FREDA).	Not Achieved

Though there were some uncompleted construction, procurement, and functions for the Thar Yar Kone FD integrated mangrove nursery, the constructed nursery and produced seedlings were handed over to FD in February 2004. Further renovations were required for the full function of the nursery, however FD gained a core seedling production in the southern Pyinalan Reserved Forest. Since, CFI states that FD's obligation is to provide seedlings for the first rotation of the CF planting activities, the existence of the nursery served as the foundation for CF management and support by FD.

6.3 Outputs of the Pilot Project 2004

The output and its evaluation are summarized in the following table. In consideration of the primary objectives and themes, and the specific purpose of the pilot project 2004, there were improvements and initiation of unachieved /problematic activities from the pilot project 2003.

Evaluation Result of the Pilot Project 2004

Project Purpose and Goal	Evaluation
CF Activity was Diversified by User Groups	Started but not satisfactorily achieved
Capacity Development of the CF User Groups.	Started but not satisfactorily achieved
CF support and management system by FD was established, improved and diversified.	Started but not satisfactorily achieved
Participatory mangrove rehabilitation through CFI is accelerated (FD).	Improved but not satisfactorily achieved

Though the output of the pilot project 2004 had not fully accomplished the original plan, it was possible to confirm the following items as a foundation of sustainable CF activities for the mangrove rehabilitation in the study area.

- Diversification of the CF Activities: On-going socioeconomic activities inside the reserved forest had been initiated or to be tried as the CF activity, such as the CF aqua-agroforestry, the CF agroforestry, the CF communal wood lots, and the CF water reservoir. Still many steps are required to officialize such activities as CF. However, the pilot project 2004 served to verify the potential of the diversified CF activity.
- CF Management and Support Setup: Though the setup and activity practiced under the pilot project 2004 for CF management and support by FD were limited and

insufficient, the CF monitoring team, the CF task force, the border line management, sales vouchers and removal passes, and public awareness/patrolling revealed constraints and potentials for further CF management and support by FD in the study area.

7 EVALUATION OF CAPACITY OF STAKEHOLDERS OF IMMP

7.1 Method of Evaluation

The evaluation method based on concept of the SLA adopted for clarification of the stakeholders' ability for engagement in sustainable CF activities. This evaluation method is expected to serve as a feedback mechanism from the pilot project to the IMMP to enhance its practicability. The capacity is evaluated, by 1) firstly confirming the facts on the progress of the two pilot projects of 2003 and 2004, 2) comparing differences between the two pilot project results, and 3) estimating the anticipated capacity of stakeholders. The data applied to the evaluation are the about 1,000 of activities of the pilot project 2003 and 2004, and reports generated at Phase I of the study. All activities of the pilot project 2003 and 2004 including planning, implementation, operation and management of the CF activities are categorized to five capitals of 1) human (technology, knowledge, ability, engage in work, health), 2) social (organization, communication, function as organization, cohesiveness), 3) physical (infrastructure, tools/equipment for CF activities), 4) natural (land, forest, water, aquatic/ natural resources), and 5) financial (income, budget for fund), and scored by stakeholders of FD and CF user groups member respectively based on support of the study team. Then the score is taken average by each capital of FD and CF user group respectively.

Sustainable Livelihood Approach:

This evaluation method employed to the study is refereed to a theory of "Sustainable Livelihood Approach (SLA)" developed by DFID. The SLA aims at formulation of a sustainable project through confirmation of context between fact composing a project environment and capacity of stakeholders related to a project.
The study must recognize an ability of stakeholders and environment of the IMMP, then the IMMP have to be formulated based on the recognitions. Therefore the SLA is refereed as of evaluation method.

7.2 Results of the Evaluation of Ability

The following table summarizes the results of the ability evaluation of the stakeholders. Based on this result, the IMMP is formulated. The evaluation shows that the ability does exist for asset for engagement in the sustainable and independent CF activity by FD and the CF user group. However, it is analyzed that further input is necessary to establish continuous CF activities because the deficit also exists for each capital.

Scoring Sheets of the Evaluation

Evaluated Point / Score	Physical output level based on input and support	Capacity of the Stakeholders	Achievements of the planned progress
2	Output gets successfully, with or without support.	Full output continues and reduce necessary input/support	100%
1.5	25 % of output is failed	Output generation continues with limited input/support	Less than 75%
1	50 % of output is failed	Output generation continues with necessary input/support	Less than 50%
0.5	75 % of output is failed	Start to generate output, but will suspend unless support	10-20%
0	100 % of output is failed	No output required input support to every activity.	0

Analysis of Results of the Ability's Evaluation

Capital	Analysis
FD	
Human	There is 1.25 of ability and 0.75 of deficit in the full score of 2.0, so that it would be able to take part in the CF management and support activities, though it is required to inputs for capacity development of FD officer and field staff.
Social	There is 1.40 of ability and 0.60 of deficit of FD social capital for engagement in the sustainable CF management and support activity. FD would be able to manage and support CF implementation stage. However, further input is required for fulfillment the duty independently.
Physical	The anticipated asset of the physical capital is analyzed to jump up during the two pilot projects implementation period, based on input by the pilot project. Deficit is evaluated due to lack of operation and maintenance ability of those physical assets.
Financial	The financial capital is resulted the lowest ability among five capitals, after estimation of improvement of asset to two times because of starting FD camp plantation and CF task force. Financial capital has potential to improve its assets, but it is required to input by donors enabling a independence sustainable CF management and support by FD.
Natural	Natural capital gains almost full score of self-reliance implementation of sustainable CF activity. Deficit would be filled up based on implementation of sustainable CF activity in the pilot project area.
CF User Group	
Human	There is 1.5 points of the ability, so that it would gains full score based on engagement in the sustainable CF activity and production from CF activity based on procedure of CFI.
Social	Social capital also get 1.5 points after adding 0.5 points to the score of 2004. It is anticipated that the CF user group would be able to engaged in sustainable CF activity based on further input in empowerment of the CF user group such as group management for CF production.
Physical	There is 0.5 points of deficit to qualify full score. The physical asset would be fulfilled based on engagement in the CF activity enabling production and income. However, this score means the activity will be suspended without support by FD or technical assistance.
Financial	The financial capital is resulted 0.6 deficit to full score. The CF user group and user group member would fulfill the asset based on also engaged in sustainable CF activity by proper FD supports.
Natural	Natural capital is resulted to be decreased or deteriorated without necessary input and have potential to fulfill the asset with proper input.

Moreover, throughout Phase I of the study and Phase II implementation stage of the pilot projects, various kinds of constraints were clarified for achieving sustainable CF activity i.e. legislative, institutional, technical, administrative, socioeconomic, or difficulty pertaining to natural conditions. When simply considering the missing essential activities for achieving sustainable CF activity, there is difficult. However there is no alternative as of permitted economic activity in the reserved forest except the forestry through the CFI.

During last eight years since issuance of CFI, Myaung Mya District, Laputta and Bogalay Township FD offices have formulated CF user groups based on allocation of CF area. Considering that strong intention for establishment of sustainable CF activities has been indicated by FD and CF user groups, the evaluation can only be "existence of potential".

This ability for the ownership establishment of FD and the user group was modelized as the cycle of ownership establishment. The cycle is composed of the three factors, or the flow of knowledge - awareness – practice. And the practice generates further knowledge and awareness. This cycle was confirmed through the pilot project as follows.

- FD (officers and field staff in the study area) and CF user groups started to accumulate knowledge of CFI and CF related technique through the pilot project implementation.
- Each stratum of the FD offices in townships, district, division, and the Director General office has become aware of the responsibility of FD and its concrete role for mangrove conservation and rehabilitation as an implementation/ supporting organization for CF through the pilot project.
- CF user groups have become aware of duties and rights of mangrove conservation and rehabilitation as the inhabitants in the reserved forest through the pilot project implementation.
- CF user groups practiced diversified CF activities such as CF agroforestry, CF school woodlot, CF communal wood lot, CF church woodlot, through the pilot project implementation.
- FD recognized insufficient implementation capacity for CF management and support, and established a CF FD camp plantation which enables benefits of the user group to be utilized as a budget for CF management and support. Furthermore FD initiated the reserved forest management and mangrove conservation activities in collaboration with local authorities such as district and township peace and development councils.
- Further awareness will be generated by accumulation of knowledge and experience of implementation, and it will generate further achievement of practice.

8 OVERALL CONCEPT OF THE IMMP

8.1 Overall Goal

The overall goal of the IMMP is to establish the "Coexistence of Vivid Mangrove Vegetation and People's Lives" in the project target area.

8.2 Project Purposes

The IMMP is implemented in three phases, and the project purpose is set for each phase of the IMMP, respectively. The following are the project purposes of each phase.

Phase I: Establishment of sustainable CF activities through 1) institutional development of FD for the CFI, 2) development of model CF user groups practicing sustainable CF activities, and 3) integration of the mangrove forestry technology of the delta.

Phase II: Extension of the developed foundation during the phase I.

Phase III: Maintenance and extension of the developed foundation to the whole target area.

8.3 Target Area

The following table describes the target project area, the target operation (plantation) areas of the Action Research Forest Development and the CF activity and the number of target communities within the project area, according to reserved forest.

Target Area of IMMP

Township	Reserved Forest	Target Project Area (ha)	Target Operation Area (ha)	Target Villages
Laputta	Kyakankwinpauk	25,222	11,628	45
	Pyinalan	38,966	22,128	50
Bogalay	Kadonkani	55,046	24,448	98
	Pyindaye	73,669	38,899	28
Total		192,903	97,103	221
(Reference)	(Meinmahla)	13,224	0	-

Note: Project target areas do not include water body areas.

Note: Numbers of target villages are based on villages recorded in the topographic map 2004.

Note: Meinmahla Reserved Forest would be covered in the Fauna and Flora Guideline prepared under the study and its area (13,224 ha) is not included in the IMMP target project area.

8.4 Project Year and Phasing

The total project period of the IMMP was planned as 40 years and composed of three phases from phase I to III. The three phases were named the "Foundation Period"(5 years), "Extension Period" (5 years) and, "De-centralization Period" (30 years), respectively. The project year and the duration of each phase were planned basically based on the expected development stage of FD's capacity for the management and support of the CF activity.

8.5 Policy Framework of the IMMP

The concepts and guiding principles contained in the following policies and plans were taken in to account for the formulation of the IMMP.

1) National Forestry Sector Master Plan,
2) Myaung Mya and Pyarpon District Forest Management Plan.

The District Forest Management Plans for the Myaung Mya and Pyarpon Districts prescribes the study area as "Local Supply and Community Forestry Working Circle," and the "Mangrove Forest Rehabilitation Working Circle" under the special working circle. The local supply and community forestry working circle is mainly operated by CF activities for fulfilling local demands for fuelwood and poles, and the mangrove rehabilitation working circle is operated by direct forest operation by FD. The IMMP is formulated within a framework of the district forest management plans.

8.6 Legislative Framework of the IMMP

The concepts and guiding principles contained in the following legal instruments were taken in to account for the formulation of the IMMP.

1) Forest Law, and
2) Community Forestry Instruction (CFI)

However, the current CFI is somewhat conceptual and not effectual as law, because of instruction by the Director General of FD. Therefore, upgrade of CFI as law and formulation of a practical bylaw of CFI, that is implementation rules and guidelines for CF activities, are necessary. The bylaw of CFI is expected to describe the authorized procedure for CF production and all of the aspects of CF management.

8.7 Basic Concept for IMMP Formulation

Basic concepts for the IMMP are summarized below.

Basic Concept for IMMP Formulation

(1) Wise-use of Reserved Forest
People's Participation for Coexistence of Mangrove Forests and People in the Reserved Forest CFI as the Tool for Achievement of Coexistence of Mangrove Forests and People Sustainable Use and Value-adding of Natural Resource Applying FD Direct Operations and CF
(2) Introduction of Zoning Concept
Introduction of zoning method for the IMMP Adoption of CORE, BUFFER and MULTIPLE Zone Adoption of Separate and Joint Operation by FD and Settlements by Zone
(3) Promotion of Sustainable Community Forestry
CF and CF User Groups as Legal Means and Major Forest Management in Buffer and Multiple-use Zones Introduction and Implementation of Authorized CF Production Diversification of CF activities
(4) Promotion of Livelihood Improvement Activities
Promotion of Livelihood Improvement Activities under CF Consolidation of Group Activities for Livelihood Improvement Promotion of Technology Improvement for Livelihood
(5) Capacity Development of FD/Stakeholders
FD Capacity Development for CF Management and Support – Strengthening CF Management and Support Capacity after CF Certification – Securing and Development of Budget Resource of FD for CF Management and Support – Integration of Forestry Technology of the Delta through Action Research Forest Development – Sharing Project Results with Other CF projects for Propelling Maturity of CFI CF User Group Capacity Development for Sustainable CF Activities – Gaining Successful Experience – Strengthening of Group Activities – Development of Leaders – Development of method for Gaining Necessary Information for CF Activities

8.8 IMMP Zoning

The definition and selection criteria for the zoning category applied in the IMMP are summarized in the following table as the IMMP zoning.

IMMP Zoning (Reserved Forest Zoning Definitions and Criteria)

Category	Definition	Criteria
1. Core Zone (CORE)	・ Areas to be conserved in natural conditions for strict protection against illegal cutting, poaching and encroachment ・ Forestry production activities shall be strictly regulated or prohibited ・ Area/FC declared as wildlife sanctuary or any other categories under protected area system	・ Dense forest area with good condition and currently habitat of wildlife ・ Strategically designated forest protection area (Kadonkani IRM, Mangrove Rehabilitation Working Circle) ・ Existing wildlife sanctuary area such as Meinmahla Reserved Forest. ・ Area/FC classified as forest type CM1-CM3 and satisfying the above criteria
2. Buffer Zone (BUFFER)	・ Area/FC to be functional as natural barrier for protection of CORE ・ Area/FC to serve as social fence against outside of CORE	・ Area/FC surrounding the CORE ・ Certain extent of such areas distinguished from other zones by landscape, topography or land-use
3. Multiple-use Zone (MULTIPLE)	・ Area/FC can be used for agriculture production and/or other production purposes such as salt pond and aquaculture ・ Area/FC to be used for mangrove forest but not more than 20% of the total area of the compartment.	・ Areas/FC with dominant cultivation areas and non-forestry production areas ・ Areas/FC with not more than 20% mangrove cover ・ Village lots and residential areas (excluding villages inside BUFFER).

Note1: Refer to Table 2.13 for the definition of CM1-CM3 on the main report,

Note2: FC: Forest Compartment

8.9 Strategies for IMMP

Following five strategies for formulation of the IMMP are adopted that implies sustainable implementation of the IMMP by stakeholders.

Strategies for the IMMP

(1) Integrated Approach (Program Approach):
Based on the potential of stakeholders for implementation of the sustainable CF activities revealed in the course of the present study, sectors combined component as an integrated approach in the IMMP are as follows; 1) development of the model CF user group, 2) capacity development of FD focusing on the CF management and support, 3) integration of the forestry techniques , and 4) integration of the obtained lessons learned through the implementation of the IMMP.

(2) Model Development:
A demonstration of sustainable CF user group activities is one of the key approaches of the IMMP. The model CF user group is expected to engage in sustainable, rather advanced, profitable, fair benefit sharing, and well managed CF activities, with good cooperation among FD and local authorities.

(3) CF Prototype Development:
The actual CF prototype such as CF Agroforestry, CF Aqua-Agroforestry, CF Public Woodlots (school, monastery, church, road, river side, compost woodlot, etc), CF paddy woodlot, CF Village, CF FD Camp Plantation, will be planned and decided in consideration of natural/socioeconomic conditions, capacity of FD, land use and CF promotion plan of FD that influence determination of applicable prototypes.

(4) Action Research Forest Development:
The Action Research Forest Development is aimed to conduct research on mangrove forestry for integration of the forestry technology in the delta for its practical use through plantation establishment, natural forest operations, seedling production, and forest management activities. The lessons and results of the Action Research Forest Development will be integrated and directly fed back to the relevant operations/activities in succeeding years for better forest management and operations. The Action Research Forest Development will be mainly applied to direct operations by FD.

(5) FD Self Reliance Concept:
During the IMMP phase I, FD has to upgrade its capacity to enable self reliance support for the CF user group and management. In line with this context, the following three concepts are employed.

- FD's ownership of the IMMP,
- Employment of project cycle management method, and
- Fade out concept on the quality and quantity of external assistance.

8.10 Proposed Approach in Mangrove Forestry Operation and Management for IMMP

To achieve purpose and goal of the IMMP, approaches indicated below are incorporated for formulation of the IMMP as the direction of the mangrove management in the study area.

Approaches for Proposed Mangrove Management

- Protect and upgrade remaining mangrove resources.
- Control further conversion into paddy areas to conserve the remaining mangrove resources.
- Emphasize "Zone Management". Especially, consider BUZ as an integral part of mangrove management to protect against migrants/encroachment.
- Reinforce the role of FD for sound mangrove forest management.
- Upgrade mangrove management capability of FD.
- Incorporate local communities as a part of mangrove management systems and endow management responsibility for protection and rehabilitation of mangrove resources to local communities.
- Emphasize the role of local communities for sound mangrove forest management.
- Consider the needs of the traditional small-scale mangrove users to give them a strong sense of responsibility and sufficient access to the resources.
- Facilitate natural regeneration processes based on appropriate and systematic forestry operation/management for rehabilitation.
- Introduce and expand rehabilitation of desirable and preferable mangrove species based on site-species matching. Silviculturally, regenerate species with site suitability, higher value and better utilization.
- Introduce fast-growing non-mangrove species with reasonable economic return and usage in sites where rehabilitation of mangrove species is difficult.
- Diversify and adapt various plantation methods based on purposes, locations, ground levels, and species.

8.11 Requirements of the Mangrove Management System

The following are requirements to be incorporated in the proposed mangrove forest management system to achieve the vision and goals of the IMMP..

Requirements for Proposed Mangrove Management System
・ Linkage between resource conservation measures and resource utilization.
・ Linkage between present, future, short and long term plans for sustainability considerations.
・ Address environmental considerations, aesthetic concerns and the need for mangrove forest products.
・ Address the multiple use/function of mangrove resources.
・ Woody vegetation recovery. Mangroves should look like a forest with high trees rather than shrubby bushes.
・ Simplicity in implementation.
・ Ease in monitoring.
・ CF operations to cover extensive areas within the study area to guarantee mangrove rehabilitation.
・ Increase the community level of awareness on the trend of environmental degradation so that communities will be able to relate the pattern of mangrove degradation to their vicious poverty cycle.
・ Address the needs of the traditional and small-scale mangrove users.
・ Establish sustainable system(s) that can be continued.

8.12 Range of Management Responsibility between FD and the CF User Groups

Under the proposed mangrove management system, overall forest management authority and responsibility lies with FD. However, the range of primary management responsibilities for FD and the CF user groups can be described as follows.

Range of Primary Management Responsibilities for FD and CF User Groups

Forest Department
・ Management and operation in critical areas and core protection areas within reserved forests (i.e. Mangrove rehabilitation working circle, IRM areas, wildlife sanctuaries, in the core zone under the IMMP). ・ Management of the buffer zone. ・ Certification and supervision of CF, and technical consultation and assistance regarding its activities. ・ Forest protection and patrolling. ・ Monitoring and evaluation. ・ Other conventional FD management activities (forest product permits, fee/revenue collection, removal pass certification, etc.).
CF User Groups
・ Operations in degraded forests, barren lands adjacent to agriculture land within reserved forests (i.e. multiple-use zone under the IMMP). ・ Management and operation of CF certified lands. ・ Joint the buffer zone management with FD. ・ CF activities in the buffer zone ・ Monitoring and evaluation of certified CF lands.

8.13 Range of Forestry Operations

The range of forestry operations to be implemented by FD and the CF user groups is described as follows.

Range of Forestry Operations for FD and CF User Groups

FD	CF User Groups
・ Natural Forest Operation ・ Plantation Operation ・ Riverbank re-vegetation/stabilization ・ Forest Protection ・ Seedling Production	・ Natural Forest Operation ・ Plantation Operation ・ Riverbank re-vegetation/stabilization ・ Forest Protection ・ Self Seedling Production ・ Other Operations under CF

8.14 Category and Description of Applicable Mangrove Forestry Operation

Under the proposed mangrove management system, forestry operations applicable to the IMMP target area will be categorized as follows. Mangrove forestry operations for FD and CF user groups are prepared based on each categorized operation.

Category of Applicable Mangrove Forestry Operation

1) Natural Forest Operation
   a. Preservation and Conservation Operation
   b. Forest Regeneration Operation
   c. Forest Improvement Operation
2) Plantation Operation
   a. Mangrove Species Plantation
   b. Non-mangrove Species Plantation
3) Riverbank Re-vegetation and Stabilization
   a. Vegetation Activities
   b. Bank Protection Work
4) Forest Protection (associated with Natural Forest Operation and Plantation Operation)
5) Seedling Production
6) Other Operations (CF activities and CF Support)

8.15 Operational Area for Mangrove Forestry Operation

Operational areas for mangrove forestry operations would be based on forest types and land use as determined through the aerial photo interpretation. The primary operational areas are closed mangrove forest high stature (CM1), closed mangrove forest medium stature (CM2), closed mangrove forest low stature (CM3), sparse mangrove forest high stature (SM1), sparse mangrove forest medium stature (SM2), sparse mangrove forest low stature (SM3), barren land, agricultural land, riverbanks, and villages/settlements. Conventionally, agricultural lands and villages/settlements were not considered as operational areas for forestry. However, since there are potential areas for mangrove forestry operations, particularly through CF activities, in the agricultural land and the villages/settlements, they are included in operational areas.

8.16 Applicable Forestry Operations for Each Operational Area

The following table summarizes applicable forestry operations for each potential operational area for the mangrove forestry operation. Since the target project area is located inside the reserved forests, a key is that all kinds of forestry operations in any of the given operational areas shall be regarded and acknowledged as an operation on "forest land". Even in the agricultural lands and villages/settlements, the land and the on-going land uses shall be justified under the Forest Law. In such areas, introduction of CF is one potential to be in accordance with the status of the reserved forest. Specific forest operational areas by ground level is summarized in the following table.

Summary of Forestry Operations in Operational Areas according to Ground Levels

Land Use & Forest Type	Low Ground Level	Medium Ground Level	High Ground Level
1. CM1: Closed Canopy High Forest (>12m)	1. Natural Forest Operation - Preservation and conservation: No harvesting - Forest Regeneration Operation: Forest Protection & Limited NFTP extraction		
2. CM2: Closed Canopy Medium Forest (6 - <12 m)	1. Natural Forest Operation - Preservation and conservation: No harvesting - Forest Regeneration Operation: Forest Protection & Controlled NFTP extraction - Forest Improvement Operation: Forest Protection & Controlled NFTP extraction		
3. CM3 Closed Canopy Low Forest (< 6m)	1. Natural Forest Operation - Forest Regeneration Operation: Controlled NFTP extraction & Forest Protection - Forest Improvement Operation: Controlled NFTP extraction & Forest Protection		
4. SM1 Sparse Canopy High Forest	1. Natural Forest Operation - Forest Improvement Operation: Controlled Harvesting & Forest Protection		
	2. Plantation Operation (with Forest Protection & Controlled Harvesting)		
	- Mangrove spp		- Mangrove spp - Non mangrove spp.
	3. Other Operations under CF		
5. SM2 Sparse Canopy Medium Forest	1. Natural Forest Operation - Forest Improvement Operation: Controlled Harvesting & Forest Protection		
	2. Plantation Operation (with Forest Protection & Controlled Harvesting)		
	- Mangrove spp		- Mangrove spp - Non mangrove spp.
	3. Other Operations under CF		
6. SM3 Sparse Canopy Low Forest (<6m)	1. Natural Forest Operation - Forest Improvement Operation: Controlled Harvesting & Forest Protection		
	2. Plantation Operation (with Forest Protection & Controlled Harvesting)		
	- Mangrove spp		- Mangrove spp - Non mangrove spp.
	3. Other Operations under CF		
7. Barren Land	1. Plantation Operation (with Forest Protection & Controlled Harvesting)		
	- Mangrove spp		- Mangrove spp - Non mangrove spp
	(Forest Improvement Operation)		
	2. Other Operations under CF		
8. Agricultural Land	- Plantation Operation	- Windbreak, boundary planting to maintain present agriculture - Plantation Operation	
	(Forest Improvement Operation)		
	Other Operations under CF		
9. Riverbanks	River Bank Re-vegetation/ Stabilization Operation (at applicable and necessary locations)		
10. Villages	Woodlot, windbreak, agroforestry, home garden under CF		

Note: Refer to Table 2.13, Volume II main report for the definition of CM1-CM3 and SM1-SM3.

8.17 Operational Category and IMMP Zoning

The definition and selection criteria of each operational category were set and the following categories were established at forest compartment level as the operational category for grouping operational areas inside the forest compartment in accordance with land use/forest type and corresponding forestry operations.

1) Closed Mangrove Forest Protection and Operation Area (CMOA),
2) Sparse Mangrove Forest and Plantation Operation Area (SMOA),
3) Multiple Operation Area (MOA), and
4) Buffer Strip Area (BSA)

8.18 Targets of IMMP (Priority Forest Compartments of Each Reserved Forest)

The following table describes the criteria for selection of priority forest compartments of the reserved forest for the CF operation and FD direct operation, respectively. The target forest compartments of each phase were selected based on the criteria.

Selection Criteria for Forest Compartment

Phase I Foundation Period
1. CF Operation Compartments: Target Area for Development of the Model CF User Group
- Located in the buffer or multiple-use zones where there are significant no vegetation areas for plantation, or degraded forests for natural forest operations, - Located outside of the target area of "integrated resource management", - Short access from villages of CF user groups and - Adjacent to population centered areas
2. FD Operation Compartments: Action Research Forest Development
- Located in the integrated resource management area (plans, on-going) - No duplication with on-going community forestry activities - Located in the core zone where there are significant no vegetation areas for plantation, or forests which require natural forest regeneration/improvement operations
Phase II Extension Period
1. CF Operation Compartments: CF Target Area
- Adjacent Forest Compartment to the phase I of model CF user group
2. FD Operation Compartments: Action Research Forest Development
- Adjacent Forest Compartment to the phase I target area
Phase III De-centralization Period
1. CF Operation Compartments: CF Target Area
- Thirty-year project targets all areas of Pyindaye, Kadonkani, Pyinalan and Kyakankwinpauk
2. FD Operation Compartments: Action Research Forest Development
- Thirty-year project targets all areas of Pyindaye, Kadonkani, Pyinalan and Kyakankwinpauk

Note: Based on the actual condition, FD operations might be conducted in CF operation compartments.

8.19 Target Setting for the Number of Community Forestry User Groups

Target numbers for the CF user groups to be formulated as 1) the model CF user group during phase I, 2) CF user groups for extension during phase II, and 3) CF user groups for de-centralization during phase III, were set by the establishment rate summarized in the following table.

Assumptions for Target CF User Group Establishment Rate

	Phase I	Phase II	Phase III
Annual CF User Group (UsG) Establishment	1 UsG per reserved forest	4 UsG per reserved forest	4 ~ UsG per reserved forest

8.20 Target Project Areas of IMMP by Zone

Based on the concept of the zoning, the target project area is divided into three zones. The target project areas of the IMMP by zones are summarized in the following table.

Target Project Areas of IMMP by Zone

Zone / Reserved Forest	CORE		BUFFER		MULTIPLE		TOTAL
	Area (ha)	%	Area (ha)	%	Area (ha)	%	(ha)
Kyakankwinpauk	3,460	13.7	5,731	22.7	16,031	63.6	25,222
Pyinalan	4,625	11.9	12,132	31.1	22,209	57.0	38,966
Kadonkani	6,318	11.5	13,968	25.4	34,760	63.1	55,046
Pyindaye	9,254	12.6	24,234	32.9	40,181	54.5	73,669
Total	23,657	12.3	56,065	29.1	113,181	58.6	192,903

Source: JICA Study Team

Note: Meinmahla Reserved Forest is included in the Core zone, but would be covered in the Fauna and Flora Guideline prepared under the study and its area (13,224 ha) is not included in the IMMP target project area.

8.21 Target Project Areas and Target Operation Area by Phases

The target project areas and target operation areas for the IMMP by zones and land use are estimated and the summary of the target project areas of the IMMP by phases is shown in the following table.

Target Project Areas of IMMP by Phases and Priority Compartments

Reserved Forest	Phase	FD FC Area	Operation Area	CF FC Area	Operation Area	Total Area	Total Target area
Kyakankwinpauk	I	1,418	1,410	2,188	177	3,606	1,587
	II	2,474	2,397	4,924	504	7,398	2,901
	III	4,594	4,273	9,624	2,868	14,218	7,141
Sub-total		**8,486**	**8,080**	**16,736**	**3,549**	**25,222**	**11,629**
Pyinalan	I	3,295	3,295	5,760	1,505	9,055	4,800
	II	2,782	2,739	6,430	3,129	9,212	5,868
	III	6,099	4,706	14,600	6,753	20,699	11,459
Sub-total		**12,176**	**10,740**	**26,790**	**11,387**	**38,966**	**22,127**
Kadonkani	I	1,099	985	3,141	567	4,240	1,552
	II	2,731	2,591	8,091	1,912	10,822	4,503
	III	11,274	11,177	28,710	7,216	39,984	18,393
Sub-total		**15,104**	**14,753**	**39,942**	**9,695**	**55,046**	**24,448**
Pyindaye	I	1,783	1,783	6,212	558	7,995	2,341
	II	9,226	5,562	13,265	1,645	22,491	7,207
	III	20,431	20,003	22,752	9,348	43,183	29,351
Sub-total		**31,440**	**27,348**	**42,229**	**11,551**	**73,669**	**38,899**
TOTAL	I	7,595	7,473	17,301	2,807	24,896	10,280
	II	17,213	13,289	32,710	7,190	49,923	20,479
	III	42,398	40,159	75,686	26,185	118,084	66,344
	Total	**67,206**	**60,921**	**125,697**	**36,182**	**192,903**	**97,103**
(Meinmahla)		**0**	**0**	**0**	**0**	(13,224)	0
(Grand Total)						(206,127)	97,103

Source: JICA Study Team

9 INTEGRATED MANGROVE MANAGEMENT PLAN

9.1 Goal, Project Purpose and Outputs of the IMMP

The development objective of the IMMP is to establish the coexistence of vigorous mangrove vegetation and viable livelihoods of people in the project target area. The goal, purpose and outputs for three phases are indicated below.

Goal, Project Purpose and Outputs of the IMMP

IMMP Phase	Phase I Foundation Period	Phase II Extension Period	Phase III De-centralization Period
Period	5 years (2005-2009)	5 years (2010-2014)	30 years (2015-2044)
Goal	Establishing coexistence of vigorous mangrove vegetation and people in 24,896 ha of in the designated forest compartments of the project area.	Establishing coexistence of vigorous mangrove vegetation and people in 49,923 ha in the designated forest compartments of the project area.	Establishing coexistence of vigorous mangrove vegetation and people in 118,084 ha in the designated forest compartments of the project area.
Project Purpose	Visible rehabilitation of 10,280 ha of mangrove comprising 2,807 ha of CF area and establishment of 7,473 ha of FD action research forest development in the area of Integrated Resource Management (IRM).	Visible mangrove rehabilitation of 20,479 ha comprising 13,289 ha of IRM areas by FD and establishment of 7,190 ha in CF areas by 100 model CF user groups.	Visible mangrove rehabilitation of 66,344 ha comprising 40,159 ha of IRM areas by FD and establishment of 26,186 ha in CF areas by CF user groups in the reserved forest.
Outputs	– Model CF user groups engaged in sustainable CF activities are developed and maintained.	– The number of model user groups is expanded to 100.	– All settlements in the reserved forest participates in CF.
	• FD's CF management and support system is drafted and applied.	• The standardized CF management and support system and integrated delta forestry technology are extended.	• FD establishes self-dependent CF management and support.
	• Integrated forestry technology of the delta is established through Action Research Forest Development.	• The officers/staff engaged in proper mangrove rehabilitation based on integrated forestry technology of the delta.	• All IRM areas in the reserved forests are maintained and engaged in production
	• FD's CF management and support system is standardized.	• FD officers/staffs apply standardized CF management and support system.	• FD establishes self-dependent mangrove management.

9.2 PDM of the IMMP Phase I (Goal, Project Purpose, and Output)

The following table describes the goal, project purpose, output, indicator, verifications, and key assumptions of PDM of the IMMP phase I. The PDM has to be reviewed at the beginning stage, mid-term and completion stage of the phase I. The revision of the completion stage should include the PDM of the IMMP phase II.

PDM of the IMMP Phase I (1/2)

Narrative Summary	Key Performance Indicators	Means of Verifications	Key Assumptions
Goal Establishing coexistence of vigorous mangrove vegetation and people in 24,896 ha of in the designated FC of the project area.	- Mangrove and non - mangrove vegetation coverage rate in the target CF area (24,896 ha) stops decreasing	- GIS data from satellite imagery, GIS section, PSD, FD - Socioeconomic condition survey	- No critical change of the Ministry of Forestry and FD governing policy of the Reserved Forest and CFI.
Project Purpose - Visible rehabilitation of 10,280 ha of mangrove comprising 2,807 ha of CF area and 7,473 ha of action research forest development.	- Activity areas of CF by demonstration user group (UsG) and FD action research forest development - Income of demonstration UsG is exceeded US$ 100.00/capita	- CF statistic data of PSD, FD and district and township FD offices - Registered CF sales voucher and removal pass	- No critical change of market condition of CF production (ex. fuelwood)
Outputs - Model CF user groups engaged in sustainable CF activities are developed and maintained.	- Achievement of demonstration CF activities (condition of activities, management, production and sales)	- CF statistic data of PSD, FD and FD district and township offices (CF progress report, patrol, meeting report)	- No critical natural disaster to hinder the mangrove rehabilitation activities (ex. storms, floods, diseases and harmful insects) - No critical change of livelihood condition of UsG members (ex. price of rice and fishery products)
- FD's CF management and support system is drafted and applied.	- Continuous staff assignment and budget allocation for FD CF management and support - Compliancy between the duty for the CF management and the implementation	- Report of CF task force - Drafted bylaw of CFI	
- Integrated forestry technology of the delta is established through Action Research Forest Development.	- Number of species utilized for IMMP and CF activity.	- Report of CF task force and book of compiled integrated forestry technology.	
- FD's CF management and support system is standardized.	- Number of district FD applying bylaw of the CF	- Minutes of annual CF meeting	

9.3 PDM of the IMMP Phase I (Activities, Input and Pre Conditions)

The following table describes activities, input and pre-conditions in the PDM of the IMMP phase I.

PDM of the IMMP Phase I (2/2)

Narrative Summary	Inputs	Pre-Condition
Activities 1. Organization of Model CF User Group - CF Prototype Activity - Capacity Development of CF User Group 2. Capacity Development of FD for CF Support - CF task force establishment - Bylaw of CFI - Improvement of capabilities of FD staff for CF management and support - Construction and renovation of CF extension centers and nurseries 3. Development of Integrated Forestry Technologies in the Delta - Establishment of action research plantation - Action Research Forest Development for integrated forestry technologies - Development of integrated forestry technology manual 4. Integration of Lessons Learned through the IMMP phase I - CF joint training - CF Annual meeting - Mangrove rehabilitation annual meeting - IMMP annual meeting	Inputs: Preparatory Activities for implementation of the IMMP Phase I - Activity and cost for the preparatory works for organization setting, preparation of action plan, and budgeting. Organization of Model CF User Group - Preparatory Stage: Activity and cost for organization of Model CF User Group - Planning Stage: Activity and cost for organization of the Model CF User Group - Implementation Stage: Activity and cost for organization of the Model CF User Group - Cost and activity for management of the Model CF User Group - Cost and activity for extension of the Model CF User Group Capacity Development of FD for CF Management and Support - Cost and activity for institutional development of FD for CF management and support - Cost and activity for construction and rehabilitation of FD mangrove CF extension center and nursery - Cost and activity for CF management and support Development of Integrated Forestry Technology in the Delta - Cost and activity for survey, planning and mapping - Cost and activity for production and diversification of plantation species - Cost and activity for action research plantation (including natural forest operations) - Cost and activity for tending - Cost and activity for integration of mangrove technology Integration of Lessons learned through the IMMP phase I - Cost and activity for annual meeting of the CF activity - Cost and activity for CF joint training of the FD - Cost and activity for annual meetings CF Task Force including allowance (Phase I) Operation and Maintenance Cost (5 % of 1.0 - 5.0) Technical Assistance Physical Contingencies	- No critical change of market condition of CF production (ex. fuelwood)

9.4 Policy Initiative for Securing Right of CF User Groups

CFI is provided based on Chapter V, Section 15 of the Forest Law that defines promotion of people's participation, which can be interpreted as inducing people to participate in forestry to fulfill the responsibility of FD for management and maintenance of the forest of Myanmar. According to the Forest Law, the director general of FD issued CFI. Therefore, the rights for 30-years land use is secured for CF user groups based on the instruction of the FD. To achieve sustainable CF activities in the delta, robust methods for guaranteeing the CF user groups rights should be established before the IMMP is fully implemented.

9.5 Proposed Land Use Plan

The target project area, designated as the reserved forest is widely divided into the CF area and the FD direct operation area.

IMMP Land Use Distribution Plan

Target Area			
Land Use Type	Forest Management Type		IMMP Component
Forest	CF Area		Applying all area to CF for justifying activities to be protected by legislation
			Plantation/NFIO areas of FD implying transfer to CF user groups
	FD Direct Operation Area	IRM Area	Plantation/NFIO areas by FD
		Protected Area	Fauna and Flora Conservation Guideline

9.6 Development of Core/Model CF User Groups (IMMP Phase I: Foundation Period)

(1) Development of Core/Model CF User Groups (Preparatory Stage)

Five model CF user groups at each reserved forest, a total of 20 model CF user groups, will be developed and maintained in the course of implementation of the IMMP phase I. The model/core CF user groups will be engaged in sustainable CF activities with productivity and profitability.

The selection of target villages in the CF operation compartment is planned to be conducted by the following procedure.

1) Practicing public awareness at the prioritized forest compartment
2) Evaluation of villagers' intentions to participate in the CF activities
3) The potential evaluation of villager to become a model CF user group
4) Estimation of land availability and potential of the CF activity

(2) Development of Core/Model CF User Groups (Implementation Stage)

The management is essential procedure for enabling sustainable CF activities by CF user groups through proper support from FD. The following is a list of work items for the CF management.

1) Monthly monitoring of CF activities
2) Monthly reporting of CF activities
3) Patrolling of the CF area based on statements of the Forest Law and CFI
4) Support for issuing sales vouchers to the CF user group and registration of the sales vouchers
5) Application of licenses for value added production
6) Any other coordination for obtaining permissions from government authorities such as fishery rights by the CF user groups
7) Update of CF management plans and CF certificates

During the implementation period of the IMMP phase I, the selected model CF user groups will finalize the CF activities that they are to implement based on the submission of CF management plans to FD and authorization of the plan by the Myaung Mya FD district officer.

The following CF prototypes are prepared based on estimation of CF user group's intentions and necessities come from socioeconomic and natural conditions. In total, 11 CF prototypes are prepared in the IMMP.

Contents of CF Activity Unit

Activity Unit No	Content (CF Prototype)
Activity Unit 1 (BUFFER) Paddy Dominant or High Population Area	– CF Buffer Plantation
	– CF Paddy Woodlot
	– CF River Side Woodlot
	– CF Water Reservoir
Activity Unit 2 (MULTIPLE) Paddy Dominant or High Population Area	– CF Agroforestry
	– CF Aqua agroforestry
	– CF Paddy Woodlot
	– CF Riverside Woodlot
	– CF Village: CF communal woodlot and CF school woodlot
	– CF Water Reservoir
Activity Unit 3 (BUFFER) Mangrove Vegetation Dominant or Low Population Area	– CF Buffer Plantation
	– CF Compost Woodlot
	– CF Paddy Woodlot
	– CF Riverside Woodlot
	– CF Water Reservoir
Activity Unit 4 (MULTIPLE) Mangrove Vegetation Dominant or Low Population Area	– CF Agroforestry
	– CF Aqua agroforestry
	– CF Paddy Woodlot
	– CF Plantation
	– CF Riverside Woodlot
	– CF Village: CF communal woodlot and CF school woodlot
	– CF Water Reservoir

(3) Extension of the Model CF User Group Activities

The extension is a preparatory activity for formulation of new CF user groups based on the active model CF user group. As a model, the model CF user group is practicing profitable and sustainable CF activities as a forerunner, then, adjacent people who will observe the activity and develop motivation to participate in a CF user group. Following is a list of planned extension activities.

1) Preparation of leaflets about activities of model CF user groups,
2) Distribution of leaflets to adjacent villagers of model user groups, and
3) Organizing tours for visiting model CF user groups.

(4) Capacity Development of CF User Groups

To efficiently achieve the sustainable CF activities by CF user groups, the following capacity development training programs will be conducted under the IMMP.

1) Education of group leaders of the model CF user group
2) Education of extension workers of the model/core CF user group

The trainings aim to develop leaders who will lead the management of group activities, and extension workers who will be the key technical/information persons within a CF user group. As a whole, the training activities are designed to contribute positively to the actual operation and management of CF user group and CF activities.

(5) Authorized CF Production and Value-added Production

A white charcoal production demonstration plan is one of the first value adding production activities to be implemented in the CF extension center/ nursery by FD. The plan will be composed of 1) institutional development for official procedure by FD and the Ayeyawady Division, and 2) trial/demonstration production at the CF extension centers based on production from the CF FD camp plantation that is one of CF prototypes. Marketing is one of the key components of value adding production. Accordingly, the model CF user groups are expected to engage in actual charcoal production to gain mass production that enables stable supply of the products to market.

9.7 Capacity Development of FD for CF Support (IMMP Phase I: Foundation Period)

(1) Institutional Development of FD for CF Management and Support

The CF Task Force, an organization within FD for implementation of the IMMP phase I, would be established at Yangon, Myaung Mya District and four reserved forests of Kyakankwinpauk, Pyinalan, Kadonkani, and Pyindaye. The subsidiary equipment is planned to supply for the CF task force for support and management of CF activities including equipment for public awareness and forest survey, particularly for the Myaung Mya District, which will be a hub entity of the IMMP implementation organization.

The development of bylaws of CFI is essential for practical CF management and support by FD and continuous CF implementation by CF user groups. The draft bylaw of CFI will be developed and applied by the CF Task Force in the course of the IMMP implementation period. The bylaw of CFI should be developed into a national standard to complement CFI. Therefore, the draft bylaw developed should be elaborated through the approach indicated in the following table.

Approach for Development of Bylaw

Capacity Development of FD for CF Management and Support	Development of draft Bylaw of CFI
	Trial Utilization of the Bylaw
	Development of National Standard Bylaw of CFI
	Distribution of the Standard to CF user group

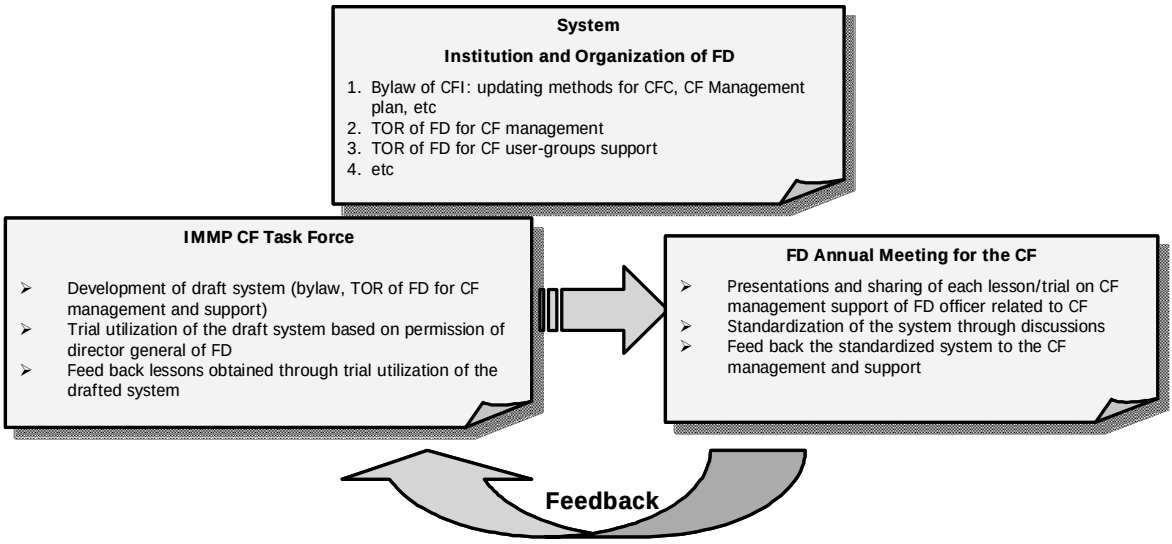
In consideration of the ongoing CF management and support activities, and for supporting sustainable CF activities of CF user groups, the draft terms of reference for the CF task force are as follows.

Draft Terms of Reference for CF Task Force

Items
1) Planning annual action plan including CF promotion/planning, CF management and support, CF extension and nursery operation,
2) CF promotion/planning,
3) CF management and support,
4) CF extension,
5) Patrolling of CF areas,
6) Operation and maintenance of CF extension centers
7) Operation and maintenance of nursery and seedling production, and
8) Recording and monitoring
9) Coordination between the CF user group and the township FD office, and
10) CF user group leader and extension worker training

The CF task force at the reserved forest will function as a fundamental office to enable the practice, management, and support of sustainable CF activities. The CF task force will also be engaged in research activities as a direct FD activity.

Moreover, the CF task force will engage in demonstrating value adding production activities to verify their potentials for sustainable CF activities. The CF task force will engage in construction and trial production of white charcoal as well as obtaining permission for the work from the Ayeyawady Division Peace and Development Council. These activities of CF task force will be discussed for standardization at annual meeting and results of the meeting will be fed back to succeeding activities. Following table describes the implications of FD's CF management and support system development.



Concepts of Implication of FD's CF Management and Support System Development

(2) Construction and Renovation of CF Extension Centers and Nurseries for Development Foundation of CF Management and Support

In the IMMP phase I, a FD nursery and a CF extension center would be the basic units to be established in each reserved forest in the target project area, except for the Meinmahla Reserved Forest.

The aims of the nursery are 1) seedling production of mangrove and non-mangrove species for CF activities, 2) seedling production for the Action Research Forest Development (FD direct plantation), 3) development of seedling production technology as well as diversification of mangrove species, and 4) observatory roles such as weather, tide level and salinity conditions. The aims of the CF extension center are to provide 1) a regional information/support center for sustainable CF activities, 2) an administration center for CF and mangrove forest management, 3) a demonstration and training center for mangrove and CF related technologies/management and 4) closer contact between FD and villagers.

As the basic unit, the nursery and the extension center serve as a regional hub for promoting and strengthening mangrove rehabilitation and CF activities in the related reserved forest under the operation and management of Laputta and Bogalay Township and Myaung Mya District FD CF Task Forces and . The following table summarizes the activities for construction and renovation of CF extension centers and nurseries.

Activities for Construction/Renovation of CF Extension Centers and Nurseries

Activity	Work Item
Construction	- Renovation of Kwa Kwa Ka Lay FD Mangrove CF Extension Center and Nursery - Renovation of Byone Hmwe FD Mangrove CF Extension Center and Nursery - Renovation of Thar Yar Kone FD Mangrove CF Extension Center and Nursery - Construction of Set San FD Mangrove CF Extension Center and Nursery
Operation and Management of FD Extension Centers and Nurseries	- Preparation of annual action plan of the CF extension center and nursery - Procurement of equipment and material for seedling production and supply - Seeding production - Marketing and trial production of white charcoal - Maintenance of the CF extension center and nursery
CF Management and Support	- Preparation of annual action plan of the CF management and support - Procurement of equipment and material for the CF management and support - Support to CF user groups in accordance with CFI

9.8 Development of Integrated Forestry Technologies in the Delta (IMMP Phase I: Foundation Period)

Integrated forest technology of the delta is established thorough the Action Research Forest Development. The role of the Action Research Forest Development is to conduct research on mangrove forestry through plantation establishment and natural forest operations under FD direct operations. The objective of the Action Research Forest Development is the integration of forestry technology in the delta. Firstly, the existing but dispersed mangrove forestry technologies held by experienced individual FD staff members will be collated. These technologies will then be confirmed and applied in one location through the implementation of the action research plantation. The resulting methods will be compiled as a manual for utilization in the field and for further integration of mangrove forestry technology.

(1) Preparation of Action Research Plantations

Preparatory activities for the establishment of the action research plantation are composed of the following items:

Activities for Action Research Plantation Establishment

Activity	Work Items
1) Survey and compilation of existing technology	- Collection of information, knowledge, experience on existing forestry technologies from experienced FD officers - Compilation of the collected information - Selection of collected information for planning and implementation
2) Surveying, delineation and mapping	- Survey the action research plantation target areas - Delineation of boundaries - Preparation of forest registration/stock maps
3) Formulation of plans	- Preparation of action research plantation implementation plans - Preparation of plans for cooperation with FD officers experienced in mangrove forestry - Preparation of seedling production plans - Preparation of planting and tending plans
4) Provision of necessary equipment and materials	- Provision of necessary equipment - Provision of necessary material (seeds, seedlings, etc.)

(2) Action Research Forest Development for Integrated Forestry Technologies

The necessary trials include fast and slow growing species, species suited to each ground level (i.e. low ground, mid-ground, high-ground and extremely high ground), and introduction of non- mangrove or mangrove associate species especially for the high and extreme high ground levels. Confirmation and diversification of the target planting species are the key aspects of the Action Research Forest Development. Based on this approach, the following operation methods are planned to be developed thorough implementation of the IMMP.

1) Delineation and mapping methods of the forestry operation areas (CF area, the IRM/FD direct plantation area, the natural forest operation area, and the protected area for preservation and, wildlife conservation)
2) Plantation operations in the necessary area,
3) Natural forest regeneration operations in the core zone,
4) Natural forest improvement operations in the buffer and multiple-use zones,
5) Sustainable forest management system for continuous forestry operations,
6) Buffer zone operations and maintenance,
7) River bank stabilization/woodlot operations and maintenance,
8) Natural nursery operations by the CF user groups, and
9) Development and maintenance of seed/seedling production by FD.

The activities of the Action Research Forest Development are composed of the following items:

1) Production and diversification of planting species
2) Action research plantation (including natural forest operations)
3) Tending operation
4) Forest management system (planning, monitoring, evaluation, extension)

The action research plantation will be mainly practiced in the Integrated Resource Management area at the Kyakankwinpauk, Pyinalan and Kadonkani reserved forests. IRM of the Kyakankwinpauk and Pyinalan reserved forests is not yet authorized by the Laputta Township Peace and Development council, so the action research plantation will be commenced after first obtaining permission for IRM.

(3) Development of Integrated Forestry Technology Manual

The final outcomes of the above activities will be compiled as the integrated forestry technology manual for the Ayeyawady Delta based on the research (monitoring) activities indicated in the following table.

Activities of Integrated Forestry Technology Manual of Ayeyawady Delta

Activity	Work Item
Research Activities	Setting plantation/NFIO plans including trial forestry technology
	Setting sample plots for each natural condition category
	Monitoring survival rate and growth
Integration of Results	Compilation of the research results as forestry technology manual
	Publishing the compiled integrated forestry technology manual
Extension	Presentation of the manual at annual workshop of FD
	Development of dioramas at CF extension centers for presentation of the results and extension of mangrove forestry technology

9.9 Integration of Updated Information/Knowledge and Lessons Learned through the Implementation of the IMMP (IMMP Phase I: Foundation Period)

1) CF Joint Training, 2) Annual Meeting for CF and 3) Annual Meeting for Mangrove Rehabilitation is planned for Standardization of developed CFI management and support system, mangrove rehabilitation and project management system developed in the IMMP phase I.

(1) CF Joint Training

The following items are planned for implementation of the joint training trip for development of a system about how to apply the CFI, especially in the delta area.

1) Holding an annual CF meeting by FD (refer to the succeeding section),
2) Preparing an implementation plan through sharing information about CF activities with other divisions/states and districts,
3) Implementation of the training trip, and
4) Preparation of reports

(2) Annual Meetings

The following annual meetings are planned for the integration plan for the project impact of the IMMP.

1) CF annual meeting
2) Mangrove rehabilitation annual meeting/IMMP annual meeting

9.10 Development of Mangrove Extension and Information Center (IMMP Phase II: Extension Period)

The center primarily contributes to the integration of information on mangrove rehabilitation technologies and management among the three state/divisions with mangrove areas. Secondly, the center would serve as the extension, training, guidance, and research center for FD officers/staffs. Then the center would target other government officers concerned with extension and training for mangrove rehabilitation. Also, the center would target CF user groups and general public for mangrove extension and training purposes. After all, as the center is the core, the results of the IMMP, particularly the Action Research Forest Development, would be extended to all mangrove rehabilitation areas in Myanmar where urgent rehabilitations are necessary.

(1) Basic Designing of the Center

It is recommended to develop the center for mangrove rehabilitation in Pathein, the divisional capital of the Ayeyawady Division, which has relatively easy access from Yangon and where lessons and findings for mangrove rehabilitation were accumulated and developed through the implementation of the IMMP phase I.

The CF Mangrove Division is planned to be established as a project management organization of the IMMP phase II and thereafter. The Ayeyawady CF Mangrove Division Office located in Pathein would be charged with constructing and operating the mangrove information and education center under the authority of the CF Mangrove Division in Yangon. The planned work items for basic designing of the center are summarized in the following table.

Work Items for Basic Designing

Activity	Work Item
1) Formulation of organization	Formulation of the implementation committee for the construction
2) Preparation of basic design report	- Objective - Preliminary activity plan - Preliminary facility plan - Preliminary equipment plan - Preliminary operation and management plan - Drawings - Procurement plan - Cost estimation - Implementation schedule

(2) Construction of the Center

Planned work items for the construction of the mangrove extension and information center by the Ayeyawady CF Mangrove Division are summarized in the following table.

Work Items for Construction

Activity	Work Item
Construction and procurement of the mangrove extension and information center	- Procurement of contractor - Construction and procurement - Development of mangrove garden and mangrove natural nursery - Supervision

(3) Operation and Management

Planned work items for the operation and management of the mangrove extension and information center by the Ayeyawady CF Mangrove Division are summarized in the following table.

Work Items for Operation and Management

Activity	Work Item
Operation and management of the mangrove extension and information center	- Exhibitions of mangrove rehabilitation activities - Operation and management of mangrove garden - Operation and management of mangrove nursery - Operation of trainings/mangrove related information dissemination - Release newsletters for mangrove rehabilitation - Establishment and maintenance of internet home page

9.11 CF Extension and Dissemination (IMMP Phase II: Extension Period)

The output of the plan is defined as to increase number of model CF user group from 20 to 100 through development and standardizing a CF extension system. After formulation of CF user groups and granting certification, the continual provision of support to the CF user groups to ensure continuation of CF activities is required by the CF Mangrove Division Office of each reserved forest. The support to CF user groups can be classified into 1) forestry technology, 2) production and income generation activities, and 3) monitoring and evaluation activities. Planned work items for the support of CF user groups are summarized in the following table.

Work Items of Support to CF User Groups (IMMP Phase II)

Activity	Work Item
Forestry Technology	Seeding Supply Technical and managerial technology support for CF activities Technical and managerial support for harvesting of CF products Monitoring and management of CF activities
Production and Income Generation	Support marketing of CF products by CF user groups Technical and managerial support for CF value added production (white charcoal production, phoenix plantations for larva/shoot/pole production) Monitoring and management of CF value added production
Monitoring and Evaluation	Group leaders/extension workers training Support monitoring activities of CF user groups Support report writing activities by CF user groups

9.12 FD IRM Plantation Establishment (IMMP Phase II: Extension Period)

The FD plantations would be implemented based on the forestry technology developed during the phase I for expansion of FD plantation areas. The FD plantation will be implemented by same procedure with the phase I activity. After the preparation work, following activity for the plantation establishment are planned. i.e. 1) seedling production, 2) plantation, 3) tending, 4) protection, and 5) monitoring and evaluation.

9.13 Full Implementation of CF Extension and Dissemination (IMMP Phase III: De-centralization Period)

"All settlements in the reserved forests are engaged in sustainable community forestry" is defined as the output of the phase III, de-centralization period.

Planning of the CF extension, public awareness and promotion of CF activity for the phase III Extension Period would be conducted in the same manner as in phase II with feedback from findings and lessons from the previous achievement. Organization of CF user groups by proceeding CFI sanction would be conducted in the same manner as in phase II.

Support to CF user groups after the commencement of CF activities in phase III would be conducted in the same manner as in phase II. During the 30-year implementation period of phase III, support for production, harvesting and selling would be emphasized for stabilization of CF and people at site.

9.14 FD IRM Plantation Establishment (IMMP Phase III: De-centralization Period)

Output of the FD plantation establishment of the IMMP phase III is defined as "all FD plantation areas in the reserved forest maintain production through rotational operations". During phase III, FD plantations would be established in all target operation areas located in the FD operation compartment inside the reserved forest. Periodical and sustainable production from the FD plantation, especially harvesting and processing of wood products would be started.

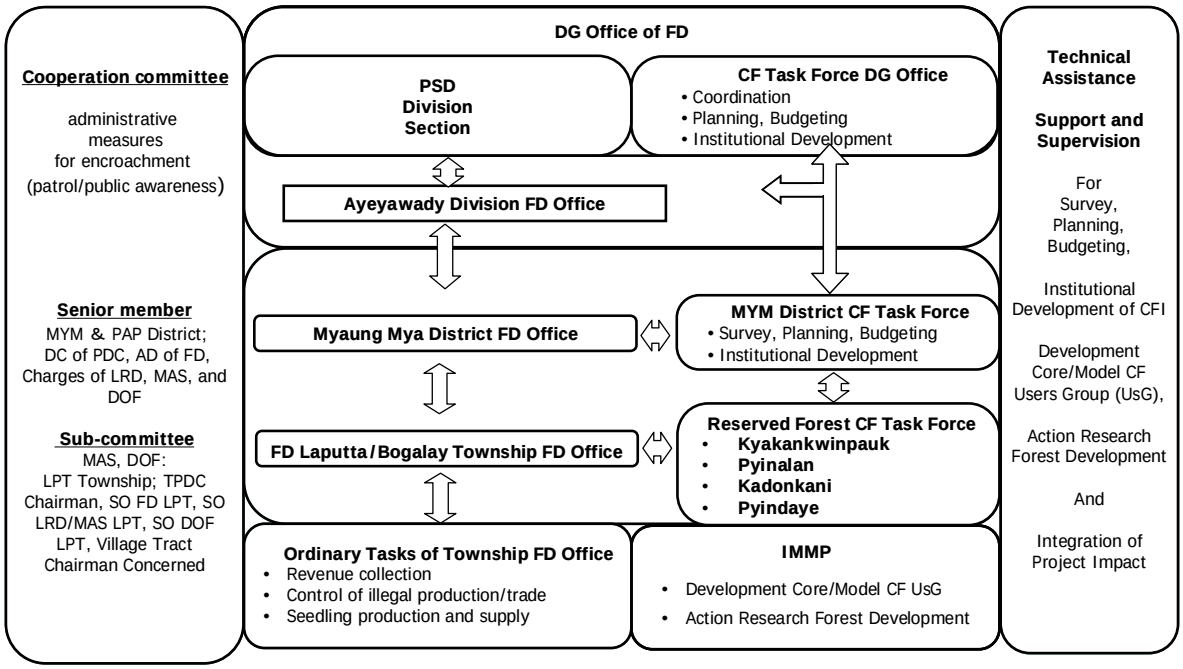
Preparation for FD plantation establishment in phase III would be conducted in the same manner as phase II by the CF Mangrove Division of each reserved forest under the supervision of the Myaung Mya CF Mangrove Division.

The plantation establishment would be conducted by direct management of CF Mangrove Division at each reserved forest in the same manner as in phase II. Tending, protection activities, monitoring and evaluation after the plantation establishment would also be conducted in the same manner as in phase II. Harvesting and provision of forest products would be realized, particularly wood products which take longer to mature.

10 IMPLEMENTATION PLAN OF IMMP

10.1 Organization Framework of the IMMP

Following figure describes an image of organization structure plan including regional and central cooperation (steering) committees. During phases II and III, the IMMP would be conducted by a CF Mangrove Division under the FD Director General Office after up grading the CF Task Force to the Division.



MYM: Myaung Mya District, DC: District Chairman, PDC: Peace and Development Council, MAS: Myanmar Agriculture Service, LRD: Land Record Department, DOF: Department of Fishery, LPT: Laputta, BGL: Bogalay, SO: Staff Officer, UsG: users group

Organization Plan (IMMP Phase I)

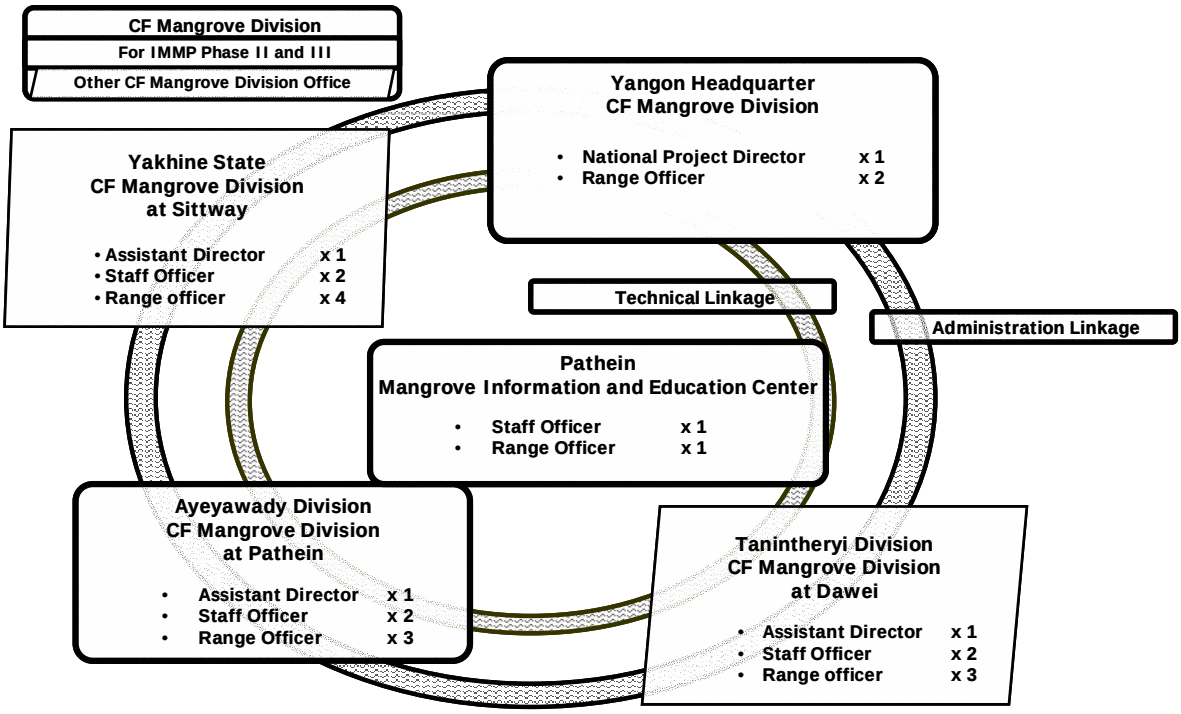
10.2 Formulation of Cooperation Committee of the IMMP

At the commencement stage of IMMP phase I, FD will lead a formulation of central and regional cooperation committees for obtaining understanding and support of the local authorities about the IMMP. The planned regional cooperation committee members are described in the above organization plan. The duty of the central cooperation committee would be concentrated on coordination of related agencies, and support for implementation of IMMP. The regional cooperation committee would be more directly involved in the IMMP implementation. Especially, the Myaung Mya DPDC and the Laputta TPDC are authorized organizations regarding the integrated resource management plans of FD in the Kyakankwinpauk and the Pyinalan Reserved Forests. The two IRM include resettlement of illegal dwellers in the areas that have to be permitted by the authorities such as DPDC and TPDC.

10.3 Extension and De-centralization of Developed Foundation

The CF Mangrove Division is planned in the IMMP to formulate an organization that covers mangrove rehabilitation through CF at the national level. The organization under the CF Mangrove Division will be charged to the implementation of the phase II extension period and the phase III de-centralization period of the IMMP.

During the IMMP phase I, the CF task force within the FD will serve as a project management organization. Based on the lessons and findings of phase I, the CF task force would be upgraded as the CF Mangrove Division to be the project management organization for phase II and thereafter. A developed foundation during phase I can be utilized not only by the implementation of the IMMP phase II, but also rehabilitation of mangrove forests located in the Rakhine State and the Tanintharyi Division. Thus the establishment of the CF Mangrove Division is proposed in the IMMP to cover rehabilitation of all of the mangrove areas in Myanmar. An image of the organization of the Division including charged officers for each office is shown in following figure.



Draft Organization of CF Mangrove Division

10.4 Implementation Schedule (IMMP Phase I)

Proposed project works included in the IMMP are, 1) preparatory work, 2) establishment of model CF user groups, 3) capacity development of FD for CF management and support, 4) establishment of integrated forestry technology in the delta, and 5) integration of the project impact.

(1) Preparatory Work

Preparatory work will include, 1) establishment of the project implementation organization, 2) confirmation of FD annual plan, 3) preparation of annual action plan, and 4) budgeting.

The work for development of model CF user groups is composed of, 1) preparatory stage for the development of model CF user groups, 2) planning stage for the development of model CF user groups, 3) implementation stage for development of model CF user groups, 4) management of model CF user groups, and 5) extension of the model CF user group activities.

The CF Task Force at each reserved forest will support the villagers for the formulation of model CF user groups based on the annual action plan and procedure of CFI through a participatory measure. One model CF user group per reserved forest per one year, in total 20 model CF user groups is planned to be established during the IMMP implementation period.

Actual CF activity areas are different among the reserved forests depending on the selected CF activities and land availability for such CF activities. The estimated CF activity area where coexistence will be achieved between mangrove vegetation and people's life is indicated in the following table. The area presented in the table is based on the 2002 aerial photo interpretation.

Estimated CF Activity Area of the Model CF User Group (Phase I)

(unit: ha)

Reserved Forest	year	1	2	3	4	5	Total
Kyakankwinpauk	Annual		33	44	44	56	177
	Accumulation			77	121	177	-
Pyinalan	Annual		283	376	376	470	1,505
	Accumulation			659	1,035	1,505	-
Kadonkani	Annual		105	142	142	177	567
	Accumulation			247	390	567	-
Pyindaye	Annual		105	140	140	174	558
	Accumulation			245	384	558	-
Total	Annual		526	702	702	877	2,807
	Accumulation			1,228	1,930	2,807	-

Note: Prepared based on assumption of land use .
Actual activity area will be fixed based on intention of villagers and land availability during preparatory stage of the IMMP Phase I.

The extension based on model CF user group's activity is a preparatory activity for formulation of new CF user groups. The estimated number of necessary leaflets and tours are shown in the following table.

Number of Extension Leaflets and Tours (one reserved forest)

CF Task Force	Unit	1st year	2	3	4	5	Total
Each reserved forest (No of CF UsG)		1	1/2	1/3	1/4	1/5	5
– Extension leaflet	sheet	200	200	200	200	200	1,000
– Visit for distribution of leaflet	time	5	5	5	5	5	25
– Extension tour	time	5	5	5	5	5	25

The number of model CF user groups will increase year by year, so that it is important to select the best performed CF user group among similar natural and socioeconomic condition areas. Then the extension and demonstration effects from the activity are highly expected.

(2) Capacity Development of FD for CF Management and Support

The CF task force at each reserved forest will conduct design, cost estimation, procurement, and construction of the CF extension center and nursery. The following table describes the construction and renovation schedule of the CF extension center and nursery, and the succeeding table shows the facility and extension unit of a CF extension center and nursery.

Construction and Renovation Plan of CF Extension Center and Nursery

CF Extension Center and Nursery	Unit	1st year	2	3	4	5	Total
Kyakankwinpauk	ls		1				1
Pyinalan	ls			1			1
Kadonkani	ls			1			1
Pyindaye	ls				1		1

The CF task force at each reserved forest will be in charge for the annual operation and management of the extension center and nursery after completion or renovation of such facilities. The staff of later starting reserved forest CF task force staff has to visit forerunning task force for obtaining construction, operation and maintenance technology.

(3) Establishment of Integrated Forestry Technology in the Ayeyawady Delta

Seedling production for the action research plantation will be started in accordance with construction/renovation of the FD mangrove nursery and survey, planning and mapping result. Estimated seedling production amount is shown in the following table.

Annual Seedling Production Plan by FD Mangrove Nursery (Phase I)

(x 1,000)

FD Mangrove Nursery	Annual Seedling Production	Total
- Kyakankwinpauk	1,190	4,760
- Pyinalan	3,600	14,400
- Kadonkani	1,164	4,656
- Pyindaye	1,756	7,024
Total	7,710	30,840

Assumptions: spacing 6'x 6', 3,000 seedling/ ha including 25 % for patching

The annual action research plantation plan is shown in the following table. Gap planting and other planting activities under the natural forest regeneration/improvement operations are also covered in the action and research plantation.

Plan for Annual Action research Plantation Area (Phase I)

(unit: ha)

Reserved Forest		1st year	2	3	4	5	Total
- Kyakankwinpauk	Annual	0	353	353	353	353	1,410
	Accumulation			705	1,058	1,410	-
- Pyinalan	Annual	0	824	824	824	824	3,295
	Accumulation			1,648	2,471	3,295	-
- Kadonkani	Annual	0	246	246	246	246	985
	Accumulation			493	739	985	-
- Pyindaye	Annual	0	446	446	446	446	1,783
	Accumulation			892	1,337	1,783	-
Total	Annual	0	1,868	1,868	1,868	1,868	7,473
	Accumulation			3,737	5,605	7,473	-

Note: actual plantation area will be selected through site survey.

In accordance with progress of the action research plantation, planned tending activity will be carried out including protection or pest control. The integration of forestry technology will be carried out based on the monitoring and evaluation results of regular monitoring targeting whole procedure of the plantation activity including seedling production or salinity / weather observation. The monitored data, including evaluation results, will be compiled and summarized by the CF task force at Myaung Mya FD office by every November except for the first year of the IMMP Phase I. The results will be compiled by species as an "Integrated Forestry Technology Manual in the Delta" for utilization and confirmation of succeeding years' Action Research Forest Development.

(4) Integration of the Project Impact

The CF Annual Meeting is to be held once a year in January in Yangon. The CF Joint Training is also planned to be implemented once a year by the FD district offices who are engaged in the CF activities. The IMMP annual and mangrove rehabilitation annual meeting are planned to open once a year for summarizing activities and lessons of the year for feeding back to the following year's activities. Regarding the timing of the meetings, November to January are recommended for holding the meetings before preparation of the succeeding year's action plan and budget.

10.5 Implementation Schedule (IMMP Phase II)

Proposed project works included in the IMMP phase II are, 1) CF extension by CF Mangrove Division, 2) Action Research Forest Development extension by FD direct operation and 3) construction and operation of mangrove education and information center.

(1) Extension of Model CF User Group Phase II

The planned number of newly formulated CF user groups is 80 compared to 20 of the preceding five years. The planned number of CF user groups during phase II is shown in the following table.

Planned Number of Model CF User Groups Phase II

Reserved Forest	Unit	6th year	7	8	9	10	Total
Kyakankwinpauk	set	4/9	4/13	4/17	4/21	4/25	20/25
Pyinalan	set	4/9	4/13	4/17	4/21	4/25	20/25
Kadonkani	set	4/9	4/13	4/17	4/21	4/25	20/25
Pyindaye	set	4/9	4/13	4/17	4/21	4/25	20/25
Total	set	16/36	16/52	16/68	16/84	16/100	80/100

Note: Number of newly started CF user groups / Accumulated number of CF user groups

The estimated CF activity area based on the 2002 aerial photo interpretation is shown in the following table.

Estimated CF Activity Area of the Model CF User Group Phase II

Reserved Forest	Total Area (ha)
- Kyakankwinpauk	504
- Pyinalan	3,129
- Kadonkani	1,912
- Pyindaye	1,645
Total	7,190

Note: Prepared based on assumption of land use .
Actual activity area will be fixed based on intention of villagers and land availability

(2) Action Research Forest Development Phase II

Felling operations will be added to the action research plantation for starting harvesting stage of the plan. The schedule of annual action research plantation plans for each reserved forest is shown in the following table.

Annual Action Research Plantation Plan (Phase II)

Reserved Forest		1	2	3	4	5	Total (ha)
Kyakankwinpauk	Annual	479	479	479	479	479	2,397
	Accumulation		959	1,438	1,918	2,397	-
Pyinalan	Annual	548	548	548	548	548	2,739
	Accumulation		1,096	1,643	2,191	2,739	-
Kadonkani	Annual	518	518	518	518	518	2,591
	Accumulation		1,036	1,554	2,073	2,591	-
Pyindaye	Annual	1,112	1,112	1,112	1,112	1,112	5,562
	Accumulation		2,225	3,337	4,450	5,562	-
Total	Annual	2,658	2,658	2,658	2,658	2,658	13,289
	Accumulation		5,316	7,973	10,631	13,289	-

Note: actual plantation area will be selected through site survey.

The required number of seedlings for the phase II Action Research Forest Development is calculated based on the estimated plantation area.

Required Number of Seedling by Reserved Forest (Action Research Forest Development Phase II)

FD Mangrove Nursery	Annual Seedling Production	Total (x 1000)
- Kyakankwinpauk	1,741	8,705
- Pyinalan	3,521	17,605
- Kadonkani	2,702	13,510
- Pyindaye	4,324	21,620
Total	12,288	61,440

Assumptions: spacing 6'x 6', 3,000 seedling/ ha including 25 % for patching

(3) Mangrove Information and Education Center

The mangrove information and education center is proposed to practice the following operation for dissemination of mangrove related information as the center of mangrove rehabilitation. The operation plan is prepared according to the target users (villagers and staff of FD) of the center who should understand about functions of mangrove vegetation and take necessary action for mangrove rehabilitation. The operation plan estimates over 10 months of training activities at the center per year.

Activity Plan of Mangrove Information and Education Center (Phase II)

User	Function	Period
1. Officers of FD	Basic technology training on mangroves	2 weeks x 2 times /year
2. Field staff of FD	- do -	1 month x 2 times /year
3. CF user groups	Mangrove rehabilitation	5 days x 8 times /year
4. Women's associations	Mangrove function and environment	0.5 day x 5 times / year
5. Elementary school children	Mangrove function and environment	1 day x 40 times / year
6. Junior-high school children	Mangrove function and environment	1 day x 40 times /year
7. Local authorities	Mangrove rehabilitation and public awareness	0.5 day x 20 times /year

10.6 Implementation Schedule (IMMP Phase III)

Proposed project works included in the IMMP phase III are, 1) CF de-centralization by CF Mangrove Division and 2) stabilization of integrated mangrove forestry technology by FD direct operation.

(1) De-centralization of Model CF User Group Phase III

At the end of phase III, it is expected that the whole target project areas of the IMMP for the CF operation compartments would be occupied by certified CF areas. Based on current numbers of villages in the target area, it is estimated following number of target villages and CF user groups to be formulated during the phase III.

Annual Target of CF User Groups of Phase III

Reserved Forest	Number of Villages	Annual Target Number of CF UsG
– Kyakankwinpauk	165	6
– Pyinalan	165	6
– Kadonkani	235	8
– Pyindaye	225	8
Total	790	28

The total and annual target areas of CF activities are shown in the following table. The area planned to be allocated to CF areas during the IMMP phase III was estimated based on the zoning prepared by 2002 aerial photo interpretation.

Estimated CF Activity Areas of the Model CF User Groups Phase III

(unit: ha)

Reserved Forest	Total Target Area	Annual Target Area
– Kyakankwinpauk	2,868	96
– Pyinalan	6,753	225
– Kadonkani	7,216	241
– Pyindaye	9,348	311
Total	26,185	874

(2) Action Research Forest Development Phase III

Results of the Action Research Forest Development in phase II will be transferred to the Action Research Forest Development Phase III. It is recommended that all operations be continued by CF Mangrove Division, as well as in the IMMP phase II. The Division will continue the same procedure with the phase II activity for the IMMP operation.

Targets of the Action Research Forest Development III will be the whole area designated to the FD operation compartment in the reserved forest i.e. IRM and CORE/BUFFER zone except for the protected area and on-going forestry activity areas.

The annual action research plantation plan for phase III in each reserved forest is shown in the following table.

Annual Action Research Plantation Plan (Phase III)

(unit: ha)

Reserved Forest	Total Target Area	Annual Target Area
– Kyakankwinpauk	4,273	142
– Pyinalan	4,706	157
– Kadonkani	11,177	373
– Pyindaye	20,003	667
Total	40,159	1339

The required numbers of seedlings for phase III action research plantation are calculated based on the estimated plantation area (numbers of seedlings are shown in the following table).

Required number of Seedlings for Action Research Plantation Phase III

(x 1000)

Reserved Forest	Annual Plantation Target Area
– Kyakankwinpauk	214
– Pyinalan	1,146
– Kadonkani	1,839
– Pyindaye	2,935
Total	6,134

10.7 Budgetary Plan

The total cost required for implementation of the IMMP is estimated at 18,258 million kyat. The project cost of each IMMP phase is shown in the following table.

Project Cost

(unit: million kyat)

Works	Total	Phase I	Phase II	Phase III
1. Preparatory Work Setting the Project Implementation Organization	-	-	-	-
2. Development Model CF User Group	3,552	232	474	2,846
3. Capacity Development of FD for CF Management and Support	1,392	621	102	669
4. Establishment of Integrated Forestry Technology in the Ayeyawady Delta	2,558	371	587	1,600
5. Integration of the Project Impact	3,886	108	540	3,239
6. CF Task Force including allowance (Phase I), CF MNP (Phase II, III)	1,409	50	194	1,165
7. Operation and Maintenance Cost (5 % of 1.0 - 5.0)	569	67	85	418
8. Technical Assistance	4,892	2,804	2,088	0
Total	18,258	4,253	4,070	9,935

10.8 Option Plan of the IMMP Phase I

A quantity, organization, staffing and budget allocation of the IMMP phase I on the draft final report was discussed between FD and the JICA study team. Following option plan of the IMMP phase I was agreed contents for practical implementation of the IMMP phase I.

(1) Institutional Development of CF Task Force of the Option Plan of the IMMP Phase I

FD will formulate the CF task force for development of system for CF management and support by FD itself during the IMMP phase I. The system is composed of following subjects, 1) management system of CF activity, 2) budgeting system including the budget resource development, 3) rules and regulation of CFI, 4) duty and responsibility (terms of reference) of the CF task force. The CF task force implies upgrade to CF Mangrove

Division for implementation of the IMMP phase II in accordance with achievements of the system developed during the implementation stage of the option plan of the IMMP phase I.

(2) Target Area and Development of Model CF User Group of the Option Plan of the IMMP Phase I

Target area of the option plan of the IMMP phase I set as four reserved forest of Kyakankwinpauk, Pyinalan, Kadonkani and Pyindaye which are same as the IMMP phase I. The CF activities of the model CF user group focuses on 1) CF buffer plantation, 2) CF river side plantation, 3) CF paddy woodlot, 4) CF village, 5) CF plantation/NFIO. Remaining planned CF prototypes on the IMMP such as 1) CF water reservoir, 2) CF agroforestry, 3) CF aqua-agroforestry, 4) CF compost woodlot and 5) CF FD camp plantation those are highly related to production activities will be implemented for demonstration at four FD CF extension centers and nurseries at each reserved forest. Land mark and staking material and producer goods such as seed and rhizome for seed production, stock and scion seedling for seedling production for starting production activity are planned in the option plan as of minimum input of the participatory type project. Following number of the model CF user groups will be developed at the four reserved forest where urgent mangrove rehabilitation is necessary to serve as the core for extension of the CF activities.

Planned Number of Model CF User Groups (Option Plan of the IMMP Phase I)

Reserved Forest	1 year	2	3	4	5	Total
Kyakankwinpauk	0	1	1	1	2	5
Pyinalan	0	2	1	1	1	5
Kadonkani	0	1	2	1	1	5
Pyindaye	0	1	1	2	1	5
Total	**0**	**5**	**5**	**5**	**5**	**20**

(3) Action Research Forest Development Target Area and Cost of the Option Plan of the IMMP Phase I

Target area of the Action Research Forest Development of the option plan are set at river and coast side areas of the forest compartments of the IMMP phase I at four reserved forests of Kyakankwinpauk, Pyinalan, Kadonkani and Pyindaye. The area is of the highest priority required for urgent rehabilitation of mangrove vegetation not only for local supply, but also conservation of environmental conditions and disaster prevention such as land erosions or tsunami. Target area of the option plan is 1,495 ha which is equivalent to 20 % of IMMP phase I target area.

Target Area of Action Research Plantation

Unit: ha

Reserved Forest	Zoning category	Option Plan	IMMP			
			Total	Phase I	Phase II	Phase III
Kyakankwinpauk	Core	165	1,376	824	57	495
	Buffer/Multiple-use[1)]	117	6,703	586	2,340	3,778
Pyinalan	Core	307	2,693	1,537	391	765
	Buffer/Multiple-use[1)]	352	8,048	1,758	2,348	3,941
Kadonkani	Core	27	6,196	134	969	5,093
	Buffer/Multiple-use[1)]	170	8,556	850	1,622	6,084
Pyindaye	Core	44	5,705	218	199	5,289
	Buffer/Multiple-use[1)]	313	21,643	1,564	5,364	14,715
Total		1,495	60,920	7,471	13,290	40,160

(4) Cost and FD Organization for Implementation of the Option Plan of the IMMP Phase I

1) Cost and Its Distribution of the IMMP Phase I

Cost and its distribution of the option plan of the IMMP phase I is set as FD and external assistance contribute 221 and 3,950 million kyats respectively. Following table describes breakdown of the cost that is confirmed the budget allocation by FD.

Indicative cost of the operation plan of IMMP phase I is estimated as 4,171 million kyat.

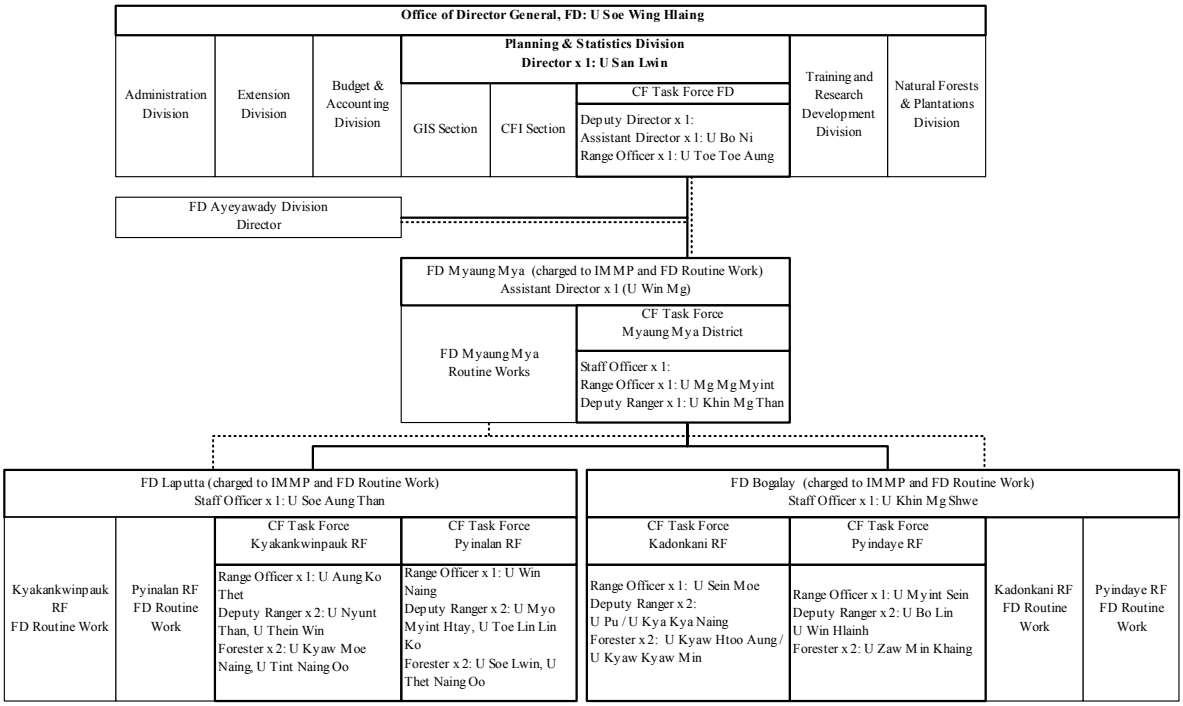
Cost and Distribution of the Option Plan of the IMMP Phase I

Unit: 1000 kyats, exchange rate Yen/US$: 108.47, :Kyat/US$: 920

	Item	Budget Sharing	Total	1st year	2nd year	3rd year	4th year	5th year
1.0	Preparatory Work Setting the Project Implementation							
1.1	Setting the Project Implementation Organization		-	-	-	-	-	-
1.2	Confirmation of the Annual Plans of the FD		-	-	-	-	-	-
1.3	Preparation of IMMP Annual Action Plan		-	-	-	-	-	-
1.4	Budgeting		-	-	-	-	-	-
2.0	Development Model CF User Group							
2.1	Preparatory Stage: Development Core/Model CF User Group	External Support	25,788	0	16,768	2,120	6,900	0
2.2	Planning Stage: Development of the Core/Model CF User Group		-	-	-	-	-	-
2.3	Implementation Stage: Development of the Core/Model CF User	CF Task Force	17,568	0	4,392	4,392	4,392	4,392
	Seedling and boundary poles for CF River bank plantation, CF							
	CF buffer plantation, CF Plantation/NFIO, and CF village							
2.4	Management of the Core/Model CF User Group		-	-	-	-	-	-
2.5	Extension of the Core/Model CF User Group	External Support	4,266	0	1,580	1,580	790	316
3.0	Capacity Development of FD for CF Management and Support							
3.1	Institutional Development of FD for CF Management and	External Support	169,734	141,251	12,301	8,621	1,841	5,722
3.2	Construction and Rehabilitation of FD Mangrove CF Extension Center and Nursery							
1)	Kyakankwinpauk FD CF Extension Center and Nursery	External Support	86,782	28,927	57,855	-	-	
2)	Kadonkani FD CF Extension Center and Nursery	External Support	93,030	0	31,010	62,020	-	-
3)	Pyinalan FD CF Extension Center and Nursery	External Support	40,779	0	13,593	27,186	-	-
4)	Pyindaye FD CF Extension Center and Nursery	External Support	117,702	0	0	39,234	78,468	-
3.3	Demonstration of CF production activity (CF water reservoir, CF agroforestry, CF aqua-agroforestry and CF FD labor camp	External Support	128,477	32,119	32,119	32,119	32,119	
3.4	CF Management and Support		-	-	-	-	-	-
4.0	Establishment of Integrated Forestry Technology in the							
4.1	Survey, Planning, Mapping and Mangrove Forestry Manual	External Support	27,830	13,380	0	4,250	0	10,200
4.2	Production and Diversification of Plantation Species		-	-	-	-	-	-
4.3	Action Research Plantation (1st Year plantation)	External Support	211,637	0	52,909	52,909	52,909	52,909
4.4	Action Research Plantation (Tending 1-5 years)	CF Task Force	53,956	0	13,489	13,489	13,489	13,489
4.5	Integration of Mangrove Technology through Monitoring		-	-	-	-	-	-
5.0	Integration of the Project Impact							
5.1	Annual Meeting of the CF Activity	External Support	10,690	2,486	2,486	2,486	1,989	1,243
5.2	CF Joint Training of the FD	External Support	7,009	1,630	1,630	1,630	1,304	815
5.3	Annual meeting for the mangrove rehabilitation	External Support	8,974	2,087	2,087	2,087	1,670	1,044
6.0	CF Task Force (saraly and allowance)							
6.1	Salary	CF Task Force	47,748	9,550	9,550	9,550	9,550	9,550
6.2	Allowance	CF Task Force	74,935	0	0	0	28,821	46,114
7.0	CF Task Force (allowance)	External Support	213,278	57,643	57,643	57,643	28,821	11,529
8.0	Operation and Maintenance Cost (5 % of 2.3, 3.2, 4.4, 6.1, 6.2)	CF Task Force	26,625	1,924	6,494	7,794	6,736	3,677
9.0	Technical Assistance	External Support	2,804,290	542,467	664,763	664,763	507,658	424,640
	CF Task Forece Total		220,832	11,474	33,925	35,225	62,988	77,222
	External Support Total		3,950,264	821,990	893,833	905,738	661,559	455,508
	Grand Total		4,171,097	833,463	927,758	940,962	724,547	532,729

(5) Organization and Staffing of the CF Task Force of the Option Plan of the IMMP Phase I

The organization chart of the CF task force including its staffing is shown in the following figure. The chart is provided by FD in the course of the study. Currently, PSD and FD Myaung Mya office are working on staffing of the organization. The staffing will be completed by the end of March, 2005, depend on FD.



Note 1: FD currently engages in formulation of the organization and scheduled to complete by the end of February 2005.
Note 2: Thick line describes CF Task Force organization and operation line charged for implementation of IMMP and the broken line depicts FD routine operation line.
Note 3: FD Myaung Mya, FD Laputta and FD Bogalay offices charged to FD routine work and implementation of the IMMP.
Note 4: CF Task Force FD, Myaung Mya, Laputta and Bogalay charged sole implementation of the IMMP.

(6) Construction Plan for CF Extension Center and Nursery

It is recommendable that the construction of the CF extension center and nursery should be procured by direct operation of FD and external assistance. The construction activity itself will integrate technologies regarding mangrove nursery and extension center such as construction of mangrove nursery bed, demonstration facilities such as mangrove studio, natural nursery, aqua-agroforestry, etc. The developed technology will be extended to charged staff of the FD CF task force for applying succeeding construction of the extension center and nursery constructions at other reserved forests in the target area of the IMMP option plan.