

CHAPTER 7 EVALUATION OF CAPACITY OF STAKEHOLDERS OF IMMP

7.1 Method of Evaluation

7.1.1 Employed Evaluation Method

(1) Evaluation Method

This evaluation aims to clarify the stakeholders' capacity for engagement in sustainable community forestry (CF) activities. The capacity is evaluated, by (a) firstly confirming the facts on the progress of the two pilot projects of 2003 and 2004, (b) comparing differences between the two pilot project results, and (c) estimating the anticipated capacity of stakeholders. The data applied to the evaluation are the records of the pilot project 2003 and 2004, and reports generated at Phase I of the study. This evaluation method is expected to serve as a feedback mechanism from the pilot project to the Integrated Mangrove Management Plan (IMMP) to enhance its practicability.

Sustainable Livelihood Approach:

The evaluation method employed in the study is referred 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 referred as of evaluation method.

(2) Implication of the Evaluation Method

The following Figure 7.1 illustrates the structure of the evaluation and relationship between the evaluation and the IMMP. The anticipated asset is evaluated based on confirmation of current asset-present activity implies findings of feasible works for the stakeholders in engaging in the CF activity. The requirements for fulfilling all activities for each component of the pilot project are identified.

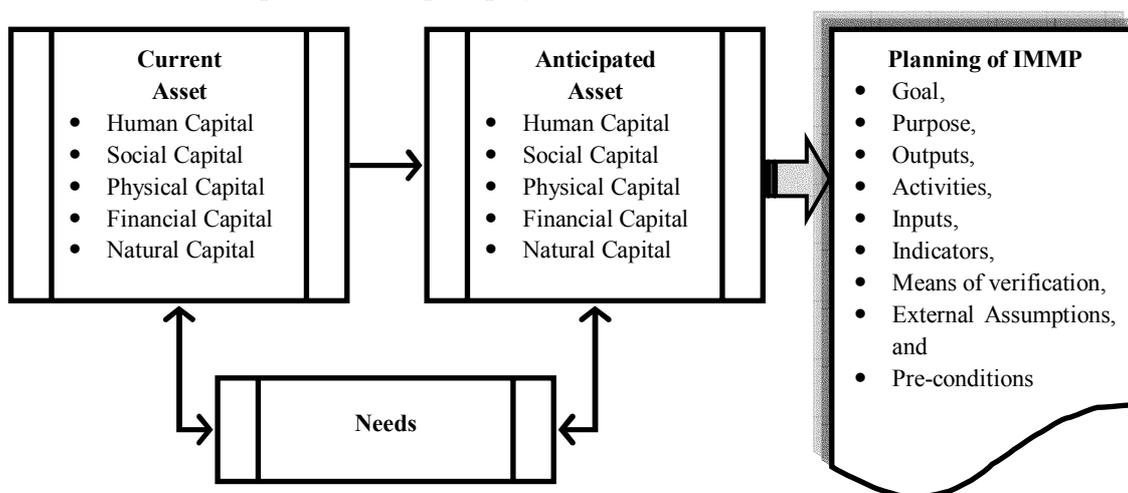


Figure 7.1 Structure of the Evaluation

(3) Data Applied to the Evaluation

To confirm current and anticipated assets, the following data and survey results are referred to:

- Interview of stakeholders of FD and the CF user group,
- Monthly progress reports of the supervisor of the pilot project,
- Village profile survey and Rapid Rural Appraisal (RRA),
- Socioeconomic condition survey 1 and 2, and
- Pilot project 2003 and 2004

7.1.2 Capital and Evaluation Element

(1) Capital

The five capitals are the framework used to comprehend capacity of the stakeholders. The following table shows contents of each capital applied the evaluation.

Contents of Five Capitals

Capital	Content
Human Capital	skills, knowledge, ability, good health
Social Capital	networks, group relationship, rules, norms
Physical Capital	infrastructure, tools, equipments
Financial Capital	available stock of financial resource, money flows
Natural Capital	natural resource stocks including flows and services of them

(2) Setting Evaluation Element

The capitals cannot be directly evaluated, so the evaluation elements corresponding to the capitals are selected from each activity practiced under the pilot projects. Therefore the evaluation elements are composed of the activities of each stakeholder in the pilot projects. The following table shows simplified structure of capital, evaluation elements and activities.

Structure of the Capital, Evaluation Elements and Pilot Project Activities

Capital	Evaluation Elements	Activities
Five Capitals	Five major elements are selected from pilot project activities corresponding to each capital	Pilot project 2003 and 2004: All activities of planning, implementation, operation and management of the CF activities are listed.

(3) Capitals and Evaluation Element for FD

The following table shows the selected evaluation elements for each capital. The evaluation elements and corresponding pilot project activities to each element are identified by the study team as essential factors for achieving sustainable CF activity.

Capital and Evaluation Elements (FD)

Capital	Evaluation Elements
Human Capital of the FD officer and field staff	<ul style="list-style-type: none"> - The FD officer and field staff have a practical intention regarding CF - The FD officer and field staff have intention for CF expansion for forest conservation and production - The FD officer and field staff possess practical techniques and knowledge - The FD office and field staff have enough income for engaging in CF management and support - The FD officer and field staff maintain healthy CF management and support
Social Capital of the FD as an aggregation	<ul style="list-style-type: none"> - Necessary policy, national and regional plans for CF are prepared - Necessary institutional development for fulfillment of the CF objective and intention of FD is completed - Necessary records are accumulated based on a proper reporting system regarding the CF activity - Necessary organization for the CF management and support is prepared - Necessary CF training and extension material of FD and community are prepared
Physical Capital	<ul style="list-style-type: none"> - FD has facilities and equipment of the CF extension, management and support - FD has facilities and equipment for seedling production and distribution - FD has equipment and tools for forestry operation - FD has facilities, equipment for patrolling - FD has facilities and equipment for the CF extension and public awareness
Financial Capital	<ul style="list-style-type: none"> - FD has necessary budget for the CF extension, management and support - FD has necessary budget for seedling production and distribution - FD has necessary budget for forestry operations - FD has necessary budget for patrolling - FD has necessary budget for the CF extension and public awareness activities
Natural Capital	<ul style="list-style-type: none"> - Vegetation can be rehabilitated by culturing methods of the local people - Natural conditions are suited to sustainable production - Forest conditions have anticipated to fulfill demand for wood products and non-timber forest products (NTFP) for local needs - FD has necessary budget for patrolling - Forest conditions have potential to fulfill wood products and NTFP demands of FD

(4) Capitals and Evaluation Element for the CF User Group

The following table shows the selected evaluation elements for each capital of the CF user group. The evaluation elements and corresponding pilot project activities to each element are identified by the study team as essential factors for achieving the sustainable CF activity by the CF user group.

Capital and Evaluation Elements (the CF User Group)

Capital	Evaluation Elements
Human Capital	<ul style="list-style-type: none"> - People have a practical intention regarding CF. - People have intention for CF expansion for forest conservation and/or production. - People possess practical techniques and knowledge for CF. - People earn enough income and production from engagement in CF. - People maintain good conditions for CF management and support.
Social Capital of village or the CF user group	<ul style="list-style-type: none"> - Community possesses customs and know-how to engage in group activities. - Community possesses informal customs or norms to engage in group activities. - Community has customs or written rules for engaging in group activities. - Community possesses necessary knowledge and techniques for forestry. - Community has leadership supporting engagement in CF activities.
Physical Capital	<ul style="list-style-type: none"> - Community has necessary solid assets to engage in the CF activities such as roads, boats, jetties, warehouses, tools, equipment and materials. - People have necessary equipment to engage in the CF activities such as forestry equipment, tools (boat, machete, and boots), etc. - Community has necessary labor forces to be engaged in the CF activities. - People have necessary labor forces to be engaged in the CF activities. - Community has necessary facilities to engage in processing value added production.
Financial Capital	<ul style="list-style-type: none"> - People have necessary income for preparatory work of the CF activity - People have necessary income for implementation of the CF activity - People have necessary income for harvesting - People have necessary income for management of the CF activity - People have necessary income for patrolling of the CF area
Natural Capital as of needs of CF for local people	<ul style="list-style-type: none"> - Natural conditions allow people to live in the reserved forest. - There is land for engaging in the CF activity. - Natural resources exist in the area. - The productivity of the area is enough to sustain CF activities. - There are seeds and propagules for the CF activity nearby.

7.1.3 Scoring of the Activities and Evaluation Point

The stakeholders and the study team undertake the evaluation and scoring in terms of the all activities of the pilot projects. The criteria applied to the evaluation and scoring are shown in the following table.

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

Then the scores of each activity were taken average of the scores of activates for each evaluation elements level and capital level. Summary of evaluation and scoring of the activities are shown in Section 7.2 and 7.3. Details of the evaluation and scoring of the activities are listed in Attachment 11, Volume III of this report.

7.2 Current and Anticipated Assets of the Forest Department

7.2.1 Human Capital

The human capital of FD is evaluated from the five elements identified in Section 7.1 as follows.

The Change of Human Capital of FD during the Pilot Project and its Anticipation

Elements / Asset	Asset 2003	Asset 2004	Anticipated
(1) The FD officer and field staff have a practical intention regarding CF	1.0	1.2	1.3
(2) The FD officer and field staff have intention for CF expansion for forest conservation and production	0.8	1.5	1.3
(3) The FD officer and field staff possess practical techniques and knowledge	1.0	1.3	1.3
(4) The FD office and field staff have enough income for engaging in CF management and support	0.7	0.7	1.0
(5) The FD officer and field staff maintain healthy CF management and support	0.5	0.5	1.0

(1) The FD officer and field staff have a practical intention regarding CF

General motivation for the work was evaluated by observing the activities of the frontline staff, either by (a) on-the-job training or (b) the training program for frontline staff provided by the pilot project in 2003. Fifteen FD staffs attended the program. Participants were: (a) FD field staff, such as deputy range officers, foresters, forest guards, and (b) FD officer of range officers.

The FD field staff were motivated mainly by instruction from their superiors and have good motivation. The field staff seem to have difficulty sparing time for supporting CF user groups, mainly due to the concurrent duties, like revenue collection and nursery operation. There seems to be several constraints for officers to keep their motivation: (a) Job-rotation, (b) unclear ToR for CFI, and (c) assignment of inexperienced personnel, like young officers, or officers from other regions of the country. Thus, the anticipated asset of the motivation is evaluated as 1.3.

(2) The FD officer and field staff have intention for CF expansion for forest conservation and production

Both the FD officers and field staff understood the importance of CF extension. However, the FD field staff tended to just wait for instruction from their superiors.

The strategy to extend the CF area was not achieved by the CF support organizations, even though the objectives of the CFI were shared among the FD officers.

The intention for CF expansion for forest conservation and production is possessed by the FD officers and they will be able to set up an implementation system. Compared with the officers, the intentions of the field staff (deputy range officer, forester, forest guard) are weak in the sense that detailed ToR and instructions are needed to precipitate action and

they need more knowledge to support user groups in implementation of CF. Thus, the anticipated asset of the motivation for extension was evaluated as 1.3.

(3) The FD officer and field staff possess practical techniques and knowledge

Before starting the pilot project, the FD field staff had a limited opportunity and experience on CF expansion. This is especially true during planning and the first year of operation. Through the pilot project 2003, the training course provided knowledge and techniques on: (a) mangrove management, (b) CFI procedures, and (c) the participatory approach. In addition, the pilot project offered opportunities for on-the-job training, training at CFDTC, and counterpart training in Japan.

The practical techniques and knowledge of CF of the FD officers related to the pilot project increased through the pilot project implementation. On-the-job training continued during the pilot project in 2004, and they experienced a nursery operation.

The trainees assigned to the pilot project gained practical experience and knowledge on CF implementation, especially technical aspects. However, some FD officers and field staff did not acquire practical techniques or knowledge on participatory extension, even though some of them received training at CFDTC and joint training. CFI procedural issues like (a) harvesting, (b) issuing a sales voucher, (c) selling the products would be future issues to be tackled. Thus, the anticipated asset of the knowledge and techniques was evaluated as 1.3.

(4) The FD office and field staff have enough income for engaging in CF management and support

Official monthly income of the FD field staff is around 5,000 kyat. Officers like the assistant director and director officially receive around 5,000 to 7,000 kyat per month as salary and also about the double amount of salary as the allowance for rice and oil. However, the subsistence cost has increased to around 30,000 kyat per month per household, reflecting recent trend of inflation. Considering the situation, the FD officer and field staff do not appear to have an enough income for livelihood. The livelihood problem seems to be an obstacle to engaging the duty of the CF management and support. In order to ensure a satisfactory duty, they certainly need to have opportunities for additional income.

Even though the pilot project started the CF FD camp to generate the benefit for FD by the CF activity, FD should consider some ways to solve this issue, including the re-allocation of salary. Thus, the anticipated asset of the income was evaluated as 1.0.

(5) The FD officer and field staff maintain healthy CF management and support

The health condition of the FD field staff who reside in the camps of the FD and the FD beat offices was not always good: they suffered from malaria, diarrhea, fever and other diseases once or twice a year. Also access to medical support is difficult. In the Pyinalan Reserved Forest area, patients need to be transferred to Laputta to see a doctor. The

transportation is not easy because of limited boat availability and the high cost of fuel. The health conditions remained the same in 2003.

It is difficult to eliminate disease in the remote areas of the delta. The health of field staff is taken care of by officers at the moment, but the official support such as medicine for the and field staff should be considered for the effective operation of forestry in the remote area. Thus, the anticipated asset of the health was evaluated as 1.0.

7.2.2 Social Capital

The social capital of FD is evaluated from the five elements identified in Section 7.1 as follows.

The Change of the Social Capital of FD during the Pilot Project and its Anticipation

Elements / Asset	Asset 2003	Asset 2004	Anticipated
1) Necessary policy, national and regional plans for CF are prepared	2.0	2.0	2.0
2) Necessary institutional development for fulfillment of the CF objective and intention of FD is completed	0.8	0.9	1.0
3) Necessary records are accumulated based on a proper reporting system regarding the CF activity	0.5	0.5	1.0
4) Necessary organization for the CF management and support is prepared	0.5	1.0	1.3
5) Necessary CF training and extension material of FD and community are prepared	0.7	1.5	1.5

(1) Necessary policy, national and regional plans for CF are prepared

A National Forestry Sector Master Plan (2001-2031) and district Forest Management Plan has been prepared both for Myaung Mya District and Pyar Pon Districts. Township annual and five-year plans were also prepared at the beginning of the pilot project. The establishment of 2.26 million acres of CF area in the country was fixed as the target and local supply/community forest working circles were introduced to contribute to fulfilling the basic needs of local people. Based on the policy and plans for CF mentioned above, CF is regarded as one of the prioritized forestry activities by FD. It is clearly mentioned in the national policy and regional plan. However, the means of promotion or concrete regulation need to be included in these plans. Thus, the anticipated asset of the policy and plan was evaluated as 2.0.

(2) Necessary institutional development for fulfillment of the CF objective and intention of FD is completed

At the beginning of the pilot project, there was no particular organization responsible for the management and support for CF activity. At the first phase of the pilot project 2003, Laputta Township FD Office facilitated the user groups from the CF information extension to the application of the management plan. Myaung Mya District FD Office granted the CF certificate to the user groups of Thar Yar Kone and Nyaung Ta Pin in July 2003. A CF monitoring team was set up in Myaung Mya District and a CF task force in Laputta Township. Officers of the FD Director General Office and the FD district office started the discussion about the future CF support organization. However, for the CF task

force and the CF monitoring team, ToR for the officers, promotion, management, support plan or CF mandate, members, targets or budget were not established. The supporting system for the CF production management regulation (sales voucher and etc.) was understood by the FD managerial officer, but not yet activated as of October 2004. Considering these facts, institutional requirements for the management and support of CF was not completely developed to fulfill the objective of CF. A key for success must be an institutional development in terms of CF management and support. Thus, the anticipation of the institution was evaluated as 1.0.

- (3) Necessary records are accumulated based on a proper reporting system regarding the CF activity

The record keeping and reporting system in the CF task force or Laputta FD township were not rehabilitated. Regarding the management and support of CF, the system of recording and reporting (item to be recorded, format, and submission time) was not established during the pilot project period. On the other hand, regular monthly meetings were held at the township level and the information was sent to the staff officer by the range officers and field staff. But in the monthly meeting, the CF issues did not always come up for discussion. The records regarding CF were not accumulated because of the lack of records, even though the FD Myaung Mya and Laputta understood the necessity to accumulate the records.

With further support, the proper reporting system can be established by the FD district office and implemented by officers and field staff who are engaged in the CF support. The FD field staff who attended the training during the pilot project experienced and learned a method of monitoring. On-the-job training was also done for the FD officers and field staff through the pilot project activities. It was confirmed that they need more training in note taking, making minutes and reporting in order to establish the practical recording and reporting system regarding the CF activity. Thus, the anticipated asset of the record keeping and reporting system was evaluated as 1.0.

- (4) Necessary organization for the CF management and support is prepared

The FD director general office selected themes, target areas and villages for the pilot project in collaboration with the JICA study team. In addition, the CF monitoring team was established at Myaung Mya District Office, and the CF task force in Laputta Township Office.

Major supports supplied by the CF task force during the pilot projects were: (a) planning and drawing a CF management plan (b) drawing up of CF management map, (c) development of the rules and regulations, (d) seedling distribution, (e) technical support, and (f) patrolling in collaboration with the JICA study team.

These provisions of the pilot project implementation were not sufficiently successful due to (a) unclear ToR, (b) concurrent field staffs, and (c) job-rotation. Hand-over of information was insufficient during job rotation. Sustainability of the organization

depends on: (a) Clear ToR and (b) hand over of the information at the time of job rotation. Thus, the anticipated asset of the organizational support to use groups was evaluated as 1.3.

(5) Necessary CF training and extension material of FD and community are prepared

Three types of training courses were offered through the pilot project: (a) pilot project named 'front-line staff training', (b) joint training with COMFORT project. The training was done in CFDTC in collaboration of FD and the COMFORT project. The trainees learned the participatory approach, mangrove management techniques, CF extension, and so on. In the FD frontline staff training, the draft mangrove rehabilitation manual was utilized for CFI, the participatory approach, and the mangrove technical guidance.

With respect to training materials, the above trainings under the pilot projects utilized the draft mangrove rehabilitation manual for FD and the community. CFDTC also provided material for training. With the experience of the two pilot projects and also the comments from the FD officers concerned, the draft manuals were updated at the end of the study by FD and the study team. Further effective utilization of the manual needs to be considered.

Concerning the training and extension for community, a number of workshops held actively by the user groups, FD and the study team served as on-the-job training. As the following continuous days training, i.e. the mutual understanding trip in the mid-term evaluation under the pilot project 2003, the workshop for development the rules and regulations, and the group leader training in the pilot project 2003, the draft mangrove rehabilitation manual for the community was utilized.

Through such utilization of the drafted manuals on the trainings or extension activities, it was confirmed that the CF user group has a capability to understand the contents of manuals and also FD field staff.

For the inhabitants of the reserved forests, handouts were prepared as a part of the public awareness activities. The handouts were prepared to explain the current situation of the mangrove forest and CF. They were distributed to the people in collaboration with District Peace and Development Council and FD Myaung Mya in December.

FD has just started CF training and extension as an organizational response. The pace seems to be slow, but the social capital of the FD surely improved through the pilot project. If these training programs are institutionalized, the anticipated asset for this item could be evaluated as high. For the establishment of the institutional development it needs further assistance and also the involvement of all levels of FD especially at the district and township level. Thus, the anticipated asset of the training and extension was evaluated as 1.5.

7.2.3 Physical Capital

The physical capital of FD is evaluated from the five elements identified in Section 7.1 as follows.

The Change of the Physical Capital of FD during the Pilot Project and its Anticipation

Elements / Asset	Asset 2003	Asset 2004	Anticipated
1) FD has facilities and equipment of the CF extension, management and support	0.5	1.5	1.5
2) FD has facilities and equipment for seedling production and distribution	1.0	1.5	1.5
3) FD has equipment and tools for forestry operation	1.0	2.0	2.0
4) FD has facilities, equipment for patrolling	0.5	0.5	1.0
5) FD has facilities and equipment for the CF extension and public awareness	0.5	1.5	1.7

(1) FD has facilities and equipment of the CF extension, management and support

FD established (a) an integrated mangrove nursery at Thar Yar Kone, and (b) extension centre in February 2004 as a pilot project. The capacity of the nursery was planned as 500,000 potted seedlings per year, which can supply the CF activities of ten user groups in the southern part of the Pyinalan Reserved Forest. Using these facilities, FD started demonstrated activities for water reservoir and aqua-agroforestry with support from the JICA Study team during a pilot project in 2004. This nursery and extension centre is expected to serve as a base camp for extension activities and seedling production in the area.

With respect to information management aspect of the FD Myaung Mya and Laputta FD Offices are consolidated based on procurement and maintenance of office equipment to facilitate the information management on CF activities. Thus, the anticipated asset of the facilities and equipments for the CF extension was evaluated as 1.5.

(2) FD has facilities and equipment for seedling production and distribution

Before the pilot project in 2003, Laputta FD Office produced mangrove seedlings at only Kwa Kwa Ka Lay nursery in Kyakankwinpauk Reserved Forest. By the end of the pilot project 2003, Thar Yar Kone integrated mangrove nursery was constructed, and necessary tools were supplied, and the seedling production was started. For the seedling transportation, a boat was supplied by the pilot project 2003. The boat is maintained and utilized for seedling distribution by Laputta FD. The nursery facilities such as office, residence, warehouse, etc. were constructed. Operation for the diversification trial for both mangrove and non-mangrove species was started.

As stated above, Thar Yar Kone integrated mangrove nursery can produce enough seedlings for 10 CF user groups based on assumption of the seedling distribution record to the pilot project target CF user group. If FD needs to produce more seedlings for the plantation by the FD direct operation, seedling beds can be utilized for bare-root seedling production. Hence the scale of the nursery is evaluated as enough. Thus, the anticipated asset of the facilities for seedling production was evaluated as 1.5.

(3) FD has equipment and tools for forestry operation

The necessary equipment and tools were supplied to the Thar Yar Kone Nursery, especially carrying tools for efficient work such as plastic containers and wheel barrows

were supplied. The equipment and tools for forestry operation are possessed by FD and can continue to be used carefully if the listing and registration of the equipments is necessary. However, it is recognized that iron made goods such as galvanized iron, iron made wheel barrow were seriously damaged by salt after one year. Thus, the anticipated asset of the equipment for forestry operation is evaluated as 2.0.

(4) FD has facilities, equipment for patrolling

Concerning the patrol, there were six forest camps located in Pyinalan and Kyakankwinpauk Reserved Forests that could function as bases of patrolling of the reserved forests. The Laputta FD CF task force started the patrolling activities, even though no budget allocation or equipment supply from the Laputta FD Office. The boat availability and limited budget for fuel were the constraints for the continuous patrols.

Facilities and equipment for patrolling are not enough for future activities by FD. During the pilot project, the situation was not changed; however the asset is evaluated to be better because the CF task force members started the patrolling without the budget from the superior office. Also, the district office understood the importance of the patrolling. Thus, the anticipated asset of the facilities for patrolling was evaluated as 1.0.

(5) FD has facilities and equipment for the CF extension and public awareness

Integrated mangrove nursery at Thar Yar Kone FD was planned as the centre for public awareness of mangrove conservation. This nursery also served as a place for information exchange and public awareness. In October 2004, some facilities began to be utilized as the place of communication between user groups and FD, as well as the demonstration for the user groups. Equipment and tools necessary for public awareness such as blackboard were procured for the Thar Yar Kone FD integrated mangrove nursery under the support of the pilot project. The hand out for public awareness of mangrove conservation was prepared in collaboration with FD and the JICA study team.

The facilities for the CF extension and public awareness were improved through the pilot projects, and now FD can utilize these facilities and equipments for demonstration.

Based on the improved capacity, the anticipated asset of the physical capital were evaluated as high. The physical capital of the seedling production and forestry operation was easy to utilize effectively because FD has its own experience. On the other hand, more experience is necessary for patrolling. Thus, the anticipated asset of the facilities for extension and public awareness was evaluated as 1.3.

7.2.4 Financial Capital

The financial capital of FD is evaluated from the five elements identified in Section 7.1 as follows.

The Change of Financial Capital of FD during the Pilot Project and its Anticipation

Elements	Asset 2003	Asset 2004	Anticipation
(1) FD has necessary budget for the CF extension, management and support	0.6	0.6	1.0
(2) FD has necessary budget for seedling production and distribution	0.8	0.8	1.0
(3) FD has necessary budget for forestry operations	1.0	1.0	1.0
(4) FD has necessary budget for patrolling	0	0	1.0
(5) FD has necessary budget for the CF extension and public awareness activities	0	0	1.0

(1) The FD has necessary budget for CF extension, management and support

A system of budget request and allocation existed in FD. Until the end of the pilot project, no project budget was distributed for supporting user group by the director general office of FD. FD Laputta requested project budget to the FD director general office but it was not accepted during the pilot project 2003 due to the lack of breakdown in the budget estimation. The salary of foresters was found to be an obstacle against the effective management and support of CF. As mentioned above, the FD Myaung Mya and Laputta did not have the budget to overcome this.

It will be difficult for the FD director general to allocate the full requested amount because of shortage of project budget unless the FD re-arranges an income-expenditure system or finds new income source. The CF FD camp or starting new organization under the FD specialized to CF can be alternatives of the new income sources especially for CF extension, management and support. Thus, the anticipated asset was evaluated as 1.0.

(2) The FD has necessary budget for seedling production and distribution

FD had experience to produce seedling. However, the allocated budget was one-fifth of the necessary amount and the budget is only for development of plantation of FD. The cost of seedling distribution was not included in the FD budget estimation, at all. Moreover, the timing of budget allocation tended to be delayed due to the long administration procedure. Because of the budget constraints as above, the CF FD camp started to generate the operational budget and income for the FD field staff and labors from October 2004.

There is budget allocation for seedling production; however, the necessary budget amount cannot be provided. However there is official system to request the special budget. In addition, some budget is expected to be generated from the CF FD camp. Thus, the anticipated asset was evaluated as 1.0.

(3) The FD has necessary budget for forestry operation

FD has the regular budget for the plantation implemented by the FD direct operation. But the amount of regular budget for the CF management and support is inadequate.

It is judged that the budget for forestry operation exists but it is only for FD's direct operation. No current or capital budget is prepared for the CF management and support in FD.

The following table shows the assets of the budget for forestry operation. Before and during the pilot project, FD provided the budget for forestry operation except CF, though the amount was small. The asset is evaluated by the fact that there is an official system for requesting the special budget for complementing budget. Thus, the anticipated asset was evaluated as 1.0.

(4) The FD has necessary budget for patrolling

FD did not allocate any budget for patrolling during the pilot project. The CF task force did not request any budget either. There is no regular budget for patrolling, but there exists a system for budget request.

During the pilot project, no budget was provided for patrolling. However, the asset is evaluated because there is a system for applying for special budget for patrolling. Thus, the anticipated asset was evaluated as 1.0.

(5) The FD has necessary budget for CF extension and public awareness

During the pilot project, FD did not allocate the budget for the CF extension or public awareness raising. However, FD can request the special budget from the FD district office. For the extension of the distribution of the handout for public awareness raising can be done by collaboration with the District Peace and Development Council.

There is no regular budget for the CF extension or public awareness raising, the system of budget request is available. Even though the budget was not provided by the FD superior offices for this purpose during the pilot project. However, the asset is evaluated by the fact that there is an official system for applying for special budget for the CF extension and the FD township office. Thus, the anticipated asset was evaluated as 1.0.

7.2.5 Natural Capital as the Needs of Community Forestry for the Forest Department

The natural capital of FD is evaluated from the five elements identified in Section 7.1 as follows.

The Change of the Natural Capital of FD during the Pilot Project and its Anticipation

Elements	Asset 2003	Asset 2004	Anticipated
(1) Vegetation can be rehabilitated by culturing methods of the local people	2.0	2.0	2.0
(2) Natural conditions are suited to sustainable production	1.5	1.5	2.0
(3) Forest conditions have anticipated to fulfill demand for wood products and non-timber forest products (NTFP) for local needs	1.0	1.0	1.0
(4) FD has necessary budget for patrolling	1.5	2.0	2.0
(5) Forest conditions have potential to fulfill wood products and NTFP demands of FD	2.0	2.0	2.0

(1) Vegetation can be rehabilitated by culturing methods of the local people

With the support of FD, the user group members implemented the CF plantation and the CF NFIO to rehabilitate the mangrove area. Seeds, saplings and propagules of common mangrove species are available in the area. Some species, like *Sonneratia apetala* and

Melaleuca species are difficult to nurse or newly introduce without support to the user groups by FD. Seven species of non-mangrove species were started to be nursed because these species suit the high-ground and extremely high ground area in the delta. The support to user groups by FD is necessary for these species. Though the natural vegetation remaining in the southern Pyinalan is degrading rapidly, rehabilitation of the mangrove area can be done by local culturing methods. Thus, the asset was anticipated as 2.0.

(2) Natural conditions are suited to sustainable production

The procedures for sustainable production were planned in the pilot projects. They are: (a) harvesting plan and (b) sales voucher for legal timber extraction, (c) CF agroforestry and (c) CF aqua-agroforestry. As described in Section 4.2 and 4.3, these methods will help to maintain the natural conditions while ensuring income generation for the short term. If these method and techniques are transferred to local people and properly implemented, forest condition will achieve sustainable production. Thus, the asset was anticipated as 2.0.

(3) Forest conditions have anticipated to fulfill demand for wood products and non-timber forest products (NTFP) for local needs

There are 1,666 ha of the mangrove area in the Pyinalan Reserved Forest. Local people harvest wood products such as poles, timber, fuelwood, or nipa leaves for thatch in mangrove adjacent their residential areas. About 115 ha of nipa are harvested in Pyinalan Reserved Forest. Also, the socioeconomic condition survey (2) in November, 2004 revealed that the forest resource is one of the attracting factors that made people migrate from the upper delta to the southern Pyinalan area. Through pilot project activities, CF plantation, CF-NFIO and the direct operation of FD were continued.

The forest is being degraded; however it still attracts migrants from other areas into Southern Pyinalan. By conserving the resources through CF activities with the FD direct operation, the area should be capable of producing continuous revenue for the CF user group members. Thus, the asset was anticipated as 1.0.

(4) FD has necessary budget for patrolling

The objective of the FD's forest management is to obtain the wood and NTFP products to fulfill their demand. FD operation in the Pyinalan Reserved Forest, including plantation, revenue collection and countermeasure against the illegal encroachment, meets the need of FD.

In addition, the CF FD camp was commenced with 369 ha of the mangrove area established out of 565 ha in forest compartment No.61.

The forest condition is judged to have the asset to fulfill demand of FD, if FD continues its effort to manage it as long as it can be classified as the reserved forest. Thus, the anticipated asset was evaluated as 2.0.

(5) Forest conditions have potential to fulfill wood products and NTFP demands of FD

The reserved forests are under the management of FD while ever the area is covered with forest vegetation.

Reserved forests are what FD is responsible for and FD gets income through the management of the reserved forests such as the CF FD camp. The CF FD camp that is one of the CF prototypes is started under the pilot project by settled FD labor nearby the site. An incentive for FD to undertake management of reserved forests is increased and exists anticipated asset, so that the anticipated asset was evaluated as 2.0.

7.3 Current and Anticipated Assets of the Community Forestry User Group

7.3.1 Human Capital

The human capital of CF user group is evaluated from the five elements identified in Section 7.1 as follows.

The Change of the Human Capital of User Group during the Pilot Project and its Anticipation

Elements	Asset 2003	Asset 2004	Anticipated
1) People have a practical intention regarding community forestry	0.8	1.4	1.5
2) People have intention for community forestry expansion for forest conservation and/or production	0.8	1.5	1.6
3) People possess practical techniques and knowledge for community forestry	0.7	1.2	1.8
4) People can earn enough income and production from engagement of community forestry activity.	0.5	1.0	1.5
5) People maintain good health condition for community forestry management and support.	0.5	1.0	1.5

(1) People have a practical intention regarding community forestry

When the pilot projects began in 2003, villagers at Nyaung Ta Ping village formed a new user group, while in Thar Yar Kone Village, the villagers modified the existing user group which was formed at the time of UNDP assistance in 1995 by organizing two subgroups and electing the management committee. Through pilot projects activities, both user groups formulated a management plan in 2003 and updated them in 2004 reflecting the feedback from the experiences in 2003. In addition, extension workers were selected in both villages when the on-the-job training program was started as part of the pilot project in May 2004.

Income generation activities have started, but not yet being induce income to the CF user group during the pilot projects. Hence, actually the income was not generated, and CF user group did not realize the practical intention to continue the CF activities. However, through participatory implementation of the pilot projects, the member obviously mentioned strong interest in issuing sales vouchers as well as the model of production activities under CF like the CF agroforestry and the CF aqua-agroforestry. In addition, 30 years of land utilization was observed as a strong incentive for villagers to start the CF

activities. Considering these facts, the anticipated asset for user groups could be evaluated as 1.5.

- (2) People have intention for community forestry expansion for forest conservation and/or production

Concerning the assets, when the pilot project was started in 2003, both user groups had an intention to produce timbers from the area. In order to secure their plantation area, at the midterm evaluation workshop in October 2003 the CF user group in Thar Yar Kone Village discussed the construction of a hut to guard against illegal cutting. After obtaining the donated boat from Japanese prefectural assembly member in June 2004, both user groups started patrolling activities; however, it requires the further support and facilitation so that the user group could continue and manage the patrolling system including financial management, recording, reporting and collaboration with the local authorities. Concerning the surrounding villages, the adjacent villages stated at the impact survey in February 2004 that they had a willingness to start the CF activities to obtain forest utilization right as CF user group member of Thar Yar Kone and Nyaung Ta Pin Village.

Regarding the asset, although the patrolling activities were continued by both of the user groups, there still needs to be improvement of the patrolling system in the sense that the extension workers in the target villages do not have adequate capability for supporting the patrolling in other villages. There still needs to be support for knowledge to extension workers in the user groups. Considering these circumstances, the evaluator scored the anticipated asset as 1.6.

- (3) People possess practical techniques and knowledge for community forestry

Concerning assets, at the beginning of the pilot project in 2003, members of both user groups did not have much experience on the NFIO method, though they have a decent knowledge of mangrove species in terms of use and suitable ground level. The knowledge of NFIO was provided through the training workshops in June and December 2003 and on-the-job training through actual operation of NFIO in the pilot project 2003 and 2004. Through the pilot project 2003, the user group experienced the basic techniques and acquired knowledge for the forestry operation including the plantation and the NFIO of mangrove species. In the pilot project in 2004, the user group planted new non-mangrove species, such as *Melaleuca* species, that were introduced at the suggestion of the study team. The knowledge of the species was provided on site in the pilot project 2004.

Regarding asset, through pilot projects, the user groups acquired practical techniques and knowledge for maintaining the CF activities. However, the knowledge was obtained only through the support of FD. In addition, user group members did not acquire enough knowledge on newly-introduced non-mangrove species, since the trial plantation was started in the pilot project in 2004. Considering these circumstances, the user group members needed more knowledge and experience for the plantation concerning these new species. Therefore, the anticipated asset was evaluated as 1.8.

- (4) People can earn enough income and production from engagement of community forestry activity

When the pilot project was started, the villagers could only sell the timber and fuelwood illegally. In the pilot project 2003, each of the user group members received the certificate for the CF area, which was an average 4.8 ha. After that, the CF plantation and the NFIO operated for two years to improve the expected productivity from the CF area. Further operation with harvesting plan and sales voucher is necessary to generate the income.

The income from the individual CF area of 5 ha is estimated roughly as around 75,000 kyat per year after 5 years rotational operation based on assumption of harvesting half of effective standing volume as 4.11 m³/ha. This income can improve the user groups' livelihood. In addition, the incomes generated from non-timber forest products can also be expected such as the phoenix shoot. However, marketing of the preferred timber and NTFP is necessary for better profit, hence the anticipated asset is evaluated as 1.5.

- (5) People maintain good health condition for community forestry management and support

In the RRA applied in September and October 2002, Thar Yar Kone and Nyaung Ta Pin Village people answered that poor access to health service was the foremost severe problem. The social and economic condition survey (1) also pointed out the lack of primary health care. Doctors, nurses, or mid-wives were not available in the two villages. Diarrhea is common in the villages.

In the pilot project 2003, the user group could implement the CF activities. However, it was observed that people suffered the chronic disease including diarrhea, malaria and fevers. The reasons were understood by the user group and the study team as the hygiene condition in the village, especially the water quality in the dry season, and also imbalanced diet of infant.

Also, throughout the pilot project period, the evaluator observed that the people suffered various kinds of chronic water-borne diseases including malaria, diarrhea, and so on.

In the pilot project 2004, the health condition of the user group members did not change. In accordance with the user groups' needs, the construction of the CF water reservoir was supported by the pilot project. The planning started in May 2004 and the construction started in November 2004.

People answered, at the evaluation workshop in October 2004, that the health condition is one of the big obstacles for not only weak and poor people such as widow or old family member, but also average household, though the user group could still implement CF activity. The water reservoir and water filtration material are necessary for improving the water quality of drinking water in the target area, especially in the dry season. Thus, the anticipated asset was evaluated as 1.5.

7.3.2 Social Capital

The social capital of CF user group is evaluated from the five elements identified in Section 7.1 as follows.

The Change of the Social Capital of User Group during the Pilot Project and its Anticipation

Elements / Asset	2003	2004	Anticipated
(1) Community has customs and know-how to engaged in group activities	1.0	1.3	1.5
(2) Community possesses informal customs or norms to be engaged in group activities	0.8	1.2	1.7
(3) Community has customs or written rules for engaged in group activities	1.0	1.5	1.8
(4) Community possess necessary knowledge and techniques for forestry	1.0	1.3	1.5
(5) Community has leader for engaged in community forestry activities	0.5	1.0	1.5

(1) Community has customs and know-how to engaged in group activities

At the beginning of pilot project in 2003, the socioeconomic condition survey (1) revealed that there was no apparent leader of the user group in Nyaung Ta Pin Village, while there were leaders in Thar Yar Kone Village.

The CF user group of Thar Yar Kone Village was originally formed in 1998, supported by the UNDP project. Related to the pilot project, subgroup 3 and 6 were formulated in February 2003, a new management committee was elected in June 2003 and maintained monthly meetings since November 2004, which was based on the self-evaluation by the user group members at the mid-term evaluation in October 2003.

In Nyaung Ta Pin Village, on the other hand, the management committee was established in February 2003. During the pilot project 2003, they self evaluated that only the CF chairman led the activity. However, in the pilot project 2004, the management committee members started to lead the discussion and arrangement for the CF water reservoir construction, and the annual progress report for the CF activity was filled by the secretary of the management committee.

Through the pilot project, it was confirmed that the community could start CF activity, including the formation of the user group, the CF communal woodlots, the CF water reservoir and so on, with the facilitation by FD and the pilot project. One of the user groups even started the CF monthly meeting. However, the user group members self-evaluated that many of the user group members could not share the information, and records were not kept. Thus the anticipated asset is evaluated as 1.5.

(2) Community possesses informal customs or norms to be engaged in group activities

When the pilot project 2003 was started, Thar Yar Kone Village was thought to be more collaborative in the group activity because of their uniform ethnicity. The two Christian sects' activity and the school committee's activity were active, which collect the fund from the members for the group activity, such as for the renovation of the church and an honorarium for the teacher. Two Christian groups were different denominations, and this along with differences in kinship had an effect on selecting candidates for training or the group formulation. However, there was no problem in collaboration of these two religious

groups for the mass meeting and village work. In the course of the pilot project 2003, Thar Yar Kone user group started CF monthly meetings in November 2003. In the pilot project 2004, the church woodlot, the school woodlot, and the roadside plantation were planned to be implemented.

On the other hand in Nyaung Ta Pin Village, the ethnicity was a mix of Burmese and Karen. The frequency of incoming and outgoing migration also made the community less collaborative. Even though the user group members stated in the workshops that the periodical CF meeting should improve the CF activity, no periodical meeting was set (however, the CF issue was discussed for a short time in the village monthly administrative meeting led by the 100 household head). In addition, the user group members were eager to renovate the school by the community and the CF school woodlot and the CF church woodlot were started. The CF water reservoir construction was also organized by the user group.

In Thar Yar Kone Village, most of the population is Karen, who are thought to be more collaborative among the community members. The village groups such as parents and teachers association and the religion group were active. It is evaluated that the informal custom or norms in the village enabled the CF monthly meeting to be started. On the other hand, except for the school committee, other groups in Nyaung Ta Pin Village were not active. The groups formed by the intervention of United Nations Development Program (UNDP), were no longer active without the revolving fund and facilitation from UNDP in both of the villages. The school committees and religious groups in both villages were interested in the communal woodlot for production. These traditional groups were capable of being the CF subgroup. Thus, the anticipated asset was evaluated as 1.7.

(3) Community has customs or written rules for engaged in group activities

When the pilot project 2003 was started, the user groups did not have any idea to develop the rules and regulations for the CF activity. After several preparatory workshops about the rules and regulations, members of both user groups developed rules and regulations through the workshop held from the 30th December to 5th January by FD and the pilot project.

In the pilot project 2004, both user groups formed the subgroups for new CF prototypes and developed rules and regulations in a written format. In the completion check workshop in October 2004, the user group members stated that the rules and regulations were kept only in their memory. This suggested that the user group members were weak in recording these rules and regulations; however, some extension workers under the training learned to make records.

Through the two years of the pilot project experience, the user group learned the importance of developing rules and regulations for managing the CF activities. However, they still needed support to develop rules and regulations by themselves. The support for the sample and facilitation for the discussion is necessary. This is also partly due to the

fact that they are not accustomed to keeping written records. A one-week workshop on rules and regulations would be a tool for further development on their capability for making and keeping rules and regulations. Therefore, the anticipated asset is evaluated 1.8.

(4) Community possess necessary knowledge and techniques for forestry

In the pilot project 2003, the user groups learned the CF activities and the aqua-agroforestry in Bogalay through the mutual understanding trip in October 2003 as one of the capacity building activities for the user group. The group leader training and the actual implementation of the CF activities improved the forestry related knowledge and techniques of the user group members. The stock map was prepared that indicated the vegetation (species distribution) of the CF area. In the pilot project 2004, the user groups acquired decent knowledge about mangrove species, but not on non-mangrove species. The knowledge about the site-species matching of mangrove species was utilized for revising the action plan. The stock map to estimate the resource volume and allowable harvesting volume was not yet prepared.

When the pilot project 2003 was started, the user group members were not sure about the plantation and NFIO techniques, although they had common knowledge about mangroves (species, utilization, typical vegetation distribution, etc.). However, the user groups have limited information sources on forestry. With the support of FD and the pilot project, the forest operation knowledge for mangrove species was improved. In the completion check of the pilot project 2003 in February, it is recognized that more information is necessary for the user groups about non-mangrove species. Thus, the anticipated asset was evaluated as 1.5.

(5) Community has leader for engaged in community forestry activities

In the pilot project 2003, the both of the CF chairmen in the user groups were active. Some of the management committee members and the subgroup leaders of Thar Yar Kone CF user group were also active in discussing their activities. On the other hand, the management committee members and subgroup leaders of Nyaung Ta Pin user group were not active, but getting more and more active after the self evaluation workshop. In the pilot project 2004, the chairman of the user groups coordinated the user group members, based on communication with the forest department at Thar Yar Kone nursery. Also the management committee took the responsibility for submitting documents and organizing the members. The extension workers supported the management committee for recording and monitoring the activities. However, because the knowledge and skill of the extension worker was limited, the role of extension worker as of communication and information center in the management committee of the user group was evaluated as just at the beginning stage.

As the leaders for the CF activity, the management committee, the subgroup leaders and the extension workers were found to be important through the pilot project implementation. When the pilot project 2003 was started, the user group selected the

management committee and subgroup leaders. In the pilot project 2004, the extension workers were trained in the on-the-job training and obtained the knowledge, customs and skills for recording. However, as in the self-evaluation by the community in the mid-term evaluation, the group management needs more experience and support. The extension workers themselves stated that they can support the smooth communication and collaboration between the management committee and the user group members. Thus the anticipated asset was evaluated as 1.5.

7.3.3 Physical Capital

The physical capital of CF user group is evaluated from the five elements identified in Section 7.1 as follows.

The Change of the Physical Capital of User Group during the Pilot Project and its Anticipation

Elements / Asset	2003	2004	Anticipated
(1) Necessary solid asset (infrastructure)	1.0	1.0	1.3
(2) Necessary solid asset for forestry equipments (boat, machete, shoes and etc.)	0.8	1.0	1.3
(3) Necessary labor forces (community)	1.0	2.0	2.0
(4) Necessary labor forces (individual)	1.0	1.5	2.0
(5) Facility for processing the value added products	0.5	1.5	1.5

- (1) Community has necessary solid asset to be engaged in community forestry activities such as road, boat, jetty, warehouse, tools, equipment and material

Through the pilot project implementation, the school and jetty in Thar Yar Kone were renovated. The road in the nursery and the extension center area was improved. Also the Nyaung Ta Pin user group members had a plan to construct the new school building by collecting money from each member.

It was evaluated that the user group members possess the asset to improve their infrastructure, but they had to wait for several years if they had to collect the necessary budget for material from the members. Thus, the anticipated asset was evaluated as 1.3.

- (2) Community has necessary solid asset to be engaged in community forestry activities such as forestry equipments (boat, machete, shoes and etc.)

In the pilot project 2003, the user group received equipments for the CF activity and user group members utilized the tools. The subgroups such as the subgroup 6 of Thar Yar Kone user group and sub user group 5 and 6 of Nyaung Ta Pin user group had a difficulty for the transportation.

In the pilot project 2004, the user groups started utilization of the donated boat. The rules and regulations were developed to manage the boat utilization. The supplied machetes and jungle boots in the pilot project 2003 were already damaged by the harsh natural conditions, and the user group members had difficulty to renew these equipments without the benefit from CF.

Through the pilot project, transportation and equipment for the CF activities were found to be important. The user groups had difficulty to purchase boat and necessary tools at the moment without the project support. However, it was proved that the user group could start the management of the donated boat with rules and regulations. Thus, the anticipated asset was evaluated as 1.3.

(3) Community has necessary labor forces to be engaged in community forestry activities

In the pilot project 2003, the user groups cooperated for the demo plantation, school woodlot in plantation and NFIO. In the pilot project 2004, the user group is supplying labor force for the construction of the water reservoir that required around 1,000 man-days.

The labor force of the community was evaluated as enough because the user group could start the CF communal woodlots and construction of the CF water reservoir. There was a person who joined the CF church woodlot activity even though he could not continue his individual CF activity because he was busy earning his living. The user groups (or subgroups) could organize the members for the major construction of the CF water reservoir. Thus, the labor force of the community was evaluated as 2.0.

(4) People have necessary labor forces to be engaged in community forestry activities

In the pilot project 2003, 13 out of 26 non-participants interviewed in the survey for the CF activity answered that they were too busy earning their livelihood to participate in CF activities. In the pilot project 2004, six user group members left the user group because they were too busy. Also, the labor force as the individual user group member, which was evaluated that support is necessary, because the non-participants survey in February 2004 revealed that olds or widow families could not join the user groups because of they were too busy for their livelihood.

On the other hand, communal type of the CF activities were started by Thar Yar Kone and Nyaung Ta Pin CF user groups i.e. the CF school woodlot, the CF church woodlot, and the CF village woodlot. However, even such communal type CF activity, busy or weak families did not participate yet, except Thar Yar Kone CF church woodlot. This communal cooperation was evaluated as the maturity of Thar Yar Kone CF user group.

After the CF production is started and the livelihood improvement under the CF activities is achieved, the group will be more matured to improve a system to support to each other. Then these busy or weak families will be able to get fuelwood as the member of CF user group. Thus, the anticipated asset was evaluated as 2.0.

(5) Community has necessary facility to be engaged in processing the value added products

In the pilot project 2003, there was no facility of the user group to process the value added products except for the meeting hall in both of the villages. In the pilot project

2004, a hut was renovated by the pilot project together with the CF women group of Thar Yar Kone. It was utilized for processing the phoenix heart (the heart of *Phoenix paludosa*). The women group was able to manage the hut. Thus, the anticipated asset was evaluated as 1.5.

7.3.4 Financial Capital

The financial capital of CF user group is evaluated from the five elements identified in Section 7.1 as follows.

The Change of the Financial Capital of User Group during the Pilot Project and its Anticipation

Elements / Assets	2003	2004	Anticipated
(1) People have necessary income for the preparatory work of the CF activities	1.0	1.3	1.6
(2) People have necessary income for the implementation work of the CF activities	1.0	1.0	1.5
(3) People have necessary income for the harvesting work of the CF activities	0.5	0.5	1.0
(4) People have necessary income for the management of the CF activities	0.5	1.0	1.5
(5) People have necessary income for the patrolling of the CF area	0.5	1.0	1.5

- (1) People have necessary income for the preparatory work of the CF activities

Annual Income in Two Villages by the Social and Economic Condition Survey 1 and 2

Survey #	Village	Population by HH	Income per HH	Income per capita
1	Thar Yar Kone	3.4	242,495	70,526
	Nyaung Ta Pin	6.7	323,844	48,485
2	Thar Yar Kone	4.8	314,740	66,176
	Nyaung Ta Pin	4.6	296,329	64,664

The income of the two villages is shown above. During the pilot project 2003, the subcontractor reported to the study team that starvation existed. The study team practiced additional survey for the report and revealed that there was difficulty for living and not starvation (people could at least eat two times a day); however, it was also clarified that the unstable crab price damaged the village economy in Nyaung Ta Pin.

Concerning the expenditure, the minimum expenditure was estimated for one household (4.7 persons) as 254,000 kyat (210,000 kyat for food, 25,000 kyat for clothes, 12,000 kyat for contribution to public works by the government and community, 7000 kyat for education) for each year. Considering that expenditure is also necessary for transportation, sometimes medicine and medical care, the livelihood of the user group is just enough, but not well off for being engaged in the CF activities.

The livelihood of the people in the delta area is generally that they are in poverty and their livelihood is unstable and dependent on fisheries, agriculture and wage labor. In the pilot project targeted villages, the income generation activities under CF were promoted; however, the income was not generated yet at the completion check and the asset was not confirmed even though the willingness of the user group members towards income generation was high. Thus, the anticipated asset was evaluated as 1.6.

(2) People have necessary income for the implementation work of the CF activities

From the result of RRA of the target two villages, the farmers were busy in June-August and December-March, the casual laborers were busy in June-February, and the fishermen were busy in July-January.

The important thing was that the CF planting season from the end of May to August (especially June and July) overlapped with the busy season for the paddy activity. However, it was unavoidable because this was the rainy season and it was the best season for sowing and planting. On the other hand, the user group members operated the CF NFIO during the March-April and October-December periods by their own preferences, as this was when they were less busy with other activities. There were still mangrove resources in the southern Pyinalan area, where the CF NFIO area was more than the CF plantation area. Thus, with implementing the CF activity, the user group members were evaluated to be able to secure their income. In terms of this element, the anticipated asset of the pilot project CF user group was evaluated as 1.5.

(3) People have necessary income for the harvesting work of the CF activities

During the pilot project, the legal sales of the CF products were not achieved by the end of October 2004. If the production was estimated, from 5 years later, 75,000 kyat of income is estimated to be generated every year if the harvesting intensity was the half of the stand volume. Since the income from CF activity is equivalent to 25 % of current average annual income of 300,000 kyats per year per household in the pilot project area (socioeconomic condition survey 2).

The income from the harvest is considered as big enough to raise the incentive. However, it is necessary that the selling destination was secured and the sales price should be stable. The user group members should bargain with the traders as the group, not as individual, to achieve the better deal. This kind of the marketing of the CF product was still necessary. Thus, the anticipated asset was evaluated as 1.0.

(4) People have necessary income for the management of the CF activities

Besides the daily livelihood, budget is necessary for the following CF activities for implementation of CF activity, 1) the income for purchasing the material for the boarder line management, 2) the income to purchase the necessary input for the CF agroforestry and the CF aqua-agroforestry, and 3) necessary stationery for keeping records.

These materials were procured and supplied by the pilot project. Some equipment was available from Laputta, such as the paint for border management, the insecticide for agroforestry nursery and so on. The others were available from the adjacent villages. As long as the user group members collaborate for the purchasing these materials together, these items are available for the user group members. Concerning agroforestry and the CF aqua-agroforestry, the low input method is recommended by the pilot project for the sustainable activities.

During the pilot projects, the sub user group members of the agro-nursery started the management system to sell seedlings to the member to get income for the continuous activities. Thus, the anticipated asset was evaluated as 1.5.

(5) People have necessary income for the patrolling of the CF area

Besides the daily livelihood, following cost should be borne by the user groups for the patrolling work. 1) The cost for purchasing necessary fuel, 2) The cost for the maintenance of the boat, and 3) the cost for purchasing necessary equipments for patrolling such as the flashlights, siren and so on.

The estimated cost for weekly patrolling by the engine boat is 250,000 kyat per year including the fuel, the boat maintenance, and the patrolling equipments. Currently, the user group does not have a capability to bear the cost since they do not have surplus revenue as a user group. Now the user groups set rules and regulations and started to share the work for patrolling and to manage the operation and maintenance cost for the boat and necessary equipment. By establishing the cost sharing mechanism by the user group members as well as the revenue generation from the CF activities, the user groups will be able to sustain the patrolling activities. Thus, the anticipated asset was evaluated as 1.5.

7.3.5 Natural Capital

The natural capital of CF user group is evaluated from the five elements identified in Section 7.1 as follows.

The Change of the Natural Capital of User Group during the Pilot Project and its Anticipation

Elements / Asset	2003	2004	Anticipated
(1) Natural condition allows people to live in the reserved forests	1.0	1.0	1.0
(2) There is land for engaged in community forestry activity	1.5	1.5	1.5
(3) Natural resource exists in the area	0.5	1.0	1.5
(4) The productivity of the area is enough to sustain the CF activities	1.0	1.5	1.8
(5) Seeds and propagules can be easily obtained	1.0	1.5	1.5

(1) Natural condition allows people to live in the reserved forests

Around the project area, some villages suffered land erosion. In the river mouth area of the delta, the coastal lines changed significantly and sometimes the ground was washed out with the buildings on it. As was heard from local people, the amount of production of fishery resources decreased and also the size of crabs, shrimps, and fish became smaller.

Social and economic condition survey (2) revealed that the people are still migrating from the upper delta to the southern Pyinalan area to look for the forest resources. It meant that the natural resources were still under population pressure in the area. However, without the management of natural resources, it was expected that the natural condition would deteriorate quickly. Thus, the anticipated asset was evaluated as 1.0.

(2) There is land for engaged in community forestry activity

In the pilot project 2003, FD certified the area of the CF land in Thar Yar Kone and Nyaung Ta Pin Village. During the pilot project 2004, when new members joined the user group and the new subgroups were formed, there arose a need for both eight of the individual CF areas and five of the CF communal woodlots. With respect to the individual CF areas, FD reallocated the new comers abandoned CF areas which had been used by former CF user group members. Regarding the CF communal woodlot, FD arranged four new CF sites and one site by reallocating the abandoned CF area.

Considering this anecdote, there still seems to be vacant land that could be used for CF in the southern Pyinalan Reserved Forest, so the anticipated asset land availability for CF activity was evaluated as 1.5.

(3) Natural resource exists in the area

In the target area, 90,387 ha of the mangrove forest exist in the year 2001, however, it is decreasing rapidly in quantity and quality. Within 6 years from 1995 to 2001, it is estimated that 30% of the mangrove area disappeared. Population pressure is thought to be one of the causes of mangrove degradation and the population growth in the reserved forests is 3.3%, while 1.9% in Laputta and Bogalay Township. Meanwhile, around two target villages of the pilot project, there are 1,666 ha of mangrove area. Through the pilot project 2003, two user groups achieved totally 17.81 ha of the CF plantation and 46.65 ha of the CF NFIO. In the pilot project 2004, the user group achieved 8.95 ha of the CF plantation and 25.06 ha of the CF NFIO. FD took measures to cope with illegal encroachment by destroying illegal weirs and started taking action against illegal activities more often than ever, in collaboration with the local authorities. As of November 2004, the evaluator confirmed these planted land were well-maintained.

Through two-year pilot project, many illegal weirs were destroyed by Laputta Township FD. Also 26.76 ha of the degraded forest area were planted and 71.71 ha was improved by NFIO. Illegal cutting are still found in the CF area, but the cutting amount decreased by the effort of patrolling by the user groups and FD.

The asset was estimated as 1.5 because the benefit was not actually generated. However, the user group members prepared the management plan for the CF agroforestry and the CF aqua-agroforestry. These CF activities are expected to be successful because of the user group members' experience in home garden. The CF aqua-agroforestry needs further trial implementation; however it is expected to be a source of income.

(4) The productivity of the area is enough to sustain the CF activities

The productivity of the target area is assessed to be low. For example, the amount of rice produced per unit area in the target reserved forests reaches only 59% of that in Ayeyawady Division. Productivity of the other crops like sesame (53%), green gram (26%) and so on were also below the average production of the delta except for the coconut (161%). Through the pilot project, agroforestry was started, but the unexpected

extreme high tide damaged the home garden area in Nyaung Ta Pin Village. The site for the agriculture should be selected carefully by the ground level and land location.

For agriculture, fishery, and forestry, the user group members could start the new CF activities by the support from FD and the study team. These activities are ecologically sustainable; however further support is necessary. For agriculture, the CF agroforestry was started by the user group. In addition, compost making by leaves and residue of the NFIO to increase productivity can be extended as is by the pilot project. The CF plantation can be utilized as the wind break to increase the agricultural productivity. For the fishery resources, many illegal shrimp and crab ponds were constructed and produced a lot of income for the owners in the area. The CF aqua-agroforestry can be the sustainable and legal method of aqua culture as the system of small scale and low input. For the forestry, the NTFP such as medicinal plants and phoenix shoots have the anticipated asset to be developed and commercialized. Thus, the anticipated asset was evaluated as 1.8.

(5) Seeds and propagules can be easily obtained

In the pilot project 2003, the user group members collected seeds and propagules and planted them in the CF area. It is observed that one user group members in Nyaung Ta Pin nursed *Xylocarpus* species seeds for transplantation.

In the pilot project 2004, FD established a mother tree orchard for nursery operation. The seedling supply for the first rotation of the CF activity was achieved. The non-mangrove species seeds were supported by the pilot project.

Around both of the pilot project area, seeds and propagules are abundant and saplings of mangrove species can be easily obtained. However, non-mangrove species introduced through the pilot project, such as *Melaleuca* species were not common around the pilot project area, though it can potentially be grown in the environment. *Melaleuca* species are more resistant to salty water than the other non-mangrove species, so *Melaleuca* species should be adapted for high ground or the extremely high ground in the delta. To sow and nurse these non-mangrove species, seedlings should be raised in the nursery until the trees start fruiting. Thus, the anticipated asset was evaluated as 1.5.

7.4 Evaluation Results

7.4.1 Overall Results

(1) Summary of the Scoring and Evaluation Results

Assessed results in Sections 7.2 and 7.3 are summarized in the following radar charts(Figures 7.2 and 7.3). Score of “2” means the ability of stakeholders is enough for implementing the sustainable CF activity in regard to each capital. Therefore, the balance between anticipated assets and score of “2” is evaluated as a deficit for the stakeholders to be engaged in sustainable CF activity.

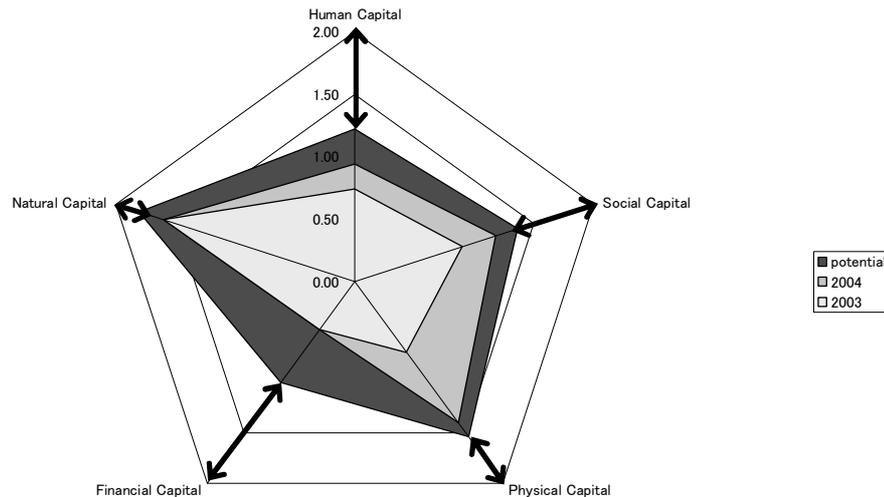


Figure 7.2 Current and Anticipated Asset Evaluation of FD

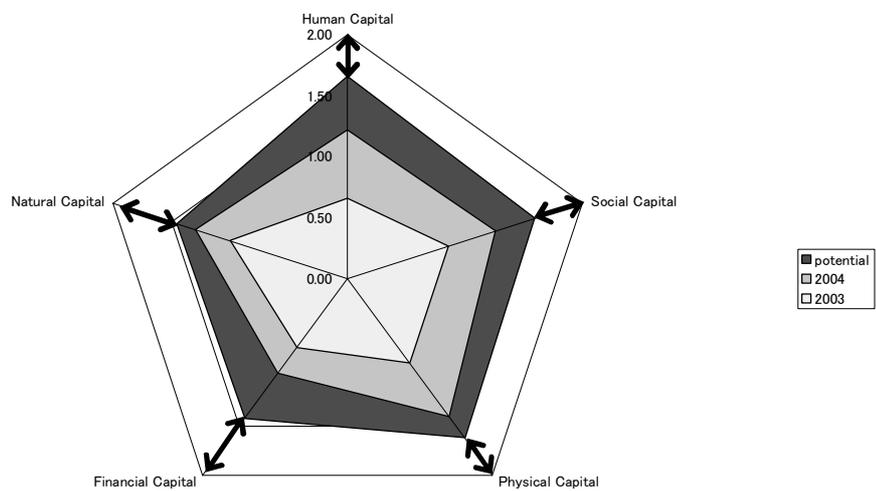


Figure 7.3 Current and Anticipated Asset Evaluation of CF User Group

(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.

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 constraints, institutional constraints, technical constraints, administrative constraints, socioeconomic constraints, or difficulty pertaining to natural conditions. When simply considering the missing essential activities for achieving sustainable CF activity, there is no alternative for promotion of the CFI.

However during the 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 modeled 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 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.

Further practice is necessary and also the accumulation of knowledge and awareness will generate further achievement of practice. This cycle should be continued and accelerated in the future.

7.4.2 Summary of Asset Evaluation of Forest Department

The evaluation results clarify positive and negative ability of FD regarding CF management and support. The following table summarizes the anticipated asset of FD in CF management and support in accordance with CFI procedures.

Concerned FD offices and staff have been evaluated for high ability and good output for the preparatory stage. On the other hand, most of activities in the CF implementation stage which include harvesting, and selling activity were evaluated as low anticipated asset. This reflected the current experience and CF management capacity of FD for supporting CF at implementation stage...

Anticipated Asset Evaluation of FD by CFI Procedure

	CFI Procedure	FD
1	Preparatory Stage	
1)	Public Awareness	0.5
2)	Allocation of CF area	2.0
3)	Support preparation of CF management plan	1.5
4)	Support drawing CF map	1.5
5)	Submission of CF proposal and granting CF certificate	1.0
2	Implementation Stage	
6)	Seedling supply	0.5
7)	Implementation of CF activities and support	0.5
8)	Management of CF user group	0.5
9)	Monitoring CF activities	0.0
10)	Patrolling of CF area	0.5
11)	CF border line management	0.5
12)	Harvesting CF Production	0.5
13)	Printing sales voucher based on estimation about growth and stock volume	0.5
14)	Registration of the sales voucher (township FD office)	0.5
15)	Receiving registered and sealed sales voucher	0.5
16)	Application of value added production	0.5
17)	Permission of value added production	0.5
18)	Production of value added production	0.5
19)	Printing sales voucher of value added production	0.5
20)	Registration of the sales voucher	0.5
21)	Printing removal pass for merchandize CF products to outside township	0.5
22)	Register the removal pass (township FD office)	0.5
23)	Selling CF production with registered the sales voucher	0.5

7.4.3 Subjects to Secure Sustainable CF Activities

(1) Subject to Secure Sustainable CF activities

In general, feasibility of sustainability would be composed of several external and internal conditions i.e. i) economical, ii) social, iii) environmental, or iv) institutional. Therefore sustainability would be guaranteed by consolidation of such external and internal factors. In case of sustainability of CF user group activity in the study area, the following factors are needed to secure the sustainable CF activities from their poverty condition.

CF User Group

- Existence of reliable leader in the group,
- Existence of successful experience such as production and benefit from CF activities (satisfaction of incentives of CFI), and
- Existence of information collection and delivery system.

Forest Department

- Establishment of necessary institutional system and organization for sole charged to CF activity and
- Establishment of successful forestry technology of the Ayeyawady delta.

(2) Evaluation of Subject to Secure the Sustainability of the CF User Group

“Leaders” of the CF user groups at both Thar Yar Kone and Nyaung Ta Pin villages have been educated under the pilot project. Since the capacity of chairmen, secretaries, and treasury, or extension worker of CF user group, has been improved, especially about knowledge and technology. However, capacity of group management that will be determined by capability of individual CF user group members has not been improved. Therefore the leaders were forced to work hard for management of the group. The existence of leader that will be founded by group member would be fulfilled in future in accordance with improvement of capacity of each group member.

“Successful experience” of the CF user group has not been fulfilled through the pilot project. Currently CF user group has strong intention to sell the CF products by official procedure. When this is accomplished, after estimation of CF products, and printing the sales voucher and registration of the sales voucher, CF user groups will gain successful experience and sustainability of CF activity will improve. The official selling of CF products is expected within five years. At that time, sustainability of CF activity would be consolidated. Therefore a methodology for supplying continuous incentive will be a key factor of the sustainability.

“Information” that CF user group is limited because of remoteness and isolation by water body or scarcity of communication equipment. Information reaches villages by verbal communication. It is estimated that the information source would increase in accordance with increased CF activity including harvesting and selling of CF products.

(3) Evaluation of Subject to Secure the Sustainability of FD

When considering Laputta and Bogalay Township FD Office, the “Establishment of necessary institutional system and organization for sole charged to CF” would be a subject to secure the sustainable CF activity. Though each officer or field staff of the offices have the intention of promoting and supporting CF activity, promoted CF activity is not sustainably supported or managed because no system exists for it. Based on institutional development for the CF management and support, FD will be able to practice continuously the duty. Then the sustainability of the CF activity will be secured.

“Establishment of successful forestry technology of the Ayeyawady delta” will promise production from CF activity. When periodical production by firm forestry technology is secured, expected production from CF activity will be realized.

CHAPTER 8 OVERALL CONCEPT OF THE INTEGRATED MANGROVE MANAGEMENT PLAN

8.1 Rationale

As discussed in Chapters 1 to 8, mangrove forests are rapidly decreasing, due to the increase of economic activities and population growth in the study area. Even though villages/settlements or economic activities in reserved forests are not permitted according to the Forest Law, over 200,000 people have already resided in the four reserved forests (Section 2.5.2). If the decreasing rate of the mangroves remains unchanged, the mangroves will be lost by the year 2013 (Section 2.2.2). The community forestry (CF) activity under the Community Forestry Instruction (CFI) is considered to be a tool to achieve conservation and rehabilitation of mangrove forests in the study area through participation of people residing inside the reserve forest. In consideration of socioeconomic conditions of the study area, securing basic human needs and livelihood improvement of the inhabitants as well as capacity development of the Forest Department (FD) are prerequisite for implementing CF activities. Based on findings from the conducted survey, draft Integrated Mangrove Management Plan (IMMP) was formulated for enabling coexistence of mangrove conservation and livelihood improvement of the people in the study area.

As described in Chapter 6, the pilot projects 2003 and 2004 were implemented, 1) to confirm practicability of the draft IMMP, 2) to strengthen the capacity of the stakeholders (FD, and CF user groups) concerned, and 3) to contribute to the actual CF implementation by the stakeholders. Based on the results of the pilot project, implementation capacity of CF stakeholders was evaluated (Chapter 7). The evaluation revealed that 1) the IMMP will be one of the effective measures for mangrove conservation and livelihood improvement through the application of CF, 2) the CF stakeholders has capacities to implement the IMMP, and 3) factors to be strengthened and improved to implement the IMMP.

Therefore, for rehabilitation and sustainable management of mangroves in the study area, it is crucial to implement the IMMP for the capacity development of stakeholders for the application of CF. Particularly, the capacity development of FD for strengthening the CF support and management capability is indispensable and strengthened in the IMMP.

8.2 Objectives

8.2.1 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.

8.2.2 Project Purpose

To achieve the overall goal, the IMMP concentrates on establishment and maintenance of sustainable CF activities. The sustainable CF activity in the IMMP covers not only 1) conventional forestry activities, but also 2) a wide range of activities that are in accordance with statements of the Community Forestry Instruction (CFI), and 3) enabling mangrove conservation, and 4) the needs of local communities. The CF activity includes 1) CF support and management operations/activities by FD, 2) livelihood improvement and production activities by CF user groups, 3) organizational management by CF user groups, 4) disaster prevention and forest patrolling operations/activities among concerned stakeholders, and 5) CF related capacity development activities for FD and CF user groups.

The IMMP is implemented in three phases (Section 8.3.2), 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 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 Scope of Work

8.3.1 Target Area

The target area of the IMMP is four reserved forests, namely, the Kyakankwinpauk and the Pyinalan Reserved Forests in the Laputta Township, and the Pyindaye, and the Kadonkani Reserved Forests in the Bogalay Township. The target area of the IMMP is the same as the study area of the present study, except for the Meinmahla Reserved Forest in the Bogalay Township, where a certain amount of mangrove forest remains. The following table describes the target project area, the target operation 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. Since the Meinmahla Reserved Forest is designated as the wildlife sanctuary, activities at the reserved forest would be considered and covered in the fauna and flora conservation guideline formulated under the present study.

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	-	-

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.

8.3.2 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”, “Extension Period” and, “De-centralization Period”, respectively. The scheduled duration of each phase is described below.

- 1) Phase I Foundation Period: five years between the fiscal years 2005-2009,
- 2) Phase II Extension Period: five years between fiscal years 2010-2014, and
- 3) Phase III De-centralization Period: 30 years between fiscal years 2015-2045.

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.

Phase I is regarded as the foundation period 1) to strengthen the CF implementation capacity of FD, and 2) to establish fundamental institutional and technical frameworks for the implementation of sustainable CF activities. Based on the framework, models for sustainable CF activities will be also developed as a part of the foundation. The duration of phase I was set for five years, in accordance with a CF rotational operation period regularly practiced in the target area. For sustainable CF activities, production from CF areas is essential and the five year period is the minimum duration to verify the harvesting and production of wood and other long term products from the CF activities in the target area.

Phase II is the extension period for the CF implementation setup and models developed during phase I. Phase II will serve as a development stage for establishing extension setups and methods necessary for the dissemination of the confirmed models for implementation of sustainable CF activities in the surroundings of the phase I target areas and other mangrove areas in Myanmar. The duration of phase II was also set for five years, to verify the establishment of the extension setups/methods with the minimum duration for harvesting and production of wood and other long term products from the CF activities.

Phase III is regarded as the full implementation period of CF, which in turn is expected to contribute to mangrove conservation and livelihood improvement in the target area through established setups/methods and accumulated experience from phases I and II. Phase III was named as the de-centralization period, because the period aims to disperse and fix already established models in all of the target areas. The duration of phase III was set for 30 years to establish CF areas in all of the reserved forests except for areas directly operated by FD. The 30 year duration was calculated based on estimation of required numbers of new CF user groups covering all of the target areas and FD's management and support capacity to establish and maintain CF user groups.

8.3.3 Framework of IMMP

(1) Policy Framework

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.

In particular, the IMMP is formulated within a framework of the district forest management plans. 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. In the IMMP, the concept of two working circles in the district forest management plans was adopted as a basic approach for the IMMP. The IMMP was prepared keeping consistency with the current Myaung Mya and Pyarpon District Forest Management Plans for the fiscal years 1996-2006. The district forest management plan is revised every 10 years, so the next revision is planned for the Myaung Mya District FD office in the fiscal year 2005. Thus the IMMP is scheduled to be adopted for the revision of the district forest management plan for the fiscal years 2006-2015. Accordingly, results of the IMMP phase I and phase II, and plans for phase III shall be also adopted for succeeding revisions of the district forest management plan.

(2) Legislative Framework

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)

As stipulated in the Forest Law, to conserve the environmental factors and to maintain a sustained yield of the forest product, the Government of Myanmar constitutes the reserved forest and prohibits such illegal activities as residing, conversion of land use – etc. in the reserved forest. The target area is located in the reserved forest thus on-going villages/settlements and non-forestry activities are not officially permitted. On the other hand, CFI enables CF user groups to practice CF activities in the certified CF areas based on the management and support of FD. Certified CF areas by FD are regarded as authorized land use of the forest land, and certified CF activities as authorized production in the forest land. Therefore, at present, compliance with the CFI is the only legal manner for peoples' activities in the reserved forest.

The study revealed that the sustainability of CF is secured by existence of leadership, successful experience, and necessary information (Section 7.4.3 “Subjects Secures Sustainable CF activities of CF user groups”). The sustainability of CF can be achieved through continuous production and benefits born from CF activities. Thus the establishment of continuous CF production with the sanction of the CFI is one of the essential procedures to avoid collision with the Forest Law and achieve sustainability of people residing inside the reserved forest.

However, the current CFI is somewhat conceptual and does not describe the actual CF implementation procedures in detail. This is making the implementation of CF activities difficult for maintenance/continuation of CF activities in general and production/harvesting in particular. After the issuance of CFI in 1995, production from CF was seldom conducted in accordance with the statement in the CFI. FD has no experience with sanction of CF production based on CFI. A preparation of a draft bylaw of the CFI has only been commenced under the present study, and a CF project in the Yakhine State supported by CARE.

Therefore, a practical bylaw of CFI, that is implementation rules and guidelines for CF activities, is necessary. The bylaw of CFI is expected to describe the necessary sanction for CF production and all of the aspects of CF management.

The bylaw of CFI is also necessary for applying the rules and regulations to the actual operation and management of CF activities on site. A CF certificate is granted to CF user groups based on a CF management plan submitted to FD by the user group. However, since the situation of CF user group households varies during the 30 years of the CF certificate period, it is necessary to continually update the contents of the CF management plan about changes of the user group members and the CF management plan.

8.4 Basic Concept for IMMP Formulation

8.4.1 Wise-use of Reserved Forest

(1) People's Participation for Coexistence of Mangrove Forests and People

It is hardly possible to resettle all dwellers from villages/settlements and prohibit their non-forestry activities in the reserved forest, which are major causes of mangrove destruction. It is more realistic to have them participate in mangrove management to rehabilitate and upgrade mangrove resources. In order to achieve people's participation in mangrove management activities, security of their livelihood is essential, since most dwellers heavily rely on mangrove resources for their living.

(2) Community Forestry as the Tool for Coexistence of Mangrove Forests and People

For the people's participation in mangrove management activities and their livelihood improvement in the reserved forest, application of CF in accordance with CFI is indispensable. The community forestry is considered as the tool to bridge mangrove and people in the reserved forest.

(3) Sustainable Use and Value- Adding of Natural Resource

Sustainable use of natural resource, in concurrence with alleviation of poverty is indispensable to prevent further encroachment of mangrove forests. Natural resources such as mangrove vegetation, land/soil, soil fertility, rain water are limited. Thus, efficient use and value adding of natural resources form important concepts of the IMMP.

(4) FD Operations and CF Operations

According to the Forest Law, the reserved forest is supposed to be managed directly and solely by FD. However, CF for the effective mangrove forest management is promoted in areas where settlements and non-forestry activities are predominant inside the reserved forest. Therefore, in the IMMP, forest management of the reserved forest would be mainly composed of FD direct operations and CF operations.

8.4.2 Introduction of Zoning Concept

(1) Basic Approach of the Zoning

For the rehabilitation and management of the mangrove resources, and for the coexistence of mangrove forests and people, IMMP introduces a zoning of the reserved forest in the target project area, based on the existing land use, natural/socio-economic conditions, and

intentions/objectives of mangrove forest management. The zoning that determines a clear land use management and a harmonization of multipurpose land uses is necessary to be introduced and would be the essential base of the IMMP.

(2) Zoning Categories and Definitions

In the IMMP, the following three zones have been delineated at the reserved forest level based on the goals and objectives of IMMP, current forest and land-use, and socioeconomic conditions.

- 1) Core Zone (CORE)
- 2) Buffer Zone (BUFFER)
- 3) Multiple-use Zone (MULTIPLE)

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)	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • 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)	<ul style="list-style-type: none"> • Area/FC to be functional as natural barrier for protection of CORE • Area/FC to serve as social fence against outside of CORE 	<ul style="list-style-type: none"> • 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)	<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • 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,

Note2: FC: Forest Compartment

(3) Directions of Zoning in the Target Area

The aim of the core zone is to serve mainly for protection and conservation of existing mangrove by the direct operation of FD. Sparse/degraded forest areas and barren lands in the core zone and buffer zone are to be gradually turned into dense mangrove forest through

the implementation of the IMMP. The buffer zone is planned to introduce a kind of joint management between FD and CF user groups. The agricultural and forestry productions from the multiple-use zone will be increased to maintain the living standard of villagers throughout the area of the multiple-use zone itself and the cultivation areas inside the zone will not be changed in principle.

The attainment of IMMP's vision and goal are expected through the implementation of projects and programs under the IMMP in three zones simultaneously.

8.4.3 Promotion of Sustainable Community Forestry

(1) CF and CF User Groups as Legal Means and Major Forest Management in Buffer and Multiple-use Zones

Formulation of CF user groups and implementation of activities under CF are the only ways to authorize villages/settlements and non-forestry activities inside the reserved forest through issuance of the 30-year land use right. CF is the most effective measure in the Buffer and the Multiple-use zones where villages/settlements and non-forestry activities are prevalent. In such areas, CF enables long term forest management through community participation for maintenance/utilization of mangrove forests and at the same time, needs of communities. Therefore, for implementation of CF activities by CF user groups is considered as an integral part of the mangrove rehabilitation.

(2) Introduction and Implementation of Authorized CF Production

At present, the majority of existing CF user groups have not experienced production and selling of products from CF areas. Also, FD has little experience in managing harvesting and selling of products from CF areas in accordance with statements in CFI. Since CFI does not state details on the procedure for selling products from CF areas, none of the existing CF user groups have the experience of selling CF products by the official procedure of using sales vouchers. In order to distinguish from illegal harvesting, CF production shall be authorized in accordance with CFI. Thus the IMMP considers that authorized CF production is essential toward achieving sustainable CF activity by CF user groups.

(3) Diversification of CF activities

Conventionally, CF activities have been limited to forestry operations such as plantation and natural forest operations. However, in consideration of the existing activities and needs of people inside the reserved forest, CF need to include non-forestry activities such as agriculture and aquaculture as a part of CF activities as long as the activity is in accordance with statements of the CFI. Furthermore, various activities such as group consolidation/management and livelihood improvement should be under the CF in the

reserved forest for authorization of such activities. Hence, diversification of CF activities is one of the essential concepts of the IMMP and would be promoted in the course of the IMMP implementation.

8.4.4. Promotion of Livelihood Improvement Activities

(1) Livelihood Improvement Activities under CF

Residents in the target project area are in poverty and sustain their livelihood through exploitation of mangrove resources. Securing their livelihood will avoid over-exploitation of mangrove resources and contribute to conservation of mangroves. For sustaining livelihood and mangroves, livelihood improvement is one of the prioritized activities under CF.

(2) Activation of Group Activities

Group activities are relatively weak in the target project area. In the IMMP, formulation of subgroups under a CF user group is planned. Subgroups can serve as a basic unit for processing, fresh water management, village infrastructure establishment/ maintenance, etc., which are difficult to conduct by individual. Such livelihood improvement activities are expected to be conducted as CF activities by subgroups of the CF user group.

(3) Technology Improvement for Livelihood

Production activities, particularly agricultural production in the target project area tend to be low and the yield is gradually decreasing, resulting in abandonment of production areas and causing further encroachment of mangrove vegetation for maintaining production levels. Lack of appropriate technology and inputs are major causes of the low yield. In the IMMP, not only agricultural production but also other production activities which contribute to livelihood improvement would be planned to be implemented with appropriate technology and inputs as a part of sustainable CF activities.

8.4.5 Capacity Development of FD/Stakeholders

(1) FD Capacity Development for CF Management and Support

1) Strengthening CF Management and Support Capacity after CF Certification

FD is the sole responsible agency for implementation of CF activities. Since the CF activity is a continuous activity, once initiated, support to CF user groups cannot be suspended. However, current FD's management and support is heavily concentrated on granting of CF certificates. Seedling distribution, which FD is supposed to conduct for all CF areas for the

first rotation according to CFI, tends to be conducted only for the first year of the CF implementation. Moreover, monitoring, technical support, and management/supervision of the following years' activities are seldom conducted under the current circumstances. The strengthening of FD's CF management and support capacity is essential for sustainable CF activities and is considered in the IMMP.

2) Securing Budget of FD for CF Management and Support

In the present study, the budget allocation of FD for CF management and support has not been recognized during the study period. It is apparent that the commenced CF activities cannot be suspended just for the reason of no budget of FD for the CF management and support. The IMMP considers countermeasures against the budget deficit to screw out the FD budget for CF management.

3) Integration of Forestry Technology of the Delta through Action Research Forest Development

The experience and knowledge of forestry technology practiced in the delta tend to be implemented and accumulated by FD staff who were in-charge individually. Even though most forestry operations are implemented by FD, FD as an organization has little experience and knowledge accumulated for forestry technology. Also, existing forestry technology is focused on fast growing species such as *Avicennia* and *Sonneratia* species. Since, mangrove forestry for rehabilitation and production has to be implemented over a wide area and requires to meeting various needs of stakeholders the mangrove forestry technology has to be accumulated, integrated, verified and upgraded.

Therefore, integration of existing forestry technology, and verification and renovation of the existing technology through action research development is essential for successful forestry operations.

4) Sharing Project Results with Other CF projects for Propelling Maturity of CFI

Not only in the delta, but also in other areas of Myanmar, verification and feedback of previous experiences related to CF activities were seldom conducted. Currently, lessons and useful cases were not accumulated for the further successful CF implementation. Thus experiences and results of trials on CF activities in IMMP have to be integrated and shared by all stakeholders such as FD, supporting agencies, and local authorities for establishment of sustainable CF activities.

(3) CF User Group Capacity Development for Sustainable CF Activities

1) Gaining Successful Experience

Existing CF user groups have seldom achieved success from CF activities which hinder the continuation of the CF activity itself. Most of all, obtaining continual benefits from various stages (i.e. short, mid, long term perspectives) of CF activities would be regarded as the successful experience and a key for the continuation the CF activities. The capacity development and procedures for CF user groups to gain successful CF experiences to continue the CF activity is considered.

2) Strengthening of Group Activities

In association with gaining the successful experience, strengthening group activities is also essential for the sustainable CF activities. Formulation of rules and regulations of CF user groups, monitoring and recording progresses of the CF activity, formulation of subgroups for specific activities and needs of members are considered necessary for capacity development. The IMMP aims to strengthen various group activities for improving livelihood of the CF user group. Especially, strengthening group activities for production, processing and selling will be emphasized.

3) Development of Leaders

For the successful group activities under CF, existence of leaders is essential to manage and continue concerned activities. Therefore, the IMMP aims to develop and train leaders and key persons of CF user groups for the continuous sustainable CF activities.

4) Gaining Necessary Information for CF Activities

Since, the target project area is in remote areas, residents in the area have disadvantages for communication, marketing, and distribution. Especially information related to CF activities and CFI seldom reaches residents in the target project area. Lack of necessary information also hinders continuation of successful CF activities. Therefore, the IMMP plans a system for the CF user groups to gather necessary information for sustainable CF activities.

8.5 Strategies for IMMP

8.5.1 Integrated Approach (Program Approach)

Formulating a practical plan is the fundamental approach to restore and maintain the multiple functions of the mangrove in a sustainable manner. For developing a practical plan for the IMMP, multi-sector combined project components are planned for each phase of the IMMP as an integrated 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.

8.5.2 Model Development

- Development of Model CF User Groups -

Existing CF user groups in the target area, including ones formed in the course of the pilot project implementation under the study, are not practicing sustainable CF activities. Though, various activities had been implemented by the CF user groups during the pilot project, some activities were not expected to be continued under current circumstances. Moreover, actual and authorized production and selling of products from CF areas, in accordance with CFI, has not been fully realized during the two-year pilot project implementation. This situation means that the CF user group under the pilot project cannot be instantly a model of sustainable CF activities for adjacent villages, which need to cover production, harvesting and selling of CF products.

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. From the model CF user group, advanced technology and management, which are often limited in the target area, can be deployed to adjacent villages/villagers to enable them to practice such technology and management by their own efforts. In the IMMP, the selection of the model CF user group will be conducted based on geography (accessibility), by zones and socioeconomic conditions.

8.5.3 CF Prototype Development

- Development of Diversified CF Implementation Models based on Actual Conditions-

CFI has a potential for improving mangrove forests and livelihoods by various kinds of application methods for CF user groups. IMMP proposes diversified CF prototypes as the model for the actual implementation of CF activities. The CF prototype will be developed based on local conditions and needs of CF stakeholders. The CF prototype enables the adaptation of the CF activities to natural and socioeconomic conditions that differ by areas

or regions. Therefore, it is necessary for the bylaw of the CFI to include the CF prototypes as a fundamental component of CF activities under the jurisdiction of CFI.

As conceptualized in Figure 8.1, the actual CF prototype 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.

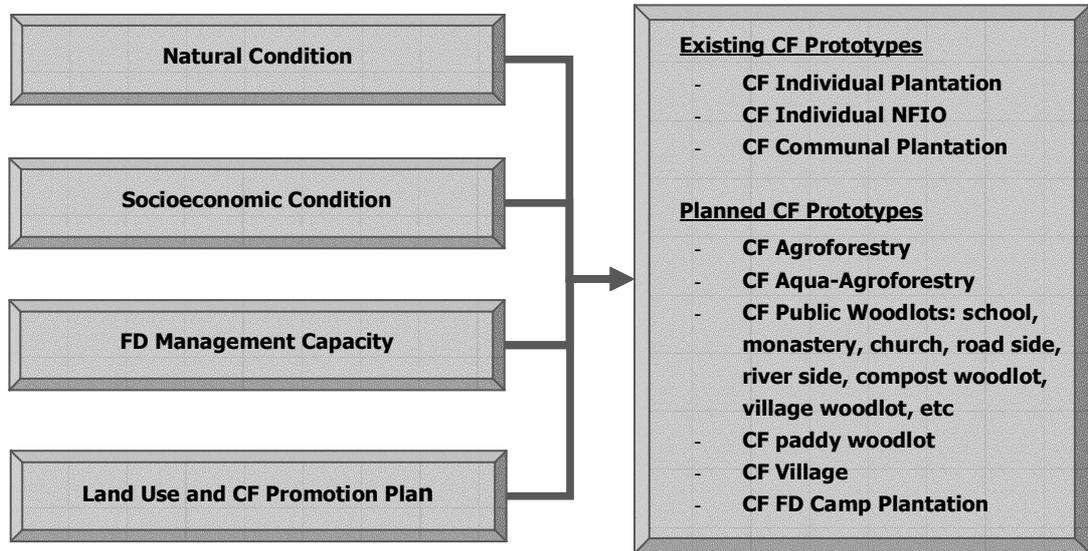


Figure 8.1 Implication of Application Methods of CF Prototypes

8.5.4 Action Research Forest Development

- Integration of Mangrove Forestry Technology and Forest Management System-

The action research 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 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 development will be mainly applied to direct operations by FD.

Under the action research development, first, the current existing technology/experience, which is scattered amongst individuals of FD, will be compiled. Then, such technology/experience will be confirmed and elaborated through trials. The results will be compiled into one, and applied in the field for actual implementation and for further integration of the mangrove forestry technology.

8.5.5 FD Self Reliance Concept

- FD's ownership of the IMMP, cycle management and fade-out of an external assistance -

FD is the sole responsible agency for CF. However, at present, the experience and capacity for the CF management and support are not yet mature. The CF can only be practiced sustainably through the successful collaboration between FD and the CF user groups, and FD has a responsibility to support the CF user groups for practicing the CF activity sustainably. Therefore 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.

For consolidation of the ownership by FD, the actual technical assistance to FD for the IMMP phase I should be limited to the essential and minimal input and support. With the essential and minimal input and support planned in the IMMP, the sustainable CF activities of the CF user group will be achieved based on the support and management by FD through increasing its ownership. Figure 8.2 explains the assistance concept.

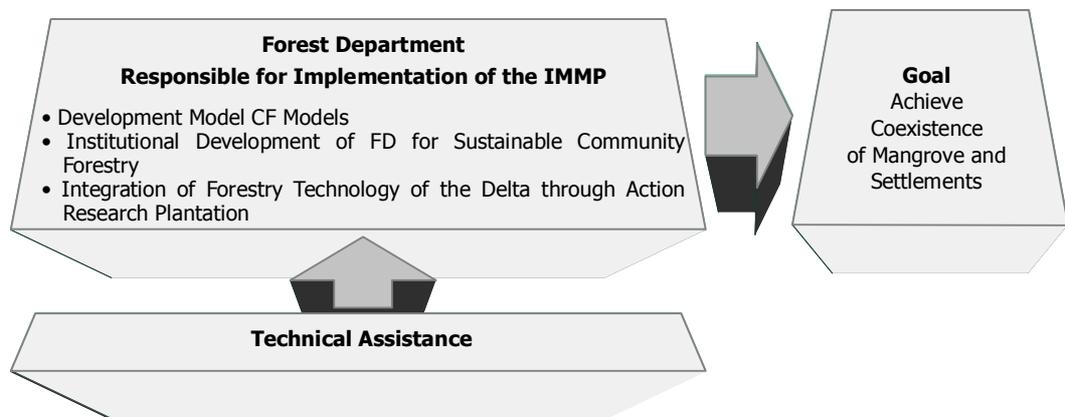


Figure 8.2 Assistance Concept of IMMP Phase I

The IMMP aims for FD to implement the IMMP and related mangrove management independently in the long run. For strengthening the self reliance of FD's implementation and continuation capacity, the support by external assistance is planned to be faded out gradually year by year. The following Figure 8.3 describes the implication of the cycle management concept, to increase the capacity of FD for the CF management and support based on progress of the cycle management and the fade-out of external technical assistance for the IMMP. A sustainable system for securing budget and implementation

capacity for continuation of the IMMP by FD will be considered and developed based on the lessons that will be obtained in the course of the IMMP phase I implementation.

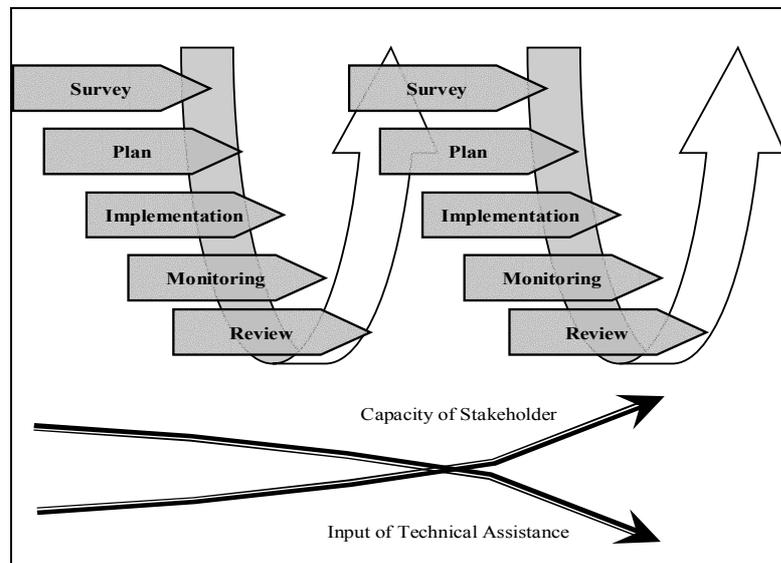


Figure 8.3 Cycle Management and Fade Out of Technical Assistance of the IMMP Phase I

8.6 Proposed Mangrove Forestry Operation and Management for IMMP

8.6.1 Approach and Description of the Proposed Mangrove Management

(1) Approach

To achieve protection of the remaining forests, rehabilitation of degraded forests, recovery of mangrove forests, and sustainable utilization of mangrove resources, approaches indicated below would be incorporated in the IMMP as the direction of the mangrove management in the study area.

Approaches for Proposed Mangrove Management
<ul style="list-style-type: none"> • Protect and upgrade remaining mangrove resources. • Control further conversion into paddy areas to conserve the remaining mangrove resources. • Emphasize “Zone Management”. Especially, consider buffer zones (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.

(2) Description

Based on the approach provided in the preceding clause, the description of the proposed mangrove management system is described as follows. The summarized concept of the proposed mangrove management system is described in Figure 8.4.

1) Implementation Bodies for Mangrove Management

The proposed mangrove management system for the study area involves two major implementation bodies, namely FD, and local communities, particularly user groups of the CF activities.

In principle, FD is the competent authority of the reserved forest and responsible for the entire forest management within the reserved forest. However, in practice, due to various constraints such as budgetary and organizational limitations within FD, and also due to present land use patterns and social conditions within reserved forests, FD currently covers only a part of its original duties and responsibilities of forest management in the study area. Especially, implementation of the actual forestry operations by FD is limited to certain protection and conservation areas like the protected reserve area in the Kadonkani IRM.

Up to now, the CF activities under the community forestry instruction (CFI) have been somewhat complementing forestry operations outside of the protection and conservation areas within reserved forests. For the effective rehabilitation of mangrove forests, more active and extensive involvement of CF by local communities is crucial. Thus, local communities should be included in the mangrove management system and serve as de facto managers for the actual forestry operations on sites outside areas directly operated by FD.

Therefore, the mangrove management system proposed under the Integrated Mangrove Management Plan (IMMP) aims to strengthen the current management/operation capability of FD and to emphasize the roles and responsibility of the CF activities for protection and rehabilitation of mangrove resources in the study area.

2) Requirements of the Mangrove Management System

The proposed mangrove forest management system necessitates the establishment of stronger linkage between FD and local communities (the CF user groups). Furthermore, more effective rehabilitation measures, as well as sustainable utilization of mangroves, compared to existing management and operation are crucial to achieve the vision and goals of the IMMP. Based on findings from the current situation with mangrove management, the following are requirements to be incorporated in the proposed mangrove forest management system.

Requirements for Proposed Mangrove Management System
<ul style="list-style-type: none"> • 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.

3) 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

FD
<ul style="list-style-type: none"> • 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, revenue collection, removal pass certification, etc.).
CF User Groups
<ul style="list-style-type: none"> • Operations in degraded forests, barren lands adjacent to agriculture land within reserved forests (i.e. the multiple-use zone under 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.

4) 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
<ul style="list-style-type: none"> • Natural Forest Operation • Plantation Operation • Riverbank re-vegetation/stabilization • Forest Protection • Seedling Production 	<ul style="list-style-type: none"> • Natural Forest Operation • Plantation Operation • Riverbank re-vegetation/stabilization • Forest Protection • Self Seedling Production • Other Operations under CF

Details of forestry operations covered under the proposed mangrove management system, based on forest type, land use, and ground level are described in the following section 8.6.2.

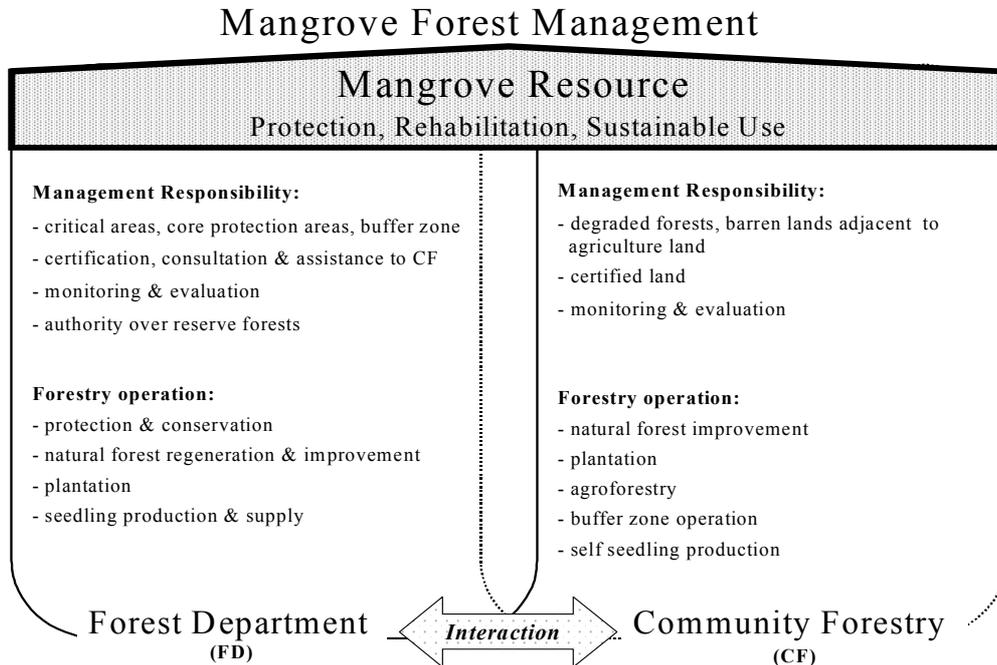


Figure 8.4 Concept of Proposed Mangrove Management System

8.6.2 Category and Description of Applicable Mangrove Forestry Operation

Under the proposed mangrove management system, forestry operations applicable to the study area will be categorized as follows.

- 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)

Mangrove forestry operations for FD and CF user groups are summarized in the following table.

Summary of Activities for Mangrove Forestry Operation

	FD Operation	CF Operation
1. Natural Forest Operation:		
a. Protection and Conservation	<ul style="list-style-type: none"> - Preservation of critical areas - Wildlife/ecosystem conservation - Patrolling to prevent illegal activities & fires - Monitoring & evaluation 	-
b. Forest Regeneration Operation (Forest Stand Improvement: FSI)	<ul style="list-style-type: none"> - Climber cutting & clearing - Pruning - Thinning - Regeneration treatments (seed tree, coppice, assisted natural regeneration, enrichment planting) - NFTP extraction - Forest Protection 	-
c. Forest Improvement Operation: (Regeneration Improvement Felling: RIF) (Natural Forest Improvement Operation: NFIO) (Timber Stand Improvement: TSI)	<ul style="list-style-type: none"> - Improvement felling (cutting, clearing, thinning, pruning) - Regeneration treatments (clear felling on alternative strip, selection, seed tree, coppice, assisted natural regeneration, enrichment planting) - NFTP extraction - Forest Protection 	<ul style="list-style-type: none"> - Improvement felling (cutting, clearing, thinning, pruning) - Regeneration treatments (selection, seed tree, coppice, assisted natural regeneration, enrichment planting) - Harvesting - Forest Protection
2. Plantation Operation:		
	<ul style="list-style-type: none"> - Plantation establishment - Weeding - Thinning - Pruning - Controlled harvesting - Patching & replanting - Forest protection 	<ul style="list-style-type: none"> - Plantation establishment - Weeding - Thinning - Pruning - Harvesting - Patching & replanting - Forest protection
a. Mangrove Species Plantation	<ul style="list-style-type: none"> - Potted seedling for mid/high ground - Bare root seedling & propagule for low/mid ground 	<ul style="list-style-type: none"> - Potted seedling for mid/high ground - Bare root seedling, propagule, sowing for low/mid ground
b. Non-mangrove Species Plantation	<ul style="list-style-type: none"> - Assisted natural regeneration (nurse/shade tree at high ground) 	<ul style="list-style-type: none"> - Multiple-use tree establishment at high ground
3. Riverbank Stabilization		
a. Vegetation activities	<ul style="list-style-type: none"> - High ground reforestation - Re-vegetation for surface erosion - Low ground/ wave action stabilization 	<ul style="list-style-type: none"> - High ground reforestation - Re-vegetation for surface erosion - Low ground/ wave action stabilization
b. Bank protection work	<ul style="list-style-type: none"> - River embankment 	<ul style="list-style-type: none"> - River embankment
4. Forest Protection		
	<ul style="list-style-type: none"> - Pest & disease prevention control, - Fire protection & control, - Patrolling & monitoring against illegal cutting & encroachment - Monitoring & evaluation 	<ul style="list-style-type: none"> - Pest & disease prevention control, - Fire protection & control, - Patrolling & monitoring against illegal cutting & encroachment - Monitoring & evaluation
5. Seedling Production		
	<ul style="list-style-type: none"> - Seed/ propagule/ wildling collection - Seed orchard operation - Seedling production (bare-root & potted seedling) 	<ul style="list-style-type: none"> - Seed/ propagule / wildling collection - Village nursery operation
6. Others		
	<ul style="list-style-type: none"> - CF promotion and support 	<ul style="list-style-type: none"> - Other CF activities (agroforestry, home garden, processing, selling, etc.)

Note: For each operation, actual activities will be the combination of activities listed above, based on ground level, site condition, and management objectives.

8.6.3 Desirable and Preferable Species for Mangrove Forestry Operation

Based on the results of the field survey, species indicated in the following table should be considered as desirable species and preferable species to be introduced under the proposed mangrove management. Desirable species were selected based on site/species matching, suitability and profitability (financial and economic returns and environmental soundness) considerations. Preferable species were selected based on availability of abundant seed sources, ease in collection and raising seedlings, or already established planting/nursing methods, and often selected by FD and/or villagers.

The desirable and preferable species are for reference in selecting species for mangrove rehabilitation in the study area. The actual selection of species should be based on objectives and site conditions of the proposed operational areas.

Desirable and Preferable Species

Ground Level		Desirable Sps.		Preferable sps.	
High (equinoctial tides & rainy seasons)	Plantation	<i>Albizia lebbeck</i> <i>Melaleuca spp.</i> <i>Acacia mangium</i> (spp proved in trial plantaion) <i>Amoora cucullata</i> Pandaka <i>Excoecaria agallocha</i> Thayaw		<i>Avicennia officinalis</i> Thame <i>Sonneratia apetala</i> Kanbala	
	Natural Forest	<i>Phoenix padulosa</i> Thinbaung <i>Heritiera fomes</i> Kanazo		Spp. existing in natural conditions <i>Excoecaria agallocha</i> Thayaw <i>Amoora cucullata</i> Pandaka	
Medium (normal high tides or spring high tides)	Plantation	<i>Avicennia officinalis</i> Thame <i>Ceriops spp</i> Madama <i>Sonneratia apetala</i> Kanbala		<i>Bruguiera spp</i> Byu <i>Avicennia officinalis</i> Thame <i>Sonneratia apetala</i> Kanbala	
	Natural Forest	spp. existing in natural conditions		spp. existing in natural conditions	
Low (all high tides)	Plantation	<i>Rhizophora apiculata</i> Byuchidauk		<i>Sonneratia apetala</i> Kanbala <i>Avicennia. marina</i> Thame-phyu	
	Natural Forest	Spp. existing in natural conditions		Spp. existing in natural conditions	

Note1: Desirable spp are based on site-spp matching, suitability and profitability (financial and economic returns and environmental soundness) consideration

Note2: Preferable spp are based on availability of abundant seed sources, ease in collection and raising seedlings, or already established

8.6.4 Direction of Mangrove Forest Management

Under IMMP, the primary goal and objective for the mangrove forest management is to protect and rehabilitate the mangrove resource for coexistence with people's lives. The proposed mangrove forest management and operations are oriented to attain such a goal and objective in a designated time frame of IMMP. At the same time, the forest management system should be directed to multi-layer/function forest management to provide not only protection and rehabilitation, but also for future functions and benefits of forest product utilization and continuous regeneration of mangrove forests.

The ideal multi-layer/function forest management system in the study area can be described as three tiers of silvicultural management consisting of the following, details of which are described in Table 8.1.

- ① “The Protection Tier” normally in the upper canopy to provide: forest physiognomy, seed production; and protection and partial shade for lower layers and forest floor.
- ② “The Production Tier” normally in the middle layer to provide: fuelwoods, poles and timber and other wood products; growing space for regenerated seedlings and saplings through cutting and harvesting operations.
- ③ “The Regeneration Tier” normally in the lower layer and forest floor to provide: favorable regeneration of seedlings; and constant renewal of seedlings.

8.6.5 Mangrove Forestry Operational Area and Zoning

(1) 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.

(2) Applicable Forestry Operations for Each Operational Area

Table 8.2 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.
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.
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.
7. Barren Land	1. Plantation Operation (with Forest Protection & Controlled Harvesting) - Mangrove spp		
			- Mangrove spp - Non mangrove spp
	(Forest Improvement Operation)		
8. Agricultural Land	2. Other Operations under CF		
	- Plantation Operation	- Windbreak and boundary planting and maintain Present Agricultural Activities	
		- 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 for the definition of CM1-CM3 and SM1-SM3.

(3) Operational Category and IMMP Zoning

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)

The definition and selection criteria of each operational category were set as in the following table.

Operational Category at Forest Compartment Level

Category	Definition	Criteria
1. CMOA	<ul style="list-style-type: none"> • Areas to be preserved, protected, or conserved in natural condition • Area for natural forest regeneration operations 	<ul style="list-style-type: none"> • Area classified as forest type CM1-CM3 • (Areas under wildlife sanctuary or other protected areas) • (Areas under mangrove rehabilitation working circle) • Riverbanks/coastal banks surrounding CMOA
2a. SMOA-1	<ul style="list-style-type: none"> • Sustainable use area for resource reservation • Area to be rehabilitated by natural forest improvement operations and forest plantation establishment • Area can be used for forestry production managed by FD 	<ul style="list-style-type: none"> • Area outside of CMOA with small CM1-CM3 areas in FD Operation FC (if applicable) • Area classified as forest type SM1-SM3 in FD operation FC • Mangrove forest areas allocated as mangrove rehabilitation working circle (but not categorized as CMOA) in FD operation FC • Barren land, open land, and uncultivated agricultural land in FD operation FC • Riverbanks/coastal bank surrounding SM1-SM2, and other areas considered to be SMOA-1
2b. SMOA -2	<ul style="list-style-type: none"> • Sustainable use area for resource reservation • Area to be rehabilitated by natural forest improvement operations and forest plantation establishment • Area can be used for forestry production managed by CF user groups. 	<ul style="list-style-type: none"> • Area outside of CMOA with small CM1-CM3 areas in CF Operation FC (if applicable) • Area classified as SM1-SM3 in CF operation FC • Barren land, open land, and uncultivated agricultural land in CF operation FC • Areas allocated as mangrove rehabilitation working circle (but not categorized as CMOA) and in CF operation FC • Barren land, open land, and uncultivated agricultural land in CF operation FC. • Riverbanks/coastal banks surrounding SM1-SM2, and other areas considered to be SMOA-2
3 MOA	<ul style="list-style-type: none"> • Area can be used for sustainable agriculture and other production purpose • Area can be used for forestry and non-forestry production managed by CF user groups. 	<ul style="list-style-type: none"> • Areas under cultivation and no-forestry production areas • Village lots and residential areas • Riverbanks/coastal banks surrounding MOA
4 BSA	<ul style="list-style-type: none"> • Area to be functional for protection and outside boundary of CMOA and/or SMOA-1 (200 m width) • Area to be jointly managed/ operated by FD and Community 	<ul style="list-style-type: none"> • Surrounding area/FC of CMOA and/or SMOA-1

Note1: Refer to Table 2.13 for the definition of CM1-CM3 and SM1-SM3

Note2: FC: Forest Compartment

The relationship between the IMMP zoning and the operational category with corresponding land uses/ forest types is described in the following table.

Relationship between IMMP Zones and Operational Category

Operational Category \ IMMP Zone	CORE		BUFFER		MULTIPLE	
	Operational Area	By	Operational Area	By	Operational Area	By
CMOA	CM1 CM2 CM3	FD	CM1 CM2 CM3	FD/CF	CM1 CM2 CM3	(FD)/CF
	Riverbank	FD	Riverbank		Riverbank	
SMOA-1	SM1 SM2 SM3 Barren Land	FD	n.a.		n.a.	
	Riverbank	FD/(CF)				
BSA	Around CMOA and SMOA-1	FD	Around CMOA and SMOA-2	FD/CF	Around CMOA and SMOA-2	(FD)/CF
SMOA -2	n.a.		SM1 SM2 SM3 Barren Land CF Area	FD/CF	SM1 SM2 SM3 Barren Land (CF Area)	(FD)/CF
			Riverbank	FD/CF	Riverbank	
MOA	n.a.		(Agricultural Land) (Village)	CF	(Agricultural Land) (Village)	(FD)/CF
			Riverbank	(FD)/CF	Riverbank	

Note: Refer to Table 2.13 for the definition of CM1-CM3 and SM1-SM3.

Note: Based on the actual condition, FD operations might be conducted in the multiple-use zone.

8.7 Targets of IMMP

8.7.1 Assumptions and Conditions Applied

(1) Introduction

Actual operations related to mangrove rehabilitation and livelihood improvement in the IMMP will be conducted in all of the three zones in the target project area. Firstly, the target project area was divided into two types of priority forest compartments, namely, 1) the CF operation compartment, and 2) the FD operation compartment. Within each priority forest compartment category, the target operation area was set based on the land use/forest types, socioeconomic conditions and zone category. In this section, assumptions and conditions for developing targets for the IMMP are discussed.

(2) 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 Priority Forest Compartment

Phase I Foundation Period
1. CF Operation Compartments: Target Area for Development of the Model CF User Group
<ul style="list-style-type: none"> – 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
<ul style="list-style-type: none"> – 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
<ul style="list-style-type: none"> – Adjacent Forest Compartment to the phase I of model CF user group
2. FD Operation Compartments: Action Research Forest Development
<ul style="list-style-type: none"> – Adjacent Forest Compartment to the phase I target area
Phase III De-centralization Period
1. CF Operation Compartments: CF Target Area
<ul style="list-style-type: none"> – Thirty-year project targets all areas of Pyindaye, Kadonkani, Pyinalan and Kyakankwinpauk
2. FD Operation Compartments: Action Research Forest Development
<ul style="list-style-type: none"> – 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.

The selection of priority forest compartments, except for the Meinmahla Reserved Forest, will be finalized upon commencement of the IMMP. Also the target forest compartment of the preceding phases will be reviewed based on annual progress of the IMMP. For the Meinmahla Reserved Forest, the operation will be conducted by FD based on the fauna and flora conservation guideline prepared under the present study.

(3) Target Setting for the Community Forestry Operation Area

The target operation areas in CF operation compartments were selected based on the land use and forest type. Sparse mangrove forest areas, open/barren lands, and paddy fields were considered as the target operation areas for CF operations.

(4) 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/ reserved forest	4 UsG/ reserved forest	4 ~ UsG/ reserved forest

The establishment rate was set based on considerations of the following points.

After issuance of the CFI in 1995, Laputta and Bogalay Township FD Offices achieved the formulation of approximately 90 CF user groups and as of March 2004, 56 CF user groups had CF certificates. It is estimated that annual average certification is 7 CF user groups by both township FD offices. Since there are two reserved forests in each township applicable for CF, a current annual average CF user group establishment is approximately less than two CF user groups per reserved forest. Currently, FD offices are mainly engaged in granting CF certificates and seedling supply for first year plantation of CF user groups, and because of FD's other routine works, enough emphasis could not be paid to follow up activities of successive years' CF management and support. Since the IMMP is aimed to enable the CF user group to practice sustainable CF activities, the FD offices have to allocate further work load for CF management and support.

Therefore, during phase I, the target annual average user group establishment rate was set as one user group per reserved forest to correspond to the increase in workloads of FD, and the required time to establish and maintain model CF user groups. Also during phase I, CF task forces (refer to Section 10.1.2 for details) are planned to be established in each of four reserved forests. The CF task force will solely engage in CF management and support of the assigned reserved forest. Therefore, during phase II, the target annual average user group establishment rate was set as four user groups per reserved forest by the CF task force. The rate is set slightly higher than the current annual average establishment rate (3.5 user groups/township) of each township FD office but the CF task forces are also expected to conduct continuous CF management and support based on experience gained during phase I of the IMMP. For phase III, the annual average establishment rate varies among the reserved forests based on land areas and population.

(5) Target Setting for FD Operation (Action Research Forest Development)

The target operation areas in FD operation compartments were selected based on the land use and forest type. Closed mangrove forests, sparse mangrove forest areas and open/barren lands, were considered as the target operation areas for FD operations.

For calculation of annual operation areas, a realistic annual maximum operation capacity in terms of operational area was inferred based on the present annual operation capacity and past operation results of FD.

8.7.2 Targets

(1) Zoning Results

Based on the concept of the zoning, the target project area is divided into three zones. The IMMP zoning map is attached as Figure 8.5. The target project areas of the IMMP by zones are summarized in the following table.

Target Project Areas of IMMP by Zone

(unit: ha)

Zone	CORE		BUFFER		MULTIPLE		TOTAL (ha)
	Area (ha)	%	Area (ha)	%	Area (ha)	%	
Reserved Forest							
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
(Meinmahla)	13,224	100.0	0	0.0	0	0.0	13,224
(Grand Total)	36,881	17.9	56,065	27.2	113,181	54.9	206,127

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.

(2) 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 results are attached at Table 8.3. The summary of the target project areas of the IMMP by phases is shown in the following table. The target project area for the IMMP covers the whole study area. Figure 8.6 and 8.7 show the target project area by forest compartment in each phase of IMMP.

Target Project Areas of IMMP by Phases and Priority Compartments

(unit: ha)

Reserved Forest	Phase	Target Project Area		
		FD Operation	CF Operation	Total area
Kyakankwinpauk	I	1,418	2,188	3,606
	II	2,474	4,924	7,398
	III	4,594	9,624	14,218
Sub-total		8,486	16,736	25,222
Pyinalan	I	3,295	5,760	9,055
	II	2,782	6,430	9,212
	III	6,099	14,600	20,699
Sub-total		12,176	26,790	38,966
Kadonkani	I	1,099	3,141	4,240
	II	2,731	8,091	10,822
	III	11,274	28,710	39,984
Sub-total		15,104	39,942	55,046
Pyindaye	I	1,783	6,212	7,995
	II	9,226	13,265	22,491
	III	20,431	22,752	43,183
Sub-total		31,440	42,229	73,669
TOTAL	I	7,595	17,301	24,896
	II	17,213	32,710	49,923
	III	42,398	75,686	118,084
	Total	67,206	125,697	192,903
(Meinmahla)		-	-	(13,224)
(Grand Total)				(206,127)

Source: JICA Study Team

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.

The target operation areas of the IMMP by phases where the practical action research forest development and the CF activity are implemented are summarized in the following table. All of the land uses in the study area are regarded as the target project area. However, it is not reasonable to set the whole target area as the target operation area, because there are areas of paddy, salt pans or residential area that are registered by the government. Therefore, the target operation areas of such land uses are estimated by multiplying the land area by the rate of estimated CF activity area for each land use. The breakdown of the target operation areas of the IMMP is shown in Table 8.4.

Target Operation Areas of IMMP by Phases and Priority Compartments
(unit: ha)

Reserved Forest	Phase	Target Operation Area		
		FD Operation	CF Operation	Total area
Kyakankwinpauk	I	1,410	177	1,587
	II	2,397	504	2,901
	III	4,273	2,868	7,141
Sub-total		8,080	3,549	11,629
Pyinalan	I	3,295	1,505	4,800
	II	2,739	3,129	5,868
	III	4,706	6,753	11,459
Sub-total		10,740	11,387	22,127
Kadonkani	I	985	567	1,552
	II	2,591	1,912	4,503
	III	11,177	7,216	18,393
Sub-total		14,753	9,695	24,448
Pyindaye	I	1,783	558	2,341
	II	5,562	1,645	7,207
	III	20,003	9,348	29,351
Sub-total		27,348	11,551	38,899
TOTAL	I	7,473	2,807	10,280
	II	13,289	7,190	20,479
	III	40,159	26,185	66,344
	Total	60,921	36,182	97,103

Source: JICA Study Team

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.

CHAPTER 9 INTEGRATED MANGROVE MANAGEMENT PLAN

9.1 Overview of the Integrated Mangrove Management Plan

9.1.1 Objectives of the IMMP

The development objective of the Integrated Mangrove Management Plan (IMMP) is to establish the coexistence of vigorous mangrove vegetation and viable livelihoods of people in the project target area. The Plan will be implemented in three phases: phase I foundation period, phase II extension period and phase III de-centralization period. The goal, purpose and outputs 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.

9.1.2 Proposed Project Design Matrix of the IMMP Phase I

(1) Goal, Project Purpose, Output, Indicator, Verifications, and Key assumptions

The following table describes first four lines of project design matrix (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.

Narrative Summary	Key Performance Indicators	Means of Verifications	Key Assumptions
<p>Goal</p> <p>Establishing coexistence of vigorous mangrove vegetation and people in 24,896 ha of in the designated FC of the project area.</p>	<ul style="list-style-type: none"> - Mangrove and non - mangrove vegetation coverage rate in the target CF area (24,896 ha) stops decreasing 	<ul style="list-style-type: none"> - GIS data from satellite imagery, GIS section, PSD, FD - Socioeconomic condition survey 	<ul style="list-style-type: none"> - No critical change of the Ministry of Forestry and FD governing policy of the Reserved Forest and CFI.
<p>Project Purpose</p> <ul style="list-style-type: none"> - Visible rehabilitation of 10,280 ha of mangrove comprising 2,807 ha of CF area and 7,473 ha of action research forest development. 	<ul style="list-style-type: none"> - 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 	<ul style="list-style-type: none"> - CF statistic data of PSD, FD and district and township FD offices - Registered CF sales voucher and removal pass 	<ul style="list-style-type: none"> - No critical change of market condition of CF production (ex. fuelwood)
<p>Outputs</p> <ul style="list-style-type: none"> - Model CF user groups engaged in sustainable CF activities are developed and maintained. 	<ul style="list-style-type: none"> - Achievement of demonstration CF activities (condition of activities, management, production and sales) 	<ul style="list-style-type: none"> - CF statistic data of PSD, FD and FD district and township offices (CF progress report, patrol, meeting report) 	<ul style="list-style-type: none"> - No critical natural disaster to hinder the mangrove rehabilitation activities (ex. storms, floods, diseases and harmful insects)
<ul style="list-style-type: none"> - FD's CF management and support system is drafted and applied. 	<ul style="list-style-type: none"> - Continuous staff assignment and budget allocation for FD CF management and support - Compliancy between the duty for the CF management and the implementation 	<ul style="list-style-type: none"> - Report of CF task force - Drafted bylaw of CFI 	<ul style="list-style-type: none"> - No critical change of livelihood condition of UsG members (ex. price of rice and fishery products)
<ul style="list-style-type: none"> - Integrated forestry technology of the delta is established through Action Research Forest Development. 	<ul style="list-style-type: none"> - Number of species utilized for IMMP and CF activity. 	<ul style="list-style-type: none"> - Report of CF task force and book of compiled integrated forestry technology. 	
<ul style="list-style-type: none"> - FD's CF management and support system is standardized. 	<ul style="list-style-type: none"> - Number of district FD applying bylaw of the CF 	<ul style="list-style-type: none"> - Minutes of annual CF meeting 	

(2) Activities, Input and Pre Conditions

The following table describes activities, input and pre-conditions in the PDM of the IMMP phase I. It is proposed to review the activities and input by same manner with the above PDM at same timing.

Narrative Summary	Inputs	Pre-Condition
<p>Activities</p> <ol style="list-style-type: none"> 1. Organization of Model CF User Group <ul style="list-style-type: none"> - CF Prototype Activity - Capacity Development of CF User Group 2. Capacity Development of FD for CF Support <ul style="list-style-type: none"> - 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 <ul style="list-style-type: none"> - 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 <ul style="list-style-type: none"> - CF joint training - CF Annual meeting - Mangrove rehabilitation annual meeting - IMMP annual meeting 	<p>Inputs:</p> <p>Preparatory Activities for implementation of the IMMP Phase I</p> <ul style="list-style-type: none"> - Activity and cost for the preparatory works for organization setting, preparation of action plan, and budgeting. <p>Organization of Model CF User Group</p> <ul style="list-style-type: none"> - 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 <p>Capacity Development of FD for CF Management and Support</p> <ul style="list-style-type: none"> - 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 <p>Development of Integrated Forestry Technology in the Delta</p> <ul style="list-style-type: none"> - 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 <p>Integration of Lessons learned through the IMMP phase I</p> <ul style="list-style-type: none"> - 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 <p>CF Task Force including allowance (Phase I)</p> <p>Operation and Maintenance Cost (5 % of 1.0 - 5.0)</p> <p>Technical Assistance</p> <p>Physical Contingencies</p>	<ul style="list-style-type: none"> - No critical change of market condition of CF production (ex. fuelwood)

9.1.3 Policy Initiative for Securing Right of CF User Groups

CFI is provided based on Chapter V, Article 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.

9.2 Proposed Land Use Plan

9.2.1 Assumption

The management planning map prepared under the study and the zoning and land use plan applied in the IMMP are based on the land use/forest type classification map developed through the 2002 aerial photo interpretation. The land use and forest type classification map is presented in Figure 2.2.

9.2.2 Land Use Plan

(1) Status of Land in Target Project Area

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 Operation 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

Since the IMMP area is required to sustain the basic needs of the stakeholders, the area was zoned to satisfy the requirements of stakeholders. Therefore, the zoning should be the essential base of the IMMP.

(2) Basic Concept of Land Use and Land Distribution in the Target Project Area

1) Closed Mangrove Area

The area currently covered by dense forest, shown as closed canopy mangrove (forest type CM1-CM3: Table 2.13) on the land-use forest type map, and the areas strategically selected as important forest areas are categorized as the CMOA at the forest compartment level. This means that the CMOA would be preserved and/or maintained mainly by natural regeneration operations. CMOA in the core zone requires direct management by FD, not by CF activities. However, some CMOA areas located in the buffer zone and all in the multiple-use zone are eligible for CF management. The Integrated Resource Management Project (IRM project) currently operated by FD in the Kadonkani Reserved Forests area is composed mostly of CMOA areas, and FD direct operations could be classified as a project in the core zone. Because the core zone is the most important area for mangrove resource conservation, its periphery must be designated as buffer zone to serve as a social fence for encroachment from outside and a natural barrier to protect the core from encroachment. The actual delineation of the buffer zone depends on the distribution of the core zone.

2) Sparse Mangrove Forest and Open/ Barren Land Areas

These land use and forest type areas are the principal areas that require active forestry operations, mainly through plantation establishment. In addition, the area includes degraded lands and abandoned paddy fields particularly in the core and buffer zones. These areas would be categorized as SMOA-1 in the core zone and as SMOA -2 in the buffer and multiple-use zones (details of categories are described in Section 8.4.2 (2)). The category was broadly divided into two operational categories from the viewpoint of the actual rehabilitation works, namely, a) areas for direct forestry operations by FD (SMOA -1) and b) areas for community forestry (SMOA -2). These rehabilitation activities in SMOA will result in the increase of mangrove forest coverage and accumulation of mangrove forest resources.

3) Cultivated Land 1: Abandoned Paddy in the Buffer and the Multiple-use Zones

Rehabilitation of the degraded and abandoned paddy fields in these two zones will be mainly conducted by the CF user group to cover the fuelwood demands of the user groups and the local people. However, CF operations on abandoned paddy areas could be limited to areas near villages because the function of the CF operation depends on the accessibility of the land to the villagers. Also, it can be expected that there could be a limit in the number and location of abandoned paddy areas in future due to population increase inside the reserved forest. Therefore, the CF operation will be introduced to all areas suited to CF operation. Areas where CF is not suited, particularly in the buffer zone, should be rehabilitated by the direct operation of the Forest Department FD.

4) Cultivated Land 2: Current Cultivation Area

The majority of the current cultivation area, excluding degraded and abandoned paddy fields, is located in the multiple-use zone. The multiple-use zone is important to attaining the compatibility of mangrove resources and the socioeconomic activities in the area. So, the delineation of existing cultivation areas has to be conducted carefully by verifying the affordability of agricultural products for the villagers and confirming the extent of the cultivation area to prevent the further encroachment on adjacent mangrove forests. Also, investment to protect further degradation of cultivation areas will be a necessary component of the IMMP, since areas in the multiple-use zones would be submerged several times per month by tides with the risk of reduced yields. Moreover, the total area of the multiple-use zone will not be changed up to 2045, the target year of the IMMP, to avoid further impacts on mangrove resources.

5) Village/Settlement and Saltpan/Fishpond Areas

The majority of villages and saltpans/fishponds are located in either the buffer zone or the multiple-use zone. Various CF prototypes are planned to be applied in the area in accordance with the current land use and needs of CF user groups.

6) Summary

In summary, the agricultural and forestry productions from the multiple-use zone will be increased to maintain the living standards of villagers throughout the whole area of the multiple-use zone and the cultivation areas inside the zone will not be changed in principle. The sparse/degraded forest areas and barren lands in the core zone and the buffer zone will be gradually turned into dense mangrove vegetation through the implementation of the IMMP. The projects and programs related to the living standard improvement should be included in the IMMP as well as those of the rehabilitation of mangrove resources. The integrated and simultaneous implementation of the IMMP projects and programs will enable the attainment of the vision and goals of the IMMP.

9.2.3 Activity Unit for CF Operation Compartment

Based on the proposed land use plan and the zoning discussed in the previous Section 9.2.2, activities are planned and grouped into four activity units corresponding to IMMP zoning and natural/socioeconomic conditions of the target project area. The following table shows the activity unit numbers corresponding to IMMP zones for each reserved forest. No activity unit is applied to the CORE zone because in principle there are no CF operation compartments in the CORE zone.

CF Activity Unit Corresponding IMMP Zones

Reserved Forest	Zone	Activity Unit Number	Unit Description
Laputta			Activity Unit 1 (BUFFER) Paddy Dominant or High Population Area
Kyakankwinpauk	CORE	-	
	BUFFER	Activity Unit 3	
	MULTIPLE	Activity Unit 4	
Pyinalan	CORE	-	Activity Unit 2 (MULTIPLE) Paddy Dominant or High Population Area
	BUFFER	Activity Unit 3	
	MULTIPLE	Activity Unit 4	
Bogalay			Activity Unit 3 (BUFFER) Mangrove Vegetation Dominant or Low Population Area
Kadonkani	CORE	-	
	BUFFER	Activity Unit 3	
	MULTIPLE	Activity Unit 4	
Meinmahla	-	-	Activity Unit 4 (MULTIPLE e) Mangrove Vegetation Dominant or Low Population Area
Pyindaye	CORE	-	
	BUFFER	Activity Unit 1	
	MULTIPLE	Activity Unit 2	

9.3 IMMP Phase I: Foundation Period

9.3.1 Development of Core/Model CF User Groups

(1) Outputs

[Model-CF UsG engaged in sustainable CF activities are developed and maintained]

The output of the plan is defined as above.

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.

(2) Organization of Model CF Groups

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 in collaboration with local authorities such as DPDC, TPDC, VPDC and village 100 and 10 household heads.
- 2) Evaluation of villagers' intentions to participate in the CF activities based on villagers' necessity of practicing CF.
- 3) Then, the potential to become a model CF user group is evaluated based on the following criteria a) existence of leader, and b) villager equally poses information about CFI. The criteria are prepared for securing sustainability of the CF activity under the present study.
- 4) Estimation of land availability and potential of the CF activity based on following criteria, a) available acreage of CF area for the CF user group, b) natural and forest conditions of the available CF areas, and c) applicable CF prototypes.

The number of CF user groups to be formulated by the CF Task Force will be based on the capacity of the current FD for granting CF certificates, and also on the FD's estimated capacity for management and support of CF that will be started under the IMMP. Thus, the number of CF user groups is limited to 20. Also as is stated in Chapter 3 and 4, natural and socioeconomic conditions can be broadly categorized into the following five types as the target area for model CF user groups.

Categorization of Target Area based on Natural and Socioeconomic Condition

a. Paddy dominant high population density area
b. Paddy dominant low population density area
c. Mangrove dominant high population density area
d. Mangrove dominant low population density area
e. Fishery Area

The CF management plan of the model CF user group will be prepared based on categorization of natural and socioeconomic conditions.

According to CFI, basically there is no supply of goods to CF user groups from the FD except for distribution of seedlings for the first rotation of the CF area. However, it is recommended for FD to supply the following materials to the CF user group for the smooth planning and implementation.

Material to be supplied for the Model CF User Group by FD (CF Task Force)

Equipment	Unit	Quantity	Reference
Mangrove rehabilitation manual	book	2	
Lending topographic map	-	-	tracing allocated CF area and preparation of CF management plan

In accordance with the CF management plan, the model CF user group would engage in a series of CF activities from planting to tending to harvesting.

The supporting of user groups by the CF task force is essential for user groups to engage in the sustainable CF activities (refer to Section 10.1.2 for details on the CF task force). The currently existing user groups have little experience, not only in forestry, but also in any sustainable economic activities other than extracting existing natural resources.

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

(3) CF Prototype Activity

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 Myaug Mya FD district officer.

The following table shows the contents of CF activity units, which are referred to as CF prototypes (refer to Section 9.2.3 about CF activity units). The 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
Activity Unit 3 (BUFFER) Mangrove Vegetation Dominant or Low Population Area	- CF Water Reservoir
	- CF Buffer Plantation
	- CF Compost Woodlot
	- CF Paddy Woodlot
	- CF Riverside Woodlot
Activity Unit 4 (MULTIPLE) Mangrove Vegetation Dominant or Low Population Area	- CF Water Reservoir
	- 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	

Table 9.1 describes the activities of each CF prototype and which are planned to make up the CF activity units in the IMMP.

(4) Capacity Development of CF User Groups

1) Education and Training

During the IMMP phase I, capacity development of CF user groups will be continuously conducted through planning, implementation, management and monitoring of CF activities through the supporting activities by FD. However, to efficiently achieve the sustainable CF activities by CF user groups, the following capacity development training programs will be conducted under the IMMP.

- a) Education of group leaders of the model CF user group
- b) 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.

Existence of competent leaders, easy access to appropriate information, and experiencing success are the three key factors to achieve continuation of CF activities by CF user groups. In the plan for capacity development of CF user groups, two of the three key factors are planned to be strengthened by training to be conducted under the IMMP.

The following two tables indicate the detailed plans for strengthening leaders and extension workers (i.e., access to appropriate information).

a) Education of Group Leader of the Model CF User Group

Item	Contents
Target	Management Committee Members, Sub CF User Group Leaders Senior members of the user group, Volunteer members (if applicable)
Training Item	Villagers Enlightenment <ul style="list-style-type: none"> • Mangrove Environment • Soil/Land Environment • Living Environment • School Children Environment Education • Understanding of CF CFI Management <ul style="list-style-type: none"> • CFI Management Preparatory Stage • CFI Management Implementation Stage • Group Consolidation • Buffer Zone Management • River Bank Management CFI Technical Guidance, and <ul style="list-style-type: none"> • Forestry Technical Guidance • CFI Agroforestry Technical Guidance • Buffer Zone Management Technique • River Bank Plantation Technique Consolidation Activities of CF for Mangrove rehabilitation <ul style="list-style-type: none"> • CF Extension Center • Double Cropping • Small Scale Water Reservoir • Compost Making • Self-reliance Micro Credit • Efficient Stove
Text	Mangrove Rehabilitation Manual for Community
Training Method	Lectures at classroom and field trainings
Venue	FD CF extension center at each reserved forest
Training Period	Two weeks/CF user group: 40 weeks in a total for 20 user groups
Trainer	Range Officer(s) and Deputy Range Officers of the Laputta and Bogalay FD offices

b) Education of Extension Worker of the Model CF User Group

Item	Contents
Target	Extension Worker of the model CF user group 5 person/CF user group Junior member of the user group, Volunteer members (if applicable)
Training Method	Same as for the group leader trainings
Text	Mangrove Rehabilitation Manual for Community
Venue	FD CF extension center at each reserved forest
Training Period	One month per CF user group: 40 weeks total for 20 user groups
Trainer	Range Officer(s) and Deputy Range Officers of the Laputta and Bogalay FD offices

2) Authorized CF Production and Value-added Production

The IMMP plans to implement harvesting, value added production, and necessary survey and documentation activities for the authorization of the harvest and value added production towards sustainable CF activities.

A white charcoal production plan is one of the first value adding production activities. The plan will be composed of a) institutional development for official procedure by FD and the Ayeyawady Division, and b) 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.

A trial production of boiled phoenix shoots under the pilot project 2004 in the present study is a component of the development of demonstration CF user groups for enabling sustainable use of natural resources.

(5) Extension of the Model CF User Group Activities

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

9.3.2 Capacity Development of FD for CF Support

The planned activities for capacity and institutional development of the FD are:

- 1) Institutional Development of FD for CF Management and Support
- 2) Improvement of Capabilities of FD Staff for CF Support and Management
- 3) Construction and Renovation of CF Extension Centers and Nurseries

(1) Outputs

[FD's CF management and support systems, personnel, and facilities are established and function sustainably]

The output of the plan is defined above.

Capacity of FD for CF support would be developed through improvement in systems, personnel capabilities, and facility/equipment provision.

The above mentioned items are currently not provided or functioning properly in the on-going CF activities and this is inhibiting CF activities.

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

1) CF Task Force Establishment

The CF Task Force, an organization within FD for implementation of the IMMP phase I, would be established at Yangon, Myaug Mya District and four reserved forests of Kyakankwinpuak, Pyinalan, Kadonkani, and Pyindaye (details in Section 10.1.2).

The following subsidiary vehicles and equipment are needed for mobilizing the CF task force, particularly for the Myaug Mya District, which will be a hub entity of the IMMP implementation organization.

Vehicles and Equipment of the CF Task Force

Equipment and material	Quantity	Reference
Vehicles for the CF Task Forces		
– Four Wheel Drive	2	one each for CF task force at DG office and Myaug Mya District Office
– Motor Bike	8	two each for CF task force at the reserved forests
– Motorized Boat (32 feet/ 27 Hp) with Spare Parts	5	one each for CF task force at the reserved forests and Myaug Mya district
– Motorized Boat (24 feet/ 21 Hp) with Spare Parts	8	two each for CF task force at the reserved forests
Equipment		
– Computer set with printer	6	one set each for CF task force at DG office, Myaug Mya District and the reserved forests
– Photo copier set	2	one set each for CF task force at DG office and Myaug Mya District
– GIS A with computer and printer	1	one set for GIS section, PSD
– GIS B (viewer)	6	one set each for CF task force at DG office, Myaug Mya district and the reserved forests
– GPS	8	two each for CF task force at the reserved forests
– Satellite Telephone with Antenna	6	one set each for CF task force at DG office, Myaug Mya District and the reserved forests

Equipment and material for public awareness activities will be supplied to the CF Task Force as part of the IMMP. The following table summarizes the planned equipment and material procurement for public awareness activities.

Equipment and Material for the Public Awareness

Equipment and material	Unit	Quantity	reference
Public awareness equipment			
Multi-media projector with monitor/ screen	set	5	each CF Task force at the reserved forest (extension center) and Myaug Mya District
Generator	set	5	- do -
Public awareness materials			
Leaflet for public awareness	sheet	100,000	All households, VPDCs, villages, schools, clinics, etc, in the reserved forest
Poster for public awareness	sheet	1,000	All villages, village tracts, VPDCs, schools, clinics, etc, in the reserved forest
Video for enlightenment	role	8	

During the planning stage, the approval based on the CFI will be obtained for the certification of user groups, such as for allocation of CF areas, preparation of CF management plans, drawing of CF maps, applying for CF certificates, and granting of CF certificates. Necessary equipment to support the duty of the CF task force is shown in the following table.

Field Survey Equipment for CF Planning

Equipment	Unit	Quantity	Reference
Planning equipment			
Forest survey equipment (compass, linear tape, height pole, etc.)	set	12	three set each for CF task force at the reserved forest (extension center)

2) Bylaw of CFI

As stated in the section 8.3.3 of this report, 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 bylaw of CFI will be developed in the course of the IMMP implementation, as rules and guidelines of the necessary sanction for all aspects of the CF implementation. The items planned to be covered in the bylaws of CFI are summarized in the following table.

Items of Bylaw of CFI

Activity	Item
CF Support and Management	Development of the FD organization for CF management and support Development of terms and reference of the FD CF organization Development of mandates for the staff of the FD CF organization Development of procedure for CF organization management and operations Development of procedures for coordination with relevant government offices
Extension	Preparation and implementation of CF promotion plans of township Preparation and implementation of the CF Public Awareness
CF Commencement	Development of procedures for CF promotion Development of procedures for CF user group formulation and CF area allocation Development of procedures for CF management plan preparation and CF certification
Technology Support	Development of procedures for CF seedling production and distribution Development of procedures for forestry technical guidance to CF user groups
Monitoring	Preparation of report forms for the CF monitoring by district and township FD offices Development of procedures for monitoring by FD CF organization
Patrolling	Development of procedures for patrolling and forest protection activities Development of system for patrolling among FD, CF user groups, and local authorities
CF Production	Development of system and procedure for sanction of CF production Preparation of registration forms for CF production Provision of issuing license for value added production under CF activities Development of system and procedure for CF benefits sharing mechanism
Information Updates	Development of system for updating CF management plans and CF certificates after certification
Others	Preparation of forms and development of system/procedure related to CF activities other than above Development of procedures for continual integration and development of the bylaw of CFI for the CF management

The bylaw of CFI should be developed into a national standard to complement CFI. Therefore, the draft bylaw considered in the course of the IMMP implementation 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

3) Terms of Reference of FD for CF management and CF user groups support

The CF task force for each of the reserved forest would serve as the frontline office to directly manage the specific implementation of the IMMP and support CF activities in general in the related reserved forest. Therefore, terms of reference for the CF task force or equivalent CF supporting organization have to be prepared.

Major works of CF management and support in accordance with CFI are summarized as follows.

CF Management and Support by FD Derived from CFI

Works not Covered by the Current CF Management and Support by FD
1) Support on formulation of CF user groups and planning of CF management plans
2) Allocation and delineation of CF areas
3) Technology support of CF activities
4) Managerial support of CF activities
5) Management of CF production including the sales voucher and the removal pass,

However, the following items are not covered in CF management and support currently provided by FD.

Works not Covered by Current CF Management and Support by FD

Items
1) Planning of new CF promotion,
2) Management and support of existing CF user groups and areas,
3) Patrolling of CF areas,
4) Monitoring CF activities, and
5) Reporting about CF activities, and activities of CF management and support
6) Sales voucher, removal pass and relevant administrative works for CF production

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. Charcoal production is currently prohibited by the instruction of the Ayeyawady Division. 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.

Figure 9.1 shows the implications of FD’s CF management and support system development.

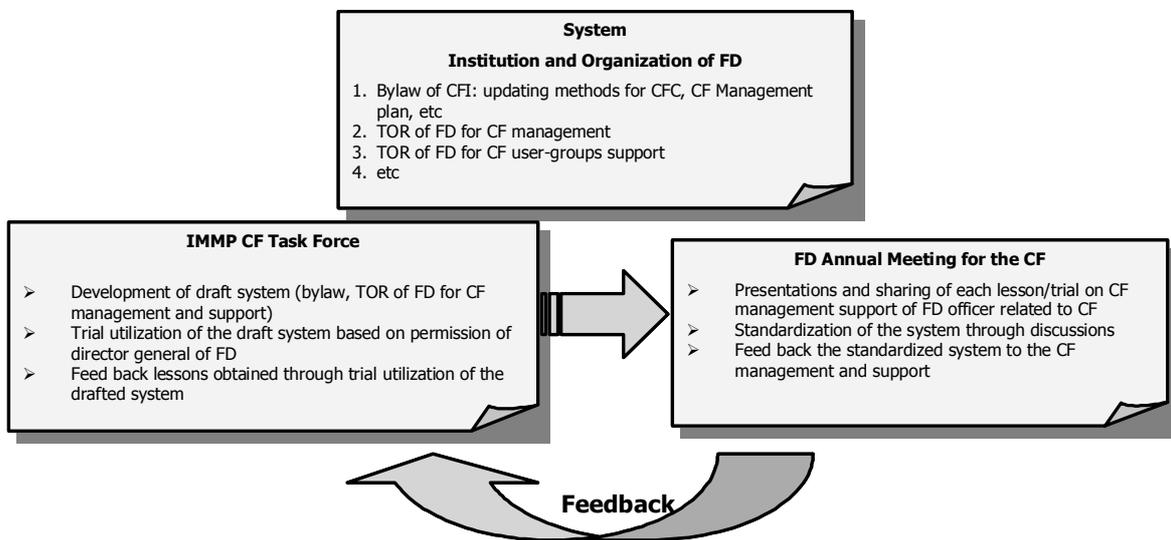


Figure 9.1 Implication of FD’s CF Management and Support System Development

(3) Improvement of Capabilities of FD Staff for CF Management and Support

Officers and staff assigned to the CF task force will be the primary target for improving CF support and management capabilities. On-the-job training will be applied for the capacity development of the FD staffs.

Furthermore, CF joint training, CF annual meeting, and IMMP annual meetings are planned to be conducted in the IMMP as part of the “Integration of Updated Information/Knowledge and Lessons Learned through the Implementation of the IMMP” described in section 9.3.4. They will serve as opportunities to strengthen the capabilities of the staff concerned for CF management and support

(4) 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 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. 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 mangrove 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

The construction and equipment procurement for one unit of a CF extension center and a FD mangrove nursery is summarized in the following table. A new CF extension center and FD nursery would only be constructed in Set San of the Pyindaye Reserved Forest. The remaining existing three nurseries would be renovated to function as a foundation for the mangrove rehabilitation and CF activities in the related reserved forest. For existing

nurseries, the renovation of existing facilities and construction or procurement of non-existing facilities would be conducted. The CF task force assigned to each reserved forest would be responsible for management and operation of the CF extension center and nursery under supervision of the CF Task Force at Myaung Mya District.

Unit of CF Extension Center and Nursery

CF Task Force	Unit	Q'ty	Reference
Nursery Facility			
– Nursery bed (mangrove)	ls	6	100,000 potted seedling x 6 beds
– Nursery bed (non mangrove)	ls	4	10,000 potted seedling x 4 beds
– Nursery office	ls	2	40 m2, one each for Officer and Staff
– Resident	ls	3	40 m2
– Kitchen	ls	1	20 m2
– Worker's hut	ls	20	30 m2 x 20 huts for 20 worker families
– Nursery road	ls	1	
– Warehouse	ls	2	Generator, Equipment
– Jetty	ls	1	
– Workshop	ls	2	Nursery production
– Water level gage	ls	1	
– Watch Tower	ls	1	15 m height
– Boat Dock with workshop	ls	1	boat maintenance
Extension Center			
– Main house	ls	1	160 m2
– Dormitory	ls	2	5 rooms x 4 beds x 2 houses
– Exhibition room	ls	1	Exhibition of CF activities record
– Natural nursery	ls	1	20,000 potted seedling
– Mangrove Seed/propagule production area	ls	1	500 m2 with seed storage
– Demonstration CF plantation	ls	2	500 m2
– Demonstration CF Agroforestry	ls	2	100 m2
– Demonstration CF aqua-agroforestry	ls	2	100 m2
– Demonstration CF Charcoal Kiln	pc	2	Aims to produce white charcoal for export
Equipment			
– Generator	pc	2	
– Seedling production equipment	set	1	
– Operation boat (17m class, FRP, 440hp)	set	1	technical assistance
– Engine boat (21 feet, 7 hp)	set	2	patrolling, extension
– Digital Camera	set	1	water resistance
– Computer set with printer	set	1	recording of CF activities
– Portable salinity meter and pH meter	set	1	recording of water salinity and pH

After the operation of the established FD mangrove CF extension center and nursery, the following work items are expected to be functionalized in the CF extension and nursery, in concurrence with other capacity development activities for FD CF management and support.

CF Management and Support Functions of CF Extension Center and Nursery

Activity	Work Item
CF Management and Support	Technology support of the CF activities for model CF user groups Manageable support of model CF user groups Support for monitoring and reporting activities of model CF user groups Proceeding for legalized CF production with the sales voucher Proceeding for legalized value added production Administration of CF activities based on the developed bylaw of CFI

9.3.3 Development of Integrated Forestry Technologies in the Delta

(1) Outputs

[Integrated forest technology of the delta is established through action research forest development]

The output of the plan is defined as above.

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 (including the natural forest operations). The resulting methods will be compiled as a manual for utilization in the field and for further integration of mangrove forestry technology.

(2) Establishment of Action Research Plantations

Mangrove forestry in the delta, particularly plantation and forest improvement operations, became prevalent from the beginning of the 1990s. The forestry technology practiced tends to be implemented and accumulated only by individuals who were in-charge of such activities, and is focused on fast growing species such as *Avicennia* species and *Sonneratia* species. Rehabilitation of a mangrove area enables local supply and conservation of mangrove vegetation, but at the same time has to fulfill the demands of the local people. The local demands include production of poles, fuelwood, material for charcoal production, or material for compost making, etc. for CF activities. For rehabilitation of mangrove vegetation, species-site matching with proper species adaptable for designated planting areas and planting objectives are required.

Activities for the establishment of the action research plantation (including natural forest operations) are composed of the following items:

- 1) Surveying and compilation of existing forestry technology in collaboration with experienced FD officers
- 2) Surveying, delineation and mapping of the action research plantation operation area
- 3) Formulation of action research plantation implementation plans
- 4) Provision of necessary equipment and materials for the action research plantation

- 5) Action research plantations in the IRM area in collaboration with experienced FD officers in the mangrove forestry

Activities for Action Research Plantation Establishment

Activity	Work Items
1) Survey and compilation of existing technology	<ul style="list-style-type: none"> - 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	<ul style="list-style-type: none"> - Survey the action research plantation target areas - Delineation of boundaries - Preparation of forest registration/stock maps
3) Formulation of plans	<ul style="list-style-type: none"> - 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	<ul style="list-style-type: none"> - Provision of necessary equipment (for seedling production, planting/tending operation) - Provision of necessary material (seeds, seedlings, etc.)

The following items are the proposed procedures for selection of the target area for action research plantation within a selected FD operation compartment.

- 1) Overall forest survey of the prioritized forest compartment for confirmation of the interpretation result of the aerial photo taken in February- March, 2002,
- 2) Delineation of the core zone, the buffer zone, and the multiple-use zone and estimation of the acreages of each area within the selected forest compartment,
- 3) Input ground level and vegetation data for each zone and delineate the target area,
- 4) Selection of annual action research plantation plan based on zoning and natural conditions, and
- 5) Preparation of annual action research plantation plans based on the selection.

The CF task force responsible for the action research plantation will undertake the work based on the mangrove management and planning map prepared under the present study.

(3) Action Research Forest Development for Integrated Forestry Technologies

The present study prepared introductory guidelines for the integration of forestry technology of the delta. Accordingly, in the IMMP phase I, detailed manuals for forestry technology in the delta regarding site-selection, nursery operations, planning, tending, etc for the various species have to be prepared through the action research that enables numbers of trials required for the integration of technology.

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)

Work Items of the above activities are shown in the following tables.

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 Kyakanwinpauk 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.

Activity of the Action Research Forest Development

Activity	Work Items
1) Production and diversification of plantation species	Preparation of seed/ proagule and seedling production action plans Collection and production of seeds and propagules Production of seedlings Seedling distribution
2) Action research plantation a. Plantation at fresh water areas low ground level Middle ground level High ground level Extreme high ground level b. Plantation at brackish/ saline water areas low ground level Middle ground level High ground level Extreme high ground level c. NFIO at brackish/ saline water areas low ground level Middle ground level High ground level Extreme high ground level	(headings a. to c. indicate the natural conditions of sites. Adequate forestry management methods will be chosen from headings (i) to (iii) below based on the natural conditions of concerned sites) (i) CMOA forest development - Preservation, wildlife conservation - Natural forest regeneration operations: climber cutting and clearing, pruning, thinning, regeneration treatments (assisted natural regeneration, enrichment planting, coppice, seed trees, etc.) and related tending operations) (ii) SMOA-1 forest development - Natural forest improvement operations: improvement felling (cutting, clearing, thinning, pruning), regeneration treatments (coppice, clear cut in strips, assisted natural regeneration, enrichment planting, seed tree etc.), and related forest stand improvement and tending operations - Plantation operations in SMOA-1: plantation establishment, especially regeneration treatments and related tending operations with desirable mangrove/ non-mangrove species and densities (iii) Coastal and/or river bank woodlots - High ground reforestation, surface stabilization/ re-vegetation, low ground / wave action stabilization - Coastal stabilization/reforestation in coast lines of the critical areas (CMOA, SMOA-1)
3) Tending activities of plantations	- Tending activities after the plantation establishment and before harvesting
4) Forest management	- planning methods and procedures - monitoring and evaluation methods and procedures - technology extension methods and procedure

(4) 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
2-1 Research Activities	Setting plantation/NFIO plans including trial forestry technology
	Setting sample plots for each natural condition category
	Monitoring survival rate and growth
2-2 Integration of Results	Compilation of the research results as forestry technology manual
	Publishing the compiled integrated forestry technology manual
2-3 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

9.3.4 Integration of Updated Information/Knowledge and Lessons Learned through the Implementation of the IMMP

(1) Outputs

[CFI management and support system, mangrove rehabilitation, and project management developed in the IMMP phase I is standardized]

The output of the plan is defined as above.

As stated earlier, written bylaws for CFI have not yet been provided for the actual management by FD township officers and staffs. Currently, 13 divisions/states in Myanmar are undertaking the CF management and support so that the lessons regarding CF should be shared among charged FD offices and officers. The results should be fed back to CF management and support activities at each site. The continual repetition of practices, discussions and feedbacks will allow FD to standardize the CF management and support system.

In Myanmar, mangrove vegetation exists in the three divisions/states of Ayeyawady, Tanintheryi, and Yakhine. However, the vegetation is seriously threatened and in danger of extinction from the area. Thus, the achievements in mangrove rehabilitation of the IMMP phase I have to be continued to succeeding phases and also shared by mangrove rehabilitation efforts in other areas and organizations.

A majority of work items under the IMMP are continuous. At the same time, the methods of the work items have to be improved year by year. Thus, a project cycle management for the IMMP needs to be reviewed, integrated, and revised for better practices to be adopted during the further IMMP periods.

(2) CF Joint Training

CFI issued in 1995 is new legislation, so the application method is not yet mature enough to provide for various natural and socioeconomic conditions to be adopted for different areas or regions. The IMMP is intended to develop a system about how to apply the CFI, especially in the delta area. Thus, the visit and understanding of other CF areas will accelerate the maturity of CFI as legislation. The following items are planned for implementation of the joint training trip.

- 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

The trip is recommended to take place once a year as an ordinary activity of FD. Planned work items of the above activities 1), 2) and 3) are described in the following table

Work Items of the Plan for CF Joint Training

Activity	Work Item
1) CF Joint Training Plan Objective: Component: Target Person: Target FD offices of state/division for visiting: Target FD offices of state/division for inviting:	Sharing information, lessons, and findings related to CF management and support at the field level 5 days visits to other CF implementation areas and inviting FD staffs from other states/divisions FD CF task Force officers (5 person per year) 1st year Shan State, 2nd year Mandalay Division, 3rd year Sagaing Division, 4th year Magway Division, 5th year Yakhine State Three state/division FD offices per year 5 officers per state/division x3 undertaking CF management and support

(3) Annual Meeting

The following three activities are planned for the Integration Plan for the project impact of the IMMP.

- 1) CF annual meeting
- 2) Mangrove rehabilitation annual meeting
- 3) IMMP annual meeting

Planned work items of the above activities 1), 2) and 3) are described in the following table.

Work Items of the Plan for Annual Meeting

Activity	Work Item
1) CF Annual Meeting Objective: Target: Component: Period: Duration:	Stabilization of the CFI management and support system Director General, division and district officers (assistant director) of FD undertaking CF management and support Holding a workshop for: - sharing lessons about CF management and support - sharing problems about CF management and support - discussions about the bylaw of CFI applied - revision of the bylaw of CFI based on discussions - award of district officers/CF user groups for development of model sustainable CF user groups Once a year One day
2) Mangrove Rehabilitation Annual Meeting Objective: Target: Component: Period: Duration	Nation wide mangrove rehabilitation Director General, and divisional and district officers of the Yakhine State and the Tanintharyi Division Holding a workshop for: sharing lessons about mangrove rehabilitation sharing problems about mangrove rehabilitation discussions about technology of mangrove rehabilitation applied award of district officers for development of model mangrove rehabilitation area Once a year One day
3) IMMP Annual Meeting Objective: Target: Component: Period: Duration:	Summarizing activities and lessons for feeding back to activities for the following year Director General, Central and regional cooperation committee members, CF Task Force Holding a workshop for: - sharing lessons about IMMP implementation - sharing problems about IMMP implementation - discussions about IMMP implementation - revision of IMMP implementation for the following year Once a year One day

9.4 IMMP Phase II: Extension Period

The components of the phase II can be classified into the following three plans.

1. Mangrove Extension and Information Center Development Plan
2. CF Extension and Dissemination Plan
3. FD Plantation Establishment Plan

9.4.1 Development of Mangrove Extension and Information Center

Mangrove rehabilitation is one of the highest priorities in Myanmar for immediate execution, not only for improvement of natural and socioeconomic conditions, but also for mitigation of natural disasters such as cyclones, which cause tremendous damage to people and infrastructure in coastal areas. However, currently there are no facilities or organizations to specifically tackle the mangrove rehabilitation in Myanmar. The mangrove extension and information center would be a technical and managerial center of mangrove rehabilitation activities/projects to be undertaken by FDs at Yakhine, Tanintharyi and Ayeyawady state/divisions.

(1) Output

[Mangrove rehabilitation is promoted among rehabilitation activities/projects in Ayeyawady, Yakhine, and Tanintheryi state/divisions with the mangrove extension and information center as a core]

The output of the plan is defined as above.

The center would primarily contribute 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.

(2) 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 (see Section 10.1.1(3) for details) is planned to be established as a project management organization from the IMMP phase II and thereafter. The Ayeyawady CF Mangrove Division located in Pathein would be charged with constructing and operating the mangrove information and education center under the authority of the CF Mangrove Division Headquarters 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

A draft plan for construction of the mangrove information and education center is shown in the following table.

Construction Plan for the Mangrove Information and Education Center

No.	Description	Function	
1	Land Preparation		1 ha (complex)
2	Main building (classroom and exhibition room)	Training room 1 & 2 Exhibition room Officer room Staff / Administration room Computer room Garage	20 x 50 m
3	Dining hall	Dining room Kitchen Storage Water Tank	12 x 15 m 50 m ³
4	Trainee dormitory	Bed room 20 x 2 person	
5	Gravity water tank		0.5 m ³
6	Water reservoir	Irrigation for demo non-mangrove nursery	20 x 20 m
7	Internal Road A	Vehicle	400 m
8	Internal Road B	Passage	400 m
9	Internal Road C	Passage	800 m
10	Water distribution system		
11	Mangrove demonstration garden	Natural nursery Mangrove plantation demonstration plantation Seed and propagule orchard Seed storage	1ha (vegetation area)

(3) 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

(4) Operation and Management

Planned work items for the operation and management of the mangrove extension and information center by the Ayeyawady CF Mangrove Divisions 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

For trainings and mangrove related information dissemination, the mangrove information and education center is proposed to practice the following operations based on the target participants. The expected target participants are FD staff, CF user group members, students, women association members, and local authorities. Local authorities should cover personnel from the Peace and Development Council, the Myanmar Agriculture Service, and the Fishery Department at division, district, township and village tract levels, respectively. The operation aims to let participants understand the functions of mangrove vegetation and take the necessary actions for mangrove rehabilitation.

Operation of Trainings/ Mangrove Related Information Dissemination

User	Function	Period
1. Officers of FD	Basic technology training of mangrove	2 weeks x 2 times /year
2. Staffs of FD	- do -	1 month x 2 times /year
3. CF user groups	Mangrove rehabilitation	5 days x 8 times /year
4. Woman's association	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

(5) Institutional Arrangements

The Ayeyawady CF Mangrove Division would be responsible for the management and operation of the mangrove extension and information center under the supervision of the headquarters and in coordination with relevant ministries and departments. The budget for construction, operation and maintenance should be allocated from the project budget of the CF Mangrove Division.

9.4.2 CF Extension and Dissemination

In principle, the extension of model CF user group activities will be conducted by the same procedure as for phase I: Foundation Period based on developed model of sustainable CF activities.

(1) Output

[Number of model sustainable CF user groups increases to 100 through CF extension]

The output of the plan is defined as above. During the phase II period, 80 new model CF user groups are planned to be formulated.

(2) Preparation of CF Extension Plans

Planning of the CF extension and promotion for the phase II Extension Period would be mainly conducted by the Myaung Mya CF Mangrove Division in collaboration with CF Mangrove Divisions established at each reserved forest. Planned work items for the preparation of CF extension plans are summarized in the following table

Work Items for Preparation of CF Extension Plan

Activity	Work Item
Preparation of CF Extension Plan	Setting target areas/villages for the CF extension and promotion Preparation of budget and five/annual action plans

(3) Public Awareness

To develop 80 new model CF user groups, enlightenment of adjacent villages/ villagers on the existing model CF user groups would be conducted by CF Mangrove Divisions at each reserved forest. Public awareness raising will be conducted not only to the potential target CF user groups, but also to local authorities who are influential to mangrove management and socio-economic activities in the reserved forest. Planned work items for the public awareness raising are summarized in the following table.

Work Items for Public Awareness Raising

Activity	Work Item
Public Awareness	Invitation of adjacent villager to model CF user groups Invitation of government officers related to mangrove rehabilitation

(4) Organization of CF User Groups (Proceeding of CFI Sanction)

Based on raised levels of public awareness, new model CF user groups would be initiated in accordance with the CFI sanction by guidance and support of CF Mangrove Divisions at each reserved forest. Planned work items for the organization of CF user groups are summarized in the following table.

Work Items for Proceeding of CFI Sanction

Activity	Work Item
Proceeding of CFI Sanction,	Support organization of CF user groups Allocation of CF areas Support preparation of CF management plan Development of CF production plans Granting of CF certificates

(5) Support to CF User Groups

After establishment of CF user groups and certification of CF areas, the continual provision of support to the CF user groups to ensure continuation of CF activities is required by the CF Mangrove Division 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

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

9.4.3 FD Plantation Establishment

FD plantations would be implemented based on the forestry technology already developed during the phase I

(1) Output

[Expansion of FD plantation areas based on forestry technology established in the delta during the phase I foundation period]

The output of the plan is defined as above.

(2) Survey, Mapping and Planning

Preparation for FD plantation establishment in the phase II Extension Period would be conducted by CF Mangrove Divisions of each reserved forest under the supervision of the Myaung Mya CF Mangrove Division. The planned work items for the preparation of FD plantation establishment are summarized in the following table.

Work Items for Preparation of FD Plantation during Phase II Extension Period

Activity	Work Items
1) Activity by natural condition category	Mangrove forestry work items
Survey, Planning and Mapping	Forest survey of the phase II FD plantation target areas Preparation of forest registration/stock maps of the target area Delineation of boundaries Preparation of the plantation plan Preparation of the seed/propagule collection and production plan Preparation of seedling production plan Preparation of planting and tending plan

(3) Plantation Establishment

After preparation of implementation plans, the actual plantation establishment would be conducted by direct management of the CF Mangrove Divisions of each reserved forest. Planned work items for the plantation establishment are summarized in the following table.

Work Items of FD Plantation Establishment during Phase II Extension Period

Activity	Work Items
Seedling Production	Preparation of seed/propagules and seedling production action plans Collection and production of seeds and propagules Production of seedlings Seedling distribution
Plantation	Land preparation Planting (Natural Forest Operations)

(4) Tending and Protection

Tending and protection activities after the plantation establishment would also be conducted by direct management of the CF Mangrove Divisions of each reserved forest. Planned work items for the tending and protection activities are summarized in the following table.

Work Items for Tending and Forest Protection during Phase II Extension Period

Activity	Work Items
Tending activities	- Replanting, patching - Weeding - Pruning and thinning up to harvesting
Forest protection activities	- Patrolling against illegal activities and encroachment - Fire control and protection - Pest control and protection

(5) Monitoring and Evaluation

Planned work items for the monitoring and evaluation activities are summarized in the following table. The results of monitoring and evaluation would be fed back for modification of FD plantation operations for the following year.

Work Items for Monitoring and Evaluation during Phase II Extension Period

Activity	Work Items
Monitoring and Evaluation	- Monitoring of survival rate and growth performance - Recording of progress, quality/quantity control - Preparation of monitoring report - Revision of implementation plans for the succeeding year

9.5 IMMP Phase III: De-centralization Period

The components of the phase III can be classified into the following two plans.

1. CF Extension and Dissemination
2. FD Plantation Plan

9.5.1 Full Implementation of CF Extension and Dissemination

(1) Output

[All settlements in the reserved forests are engaged in sustainable community forestry]

The output of the plan is defined as above.

After CF certification, the CF user group members possess land use rights even inside the reserved forest. The output implies legalization of the current encroachers and settlements inside the reserved forests. Mangrove rehabilitation and livelihood improvement through sustainable CF activities would be conducted in all applicable CF areas inside reserved forests.

(2) Preparation of CF Extension Plans

Planning of the CF extension and promotion 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. The work items planned for the preparation of CF extension plans are summarized in the following table.

Work Items for Preparation of CF Extension Plan

Activity	Work Item
Preparation of CF Extension Plan	Setting target areas/villages for the CF extension and promotion Preparation of budget and five/annual action plans

(3) Public Awareness

To generate more CF user groups throughout the compartments subject to CF operation, public awareness raising would be conducted in phase III in the same manner as in phase II. The planned work items for the public awareness raising are summarized in the following table.

Work Items for Public Awareness Raising

Activity	Work Item
Public Awareness Raising	Enlightenment of adjacent villagers about mangrove rehabilitation and CF Enlightenment of related government officers about mangrove rehabilitation and CF

(4) Organization of CF User Groups (Proceeding of CFI Sanction)

Organization of CF user groups by proceeding CFI sanction would be conducted in the same manner as in phase II. Planned work items for the organization of CF user groups are summarized in the following table.

Work Items for Proceeding of CFI Sanction

Activity	Work Item
Proceeding of CFI Sanction	Support organization of CF user groups Allocation of CF areas Support the preparation of CF management plans Development of CF production plans Granting of CF certificates

(5) Support to CF User Groups

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. The planned work items for supporting CF user groups are summarized in the following table.

Work Items of Support to CF User Groups

Activity	Work Item
Forestry Technology	Seeding Supply Technical and managerial technology supports for CF activities Technical and managerial supports 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 supports 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

9.5.2 FD Plantation Establishment

(1) Output

[All FD plantation areas in the reserved forest maintain production through rotational operations]

The output of the plan is defined as above.

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.

(2) Survey, Mapping and Planning

Preparation for FD plantation establishment in phase III would be conducted in the same manner as phase II by the CF Mangrove Divisions of each reserved forest under the supervision of the Myaung Mya CF Mangrove Divisions. The planned work items for the preparation of FD plantation establishment are summarized in the following table.

Work Items for Preparation of FD Plantation during Phase III Extension Period

Activity	Work Items
1) Activity by natural condition category	Mangrove forestry work items
Survey, Planning and Mapping	Forest survey of the phase II FD plantation target areas Preparation of forest registration/stock maps of the target area Delineation of boundaries Preparation of the plantation plan Preparation of seed/propagule collection and production plan Preparation of seedling production plan Preparation of planting and tending plan

(3) Plantation Establishment

The plantation establishment would be conducted by direct management of CF Mangrove Divisions at each reserved forest in the same manner as in phase II. The planned work items for plantation establishment are summarized in the following table.

Work Items of FD Plantation Establishment during Phase III Extension Period

Activity	Work Items
Seedling Production	Preparation of seed/ proagule and seedling production action plans Collection and production of seeds and propagules Production of seedlings Seedling distribution
Plantation	Land preparation Planting (Natural Forest Operations)

(4) Tending, Protection, and Harvesting

Tending and protection activities 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. The planned work items for tending, protection, and harvesting are summarized in the following table.

Work Items for Tending and Forest Protection during Phase III Extension Period

Activity	Work Items
Tending activities	- Replanting, patching - Weeding - Pruning and thinning up to harvesting
Forest protection activities	- Patrolling against illegal activities and encroachment - Fire control and protection - Pest control and protection
Harvesting/ production activities	- Implementation of rotational felling - Processing of felled woods - Selling of the products

(5) Monitoring and Evaluation

The planned work items for monitoring and evaluation activities are summarized in the following table. The results of monitoring and evaluation would be fed back into the implementation of FD plantation operations for subsequent years.

Work Items for Monitoring and Evaluation during Phase III Extension Period

Activity	Work Items
Monitoring and Evaluation	- Monitoring of survival rate and growth performance - Recording of progress, quality/quantity control - Preparation of monitoring report - Revision of implementation plans for the succeeding year

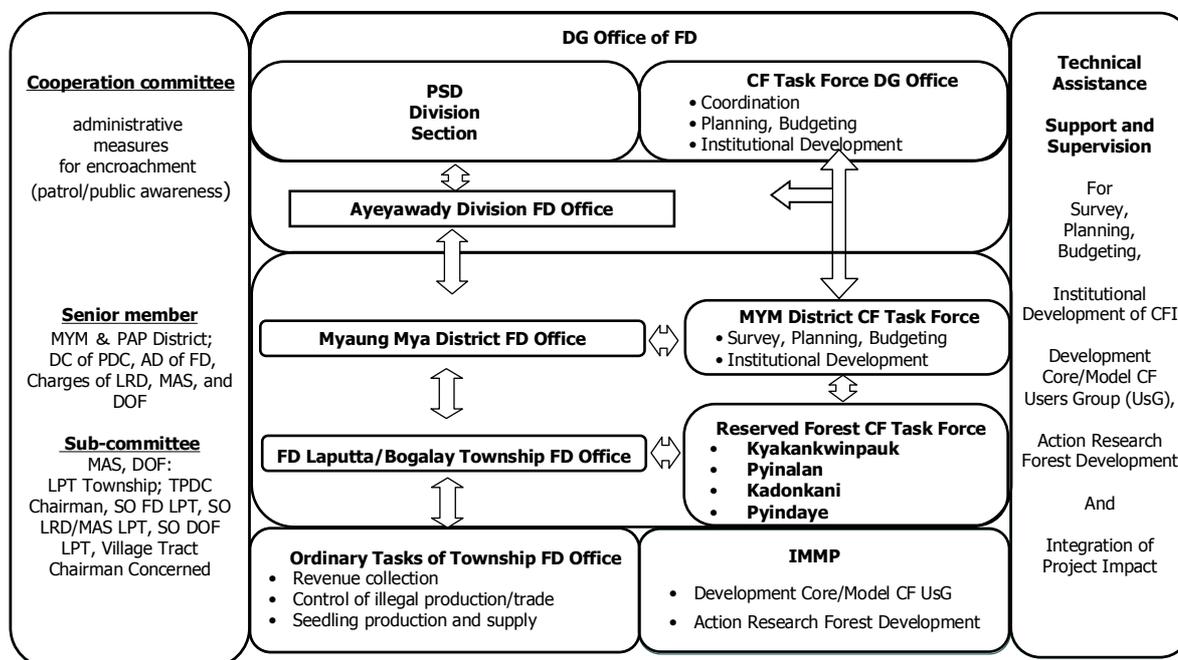
CHAPTER 10 IMPLEMENTATION PLAN OF IMMP

10.1 Institutional Framework of IMMP

10.1.1 Overall Framework

(1) Integration of Concerning Stakeholders

Currently, in Myanmar, mangrove conservation/rehabilitation is one of the highest prioritized activities/projects that is regarded to be executed immediately for not only improvement of natural and socioeconomic conditions but also mitigation of natural disasters caused by cyclones, floods, etc., which are causing tremendous damage to the people in the coastal area. For such broader perspectives and needs, it is not possible to manage and conserve mangrove forests only by the Forest Department (FD). Considering such circumstances, a practical collaboration system is essential for implementation of the IMMP by the Community Forestry (CF) user group, FD and the local authorities such as the Peace and Development Council at village tract, township, district, and division levels. In the IMMP, a practical collaboration system will be undertaken through formulation of regional and central cooperation (steering) committees. Figure 10.1, Organization Plan, shows an image of the structure including regional and central cooperation (steering) committees.



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

Figure 10.1 Organization Plan

Roles of the stakeholders according to IMMP phases are summarized in the table below. FD and CF user groups are the two major stakeholders responsible for implementation of IMMP, whereas, local authorities serve to support the implementation stakeholders. External support from donors and outside agencies is expected to diminish gradually and terminate in phase III.

Roles of Major Stakeholders of IMMP

Component of IMMP	Stakeholders			
	FD	User Group	Local Authority	External Support
Phase I Foundation Period				
Establishment of Sustainable Model of CF User Group	++	++	+	+
Capacity Development of FD for CF Management and Support	++	++	-	+
Establishment of Integrated Forest Technology of the Delta through Action Research Forest Development	++	+	-	+
Integration of the Project Impact	++	+	+	+
Phase II Extension Period				
Extension of Sustainable Model of CF User Group	++	++	+	+
Mangrove Information and Extension Center	++	+	+	+
Phase III De-centralization Period				
Extension of Sustainable Model of CF User Group to Whole Target Area	++	++	+	-

Note: ++ responsible, + support, - not related

(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 for the project.

During phases II and III, the IMMP would be conducted by a CF Mangrove Division. The CF Mangrove Division is recommended to formulate a steering committee instead of the cooperation committee based on authorization of the prime minister. The scheduled central and regional cooperation committee members are described in the following table.

At the central level, the central cooperation committee is planned to be led by the director general of FD with participation of concerned departments and ministries indicated in the following table. The Environmental Special Task Implementation Group No 5, of the Natural Environmental Conservation Committee under the Natural Commission for Environmental Affairs (NCEA) is expected to be a member of the central cooperation committee, since the special task implementation group covers environmental conservation of coastal areas, including mangrove ecosystems.

At the regional level, the regional cooperation committee is planned to be led by the district Peace and Development Council (DPDC) which is necessary to complement and fulfil the implementation responsibility of FD. The regional cooperation committee has two structures and is composed of members from concerned agencies as indicated in the following table. The senior regional committee would be composed of district level agencies. Under the responsibility of the senior regional committee, sub regional committees are formed at the township level. In the sub regional committees, village tract Peace and Development Councils (VTPDC) / Village Peace and Development Councils (VPDC) of the target project area would serve as observers of the committees.

Members of Central and Regional Cooperation Committee

Central Cooperation Committee
at Yangon
Forest Department, Ministry of Forestry (MOF)
Planning and Statistics Department, MOF
Department of Fishery, Ministry of Livestock and Animal Husbandry (MLAH)
Myanma Agriculture Services, Ministry of Agriculture and Irrigation (MOAI)
Ministry of Forestry
Environmental Special Task Implementation Group No 5 (Coastal Area),
Sub Regional Cooperation Committee
Senior Regional Committee at District level
Myaung Mya, Pyar , Pon Districts Peace and Development Councils (DPDC)
Myaung Mya, Pyar , Pon Districts Forest Department
Myaung Mya, Pyar , Pon Districts Department of Fishery, MLAH
Myaung Mya, Pyar , Pon Districts Myanma Agriculture Services, MOAI
Sub Regional Committees at Township Level
Laputta Township Peace and Development Council (TPDC)
Pyin za lu Sub-township Peace and Development Council
Laputta Township Forest Department
Laputta Township Department of Fishery, MLAH
Laputta Township Myanma Agriculture Services, MOAI
Bogalay Township Peace and Development Council
Bogalay Township Forest Department
Bogalay Township Department of Fishery, MLAH
Bogalay Township Myanma Agriculture Services, MOAI

Note: The name “cooperation committee” will be changed to “ steering committee” after the formulation of the steering committee in phase II.

Proposed duties and roles of the cooperation committee are shown in the following table.

Duties and Roles of Cooperation Committee

Central Cooperation Committee
<ul style="list-style-type: none"> • Sharing activities and progress of IMMP • Giving necessary instructions to district and township regional committee members
IMMP Regional Cooperation Committee
District level at Myaung Mya
<ul style="list-style-type: none"> • Sharing activities and progresses of IMMP • Giving necessary instructions to township regional committee members • Evaluation and permission on IRM of FD
Township level at Laputta and Bogalay
<ul style="list-style-type: none"> • Sharing activities and progress of IMMP • Evaluation and permission on IRM of FD • Giving necessary instructions to village tracts peace and development council and police station by TPDC • Taking necessary actions to encroachers or illegal activities in the reserved forest • Giving necessary technology support to the IMMP by the township DOF and MAS offices

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.

(3) Extension and De-centralization of Developed Foundation as the CF Mangrove Division (Draft)

The CF Mangrove Division is proposed 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.

In Myanmar, the CF Mangrove Division obtains additional budget and support from the Government for implementation of the project. Commencement of the CF Mangrove Division enables strengthening 1) CF management and support, and 2) mangrove forest management, by FD.

Upgrading of the project management organization for IMMP is crucial, since in the course of IMMP implementation, the number of CF user groups that have to be managed and supported by FD will exceed 200. The current capacity of the district and/or township FD offices is not enough to support the increased number of CF user groups.

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 office to be the project management organization for phase II and thereafter.

The headquarters of the CF Mangrove Division would be set at the Director General's Office of FD in Yangon. Under the headquarters, the CF Mangrove Division of Ayeyawady Division would be established for the implementation of the IMMP phases II and III.

(4) Linkage of Mangrove Rehabilitation as the CF Mangrove Division (Draft)

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 CF Mangrove Division Offices including charged officers for each office is shown in Figure 10.2.

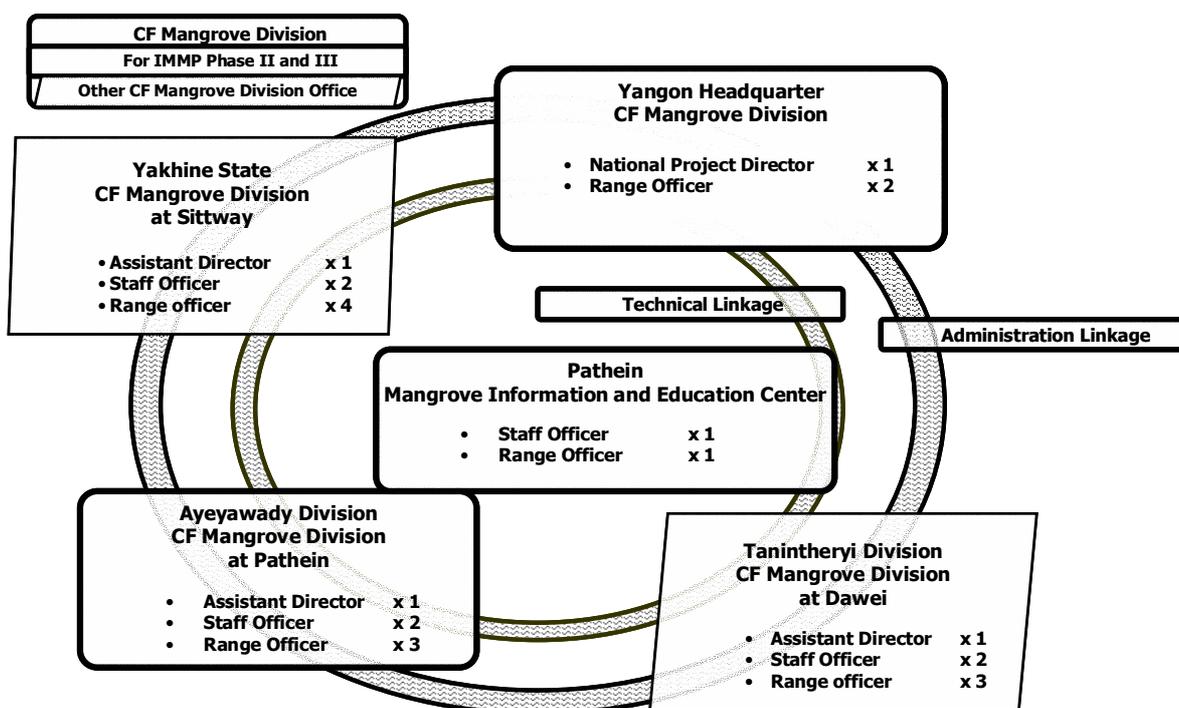


Figure 10.2 Draft Organization of CF Mangrove Division

(5) Realization of the FD Self-Reliance Concept and the Fading of External Assistance

For achieving the self reliance implementation of the IMMP Phase II and thereafter by FD, external assistances to IMMP should be diminished year by year during the phase I. The following institutional framework is proposed to be taken for realization of the FD self reliance operation.

- 1) To designate CF task force members as fulltime charged for implementation of the IMMP Phase I throughout five year implementation period. The fulltime members should be selected and assigned to each task force office as a key role of the implementation.
- 2) To clarify tasks of each designated fulltime CF task force members. The member will be able to deepen the charged works. Categorization of the works would be setup during the preparatory stage of the IMMP Phase I. The work category would cover all of the IMMP implementation aspects such as a) planning, b) budgeting, c) monitoring and reporting, d) bylaw of the CFI, e) application of the drafted bylaw for development model CF user group, f) design, procurement, construction and operation, g) Action Research Forest Development and h) integration of the project impact.
- 3) To employ a cost sharing concept for the implementation of the IMMP Phase I among stakeholders including technical assistance.
- 4) To focus the fulltime member of the CF task force for the technology transfer and technical assistance. Therefore, accumulation of knowledge and experience within each CF task force will be possible and, quality and quantity base of the assistance will be decreased annually.

Based on the above institutional framework the commencement of the CF Mangrove Division would pave the way based on such capacity development, for the self effort of FD and Myanmar supporting agencies through internal budget and facilities. A procedure for ensuring implementation of IMMP phase I by FD (CF Mangrove Division) is summarized in the following table.

**Procedure of the IMMP Phase I Foundation for Ensuring Implementation of IMMP
Phase II Extension Period by Self Reliance of FD**

Project Activities	Role of Forest Department	Role of External Technical Assistance
1. Preparatory Activities	Implementation of preparatory activities.	1st, 2nd and 3rd year: Technical Assistance of all activities including monitoring and evaluation. 4th and 5th year: Supervising, advice and consultation.
2. Establishment of sustainable model CF user groups	Planning, extension/public awareness, formulation, management and support of model CF. Procurement of supply.	
3. Capacity development of FD for CF management and support	Planning, preparation and trial application of draft CF management and support system. Procurement of supply	
4. Establishment of integrated forestry technology in the delta	Planning of survey, planning, implementation and monitoring of the works. Procurement of supply.	
5. Integration of the project impact	Planning, coordination and operation of the workshops, annual meetings, and trainings.	

10.1.2 Project Implementation Organization for Phase I

The CF Task Force will be formulated by FD that will be the sole responsible body for the implementation of the IMMP phase I. Figure 10.3 indicates the organizational chart of FD for IMMP implementation. The CF activities are currently conducted under the full responsibility of the assistant director at the FD district office and the assistant director has the responsibility to report and receive instructions from the FD division office and the director general's office. Therefore, the organization setup of the IMMP is developed to enable favorable correlation between the CF task force and existing FD organizational structure for CF management.

The number of officers/staff of the CF task force is estimated based on work loads of the IMMP phase I. During phase I, the CF Task Force at each reserved forest will undertake all implementation activities i.e. public awareness, promotion/guidance for CF user group formulation, and management and support of CF activities.

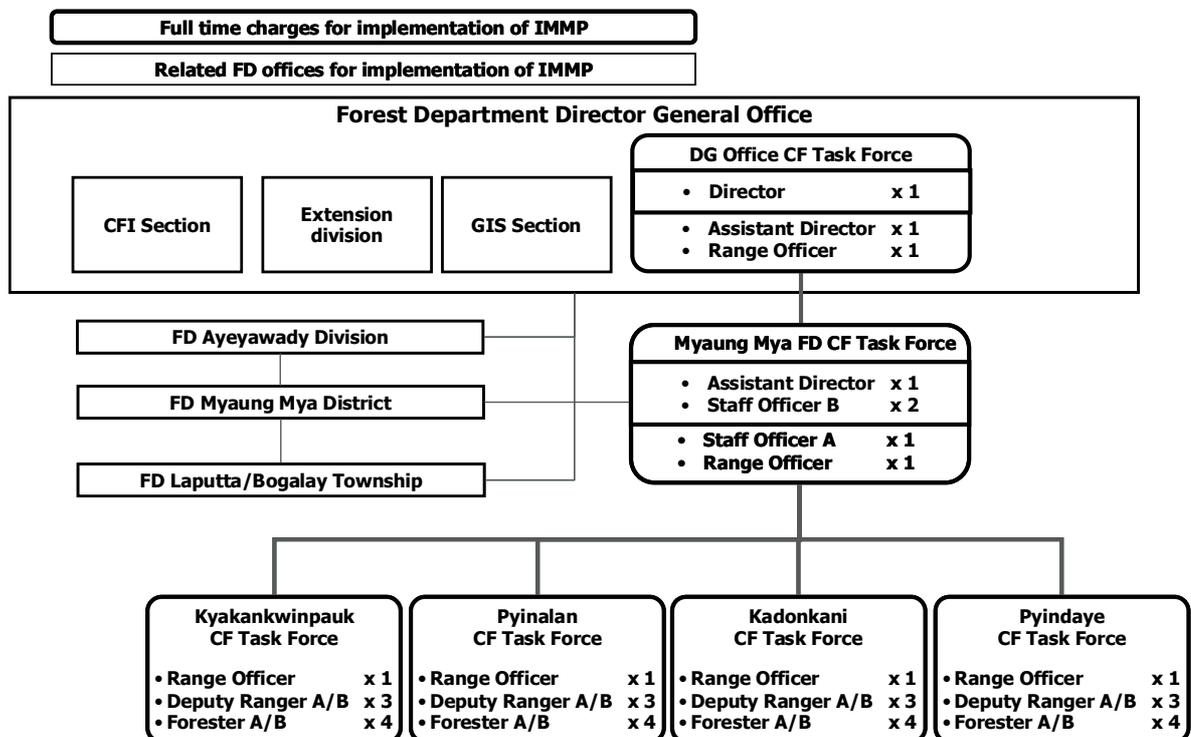


Figure 10.3 Organization Chart of the Forest Department for IMMP

The following table describes the jobs of planned officers/staff in accordance with full time or part time engagement to the IMMP. In total, 19 fulltime officers/staff are charged to the IMMP (one assistant director, two range officers, eight deputy range officers, and eight foresters), and 20 part time officers/staff (one director, one assistant director, two staff officers, four range officers and deputy range officers and eight foresters).

Planned FD Officers/Staff for the CF Task Force

Officer of the CF Task Force	Full/Part	Works
DG Office CF Task Force		
- Director x 1	Part	Responsible under the director general, cum FD Ayeyawady Director
- Assistant Director x 1	Full	Coordination, Planning and Recording
- Range Officer x 1	Full	Coordination, Planning and Recording
Myaung Mya FD CF Task Force		
- Assistant Director x 1	Part	Responsible implementation of the IMMP I, cum FD Myaung Mya assistant director
- Staff Officer A x 1	Full	Responsible implementation of the IMMP
- Staff Officer B x 2 (Laputta and Bogalay)	Part	Responsible implementation of the IMMP I in Laputta and Bogalay respectively, cum FD Laputta or Bogalay staff officers
- Range Officer	Full	Implementation of the IMMP I
CF Task Force of Reserved Forest		
- Range Officer x 4 (one for each reserved forest)	Part	Implementation of the IMMP I of each reserved forest, cum FD Laputta and Bogalay range officers
- Deputy Range Officer A x 8 (two for each reserved forest)	Full	Four charges to community forestry and another four for action research forest development under the IMMP I
- Deputy Range Officer B x 4 (one for each reserved forest)	Part	Charges for management and support of CF under the IMMP I, cum FD Laputta or Bogalay Staff
- Forester A x 8 (two for each reserved forest)	Full	Four charges to community forestry and another four for action research forest development under the IMMP I
- Forester B x 8 (two for each reserved forest)	Part	Charges for management and support of CF under the IMMP I, cum FD Laputta or Bogalay Staff

10.1.3 Project Implementation Organization for Phases II and III

As stated earlier, it is proposed to formulate the CF Mangrove Division and the Ayeyawady CF Mangrove Division is planned to be the responsible office for implementation of the IMMP phases II and III. An organizational structure of CF Mangrove Division related to the IMMP is indicated in the Figure 10.4.

The Ayeyawady CF Mangrove Division is responsible for rehabilitation of all the mangroves in the division and construction, operation and management of the mangrove information and education center under the IMMP Phase II and III. The Myaung Mya CF Mangrove Division is charged for implementation of the IMMP Phase II and III together with CF Mangrove Division charged to each reserved forest. The CF Mangrove Division charged to each reserved forest belongs to the Myaung Mya CF Mangrove Division.

The number of officers/field staff charged to the IMMP phases II and III is estimated based on work loads of the IMMP. The CF Mangrove Division at each reserved forest will be composed of two teams namely, a CF user group formulation team and a management and support team. The field staff number of CF management and support team is based on number and frequency of visits to CF user groups by the forester. The average visit to CF user groups was estimated as two days per month per forester. The number of staff in the

figure was calculated based on an assumption that one forester of CF Mangrove Division charged to a reserved forest works for 10 CF user groups for management and support of CF activities.

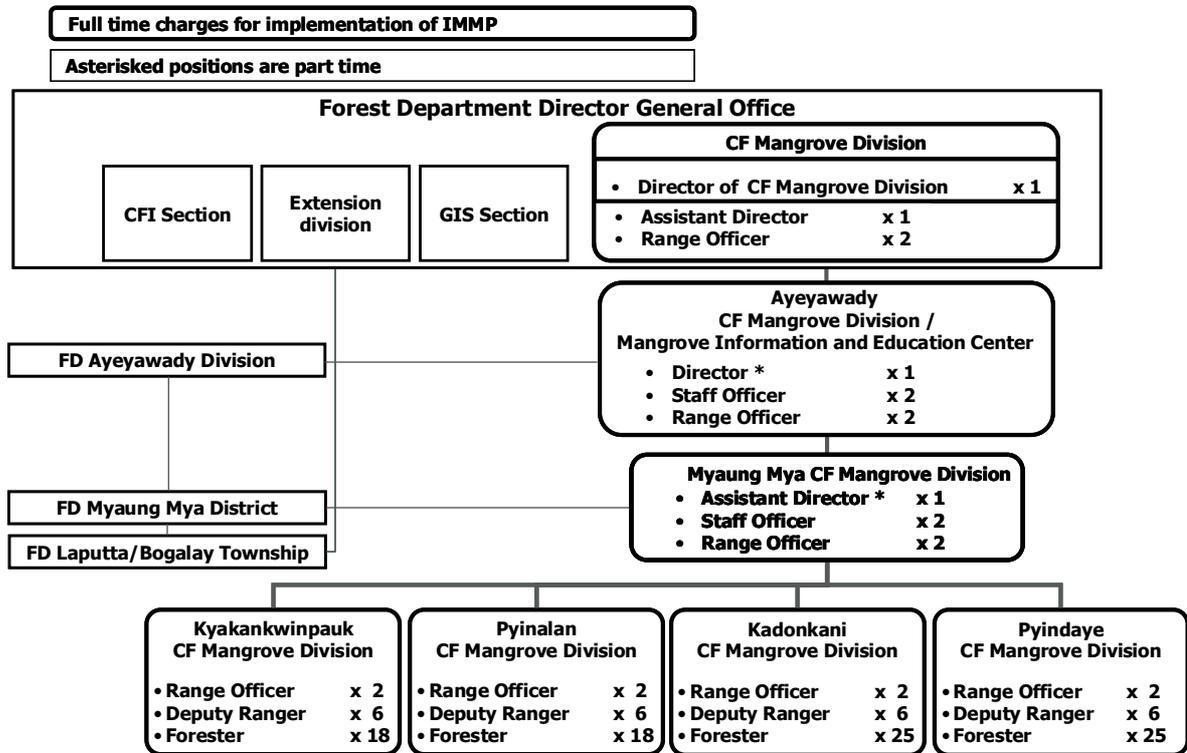


Figure 10.4 Organization Chart of the CF Mangrove Division for IMMP

10.2 Implementation Schedule

10.2.1 Phase I

(1) General Perspective

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.

(2) 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.

1) Setting the Project Implementation Organization

Every fiscal year, starting the annual activity, the setup of the organization of each CF task force office at the director general's office, the Myaung Mya District, and at the reserved forests would be confirmed. Also, staffing of the CF task force will be confirmed at the

same time.

The confirmed annual FD organization for the IMMP is informed to cooperation committee members at central, district and township levels. In relation to the information about the updated FD organization of the IMMP, each cooperation committee member would be also confirmed.

2) Confirmation of FD Annual Plan

Activities under the IMMP have to be a part of the FD annual plan and have to keep a consistency with the FD annual plan. The IMMP annual action plan has to be prepared in accordance with confirmation about the following annual plans of FD.

- i) Myaung Mya and Pyarpon District Forest Management Plan,
- ii) Laputta and Bogalay Township Annual Forest Management Plan,
- iii) Annual CF Promotion Plan,
- iv) Annual Charcoal Production Plan, and
- v) Annual Plan of Integrated Natural Resource Management (IRM).

3) Preparation of the IMMP Annual Action Plan

The actual annual activity of the IMMP will be implemented based on the IMMP annual action plan that will be prepared in the course of implementation of the IMMP. The draft annual action plan should be prepared by Myaung Mya CF task force in collaboration with the four reserved forest CF task forces. The draft will be finalized through discussions with the Ayeyawady Division FD office and the FD Director General's office.

The IMMP annual action plan has to be prepared every December for the succeeding fiscal year, except for the first year of the IMMP. The first year annual action plan has to proceed based on confirmation about the above FD annual plan after the commencement of the IMMP.

4) Budgeting

The annual budget plan for the CF task forces at Myaung Mya District and at each reserved forest has to be prepared based on the annual action plan also prepared by the Myaung Mya District CF task force and four reserved forest CF task forces. The budget plan will be finalized in the same manner with the annual action plan at the same period of the year.

(3) Development of Model CF User Groups

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.

1) Preparatory Stage for the Development of Model CF User Groups

- Public Awareness-

The CF task force at each reserved forest in collaboration with Village Tract Peace and Development Councils will conduct public awareness at selected villages located in the target forest compartment.

- Formulation of model CF user groups-

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. The estimated number of model CF user groups to be established during the IMMP is shown in the following table.

Estimated Number of Formulated Model CF User Groups Phase I

Reserved Forest	Unit	1st year	2	3	4	5	Total
Kyakankwinpauk	set	1	1/2	1/3	1/4	1/5	5
Pyinalan	set	1	1/2	1/3	1/4	1/5	5
Kadonkani	set	1	1/2	1/3	1/4	1/5	5
Pyindaye	set	1	1/2	1/3	1/4	1/5	5
Total	set	4	4/8	4/12	4/16	4/20	20

Note: newly started CF user groups / Accumulated CF user groups

2) Planning Stage for the Development of Model CF User Groups

During the planning stage, CFI sanction will be taken for certification of the user group such as an allocation of CF areas, preparation of CF management plans, drawing of CF maps, applying for CF certificates, and granting of CF certificates.

3) Implementation for Development of Model CF User Groups

In accordance with the CF management plan, the model CF user group is engaged in a series of CF activities from planting, tending to harvesting. Estimated CF activities to be practiced by user groups are shown in the following table.

Planned Number of Model CF User Groups and CF Activities Phase I

Activity Unit No	Reserved Forest	1 year	2	3	4	5	Total
Activity Unit 1 (Buffer) Paddy Dominant, High Population Area	Kyakankwinpauk		1/1	0/1	0/1	0/1	1
	Pyinalan			1/1	0/1	0/1	1
	Kadonkani				1/1	0/1	1
	Pyindaye					1/1	1
Total Activity Unit 1			1	2	3	4	4
Activity Unit 2 (Multiple) Paddy Dominant, Low Population Area	Kyakankwinpauk					1/1	1
	Pyinalan		1/1	0/1	0/1	0/1	1
	Kadonkani			1/1	0/1	0/1	1
	Pyindaye				1/1	0/1	1
Total Activity Unit 2			1	2	3	4	4
Activity Unit 3 (Buffer) Mangrove Vegetation Dominant and Low Population Area	Kyakankwinpauk				1/1	0/1	1
	Pyinalan					1/1	1
	Kadonkani		1/1	0/1	0/1	0/1	1
	Pyindaye			1/1	0/1	0/1	1
Total Activity Unit 3			1	2	3	4	4
Activity Unit 4 (Multiple) Mangrove Vegetation Dominant and Low Population Area	Kyakankwinpauk			1/1	0/1	0/1	1
	Pyinalan				1/1	0/1	1
	Kadonkani					1/1	1
	Pyindaye		1/1	0/1	0/1	0/1	1
Total Activity Unit 4			1	2	3	4	4
Activity Unit 5 Fishery Village	Kyakankwinpauk		1/1	0/1	0/1	0/1	1
	Pyinalan			1/1	0/1	0/1	1
	Kadonkani				1/1	0/1	1
	Pyindaye					1/1	2
Total Activity Unit 5			1	2	3	4	4

Note: Newly started CF activity unit / Accumulated CF activity unit
Newly started user groups / Accumulated CF user groups

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.

4) Management of Model CF User groups

Management of CF activities undertaken by the model CF user group has to be started and supported by the CF task force at each reserved forest. Staff of the CF task force will visit the CF user groups periodically for management.

5) Extension of the Model CF User Group Activities

The extension is a preparatory activity for formulation of new CF user groups based on the model CF user group. 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.

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

1) Institutional Development of FD for CF Management and Support

FD will start new operations for the CF management and support through formulation of a new organization, the CF Task Force, charged to the CF management.

2) Construction and Renovation of the FD Mangrove CF Extension Center and Nursery

The CF task force at each reserved forest will conduct design, cost estimation, procurement, and construction. 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	1 st year	2	3	4	5	Total
Kyakankwinpauk	ls		1				1
Pyinalan	ls			1			1
Kadonkani	ls			1			1
Pyindaye	ls				1		1

3) Operation and Management of the FD Mangrove Extension Center and Nursery

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.

4) CF Management and Support

The staff of each reserved forest CF task force has to visit all of the CF user groups in its assigned reserved forest, regularly and based on the necessity.

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

1) Survey, Planning and Mapping

Each reserved forest CF task force will engage in work for integration of forestry technology in the Ayeyawady Delta through the Action Research Forest Development.

The following are scheduled procedures for survey, planning and mapping regarding the annual action research forest development.

- 1) Conducting forest surveys of the annual target plantation area,
- 2) Delineation of sub forest compartments based on ground levels and vegetation,
- 3) Mapping
- 4) Selection of priority plantation areas and preparation of annual plantation plan at sub forest compartment levels that satisfies FD plantation establishment procedures instructed by the Myaung Mya District annual forest management plan, and
- 5) Preparation of seed/propagule production and seedling production plans.

2) Seedling Production of Planting Species

It is essential to secure a sufficient amount of quality seeds to supply for the required

number and species of seedlings for the plantations and planting. The species production is proposed to be undertaken by the following procedure.

- 1) Selection of priority species to each sub-forest compartment based on the following criteria, a) zoning, b) soil and ground levels, and c) objectives of the plantation/ planting,
- 2) Survey of seed/propagule production of the priority species,
- 3) Production of priority species at the FD mangrove nurseries and natural nurseries based on the annual plantation plan, and
- 4) Development of seed/propagule production areas.

The production and diversification of planting species will be started from the second year of the IMMP phase I in accordance with the progress of survey work. The work will be undertaken by the CF task force at each reserved forest. The nursery workers will be employed by the CF task force.

Seedling production for the action research plantation will be started in accordance with construction/renovation of the FD mangrove nursery. 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

3) Action Research Plantation

The annual action research plantation plan is shown in the following table according to the targeted reserved forest. 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	1 st year	2	3	4	5	Total
- Kyakankwinpauk	0	353	353	353	353	1,410
			705	1,058	1,410	-
- Pyinalan	0	824	824	824	824	3,295
			1,648	2,471	3,295	-
- Kadonkani	0	246	246	246	246	985
			493	739	985	-
- Pyindaye	0	446	446	446	446	1,783
			892	1,337	1,783	-
Total	0	1,868	1,868	1,868	1,868	7,473
			3,737	5,605	7,473	-

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

4) Tending

The tending after planting for the action research plantation area will be carried out by the CF Task Force in the same manner as with current forestry operations by the FD.

The annual schedule for major works of tending are, 1) counting and patching after plantation (July – November, after one month of plantation), 2) Weeding (two times during August to December before the dry season), and 3) Border line management (January – March), 4) patrolling of the plantation area from encroachment and fire, and 5) other forest protection activities such as pest control.

5) Integration of Mangrove Technology through Monitoring

The integration of forestry technology will be carried out based on the monitoring and evaluation results of regular monitoring. The monitoring and evaluation is the responsibility of the CF task force. The target of the monitoring is, in principle, all seedling production and action research plantation areas, by sampling collections and plots. Moreover, the tide salinity and weather conditions will be observed by the CF task force. Monitoring items to be carried out are shown in the following table.

Monitoring Items and Frequency

Monitoring Item	Frequency
Seedling Production	
– Quantity, Survival Rate	Once a Week
– Growth, Quality	Once a Week
– Pest Control, other operation	Daily
Plantation	
– Survival rate	Once a month
– Growth	Once a month
– Stock Volume	Once a month
Natural Condition Observation	
– Weather	Daily
– Salinity	Daily
– Tide level	Four times a day

The salinity and weather condition will be monitored in accordance with the start of the mangrove nursery operation.

3) Integration of the Forestry Technology of the Delta

The monitoring results, including evaluation results, will be compiled and summarized by the CF task force at Mayung 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. Moreover, the compiled manual will be presented at the annual meeting of mangrove rehabilitation that is shown in the following section.

(6) Integration of the Project Impact

1) CF Annual Meeting

The annual meeting of the CF activity is planned under the IMMP for sharing lessons of CF activities among the states/divisions that are undertaking CF activities. The meeting is recommended to be held once a year in January in Yangon.

2) CF Joint Training of the FD

It is recommended to start CF joint trainings among officers/staff of FD who are engaged in CF activities, or for the FD officers who intend to start involvement in CF activities. The joint training implementation schedule under the IMMP is shown in the following table.

Joint Training Implementation Plan

CF Task Force	Unit	1st year	2	3	4	5	Total
IMMPCF Task Force visit to							
– Shan State	time	1					1
– Magaway division	time		1				1
– Yakhine division	time			1			1
– Mandalay division	time				1		1
– Kachin state	time					1	1
IMMP CF Task Force invite officers from							
– Shan State	time		1				1
– Magaway division	time			1			1
– Yakhine division	time				1		1
– Mandalay division	time					1	1
– Kachin state	time	1					1

3) IMMP Annual Meeting

The IMMP annual meeting will be held once a year for summarizing activities and lessons of the year for feeding back to the following year’s activities. The following table shows the annual meeting schedule. For the timing of the meeting, November or early December is recommended for holding the annual meeting before preparation of the succeeding year’s

action plan and budget.

IMMP Annual Meeting Opening Plan

CF Task Force	Unit	1st year	2	3	4	5	Total
– Kyakankwinpauk	time			1			1
– Pyinalan	time	1					1
– Kadonkani	time		1				1
– Pyindaye	time				1		1
– Yangon	time					1	1
Total	time	1	1	1	1	1	1

4) Mangrove Rehabilitation Annual Meeting

The meeting is recommended to be held once a year by turns among Pathein of the Ayeyawady Division, Dawei of the Tanintheryi Division, and Sittwe of Yakhine State.

10.2.2 Phase II

(1) General Perspective

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 information and education center.

(2) 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 estimated number of CF user groups during phase II is shown in the following table. The CF management and support activity is continuous work though support for CF user groups will be gradually reduced, and in due course it is expected that CF management and support by assigned FD officers/staff will be just monitoring of CF activities, patrolling, registration of sales voucher and removal passes.

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
(unit: ha)

Reserved Forest	Total Area
- 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 during preparatory stage of the IMMP Phase I.

(3) Action Research Forest Development Phase II

In phase II, results of the action research will be transferred to FD in accordance with completion of the action research in phase I. It is recommended to continue the Action Research Forest Development by CF Mangrove Division, because further action research is favorable to understand values and various kinds of function of mangrove vegetation.

The CF Mangrove Division will continue the same procedure with the phase I activity for the Action Research Forest Development. Felling operations will be added to the operation of the action research plantation, because felling and harvesting compose important parts of forestry operations. 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
Kyakankwinpauk	479	479	479	479	479	2,397
		959	1,438	1,918	2,397	-
Pyinalan	548	548	548	548	548	2,739
		1,096	1,643	2,191	2,739	-
Kadonkani	518	518	518	518	518	2,591
		1,036	1,554	2,073	2,591	-
Pyindaye	1,112	1,112	1,112	1,112	1,112	5,562
		2,225	3,337	4,450	5,562	-
Total	2,658	2,658	2,658	2,658	2,658	13,289
		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 plantation has been calculated based on the estimated plantation area (number of seedlings is shown in the following table).

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

(x 1000)

FD Mangrove Nursery	Annual Seedling Production	Total
- 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

Felling operations in phase II are proposed to target fast growing species. Estimated felling areas are shown in the following table.

(4) 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 has been prepared according to the target users 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.

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

10.2.3 Phase III

(1) General Perspective

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.

(2) 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. The estimated target

numbers of CF user groups in phase I and phase II are based on the categorized types of natural and socioeconomic conditions. The phase III de-centralization period is aimed to maintain and extend the CF activity based on the developed foundation, so that it is proposed to put the target number of CF user groups to be formulated during phase III as the current number of existing villages.

The current numbers of villages in the reserved forests are provided in the following table. Based on the total target number, annual target numbers of CF user groups to be formulated were calculated.

Current numbers of Villages in the Reserved Forests and Annual Target of CF User Groups of Phase III

(x 1000)

Reserved Forest	Number of Villages	Annual Target Number of CF UGs
– 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	312
Total	26,185	874

(3) 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 CF Mangrove Division will continue the same procedure with the phase II activity for the IMMP operation.

Targets of the Action Research Forest Development phase 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

Felling operation for hard wood is proposed to be included in the target activity of phase III. Technology including the estimation of felling volume and area is recommended to be developed during the IMMP phase II.

10.3 Budgetary Plan

10.3.1 Indicative Cost Estimate

(1) General Condition of the Estimates

Based on the proposed work for the IMMP, an indicative cost for implementation of the plan is estimated under the following condition,

- 1) Unit prices employed in the cost estimation is those used for the pilot project 2004 implementation, or collected during the fiscal year 2004,
- 2) Personnel cost of the CF Task Force is estimated based on the standard of FD including fringe benefits and allowances. The allowance for the CF Task Force staff is calculated based on satisfaction of livelihood and employed the fade out concept.
- 3) Cost for technical assistance of the CF Task Force is estimated based on required kinds of assistance and assignment period, and
- 4) Operation and maintenance cost of the IMMP is applied as 5 % of the project cost.

(2) Indicative Cost of the IMMP (Phase I Foundation, Phase II Extension and Phase III

De-centralization Period)

The total cost required for implementation of the IMMP is estimated at 18,259 million kyat. The project cost of each IMMP phase is shown in the following table and breakdown is presented in Table 10.1. The indicative annual project cost of the IMMP phase I is shown in Table 10.2.

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 Mangrove Division (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	18,259	4,253	4,070	9,935

10.3.2 Budgetary Arrangement

(1) Current Situation

Roles of FD regarding CF are broadly divided into two parts, 1) a formulation of CF user groups based on public awareness, and 2) CF management and support. After formulation of CF user groups, the CF activity continues for 30 years by the certified CF user group. At present, FD has difficulty in securing the budget for CF management and support. Despite the fact that CF activities are a sort of public work, which contributes to protection of the national land, implementation and management of CF activities need considerable cost. However, securing budget for CF management and support is very limited under present circumstances. This unfavorable situation will not improve in a short period. CFI defines a payment of royalty to FD by CF user groups based on production from CF activities. The collected royalty normally enters the national treasury and there is less flexibility for FD to use the collected royalty for CF management.

(2) Necessity of Technical Assistance

In consideration of the current situation within and surrounding FD for CF and mangrove rehabilitation, the implementation of the IMMP solely by FD from the phase I is impracticable from both financial and technical aspects. Moreover, a commencement of the CF Mangrove Division, which is based on the special project budget of the Government of

Myanmar, from the IMMP phase I is less likely to happen with current insufficient achievement and accumulation of mangrove rehabilitation and CF activities as a foundation to start the CF Mangrove Division.

As described in Section 8.5.5: FD Self Reliance Concept, the IMMP phase I is dedicated as the period for FD to upgrade its capacity to enable self-reliance support for the further implementation of the IMMP, particularly for the CF management and support. Therefore, essential and minimal input/support of external assistance in the form of technical assistance is indispensable in the initial stage of the IMMP implementation to achieve the goal and the project purpose of the IMMP.

In consideration of the self reliance of FD and fading out of external support, the technical assistance is planned for the phase I and the phase II, respectively. Phase I requires the technical assistance to establish foundation of the core/model for sustainable CF and mangrove rehabilitation activities. On the other hand, phase II requires the technical assistance to establish foundation for extension of the core/model established in phase I.

(3) Budget Sharing Mechanism in the IMMP

Based on the current situation, the following three principles are recommended to apply for the budgeting of the IMMP.

- 1) Project cost would be compensated by an external supporter,
- 2) Budget sharing of the external support will be faded out for securing sustainable operations by FD in the latter stage of the IMMP and after the completion of the project,
- 3) FD shall be responsible for CF management and support cost i.e. operation cost of mangrove nurseries, CF extension centers, and CF management and support system,
- 4) Salary of engaged staff for IMMP shall be the responsibility of each organization.

Regarding the above, 3) construction cost and operation cost of the facilities up to two years from the construction should be a responsibility of external support. All construction under the IMMP phase I would be completed by the fourth year of the five years of the phase I project period. Thus, for the last year of the IMMP phase I, all of the cost for operation and maintenance of facilities would be covered by FD except for the mangrove nursery and the CF extension center in the Pyindaye Reserved Forest.

In summary, the planned budget sharing by concerned stakeholders is described as follows.

- CF user groups are expected to contribute their time and labor for the actual implementation of the IMMP.
- FD (the Government of Myanmar in the broad sense) is expected to share budget for 1) the CF task force operation and maintenance including allowances and fringe benefits

of its staff, 2) operational and maintenance cost of the IMMP phases I and II, and 3) all of project cost for the IMMP phase III.

- Technical assistance is expected to cover the remaining budget for phases I and II.

(4) Securing Budget for IMMP and further CF Management and Support by FD

Ideally for the self reliance of FD, the CF budget should be composed of a project budget mainly for the formulation of CF user groups and an ordinary budget of the district and township FD offices mainly for CF management and support. Considering the current situation the IMMP phase I should be allocated the project budget for FD as a development foundation of CF. During phases II and III, the project should be allocated both project and ordinary budgets for FD.

However, the current capacity and surrounding circumstances hinder such an alternative in the short term. In the IMMP, besides the financial support from external supporters, the following approach was considered for budget distribution to township FD offices for CF management and support, based on the findings from the pilot project.

Phase I: Supplying CF budget to township FD offices through engagement of CF activity by FD workers through formulation of CF user groups.

Phase II and III: Supplying budget through formulation of a CF Mangrove Division so that FD can obtain the budget from superior agencies for the project implementation.

As a funding source for the ordinary budget of CF management and support by FD, benefit sharing among CF stakeholders should be introduced, particularly between FD and CF user groups, and formulation of a special guideline should be undertaken for a procedure to incorporate funds from the benefit sharing to the ordinary budget by the end of the IMMP phase III.

Primarily direct benefits from the CF activities shall go to CF user groups as producers' right. To achieve sustainable CF activities based on support and management of FD, a benefit sharing mechanism should be established and confirmed in rules and regulations of the concerned CF user groups. Then the funds raised from the benefit sharing mechanism need to be put into service as CF management and support ordinary budget through the special guideline.

10.3.3 Implementation Schedule

The implementation schedule of the IMMP phase I foundation period is summarized in Table 10.3 based on assumption that all the proposed work would be implemented from the fiscal year 2005 to 2010.

An implementation schedule of the IMMP phases II and III is not provided because the project component of the phase II and III are planned based on many unconfirmed assumptions and proposals such as formulation of CF Mangrove Division, development and construction of the mangrove information and education center. And also the project comment would be influenced by achievement levels of FD capacity development, or the extent of diversification of CFI application during the phase I. Thus the implementation schedule should be prepared with assessment of the progress of the IMMP phase I.

10.4 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

The target CF operation compartments of the option plan is illustrated in Figure 10.5.

(4) 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

1) 50% of total area in Multiple use zone is targeted for the action research plantation

The target FD operation compartments of the option plan and the target operation area are illustrated in Figure 10.1.

(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 kyat respectively. Following table describes breakdown of the cost that is confirmed the budget allocation by FD.

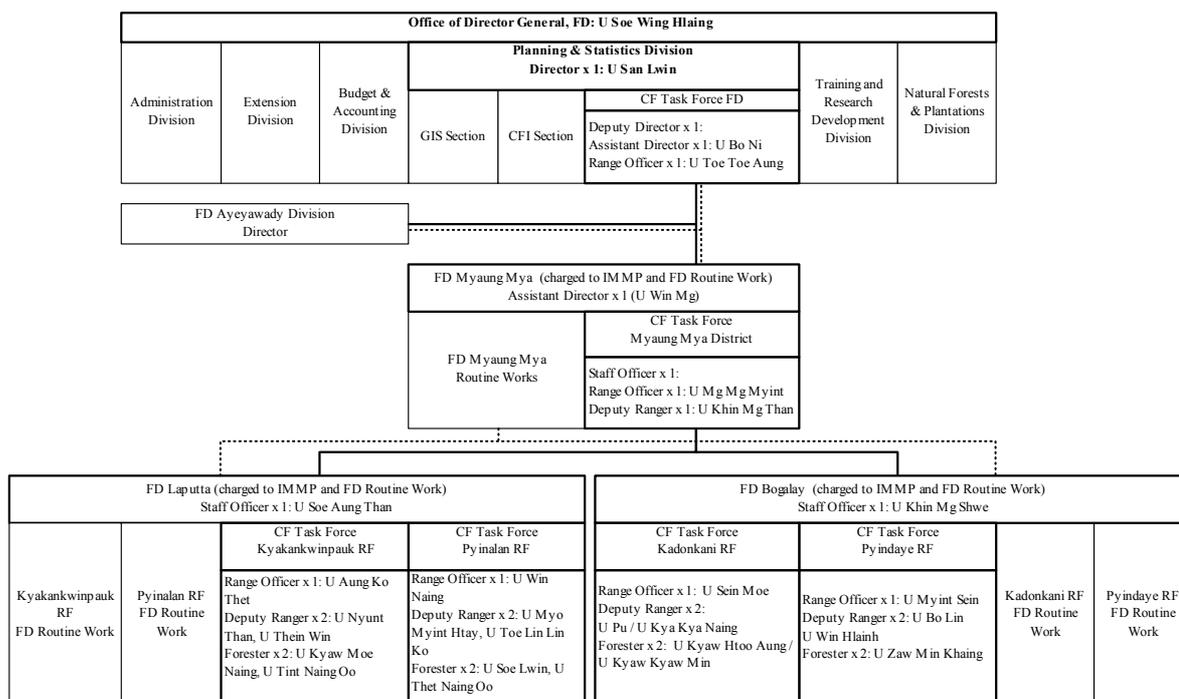
Cost and Distribution of the Option Plan of the IMMP Phase I

Unit: 1000 kyat, 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		-	-	-	-	-	-
2.3 Implementation Stage: Development of the Core/Model CF Seedling and boundary poles for CF River bank plantation, CF CF buffer plantation, CF Plantation/NFIO, and CF village	CF Task Force	17,568	0	4,392	4,392	4,392	4,392
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							
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							
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,	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,	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 Forcee 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.

Figure 10.6 FD Implementation Organization of the IMMP Option Plan and CF Task Force

(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.

CHAPTER 11 MANGROVE REHABILITATION MANUALS

11.1 Draft Mangrove Rehabilitation Manuals for the Forest Department and Community

There are two mangrove forest rehabilitation manuals, namely, the mangrove rehabilitation manuals for the Forest Department and the mangrove rehabilitation manual for the community, prepared under the present study. A draft English version of the manuals was completed in January 2003, and a draft Myanmar version was completed in March 2003 for the community and in July 2003 for the Forest Department (FD).

11.1.1 Basic Concept and Objective of Manual

The basic concept of the two draft manuals is to have practical documents for 1) mangrove forest rehabilitation through community forestry (CF) in the study area, and 2) usage by concerned users of the manual.

For practicability, the target of the manual was set for CF stakeholders, and visual appeal and portability were emphasized for easier understanding and actual usage in the field by the stakeholders. Also, the Community Forestry Instruction (CFI), as the framework of CF activities, served as an integral part of the manual. Figure 11.1 conceptualizes the basic concept of the mangrove rehabilitation manuals.

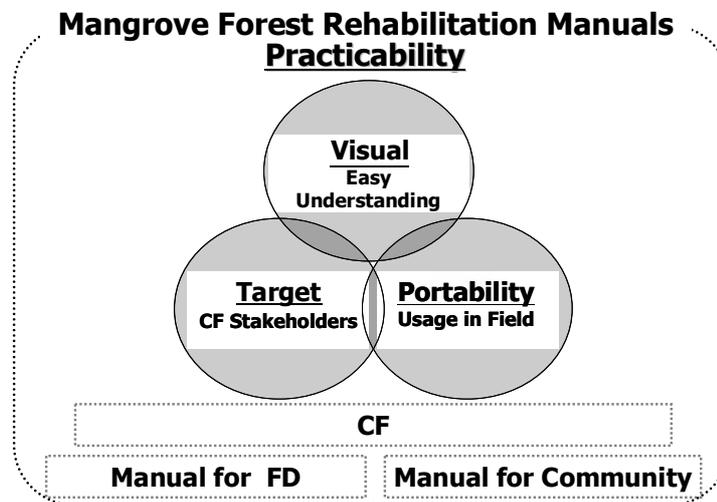


Figure 11.1 Basic Concept of Draft Manuals

Objectives of each manual were set as follows.

(1) Common Objectives of the Two Manuals

- Serve as a practical introduction for CF stakeholders to understand, promote, and implement CF activities for contribution to mangrove rehabilitation in the delta area.

- Serve as the self reliance text book and reference book for the actual implementation of CF activities.

(2) Mangrove Forest Rehabilitation Manual for FD

- Intended for front line FD staff as a “teacher’s text book”
- Help front line FD staff to protect, rehabilitate, and manage mangrove resources
- Help front line FD staff to understand, promote, and supervise CF activities
- Accumulate and integrate knowledge and experience of existing forestry technologies for effective protection, rehabilitation and management of mangrove resources.

(3) Mangrove Forest Rehabilitation Manual for the Community

- Intended for CF user group members as a “student’s text book”
- Help user groups and communities to understand and conduct CF activities
- Help user groups and communities to practice CF activities for protection, rehabilitation and management of mangrove resources.

11.1.2 Contents of Mangrove Forest Rehabilitation Manuals

The manuals were divided into volumes according to key features necessary to achieve the above objective. The following table describes volumes covered in the draft manuals.

Table of Contents of the Manual

(1) Manual for FD	
Volume I	Basic Training for Community Forestry
Volume II	Villagers Enlightenment
Volume III	CFI Management
Volume IV	Technical Guidance
Volume V	Consolidation Activities of Community Forestry for Mangrove Rehabilitation
Volume VI	Source Book
(2) Manual for Community	
Volume I	Villagers Enlightenment
Volume II	CFI Management
Volume III	Technical Guidance
Volume IV	Consolidation Activities of Community Forestry for Mangrove Rehabilitation

The content of volumes having the same title is the corresponding content for the manual for FD and the manual for the community. However, the manual for FD covers a wider range of content in more detail to serve as the teacher’s textbook, whereas the manual for the community covers rather specific and minimum content. The following table summarizes contents and topics of each volume.

Summary of Contents and Topic of Each Volume

1. Basic Training for Community Forestry (FD Volume I)	
To provide basic concepts of participatory development and mangrove rehabilitation to users of the manual	
	1) Participatory Development
	2) Basic Knowledge about Mangrove Rehabilitation
	3) Basic Technique of Mangrove Forestry
2. Villagers Enlightenment (FD Volume II, Community Volume I)	
To provide enlightenment information related to the mangrove environment and CF	
	1) Mangrove Environment
	2) Soil/Land Environment
	3) Living Environment
	4) Environment Education for School Children
	5) What is CF?
3. CFI Management (FD Volume III, Community Volume II)	
To provide necessary procedures and components related to CF activities.	
- FD Manual for extension and supervision of CF activities by front line FD staff	
- Community manual for the actual implementation of CF activities by user groups	
	1) CFI Management Preparatory Stage
	2) CFI Management Implementation Stage
	3) Group Consolidation
	4) Monitoring and Evaluation (FD manual only)
	5) Buffer Zone Management
	6) River Bank Management
4. Technical Guidance (FD Volume IV, Community Volume III)	
To provide basic concepts related to forestry operations under CF	
	1) Forestry Technical Guidance
	2) CFI Agroforestry Technical Guidance
	3) Buffer Zone Management Technique
	4) River Bank Plantation Technique
5. Consolidation Activities of Community Forestry for Mangrove Rehabilitation (FD Volume V, Community Volume IV)	
To provide information on activities which have potential incentives and consolidation for promotion of mangrove rehabilitation through CF activities	
	1) CF Extension Center
	2) Double Cropping
	3) Small Scale Water Reservoir
	4) Compost Making
	5) Self-Reliance Micro Credit
	6) Efficient Stove
6. Source Book (FD Volume VI)	
Intended to provide users of the manual with more technical and detailed information related to mangrove rehabilitation as a reference	
	1) Major Mangrove Species for Rehabilitation

11.2 Application of the Mangrove Rehabilitation Manuals

Between the fiscal years 2003 to 2004, the draft manuals were utilized for planning, implementation and monitoring of the pilot project 2003 and 2004, respectively. The draft manual for FD was particularly used during the training for frontline staff conducted under the FD frontline staff capacity development pilot project in 2003. The draft manual for the community was used by Nyaung Ta Pin and Thar Yar Kone CF user groups, mainly during

the user group/sub-user group formation period, planning period, and recording/monitoring period. Also the manual was specifically used in demonstration workshops for plantation and natural forest improvement operations, and group leader training.

At the same time, the draft manuals, especially the manual for FD, were reviewed by relevant FD offices, such as the Director General office, CFDTTC, Ayeyawady Division office, Laputta Township office, etc., for feedback and revision of the manuals.

11.3 Comment on the draft Mangrove Rehabilitation Manuals

After the review by the relevant FD offices, the study team received the following comments for the draft manual for FD. The majority of comments were related to the quality of Myanmar translation as described in the following table. There were no significant comments for the draft manual for the community, except for a comment on difficulties with the Myanmar translations for user group members to understand.

Summary of Comments from FD Offices for Draft Manual

Quality of Translation into Myanmar	
	Inappropriate translation of technical terms for forestry Inappropriate translation for terms and concepts related to CF Difficult words/translation for frontline FD staff to understand
Content of Manual	
	Some parts are inconsistent with contents and expressions in the Forest Law, the Forest Rules and Regulations, and CFI (example: The number of management committee members must be not more than or less than 5 members, in accordance with CFI)
Status of Manual	
	Manuals have to be approved by the DG to be continuously used as the manual within FD Content of the draft manual will be acceptable if regarded and named as a guideline and not as a manual.

For the manual for the community, there were no specific comments directly from user group members. However, difficulties in the concept and the format for preparing bi-weekly/monthly progress reports, and the annual report were obvious, particularly during the pilot project 2003, since none of those reports were prepared by the user group during the pilot project 2003 implementation period.

11.4 Finalization of the draft Mangrove Rehabilitation Manuals

Based on comments from FD, feedback from the pilot project implementation, and updates based on lessons and findings gathered in the course of the study, the finalization of the draft manuals was conducted by the study team. In addition to the basic concept and objectives set forth during the formulation of the draft manuals, the final versions of the manuals were revised and updated based on the following concept.

- To be continuously and practically used by FD, particularly by the frontline staff, and community members for promotion and management of mangrove rehabilitation/CF in the delta area.
- To be in accordance with the Forest Law and CFI. However, contents and wording are somewhat flexible based on the actual situation and/or practicability for implementation of sustainable mangrove conservation/CF activities in the delta area.
- To be approved by the FD for their usage.

Major Updates and Revisions for the Final Manual

Updated Components
Revising translation into Myanmar for correct usage and better understanding
Updating information on the public awareness of mangroves and CF
Updating information on line management
Updating information on value added products and harvesting plans
Updating information on monitoring and evaluation
Updating information on CF prototypes
Updating information on CF consolidation activities
Updating species information in the source book
Overall updating and modification of contents, design and layout of the manual.

Also the names of the manuals have been changed as follows to specify the target of the manuals.

- FD Manual: “Mangrove Rehabilitation Manual for the Forest Department Frontline Staff of the Ayeyawady Delta”
- Community Manual: “Mangrove Rehabilitation Manual for the Community of the Ayeyawady Delta”

For reference, the finalized “Mangrove Rehabilitation Manual for the Forest Department Frontline Staff of the Ayeyawady Delta” is attached in Chapter 2, Volume IV of the final report.

Though the manuals were completed as the outcome of the present study for the rehabilitation of mangrove resources through CF activities in the delta, the manuals should be continually revised to match the reality by FD.

In Section 13.2 “Guideline for Utilization of the Mangrove Rehabilitation Manuals”, guides and suggestions for such revisions are incorporated for usages by FD.

CHAPTER 12 MANGROVE MANAGEMENT PLANNING MAP

12.1 Development of Mangrove Management Planning Map

12.1.1 Objectives

The Mangrove Management Planning Map (hereinafter refer to as “the IMMP map”) was prepared as a base map for mangrove forest management in the study area at the forest compartment level. The IMMP map aims to serve the following purposes:

- Resource map of existing forest conditions and land use/socio-economic conditions
- Zoning map for zone management
- Planning map for forestry operations and other operations administered by FD
- Operation map for project/operation implementation, and
- Monitoring map for recording, monitoring, and evaluation of operations

Specifically, the IMMP map is provided for the Forest Department (FD) and community forestry (CF) user groups to use for the following purposes:.

For FD:

- General forest management at the forest compartment level
- Direct FD operations such as Integrated Resource Management (IRM) and FD plantation
- Seed/ propagule source map
- Preparation of CF promotion plan,
- Promotion of CF to the villagers at site,
- Management and support of the CF activities, and
- Patrolling the CF area,

For CF user groups:

- Preparation of the CF management map,
- Preparation of the annual CF action plan, and
- Practice of self-monitoring CF activities.
- Border management of the CF area,
- Patrolling of the CF area,

12.1.2 Development of Design Criteria of the Mangrove Management Planning Map

The Remote Sensing and Geographic Information System (GIS) section (hereinafter refer to as “the GIS section”) under the Planning and Statistics Division of the FD Director General Office was the organization in charge of preparation of the IMMP map with the support of the study team. Expected primary users of the IMMP map are the staffs of: a)

the GIS section, b) Myaung Mya District FD Office, and c) Laputta and Bogalay Township FD Offices, and the CF user group. The GIS section and the study team defined the following design criteria of the IMMP map to fulfill the above-mentioned objectives and considering the capability of the users.

- Introduce forest compartment as a basic management/map unit of the IMMP map,
- Utilize 2002 aerial photos for forest type and land use classification based on the identification key agreed by the two parties
- Introduce zoning at reserved forest level, based on natural and socioeconomic conditions and management objectives.
- Introduce compartment operational categories at forest compartment level based on land use and forest type
- Utilize the latest topographical maps (2004 topographic maps developed from 2002 aerial photographs) as the base layer of the IMMP map,
- Provide a scale bar, coordinate grid, legend, and other necessary map information on the IMMP map.

12.1.3 Contents of the Mangrove Management Planning Map

Based on the design criteria of the IMMP map, the contents of the IMMP map were decided as indicated in the table below.

Contents of the IMMP Map

	Data	Attribute data	Data of source
1. Boundary data			
-	Forest compartment boundary	Compartment number, area, township name, district name.	Forest compartment map from FD
-	Boundary of land use and forest type category	Category name, land use and forest type code, area	Interpretation from aerial photographs
2. Point data			
-	Village distribution data	village/township/district name, population, latitude/longitude	Point data from interpreted aerial photographs
-	Location of Forest camp	Name of forest camp	Information from FD
3. Base data			
-	Topographic map	Interpreted aerial photographs	Aerial photographs
4. Other management planning related information			
-	Reserved Forest Zoning Category	Zone name, zoning boundary	Based on land use and forest type, and management objectives
-	Forest Compartment Operation Category	Category name, boundary, and applicable forest operation in the category	Based on zoning and land use and forest type
-	Map information	Scale bar, coordinate grid, and legend	

12.1.4 Development of the Mangrove Management Planning Map

The following table summarizes the process of preparing the IMMP map conducted under the study. Figure 12.1 illustrates the conceptual flow of the IMMP preparation. Every year, at least two to three GIS section staff members were assigned to work on the IMMP map preparation under the supervision of an assistant director, the head of the GIS section.

Flow for Preparation of IMMP Map

Year	Month	Activity
2002	February	Procurement of 2002 aerial photo (by JICA)
	February	Selection of criteria for aerial photo identification keys
	February	Aerial photo interpretation (by stereoscope)
	April	Preliminary ground truthing of the interpretation
	April	Completion of preliminary land use and forest type classification
	September	Socioeconomic condition data (Village profile survey)
	November	Selection of draft IMMP design criteria
	November	Selection of draft zoning category criteria
2003	March	Completion of draft IMMP maps for pilot project target areas
	March	Review of draft IMMP maps
	April	Selection of revised criteria for aerial photo identification keys
	April to November	Aerial photo interpretation (by on screen digitization)
	June	Ground truthing the revised interpretation
	October	Selection of revised IMMP design criteria
	October	Selection of revised zoning category criteria
	October	Selection of forest compartment operation category criteria
	November	Completion of land use/forest type maps
	November	Delineation and digitization of zones and operation category
2004	January	Preparation of zoning map
	February	Overlaying zoning and land use/forest type map
	February	Completion of the IMMP map data for the study area
	February	Preparation of layout of the IMMP map
	February	Printing of the IMMP map
	May - July	Review of the IMMP Map
	July	Procurement of 2004 Topographic map (by FD)
	July - November	Update and adjustment of attribute data to new topographic map
	November	Completion of the final IMMP map data
	December	Preparation of layout of the IMMP map
	February	Printing of the final IMMP map

The identification key for aerial photo interpretation applied in the preparation of the IMMP map is shown in Table 2.13. The table in Section 8.4.2(2) shows the zoning categories, and the table in Section 8.6.5(3) shows the forest compartment operational categories used to prepare the map. The digital data of the 2004 topographic base maps, based on 2002 aerial photography, were provided to FD by the Survey Department of the Ministry of Forestry in August 2004.

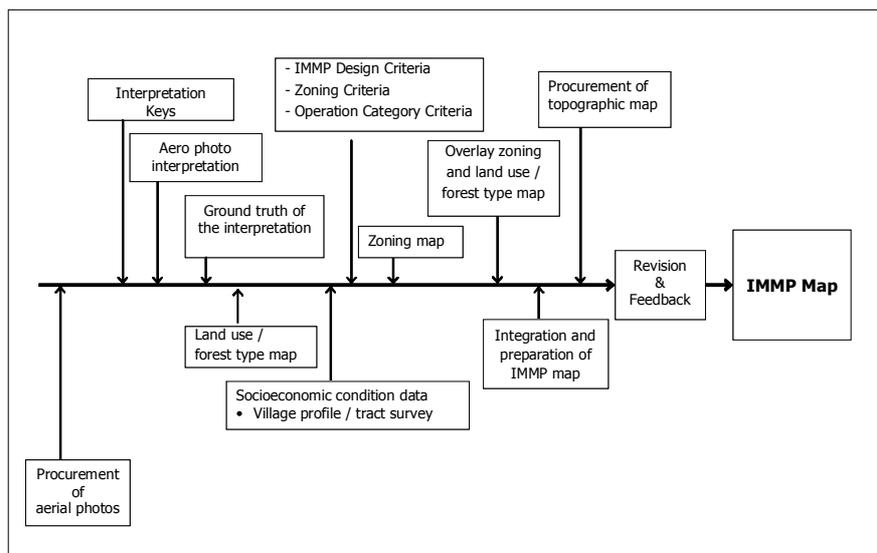


Figure 12.1 Conceptual flow for preparation of the IMMP Map

12.1.5 Results of Development of the Mangrove Management Planning Map

A full set of IMMP maps prepared under the study consists of 1) IMMP map(229 forest compartment maps), 2) land use and forest type maps (5 reserved forest maps), and 3) zoning maps (5 reserved forest maps). The map data were compiled as a GIS data set and available for printing maps at the designated scale and size. The land use and forest type maps, and the zoning maps are attached in Chapter 4, Volume IV of the final report.

The following figure shows an example of the IMMP map. The IMMP map contains a) land use and forest type by the IMMP categories, b) topographic map as base map, c) reserved forest zoning boundary, d) village location, and e) common items (legend, title of project, reference of source data, scale bar, symbol of compass etc.)

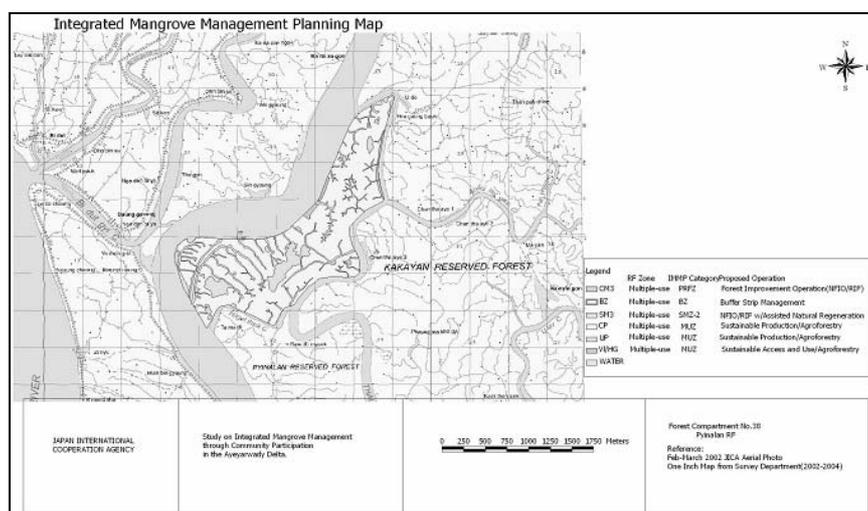


Figure 12.2 Example of the IMMP map (Compartment No. 38, Pyinalan Reserved Forest)

12.2 Utilization and updating of the Mangrove Management Planning Map

12.2.1 Utilization Method of the Mangrove Management Planning Map

With the completion of the IMMP map, the FD offices are now the main users. CF user groups will be provided with relevant parts of the IMMP map for CF management by the relevant FD office.

Since the GIS section is responsible for management and integration of all FD related maps and GIS database, it will be responsible for updating and preparing IMMP maps.

Utilization of the IMMP Map

FD Offices	Major application methods of the IMMP map
GIS section, Director General Office	<ul style="list-style-type: none"> - Compilation of area-wise statistical data of CF and the FD plantation - Supply maps for necessary offices of FD
Ayeyawady Division FD Office	<ul style="list-style-type: none"> - Planning, Management of the FD plantation and the CF activity in the division
Myaung Mya District FD Office	<ul style="list-style-type: none"> - Planning and management of the FD plantation and the CF activities - Preparation of the district forest management plan (2006-2015) - Public awareness
Laputta/Bogalay Township FD Office	<ul style="list-style-type: none"> - Planning and management of the FD plantation and the CF activities - Public awareness - Selection of the FD plantation and the CF area - Support the CF activities at site - Forest survey - Land allocation/delineation for the FD plantation and the CF activities at site - Distribution of maps to CF user groups

12.2.2 Update of the Mangrove Management Planning Map

The following table shows a summary of responsible offices in FD for updating and maintenance of the IMMP map. Detailed procedures for updating are described in Section 13.3, “Guideline for Update and Maintenance of the Mangrove Management Planning Map”.

Summary of Responsibility of FD Offices for the IMMP Map Maintenance and Update

FD Offices	the GIS/original data set maintenance	Data update	IMMP map keeping
GIS section, Director General Office	++	++	One full set of the IMMP map (printed and digital data)
Ayeyawady Division FD Office	-	+	One full set of the IMMP map (printed)
Myaung Mya District FD Office	-	+	One full set of the IMMP map (printed)
Laputta/Bogalay Township FD Office	-	-	One set of the IMMP map of reserved forest concerning (printed)

Notes: ++: responsible duty, +: supporting duty, - no duty

12.3 Distribution of the Mangrove Management Planning Map

The GIS section is expected to print out IMMP maps and distribute them to the concerned Division, District, and Township FD offices from February to March 2005. The following table describes distribution plan.

Distribution Plan of the IMMP map for the FD offices

Item No.	Type of IMMP Map	Number of Sheets /set	the FD offices concerned				
			the GIS Section	Ayeyawady	Myaung Mya	Laputta	Bogalay
1	the index (summary) map of the IMMP target area	1	+	+	+	+	+
2	Land use and Forest type map of Kyakankwinpauk RF	1	+	+	+	+	+
3	the IMMP map of Kyakankwinpauk RF (each Forest compartment)*	33	+	+	+	+	-
4	Land use and Forest type map of Pyinalan RF	1	+	+	+	+	-
5	the IMMP map of Pyinalan RF (each Forest compartment)**	39	+	+	+	+	-
6	Land use and Forest type map of Kadonkani RF	1	+	+	+	-	+
7	the IMMP map of Kadonkani RF (each Forest compartment)	76	+	+	+	-	+
8	Land use and Forest type map of Meinmahla RF	1	+	+	+	-	+
9	the IMMP map of Meinmahla RF (each Forest compartment)	15	+	+	+	-	+
10	Land use and Forest type map of Pyindaye RF	1	+	+	+	-	+
11	the IMMP map of Pyindaye RF (each Forest compartment)	66	+	+	+	-	+
12	Kyakankwinpauk RF Zoning map	1	+	+	+	+	
13	Pyinalan RF Zoning Map	1	+	+	+	+	
14	Kadonkani Zoning Map	1	+	+	+	-	+
15	Meinmahla RF Zoning Map	1	+	+	+	-	+
16	Pyindaye RF Zoning Map	1	+	+	+	-	+
17	Land use and Forest type map of the IMMP target area	1	+	+	+	+	+
18	Zoning map of the IMMP target area	1	+	+	+	+	+

RF: Reserved Forest

Note: + distributed, - undistributed

* Forest compartment No.16 is not included, because no land exists due to erosion.

** Forest compartment No.73 is not included, because no land exists due to erosion

12.4 Results of the Development of the Mangrove Management Planning Map

The GIS section and the study team evaluated the formulated IMMP map in the course of discussion for the finalization of the IMMP during October and November 2004. It was decided that the following points should improved in future updating and/or utilization of the IMMP map.

- Consistency between the IMMP map and actual landscape,
- Clarification about land availability, access for planning CF promotion or FD direct plantation

- Calculation of areas/distances on the map for the CF management and the FD direct operation
- Selection criteria of the CF area by the FD offices/staff and villagers, and
- Delineating the CF and FD direct operation areas and planned areas on the map.

The evaluation results, particularly the items of direct concern to map updating, are incorporated in the guideline for update and maintenance of the IMMP map.

12.5 Recommendation for Utilization and Update of the Mangrove Management Planning Map

The followings are recommendations derived from the result of the IMMP map development. The recommendations are beyond the framework of the guideline for update and maintenance of the mangrove management planning map. However, such recommendations need to be realized for the appropriate utilization and update of management planning maps in general.

(1) Computerization of FD

Currently FD is planning to install a computer system in each district FD office. However, due to insufficient electricity supply, lack of necessary facilities, and shortage of budget/knowledge on computer maintenance, the introduction of the computer system is stalled. The IMMP map is prepared from several layers of digital data, so maximum performance in updating and map viewing will be achieved by the use of computer. Therefore, it is strongly recommended that the FD's plan for computerization proceed to facilitate the updating of the IMMP map.

(2) Budget Allocation for Periodical update system of the IMMP map

The interpreted aerial photos taken in February 2002 were employed in the IMMP mapping work to create the layer of land use/forest type classification. Land use is a basic type of information for the IMMP map, but is subject to change year by year. Therefore, it is recommended that the land use/forest type information be updated periodically.

For periodical updating in the range of 5-year to 10-year intervals, it is necessary to consider budget of FD to procure relevant aerial photos. Satellite imagery is one alternative source of data for updating the IMMP map. Though, LANDSAT TM image (30m resolution) has low resolution compared with aerial photos, and other high resolution satellite images such as IKONOS and Quick Bird. It has an advantage for obtaining images at two-week intervals at relatively low price.

(3) Development of instructions and procedures on utilization and update of the IMMP map

Looking toward proper utilization and updating of the IMMP map by FD for its direct operations and CF activities during IMMP implementation, it is recommended that FD holds workshops to introduce the IMMP map to all users listed in Section 12.1.2 of this chapter. The Planning and Statistics Division of FD shall be responsible for introducing the IMMP map to concerned offices.

(4) Extension of mapping and planning technology to other Divisions/States

During the study, the mapping and planning techniques of the GIS section, especially the counterpart staff of the Study Team, were improved through on-the-job training in the preparation of the IMMP map. Therefore, these acquired techniques should be extended to other mangrove areas such as the Yakhine State and the Tanintheryi Division. Referring to the procedure for preparation of the IMMP map in Ayeyawady Delta, FD GIS section can develop management planning maps for these areas for improving mangrove forest management and mapping of the mangrove area based on necessity.

Furthermore, mapping and planning techniques such as land use and forest type classification, zoning, and data processing applied in the preparation of the IMMP could also be expanded to non-mangrove forest areas in Myanmar for improving forest management and mapping in general.

CHAPTER 13 GUIDELINES

13.1 Fauna and Flora Conservation Guideline

13.1.1 Introduction

(1) Introduction

Although the threatening of decreasing number and population of the species, the fauna and flora condition to be conserved is still remaining in the study area (Section 2.1.3). However, threatened species are gradually decreasing, habitat is degrading, and biological diversity is declining. The fauna and flora in the study area have to be maintained, the fauna and flora guideline is prepared in the frame work of the Integrated Mangrove Management Plan (IMMP).

Fauna and flora conservation is in accordance with the stream in Myanmar. Myanmar has signed about Biological Diversity on the Convention in 1992. The biological diversity is important to maintain the ecosystem, which brings up the people, and to provide the natural resources to the people. The National Commission for Environmental Affairs, which enacts a national biological diversity conservation programs and focal point for environmental matters, on the Myanmar Agenda 21 in 1995. On the program, the Ayeyawady Delta is required to maintain the biological diversity.

(2) Decrease of Threatened Species, Habitats, and Biodiversity in the Study Area

The vulnerable species such as macaques and wild cats are decreased and disappeared because of illegal hunting and exploitation of the mangrove. A regulation for prohibiting the hunting of the wild animals is active. However, the regulation is not applied to the area and ordinarily such illegal hunting is practiced by local people. The Nature and Wild Life Conservation Division (NWCD) of the Forest Department (FD) is currently undertaking protection and multiplication project of threatened species such as the crocodile and turtles in the study area. However, the achievement is not fully effective yet to stop decrease of the threatened species and conserving habitats for such species. The habitat of wildlife has been decreasing or degrading due to changes in land use. Simply, the human activities itself reduces the range of wildlife habitat. and biological diversity.

It is prospected that the decrease and disappearance of such threatened species and habitats will continue under current situations because the necessity of the conservation and the conservation measure itself are seldom realized by the local communities and authorities. Therefore, public awareness about threatened species and conservation activities are also required.

13.1.2 Objective of the Guideline and Approach of the Conservation

(1) Objective of the Guideline

The objective of the fauna and flora conservation guideline is to conserve the threatened wildlife and biological diversity in the study area. Also the fauna and flora guideline is included as a part of IMMP and aimed to serve as a guideline for FD to implement fauna and flora conservation measures in the course of the IMMP implementation.

(2) Approach of the Conservation

The fauna and flora conservation guideline was prepared based on current institutional framework on conservation of fauna and flora and on going wildlife conservation plan, (Section 4.4.1). The objective of the conservation of fauna and flora guideline is to maintain the biological diversity and natural resources. Employed procedure for development of the guideline for attaining the objective is shown in Figure 13.1.

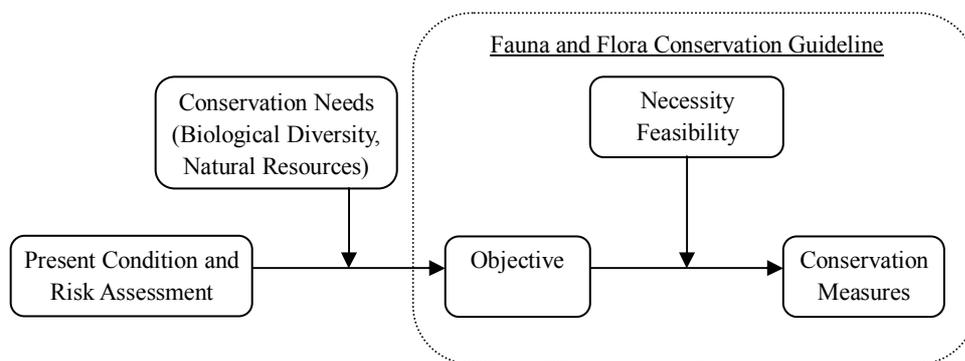


Figure 13.1 Flow for Preparation of the Fauna and Flora Conservation Guideline

Approach for development of the conservation guideline was employed from view points of the necessity for selection of conservation target and practicability of the guideline. The fauna and flora conservation is undergoing in partial area of the study area. Enlargement and integration of the activities are the priority issues. Enable to enlarge and integrate the activity, the organization has to be consolidated. Conservation activities such as promotion of public awareness, patrolling, monitoring and the results have to be fed back for achieving the system development of the guideline. Based on the consideration, the following approaches are set.

- 1) to improve the protection and increase of threatened species,
- 2) to maintain the biological diversity,
- 3) to promote the capacity development of the NWCD offices, and
- 4) to implement the monitoring and feedback to the conservation system.

13.1.3 Recommended Conservation Measures in the Guideline

(1) Management Areas and Responsibility

The management responsibility of fauna and flora conservation is different between Meinmahla Reserved Forest and other four reserved forests (Kyakankwinpauk, Pyinalan, Kadonkani and Pyindaye). The Meinmahla Reserved Forest is designated as the wildlife sanctuary and NWCD under FD manages the area directly and has a somewhat separate operation line from the Bogalay Township FD office. Other four reserved forests are managed by Laputta and Bogalay Township FD offices.

(2) Conservation Areas and Stakeholders

Target area of the fauna and flora conservation guideline is composed of 1) wildlife sanctuary (Meinmahla), and other areas to be selected and protected according to the habitats of biological indicators, 2) core zone delineated through the study in Kyakankwinpauk, Pyinalan, Kadonkani and Pyindaye Reserved Forest and 3) area to be protected for endangered species.

The responsible organization incorporating to the target area is shown in the following table. The local people are placed as an essential stakeholder in the guideline because local people can behave both negative and positive sides in conservation of the fauna and flora. Thus, co-management with local people was employed in the fauna and flora conservation guideline.

Conservation Areas and Stakeholders

Reserved Forest	Conservation Area	Stakeholders
Meinmahla	Wildlife sanctuary	NCEA (Planning), NWCD (Management)
Other four reserved forests	Areas to be protected	NCEA (Planning), FD (Management)
	Core zone of the IMMP	Fishery Department (Management) Local people Co-management

NCEA: the National Commission for Environmental Affairs

(3) Conservation Measures

The applicable measures for each target area were prepared in the following table. Adequate conservation measure has to be employed based on target area, because of differences about management responsibility and procedure to be applied. Detailed measure was provided in the fauna and flora conservation guideline described in Chapter 1, Volume IV of the final report.

Conservation Measures in Fauna and Flora Guidelines

Reserved Forest	Measure	Target Species and Methods
Meinmahla	Protection and multiplication of threatened species project	Crocodile Macaques, Otters, Sumer deer, and birds
	Restoration of habitats	Restoration of degraded forest in the northern part
	Capacity development of the NWCD officers	Strengthening of regulation Seminar and workshop
	Monitoring of the biological condition and feedback to the conservation measures	Biological survey Establishment of feedback system
Core Zone Area to be protected	Protection and multiplication of threatened species project	Turtles
	Maintenance of the areas to be protected and core zone.	Establishment of the area Protection of the forest
	Capacity development of the FD officers and local people.	Strengthening of regulation Public awareness
	Monitoring of the biological indicators and forest condition, and feedback to the review of conservation measures	Biological indicators Forest structure of core zone Forest area

13.2 Guideline for Utilization of the Mangrove Rehabilitation Manuals

13.2.1 Objective of the Guideline

This guideline was prepared for a practical utilization of the manuals by FD. This guideline consists of following parts,

- 1) Target users of the manuals,
- 2) Distribution method of the manuals,
- 3) Utilization and application method of the manuals, and
- 4) Proposed updating method of the manuals

13.2.2 Users of the Manual

Users of the mangrove rehabilitation manuals are the frontline staff of FD who are range officers, deputy range officers, foresters and forest guards of the township FD office for the “mangrove rehabilitation manual for FD frontline staff of the Ayeyawady Delta”, and the CF user groups for the “mangrove rehabilitation manual for the community of the Ayeyawady Delta”. Also, the following FD offices and organizations would be the user or the observer of the manuals.

- 1) Director General staff, Director General Office
- 2) Planning and Statistics Division, Director General Office
- 3) Geographic Information System (GIS) section, Planning and Statistics Division,
- 4) Extension Division, Director General Office,
- 5) Central Forestry Development and Training Centre (CFDTC),

- 6) Forest Research Institute,
- 7) Ayeyawady Division FD Office,
- 8) Myaung Mya District FD Office, and
- 9) Laputta and Bogalay Township FD Offices.

13.2.3 Distribution of the Manual for the Users

(1) Distribution of the manuals to the FD offices

The type and the number of manuals submitted to FD by the study team is summarized in the following table.

Number of Manuals Received by FD

	English version	Myanmar version	Digital data of manual (CD-R)
Manual for FD	50 copies	100 copies	1 set
Manual for Community	10 copies	100 copies	1 set

The following is a proposed plan for distribution of the manuals received by FD to users and observers within FD. However, based on necessity, the manual should be duplicated by FD for additional copies. Especially, copies of the Myanmar version should be distributed to all of frontline staff in the study area for the actual use in the field.

Proposed Distribution Number of the FD Manual by User

Organization	No. of manuals			
	Manual for FD		Manual for Community	
	English	Myanmar	English	Myanmar
Director General Staff	5	5	1	2
Planning and Statistics Division	10	5	2	2
Forest Extension Division	5	5	1	2
Central Forestry Development and Training Centre (CFDTC), and Forest Research Institute	10	5	2	2
Ayeyawady Division Office	5	5	1	2
Myaung Mya District Office	5	15	1	10
Laputta Township Office	5	30	1	40
Bogalay Township Office	5	30	1	40
Total	50	100	10	100

(2) Distribution of the Manual for Community

The manual for community in Myanmar version is prepared for utilization by the CF user group in particular for CF activities. Therefore, FD should distribute the manual to the CF user group. Distribution to CF user groups should be conducted by township FD offices. For efficient utilization of the first version of the manual, it is recommended to distribute the manual to the following CF user group in the IMMP targeted reserved forest.

- CF user groups at preparatory stage such as promotion, CF user group formulation,

and CF management plan preparation, and

- CF certificated user groups re-starting the CF activity
- CF certificated user groups in a stage for revision of their CF management plans and starting harvesting

At least two copies of the mangrove rehabilitation manual should be supplied to each user group by FD. One copy of manual should be kept by the chairman of management committee for corresponding to inquiries of CF user group members, and another copy to be used in the field by user group as whole.

13.2.4 Utilization and Application of the Manuals

Primarily, the mangrove rehabilitation manuals are expected to be utilized by users and observers in the scope of utilization described in the following table.

Utilization of the Manuals by Users and Observers

Organization	Scope of Utilization
Director General Staff	- Reference for CF management and support in the delta - Reference for mangrove rehabilitation in the delta
Planning and Statistics Division	- Reference for CF management and support in the delta - Reference for mangrove rehabilitation in the delta - Updating of the manual for the future usage
Forest Extension division	- Utilization of the manual for forest extension - Utilization of the manual for preparing materials for public awareness
Central Forestry Development and Training Centre (CFDTC), Forest Research Institute	- Utilization of the manual as training materials for the training courses - Utilization of the manual for development of the other CF manuals - Updating of the manual for the future usage
Ayeyawady Division Office	- Reference for the CF management and support - Reference for Mangrove rehabilitation - Updating of the manual for the future usage
Myaung Mya District Office	- Tool for the CF management and support - Reference for mangrove rehabilitation - Public awareness of people in collaboration with District Peace and Development Council (DPDC) - Updating of the manual for the future usage
Laputta Township Office	- Tool for the CF management and support - Tool for mangrove rehabilitation - Public awareness of people in collaboration with the Township Peace and Development Program (TPDC) and the Village Tract Peace and Development Council (VPDC) - Updating of the manual for the future usage
Bogalay Township Office	- ditto -
CF User Groups	- Utilization of the manual for all aspects of CF operation and management

13.2.5 Update of the Manuals

The mangrove rehabilitation manuals are prepared based on findings and lessons obtained through the study, particularly from the result of the pilot project implementation. Information source collected for the preparation of the manual is concentrated to the pilot project area and limited to information obtained during the study period of only three years or less.

Natural and socio-economic conditions in the delta mangrove area are expected to change rapidly, and the CF operation and management might be modified based on the progress of such activities. In such case, the already prepared mangrove rehabilitation manuals could not correspond properly to changes in the reality. Therefore it is recommended to update the manual as duty of Central Forestry Development and Training Center (CFDTC) in collaboration with the concerned regional offices and staff who engaged in the mangrove rehabilitation, CF management and support.

The manuals would serve as a media for accumulation of experience and knowledge of the FD staff engaged in the mangrove rehabilitation. Accumulation and compilation of the manuals are recommended to be conducted every five years at intermediate points of the 10-years district forest management plan. Update procedure of the manual is proposed in the following figure.

Update Procedure of the Manual

Activity / Year	1 st year	2 nd year	3 rd year	4 th year	5 th year
1) Distribution of the manual to each the FD office	■				
2) Utilization of manual	■	■	■	■	■
3) Accumulation of findings and lesson	■	■	■	■	■
4) Compilation of the findings and lessons					■
5) Updating the manual					■
6) Distribution of the revised manuals					■

The following procedure for updating the manuals was prepared in accordance with a progress of the IMMP phase I. Also, updating of the manuals should consider linkage and consistency with the integrated forestry technology manual planned to be prepared during the IMMP phase I (for the integrated forestry technology manual, refer to Section 9.3.3(4) for details). The manuals originally prepared under the study should be characterized as a summary manual which covers major aspects of mangrove rehabilitation and CF activities, whereas the integrated forestry technology manual is characterized as specific manual for mangrove forestry rehabilitation technology which contribute to better practice of mangrove rehabilitation and CF operations.

1) Distribution

Distribution of the manual to each concerned FD office. The township FD office will distribute the manual to the CF task Force. Then the CF task force will distribute to CF user groups.

2) Identification of findings and lessons

Through the IMMP implementation, the findings and lessons would be identified and recorded by staff of the CF task force.

3) Accumulation of findings and lessons

Every year the findings and lessons accumulated through implementation of the IMMP would be compiled by the CF task force. And such information will be transmitted to superior offices for updating of the manuals.

4) Revision of the manuals

At fifth year from the first distribution, findings and lessons accumulated up to then would be integrated as revised manuals.

5) Distribution of the revised manuals

The revised manuals will be distributed to users and observers of the manuals at the same manner with the first version. The above process would be continued in the succeeding five years.

13.3 Guideline for Update and Maintenance of the Mangrove Management Planning Map

13.3.1 Objective of the Guideline

The mangrove management planning map (hereinafter refer to as the IMMP map) needs to be continually updated, because the current map is prepared based on the 2002 aerial photograph, and changes in land use and forest conditions of the study area are regularly predicted. Therefore this guideline is aimed to explain about “how to up date” the IMMP map including distribution of updated works to related FD offices i.e. i) GIS section, ii) Ayeyawady Division FD Office, iii) Myaung Mya District FD Office and iv) Laputta/Bogalay Township FD Offices.

13.3.2 Required Contents of the Update

(1) Contents to be Updated

The following table shows about contents of the IMMP map and the necessity for updating the content.

Composition of the IMMP Map and Updating Perspective

Composition of the IMMP Map	Necessity for Updating
- Topographic map	Not required
- Land Use and Forest Type (Map)	Required (Regular updating)
- Zoning (Map)	Required (Regular updating)
- Village locations	Required (Regular updating)
- Border lines of forest compartment	Required (Upon changes)
- Border lines of Reserve Forest	Required (Upon changes)

As mentioned in the above table, all of the IMMP map contents, except for the topographic map (or equivalent data), are required to be updated to match the actual conditions of the IMMP map target area.

(2) Interval for Updating

In consideration of availability for updating information sources and anticipated changes of land use and socioeconomic conditions, the updating interval shall be at least every five years. However information which is possible to obtain in a shorter interval such as change in the border lines, should be updated upon changes of the current status.

13.3.3 Updating Procedure

(1) Update Land Use and Forest Type Map

It is recommended that FD obtains satellite images of the IMMP target area at least every five years to analyze and understand changes in land uses and forest types from the previous 5 years. However, the satellite image shall be obtained at shorter interval, since the mangrove area of the delta is decreasing five percents every year according to estimation by the GIS section.

The GIS section is kindly requested to develop revision of land use and forest type map based on newly obtained satellite image. Same development procedure and technology what the study has employed and the GIS section has obtained through co-work between FD and the study team.

(2) Updating of Zoning Classification

Zoning prepared based on information about land uses, forest types, village locations, and management objectives will allow FD to prepare necessary plan for forest management of the reserved forest. Based on changes of land uses and forest types, reclassification of zones shall be considered with FD. Then the GIS section shall update zoning data and map by the same procedure and skill applied to the current IMMP map.

(3) Updating of Village Location

Information on village location in the current IMMP map comes from 2002 aerial photograph interpretation by the GIS section and 2004 topographic map prepared from the same 2002 aerial photograph. Situation of villages in the reserved forest are not stable. Every year, migration among villages and new settlements occur in the reserved forest. Therefore, the village location information should be updated based on newly obtained satellite imagery combined with result of field surveys. When GPS is available in Laputta/Bogalay Township FD Offices, the exact location of new village should be recorded. Then, the GIS section is able to draw updated IMMP maps based on these records.

(4) Updating Border Line Information

Border line data of the forest compartment and reserved forest in the IMMP are provided based on delineation of the 2004 topographic map, keeping a consistency with existing forest compartment and reserved forest maps prepared manually on computer screen. The digital data is not originated by actual measurement at site, so that except for delineation of major water bodies, borders of the forest compartments and the reserved forests such as borders between forest compartments and unclassified lands or agriculture lands are not clearly identifiable at site. Therefore it is recommended to start operation for clarifying such borders by setting landmark and measurement. The measurement data recorded by GPS will be applied for update of border line information of the update of IMMP map.

Also if in case border lines of the forest compartment and the reserved forest are modified in accordance with the Forest Law and the FD Rules and Regulations, such changes should be also incorporated in the IMMP map

13.3.4 Work Cooperation for Updating the Mangrove Management Planning Map

The IMMP map has to be integrated and updated with various kinds of new information as mentioned in preceding section. Therefore it is recommended the work should be

collaborated among concerned FD offices. The procedure for the updating is shown in Figure 13.2.

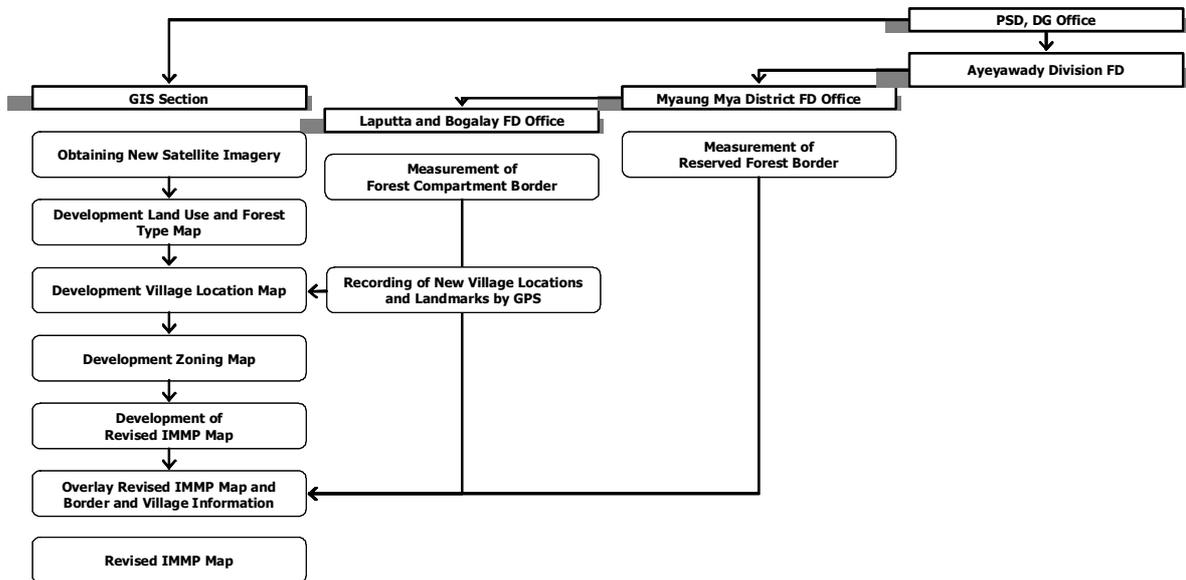


Figure 13.2 Procedure and Work Sharing for Update the IMMP Map

CHAPTER 14 INITIAL ENVIRONMENTAL EXAMINATION (IEE)

14.1 Introduction

The study was designated to practice an Initial Environmental Examination (IEE) for confirmation of environmental impacts. The result of the IEE is shown in Section 14.2 that reviewed the examination carried out in the interim report prepared in the study. An environmental and social impact evaluation based on the Japan International Cooperation Agency (JICA) Guidelines for Environmental and Social Considerations (2004) was not carried out in the study. Therefore, it is recommended that the environmental and social impact evaluation to be practiced at the beginning of the implementation of the Integrated Mangrove Management Plan (IMMP) phase I. The recommended procedure for the evaluation is presented in Section 14.3.

14.2 Initial Environmental Examination

14.2.1 Methodology

The law and guidelines on Environmental Impact Assessment have not been fully developed in Myanmar yet. Therefore, the “Guideline for Environmental Consideration on Development Study: Vol. XV Forestry, Vol. XIV Agriculture, and Vol. X Regional Development” issued by JICA was referred to for implementation of IEE. Based on the site conditions and the checklist items of the JICA guidelines, an impact matrix was prepared showing directions of impacts (negative or positive) and magnitude of impacts.

Major Environment-related Laws and Regulations in Myanmar

- | |
|---|
| <ul style="list-style-type: none">- National Environment Policy (Law No. 26/94, 1994)- Protection of Wild Life and Wild Plants and Conservation of Natural Areas Law (Law No. /94, 1994)- Drug Law, National (Law No. 7/92, 1992)- Fishing Rights of Foreign Vessels, Law Relating to (Law No. 11/89, 1989)- Fishing Rights of Foreign Vessels, Law Amending Law Relating to (Law No. 15/93, 1993)- Forest Law (Law No. 8/92, 1992)- Freshwater Fisheries Law (Law No. 1/91, 1991)- Marine Fisheries Law, Myanmar (Law No. 9/90, 1990)- Marine Fisheries Law, Law Amending Myanmar (Law No. 16/93, 1993)- Pesticide Law (Law No. 10/90, 1990)- Plant Pest Quarantine Law (Law No. 8/93, 1993)- Private Industrial Enterprise Law (Law No. 22/90, 1990) |
|---|

14.2.2 Activities that may Cause Environmental Impact

Activities which may affect the environment of the IMMP target area are selected from the work of the project. From the work, development of core/model community forestry (CF) user group and capacity development of the Forest Department (FD) for CF management

and support are mentioned as activities of environmental impact. Because the activities contain an impact on ethnic minority, construction, and possibility of resettlement at some extent. From the ethnic minority, the Karen people are mentioned as the people who receive impact. From the construction, the FD CF extension centers and nurseries including their internal roads, nursery beds, nursery offices, residential houses, extension centers, and demonstration facilities, such as the CF water reservoir, the CF aqua-agroforestry pond and the mangrove garden, are mentioned as activities that may cause environmental impacts. Regarding the resettlement, the “action research plantation” is mentioned as the activity that may cause environmental impact in the guideline. The action research is proposed to be carried out in the Integrated Resource Management (IRM) area, the Core and Buffer Zones, which are aimed for protection of mangrove forests and may require resettlement of inhabitants inside the area. The Laputta Township FD office is ready for resubmission of an updated proposal on the plan for IRM in the Kyakankwinpauk and the Pyinalan Reserved Forests to the Laputta Township Peace and Development Council (TPDC). There are nine villages in the proposed IRM area in the Kyakankwinpauk and the Pyinalan Reserved Forests.

14.2.3 Results of IEE

The results of IEE are shown in Table 14.1, and its summary is in Table 14.2.

In each reserved forest, the different impacts have been predicted in accordance with its land use. The IMMP would affect various kinds of impact such as activation of efficient and intensive land use, starting felling operation, construction of aqua-agroforestry ponds, or intensification of group activities.

In terms of “Ethnic Minority”, the impact was predicted as being relatively slight, because of the fair operation of the Laputta Township FD Office between Burmese and Karen who have settled in the area, and who are the candidates for the CF user group. No difference was identified regarding the operation among the ethnicities. Also, there was no different operation relating to the difference of religions such as Buddhism or Christianity.

The magnitudes of the impact predicted on “Construction” were relatively slight. The construction proposed in the IMMP phase I would employ the same construction methods as the pilot project under the study. Lessons obtained through construction work of the pilot project would be applied as a model. The construction under the pilot project employed environmentally friendly methods for external and landscaping work, which avoids negative environmental impacts on precious species and ecosystems. In the Meinmahla Reserved Forest, no negative impact was predicted since no exploitation activities are proposed.

In terms of “Resettlement”, the impact was predicted as relatively slight. About “Resettlement”, allocation of the settlements is performed by the operation of IRM. The impacts induced by resettlement are assumed to be relatively slight, because of the small loss of economic and livelihood bases. Based on layering the topographic map and the IRM planning map, there are five and four villages inside proposed IRM areas in the Kyakankwinpauk Reserved Forest and the Pyinalan Reserved Forest respectively. Although the villages are located in the proposed IRM area (forest compartment numbers 5, 6 and 27 in Kyakankwinpauk, and 56, 58, 64 and 77 in Pyinalan), settled areas lie in the marginal part of the IRM area, since the actual resettlement would not be taking place strictly according to the delineation line of the IRM, except for the temporary encroached village located in the Core zone of the Kyakankwinpauk Reserved Forest, which was settled about 2-3 years ago. Currently, the Laputta Township FD Office proposes joint forest management between villagers and FD for management of the IRM area. The joint forest management would employ the resettled villagers and/ or neighboring villagers, so that the chance for employment of those villagers would be increased.

14.2.4 Necessity of Environmental Impact Assessment

The necessity of Environmental Impact Assessment has been evaluated for five reserved forests. The selected items for Environment Impact Assessment were “Ethnic Minority”, “Construction” and “Resettlement”. Items whose impacts are “C (relatively slight impact)” have been selected.

(1) Ethnic Minority

In the course of pilot project implementation, the Laputta Township FD Office allocated CF church woodlot to the Karen people of Thar Yar Kone CF user group. The CF area is currently not certified yet by the Myaung Mya District FD Office, because of a change of the district FD officer. From this fact, even though there is an ethnic minority in the IMMP target area, impact is predicted as slight. Since significant impact is not predicted, impact is judged as “C” and Environmental Impact Assessment is unnecessary.

(2) Construction

A FD CF extension center and nursery is proposed in each of four reserved forests comprising one new construction at Set San village in the Pyindaye Reserved Forest, and renovations of three existing facilities located at Kwa Kwa Ka Lay, Thar Yar Kone and Byonmwe at the Kyakankwinpauk, in the Pyinalan and the Kadonkani Reserved Forests respectively. Environmentally friendly construction or rehabilitation methods would be employed in compliance with the definition of forest land use by the Forest Law. All facilities would be designed to be located under the tree canopies. Since significant impact

was not predicted, the impact was judged as “C” and Environmental Impact Assessment is unnecessary.

(3) Resettlement

Temporary residents of around 10 households in the proposed IRM area would be relocated. The resettlement target households are not long time permanent residents in the land. The number of resettlements would be limited. Also, the resettlement would offer more income opportunity as compensation for the resettlement from FD through the Joint Forest Management operation. Therefore the impact is judged as “C” and Environmental Impact Assessment is unnecessary.

14.2.5 Conclusion

The goal of the proposed IMMP is the coexistence between mangrove forest and settlements. The environment would be improved by the project generally. All selected impacts were predicted as “relatively slight”. The "Resettlement" would alter the economic basis of the people. However, the resettled people would have the chance to obtain a bigger income through participation in the Joint Forest Management or the CF activities. The poorest of the poor in village society, caused mainly by less opportunity to participate in the labor force, such as widows or the elderly of families, would also be getting positive impact through participation in the communal type CF activity.

14.3 Evaluation of the Environmental and Social Evaluation

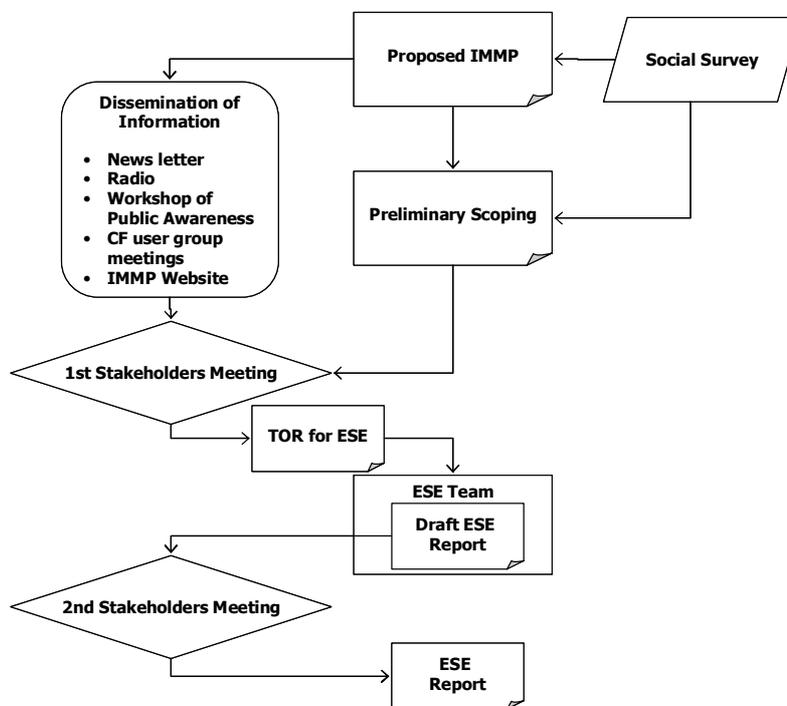
14.3.1 Guideline of the Environmental and Social Evaluation

The Environmental and Social Evaluation has to be practiced referring to the JICA Guidelines for Environmental and Social Considerations (2004) as well as the relevant laws, regulations and guidelines in Myanmar. The result of IEE is “relatively slight” with respect to the IMMP phase I. The work of the IMMP is deeply connected to social matters covering villagers of all strata. Therefore careful implementation of the Environmental and Social Evaluation is required for confirmation of intention or social conditions of the village. The result of the Environmental and Social Evaluation would give suggestions on how to avoid and mitigate negative environmental and social impacts for implementation of the IMMP phase I (Figure 14.1).

14.3.2 Proposed Evaluation of the Environmental and Social Impacts in the IMMP phase I

(1) Sequence to be followed for the Evaluation

The following steps should be taken for practicing the evaluation at the beginning stage of the IMMP phase I.



ESE: Environmental and Social Evaluation

Figure 14.1 Sequence for Evaluation of the Environmental and Social Impact

(2) Dissemination of Basic Information

Before the first stakeholders meeting, it is recommended that the information related to the IMMP phase I to be distributed to stakeholders. Targeted stakeholders, distribution methods and kinds of information are shown in the following tables.

Targeted Stakeholders

Settlement in the IMMP phase I Target area in the reserved forest
Local Authorities: DPDC, TPDC, VPDC, Village Authorities
District and Township Fishery Department and Myanmar Agricultural Services
Ayeyawady Division, Myaung Mya District, and Laputta and Bogalay Township FD Offices

Distribution Methods and Kinds of Information

Distribution Methods	Information
Public Awareness Meeting	Contents of the IMMP phase I
Annual Meeting of CF	Expected outputs of the IMMP phase I
Annual Meeting of mangrove rehabilitation	Current situation of the mangroves
IMMP News Letter	CFI
IMMP Web Site	FD operation of CFI
Extension Activities	

(3) Preliminary Scoping

It is recommended that FD lists items of potential environmental and social impact for implementation of the IMMP phase I. It is predicted that “resettlements”, “construction” and/or “Ethnic Minorities” will be listed. The results of the village profile survey and rapid rural appraisal (RRA) conducted in 2002, and the socioeconomic condition survey carried out in 2004 have been taken into consideration. However, in addition it is recommended that FD carries out an additional social survey on socioeconomic conditions.

(4) First Stakeholders Meeting

It is recommended that FD holds stakeholders meetings at the commencement stage of the IMMP phase I at each level of administration i.e. at the Myaung Mya District, at the Laputta and Bogalay Townships and at the village tracts related to implementation of phase I. For efficient operation, it is recommended that the stakeholders meeting and public awareness be held at same time. As the host organization, FD has to gather participants from all strata of villagers and should focus on obtaining the understanding of all participants equally.

(5) Preliminary Evaluation of Environmental and Social Impacts

All stakeholders are basically not accustomed to carrying out such evaluation by themselves. Therefore it is recommended that the FD officer charged with the IMMP phase I should become familiarized with the evaluation method first. The evaluation would employ a method from a viewpoint with or without the project.

(6) Second Stakeholders Meeting

The second stakeholder meeting should be planned to invite the related stakeholders based on preparation of the preliminary evaluation. The same procedure for holding the meeting should be taken as with the first meeting. Ordinarily, a limited number of participants present their opinion in Myanmar in meetings; thus the subgroup meeting method is recommended.

(7) Preparation of Report on Environmental and Social Impact

It is recommended the FD prepares the report on environmental and social impact based on the results of the second stakeholders meeting. The prepared report should be released to the stakeholders, the website of the IMMP phase I and also to the other media.

CHAPTER 15 CONCLUSION AND RECOMMENDATION

15.1 Conclusion

15.1.1 Urgent Implementation of the IMMP

Considering the expansion of degraded mangrove areas in the study area, the implementation of the Integrated Mangrove Management Plan (IMMP) is urgently needed to stop the negative flow of disappearing mangrove forest and to restore the irreplaceable functions of the mangroves. As stated in Section 2.2.1, the current mangrove forested area was estimated as approximately 40 percent of the total study area. The decrease rate of mangrove forest was also estimated as six percent per year of the existing mangrove based on comparison of Landsat images between 1996 and 2001. By calculation, all mangrove forest areas would be lost by 2013 under the current decrease rate.

In particular, the implementation of the following three items would be extremely important to facilitate appropriate management of the reserved forests.

- Development of a core/model Community Forestry (CF) user group through the following two approaches,
- Institutional development of the Forest Department (FD) (i.e. development of bylaws of the Community Forestry Instruction (CFI), and system for management and support of implementation of CF activities by CF user groups), and
- Integration of forestry technology of the delta area through the action research plantation.

15.1.2 Budget Allocation for Integrated Mangrove Rehabilitation through Community Participation

It is quite obvious that realizing sustainable CF activity through implementation of the IMMP requires continuous inputs in the forms of finance, manpower, and material, of which the most critical for FD is financing the IMMP project. In order to acquire the budget, there are several conceivable options such as funds allocated from the national project with that budget distributed from a superior organization of FD, financial aid from donor countries, or development of a concession to FD for introducing a budget for CF management and support. Thus the IMMP concluded by recommending that the CF Task Force implement phase I and the CF mangrove national project implement phases II and III as organizations to secure and apply the budget for IMMP implementation by FD.

15.2 Recommendation

15.2.1 Overall Recommendation for Implementation of the IMMP

The following items are recommended for implementation of the IMMP in accordance with the conclusions stated in Section 15.1.

- (1) FD should launch a CF management and support system enabling sustainable CF activities,
- (2) FD should formulate an organization solely charged with the CF management and support with consideration of workloads and the kinds of duties of the organization,
- (3) FD should engage in institutional development for development of bylaws of CFI, and
- (4) FD should integrate the forestry technology of the Ayeyawady Delta and compile the outputs for extension of the technology to succeeding officers and field staff for mangrove rehabilitation in the delta, and also for other states/divisions where mangrove rehabilitation is necessary.

15.2.2 Launching CF Management and Support System

The CF activity of the delta cannot be sustained by the CF user group alone because of insufficient experience and technology relating to CF activities in the CF user groups. No CF user groups in the delta have been engaged in harvesting of the CF plantation yet. Therefore, it is highly recommended that FD start supporting CF activities undertaken by the CF user group, even after granting of the CF certificates. Also FD should start management of CF such as recording of CF areas and the survival rate of planted seedlings. Currently, FD has no data about the progress of CF activities except for CF areas that have been granted CF certificates.

In particular, for launching the CF management and support system, it is necessary to consolidate a capacity in FD. Especially, it is requested that the organization and budget of FD for the management and support activity to be upgraded.

15.2.3 Formulation of Organization

(1) Formulation of CF Task Force and CF Mangrove National Project

The current FD organizational system has not been provided enough facilities for CF management and support. For realization of sustainable CF activities, continuous and considerable support to user groups is required by means of formulation of the necessary organization within FD. It is required that the organization be solely charged with the CF management and support in accordance with increasing numbers of CF user groups, and propelling the institutional development shown in the succeeding clause (15.2.2). As

mentioned in Section 15.1.2 Budget Allocation, it is recommended that FD formulates a CF Task Force charged to develop the foundation of sustainable CF activities during the IMMP phase I. The CF Mangrove National Project should be charged with the development of an extension system based on the foundation during the IMMP phase II and de-centralization of the sustainable CF activity based on the extension system during the IMMP phase III.

(2) Setting Collaboration System among FD and Technology Support Agencies

CF activities proposed in the IMMP are composed of pure forestry activity, fish culture, and agricultural activities i.e. CF plantation, CF NFIO, CF aqua-agroforestry, CF agroforestry, and CF paddy woodlots. FD has started training officers and field staff for such technologies at CFDTTC. However, officers and field staff at township level still have a shortage of knowledge and experience of the activities. Therefore, technology support of CF user groups by the Myanmar Agriculture Service and the Fishery Department at site level is highly recommended. FD has to establish a collaboration system among FD, Myanmar Agriculture Service and the Fishery Department at each level of administration i.e. Bogalay and Laputta Townships, Myaung Mya District, and the central level.

(3) Establishment of Collaboration System between FD and Local Authorities

In the reserved forests targeted by the IMMP, encroachers are broadly divided into either inhabitants in the reserved forest or traders and investors in encroaching activities such as illegal shrimp ponds or illegal felling of trees. The CF certificate is normally granted to local people who have settled more than three years at one village. The local people can be one of the stakeholders of IMMP as CF user group members. As a countermeasure for such encroachers and traders/investors, public awareness against such illegal activities is provided in the IMMP phase I. The public awareness is targeted to obtain the understanding of the Peace and Development Council at district, township and village tract levels as well as village authorities and villagers in the reserved forests. The public awareness implies establishing enlightenment of villagers through obtaining understanding of such local authorities. However, the public awareness itself is not enough for combating the encroachment pressure in the reserved forests. The pressure is lurking everywhere in the reserved forests. In addition to the public awareness, periodical patrolling in collaboration among FD, CF user groups and local authority is recommended as the second option of key countermeasures against the encroachment.

15.2.4 Institutional Development of FD for Management and Support of CF Activity

(1) Harvesting Permission from the CF Activities

As stated in Sections 7.4.3 and 8.3.3, sustainable CF activities will be achieved through providing satisfying incentives for user groups and their members, induced through CF activities. In the course of the present study, incentives for fulfillment of sustainable CF activities have been analyzed into the following structure.

- 1) Incentives realized in the short-term are composed of a) land use right and b) CF aqua-agroforestry production in the CF area. Products are expected within one year after starting the CF activity,
- 2) Incentives realized in the mid-term are composed of productions of c) agroforestry, d) leaves or branches from compost woodlots, and e) fuelwood from fast growing species plantations through periodical harvesting from agroforestry and fast growing species plantations in CF areas. Products are expected within five years after starting CF activity,
- 3) Incentives realized in the long-term are composed of productions of f) poles and timbers, g) fruits, and h) value added production from CF areas through periodical harvest from the CF activity. Products are expected within 10 years after starting CF activity.

The incentive for CF has been analyzed and there exist only two types of incentives “land use right” and “production from CF activities”. Therefore, sustainable CF activity can be guaranteed for continuation by satisfying both types of incentive in various forms.

In order to maintain incentives for CF user groups for sustainable CF activities, it is highly recommended that FD prepare bylaws of CFI, which enable harvesting of CF products within the extent of the statement in CFI.

(2) Institutional Development of FD

In reality, current capacity of township FD offices is estimated as weak for engagement in CF management and support to satisfy the incentives for CF user groups stated in the preceding clause. The office has no experience about the management and support of CF after granting CF certificates. For instance, though the CF user groups are requested in CFI to submit annual progress reports to FD, the FD office has no record or data about CF activities except for certified areas and user group member information. Harvesting of CF products based on sales vouchers and removal pass for selling CF products has not started yet. According to CFI, the CF user group can sell the CF products after printing the sales vouchers, and registration of the vouchers at the township FD office. The current status of

township FD was evaluated as having no capacity to engage in CF management and support duties for harvesting and selling CF products.

Also, CF management and support activity would be a heavy work load because of the increase in number of CF user groups year by year. Current duties of township FD offices are limited mainly to revenue collection, establishment of FD plantations, supply of seedlings for greening activities, patrolling for encroachment, and filing forest law related legal cases. The organization is currently not provided with enough facilities for CF management and support. Therefore, it is recommended that FD provides rules and regulations and organization for CF management and support.

(3) Legalization of Illegal Dwellers in the Reserved Forests

Currently all dwellers settled in the reserved forests are encroachers of the area and are against the Forest Law. The Forest Law prohibits trespassing, settlement and any economic activities in the reserved forests without permission of FD. However, resettlement of all such dwellers to outside of the reserved forest is not permitted by the TPDC of Bogalay and Laputta Townships, except for the integrated resource management (IRM) area established in the Kadonkani Reserved Forest in 1997. From this point of view, CFI, a decree issued by the director general of FD, is the only legal means to justify such encroachment activities inside the reserved forest legally. Thus, villagers settled in the reserved forest have to be members of CF user groups in order to establish legal settlement status. In line with this context, the IMMP targets all settlements in the reserved forests by planning and introducing various kinds of CF prototypes to meet the needs and natural/socioeconomic conditions of CF user groups.

15.2.5 Integration of Forestry Technology Adapted for the Ayeyawady Delta

The mangrove plantation project which enabled accumulation of existing mangrove forestry technology to some extent was started by FD in the early 1990s based on support from UNDP/FAO projects. Up to now, the mangrove forestry technology was focused mainly on fast growing species such as *Avicennia* species or *Sonneratia* species, because of an expectation of earlier growth/harvest, abundant seed sources and easier seedling production. Meanwhile, approximately 30 mangrove tree species, 20 shrub/vine species and some non-mangrove species have been counted in the study area as part of the composition of the existing vegetation.

Up to the present, the forestry technology obtained through implementation of such mangrove projects is mainly accumulated with individual officers and field staff of FD who were charged with the project. However, the technology is not yet compiled and integrated as an organization by FD for extension and for succeeding officers and field staff. The

technology regarding mangrove forestry in the delta is scattered and in unsustainable situations. Thus, integration of the forestry technology is required for compilation of existing knowledge and experience, and also for development of further necessary forestry technology to cover all priority species and areas for mangrove rehabilitation in the delta and elsewhere.