

Republic of the Union of Myanmar
Ministry of Natural Resources and Environmental Conservation

Design Phase of Component 2
(Integrated Watershed Management
in the Inle Lake Watershed)
of
The Project for Capacity Building for Sustainable
Natural Resource Management
in
Republic of the Union of Myanmar

Project Completion Report

Volume III: Attachments-19~30

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Attachment 19
Proposal for Establishment of
CF in Pha Yar Phyu Village

Proposal for Establishment of CF in Pha Yar Phyu Village

Component 2 of FDSNR
October 7, 2019

1. Background

The JICA Project Expert Team of Component 2 of the Project for Capacity Building for Sustainable Natural Resource Management (hereinafter referred to as “FDSNR”), which has been jointly implemented by Forestry Department (FD) and Japan International Cooperation Agency (JICA) since August 2018, has conducted field surveys to assess the current conditions of the Inle Lake watershed and identify the potential interventions for watershed conservation to reduce the inflow of suspended sediment into Inle Lake. The results of the assessments suggest that the changes in land use, particularly conversion of forests into farmlands or non-forest areas, significantly links to the occurrence of gully erosion and increase of surface soil erosion in the watershed. Hence, the protection of existing forests in the watershed is one of the essential issues to be addressed for sustainable watershed management in addition to an increase of forest cover in the area.

At the same time, the Team found that people in Pha Yar Phyu village protected the part of the existing reserved forest, namely Aungbang Reserved Forest, near the village as a protected area and had an intention to protect the same. After a series of discussions with communities in Pha Yar Phyu village together with the township FD, the Team confirmed that local communities in Pha Yar Phyu village had a strong will to conserve the forest for protection of the water sources for the village, reduction of potential risks of climate-related events (e.g., landslide and drought), and maintenance of the scenery of the village.

Although Aungbang Reserved Forest is registered as the commercial reserved forest, the Project Expert Team judges that the establishment of CF would be the effective way to protect the reserved forest from further degradation. Thus, the Team and local leaders of Pha Yar Phyu village submit herewith the proposal for the establishment of CF in the part of the Aungbang reserved forest, which is located within the customary boundaries of Pha Yar Phyu village.

2. Proposed Area

2.1 Location

The proposed area for CF (hereinafter referred to as “the proposed area”) is the part of Aungbang Reserved Forest located near Pha Yar Phyu village. Administratively, the area is located in Lei Kyar village tract, Kalaw Township. The locations of Pha Yar Phyu village and the target reserved forest are shown in the google earth map right

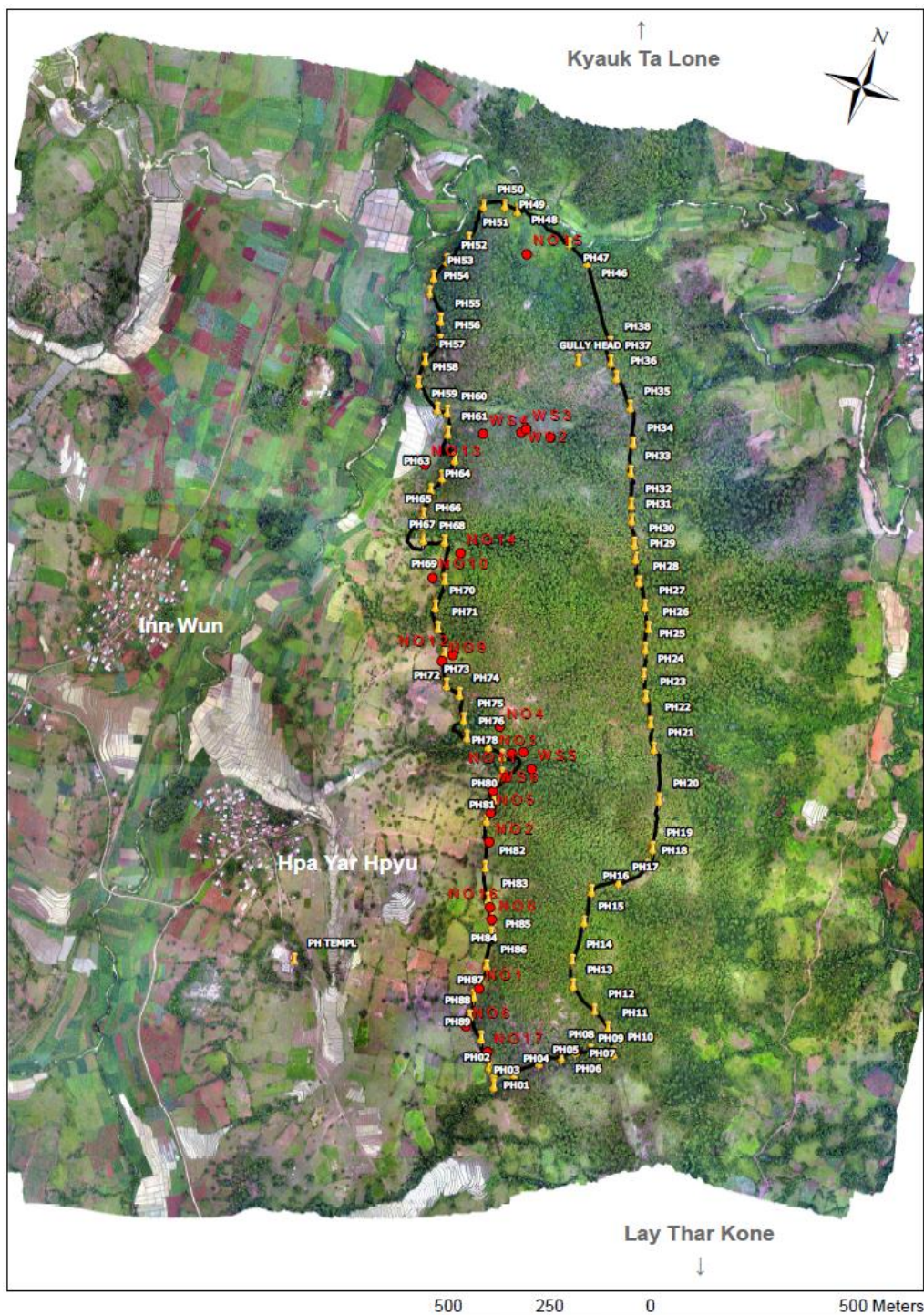


The reserved forest was registered as the commercial reserved forest in 1986 after reforestation of pine trees in the existing forests with support from Asian Development Bank. However, local

communities in Pha Yar Phyu village had customarily used and managed the part of the reserved forest, hence, a total of 17 plots (or 15.5 acre of the area) located along the boundaries of the reserved forest were recorded by FD as encroachment areas in 2013.

2.2 Proposed Area for Community Forestry

As mentioned above, communities in Pha Yar Phyu village have protected the proposed area traditionally. Hence, their first choice for CF establishment is to protect the same area that they have protected. The boundaries of the proposed area, which were taken by the Expert Team and communities in Pha Yar Phyu village in September 2019, are shown in **Figure 1** and below.



Boundaries of the Proposed Area for Community Forestry (First Option)

Kalaw river and foot paths in the reserved forest are the boundaries of the proposed area in the north and east to eastern-south, respectively, while the existing pillars and private farms are the same in the west to western-south. The total area of the proposed area is estimated at about 78 ha or 193 acre.

Among others, the catchment of the existing water sources which people in Pha Yar Phyu as well as Inn Wun villages are currently using is the most priority area for local communities to conserve the important water sources for their daily life. The locations of water sources and the boundaries of the catchment are shown below.



Micro Catchment of the Important Water Sources in the Proposed Area

In case it might be difficult for FD to accept the first option as this is the first case to allocate the commercial reserve forest to community forest, the catchment of the water sources could be the second option for communities in Pha Yar Phyu to take into account.

2.3 Type of Forest

Pine forests are the dominant type of forest in the proposed area.

2.4 Ecosystem Services which Communities benefit from

As mentioned above, the existing natural springs located in the reserved forest have supplied water to households in not only Pha Yar Phyu village but also Inn Wun village. Those in Pha Yar Phyu have also collected fallen branches for firewood and feathers of peacock inhabiting the reserved forest for earning cash income.

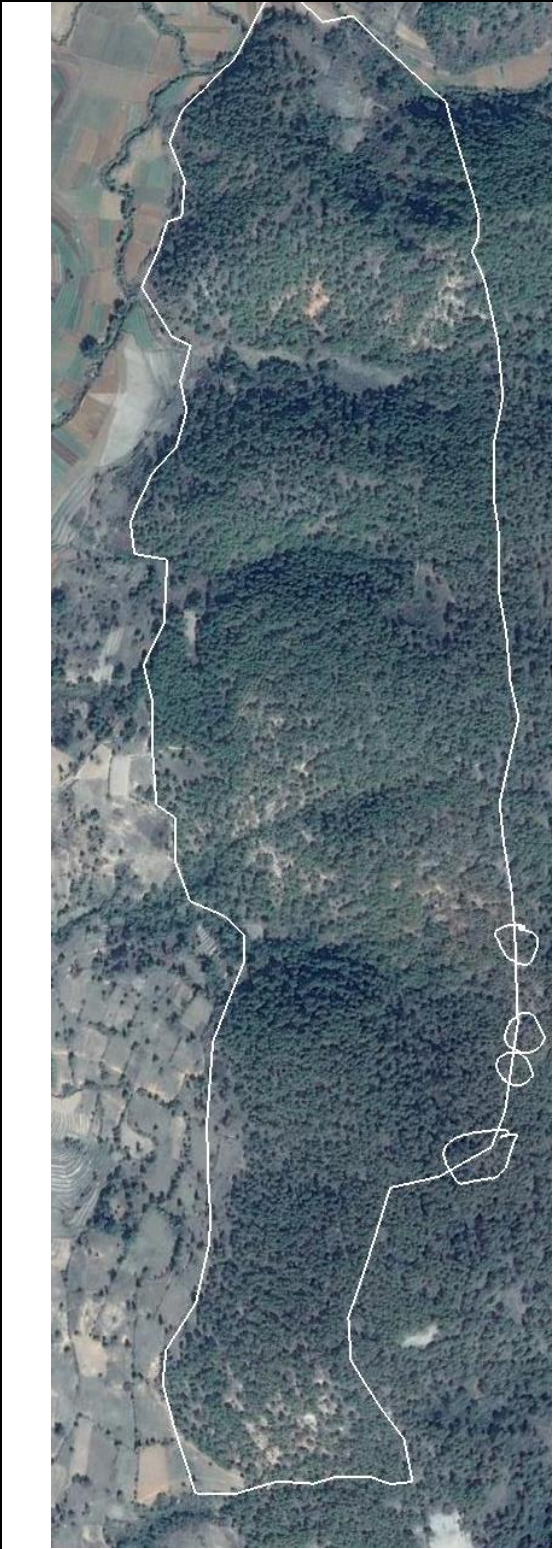
2.4 Encroachment in the Reserved Forest

A total of 17 plots which had been used for farming are recorded as encroachment areas along the reserved forest in 2013. The locations as well as the current land use of the encroachment areas are shown below.

Encroachment Areas recorded in 2013

No.	Name	Current Use	Area (acre)	Remarks	Locations of the Encroachment Areas
1	Ko Mya	Abandoned area	1	-	
2	Ko Linn	Pine forest	0.75	-	
3	U Aung Htoo	Abandoned Tea plantation	1	-	
4	U Toe	Abandoned area	1	-	
5	U Mg Oak	Abandoned area	1	-	
6	U Own	Abandoned area	1	-	
7	U Htun Sein	Abandoned area	0.5	-	
8.	Mg Soe	Upland rice field	1	Located along the boundaries.	
9.	U Lon	Abandoned area	0.5	-	
10.	U Sein Thuang	Avocado trees planted	1	Located outside the boundaries.	
11.	U Htar	Abandoned tea plantation	1.5	-	
12	U Sann	Abandoned area	2	-	
13	Ko Oo	Lowland paddy field	0.75	Located outside the boundaries.	
14	Daw Aye Tan	Abandoned area	1	-	
15	U Soe Ya	Abandoned area		-	
16	Daw Pyae	Ginger farm		Located outside the boundaries.	
17	U Khin Mg	Abandoned area		-	

In addition to the encroachment areas, newly opened spots were confirmed along the boundaries of the proposed area when the Project Expert Team took the georeferenced data of the boundaries in September 2019. Although there is no evidence about when and by whom the area was opened, but it seems that deforestation may have occurred in the last two years as indicated in comparison of the drone photo (taken in September 2019) with the google earth map (taken in 2017) shown below.



Newly Opened Areas in the Reserve Forest

2.5 Other Threats

Accordingly, forest fires have occurred in the proposed area once or twice in a year. Aside from forest fires, extraction of pine resin, which may be conducted by people from surrounding villages, is another cause of forest degradation, as such a practice makes trees easy to be broken by winds.



Signs of sResin Extraction in the Proposed Area

Local communities show their intention to reduce the occurrence of forest fires by making fire break lines and controlling the entrance of outsider in the forest once CF is granted to the village.

3. Rationale of CF Introduction

Community forestry (CF) is well known as a scheme for sustainable management of forest resources in collaboration with local communities residing near forest to be allocated for CF. The aim of the scheme is to use local human resources for protection and sustainable management of forests by vesting the right to use and manage the same in local communities for security and improvement of their livelihoods. If the forest customarily relates to local communities or its ecosystem services closely link to local livelihoods, there is a high likelihood that the scheme could work well for sustainable forest management.

Local communities in Pha Yar Phyu village have customarily protected the proposed area since it is located within its customary jurisdiction and, more importantly, the area is considered crucial for their daily life, particularly maintenance of water supply and protection of their lands and environment. Under such circumstances, CF could be an effective means to protect the reserved forest, particularly because local communities in Pha Yar Phyu village specifically emphasize the protection and conservation of the reserved forest rather than utilization of the same as an objective of CF.

As described in detail in the following section (Section 4), the members of the proposed CF user group (CFUG) have discussed and determined the vision and missions of the CFUG as below.

Vision statement

The Community Forestry User Group of Pha Yar Phyu village (Pha Yar Phyu CFUG) is the community organization which **aims to protect and improve forests in the CF area** so that communities in Pha Yar Phyu village can enjoy the benefits from ecosystem services of forests in the CF area (such as water and non-timber forest products) and agroforestry products produced in open space in the CF area.

Missions

The missions of Pha Yar Phyu CFUG are set as follows:

- 2-1 **to protect existing forests in the CF area from further degradation and encroachment**, through prohibition of any exploitation of existing trees in the CF area except for thinning for sustainable forest management or cutting trees planted by CFUG in open spaces in the CF area;
- 2-2 **to rehabilitate and restore degraded forests in the CF area;**
- 2-3 **to manage forests in the CF area in a proper and sustainable manner;**
- 2-4 to produce wood and non-wood forest products in open space in the CF area to meet the basic needs of members of CFUG;
- 2-5 to encourage members of CFUG to participate in forest protection, management, and restoration activities in the CF area; and
- 2-6 to contribute to the improvement of local livelihoods in Pha Yar Phyu village through enhancement of ecosystem services provided by forests in the CF area.

Thus, the introduction of CF in the proposed area could be effective in the protection of the reserved forest from further degradation, though the same area allocated for CF cannot be used for commercial or economic development purposes for the country. From the environmental conservation viewpoint, CF is considered as a rational approach to conservation of existing forest resources in the proposed area.

4. Proposed CF User Group (CFUG)

4.1 Members

All the community members, namely 50 households, express their willingness to engage in the protection of the proposed area as members of CFUG. A list of the members who are willing to engage in forest protection is shown in **Appendix-1**. In the member list, each household mentions both male and female representatives of family as members of CFUG so that women in the village could participate in decision making as well as CF activities.

4.2 CFUG Management Committee (CFUGMC)

The CFUG Management Committee (CFUGMC) is composed of 13 members, namely 1 Chair person, 1 Secretary, 1 Treasurer, and 10 Core members, as listed below.

Chairperson	U San Nge
Secretary	U Mg Pae
Treasurer	U Tu Gyi
Core members	Daw Tin
	Daw Hnjn Wai
	U Mg Swe
	U Mg Htway
	U Mg Than
	U Mg Tee
	U Tun Sein
	U Ba Zaw
	U Mg Kywin
	U Kyaw Hein

4.3 By-laws of CFUG with Vision, Missions, and Functions

The members of CFUG have determined the vision, missions, and functions of CFUG as well as the roles/responsibilities of the key members of CFUGMC through a series of discussions among themselves. The bylaws agreed on by the members, which include the vision, missions, and functions of CFUG, are shown in **Appendix-2**, and summarized below.

Items	Descriptions
Vision	The Community Forestry User Group of Pha Yar Phyu village (Pha Yar Phyu CFUG) is the community organization which aims to protect and improve forests in the CF area so that communities in Pha Yar Phyu village can enjoy the benefits from ecosystem services of forests in the CF area (such as water and non-timber forest products) and agroforestry products produced in open space in the CF area.
Missions	<ol style="list-style-type: none"> 1) to protect existing forests in the CF area from further degradation and encroachment, through prohibition of any exploitation of existing trees in the CF area except for thinning for sustainable forest management or cutting trees planted by CFUG in open spaces in the CF area. 2) to rehabilitate and restore degraded forests in the CF area. 3) to manage forests in the CF area in a proper and sustainable manner. 4) to produce wood and non-wood forest products in open space in the CF area to meet the basic needs of members of CFUG. 5) to encourage members of CFUG to participate in forest protection, management, and restoration activities in the CF area. 6) to contribute to the improvement of local livelihoods in Pha Yar Phyu village through enhancement of ecosystem services provided by forests in the CF area.
Functions	<ol style="list-style-type: none"> 1) to conduct patrolling works to prevent encroachment or illegal exploitation of forests in the CF area in collaboration with Kalaw Township FD. 2) to make firebreak lines to protect forests in the CF area from forest fires. 3) to report any cases of forest degradation and deforestation, such as encroachment, illegal logging, and forest fires. 4) to plant seedlings of timber and non-timber species including fruit trees in open spaces in the CF area in accordance with the forest management plan approved by FD and technical guidelines given by Kalaw Township FD. 5) to maintain and protect seedlings planted in open spaces in the CF area in a proper manner. 6) to develop long-term (5 years) and annual forest management plans in collaboration with Kalaw Township FD. 7) to monitor collection of non-timber forest products in the CF area and control harvesting of trees planted by CFUG in open spaces in the CF area in accordance with the forest management plan. 8) to develop rules on forest management in the CF area and those on benefit sharing among/between members and CFUG. 9) to control and supervise the benefit sharing among/between members and CFUG. 10) to use benefits or cash income shared with CFUG for operations and management of CFUG. 11) to keep records and a book of account of CFUG relating to incomes and expenditures of the group. 12) To report to and communicate with Kalaw Township FD any changes in the membership of CFUG, the structure of the management committee, and the forest management plan.

5. Initial Ideas on Management and Protection of the Proposed Reserved Forest

Although a forest management plan of the CF area will be discussed and developed through discussions among the members of CFUG after the permission for CF is granted by FD, the initial ideas on management and protection of the proposed area for CF are discussed and exchanged with the members of CFUG (or local communities in Pha Yar Phyu village) as described in the following sections.

5.1 Forest Protection and Management Activities planned

The members show their intention to conduct the following forest protection and management activities to protect the reserved forest on a regular basis.

Activities	Responsibility	Timing
Patrolling	Small groups of the CFUG	Every 10 days throughout a year
Installation of signboards	FD or JICA Project	
Fire break establishment	All members	January/February (onset of dry season)
Reforestation in the open spaces, particularly in the catchment of the water sources	All members	Onset of rainy season
Planting of firewood species recommended by FD and other valuable trees in 17 encroachment areas	All members	Onset of rainy season

5.2 Major Species to be Planted

As for reforestation in open spaces and planting of timber/firewood and other valuable tree species in the 17 encroachment areas, the members of CFUG proposed to plant the following species in the respective types of the area.

Open space: Pine species, Banyan trees, and other species which are not marketable

Abandoned areas: Firewood and other species recommended by FD, Avocado, and other valuable trees

5.3 Basic Rules for Management and Protection of the Forest

The members of CFUG also discussed the basic rules that communities in Pha Yar Phyu village, and those from the neighboring villages should obey as listed below.

- Do not cut existing trees in the CF area in principle.
- Do not open a new farm in the CF area.
- Do not hunt wild animals in the CF area.
- Do not burn the CF area.
- Do not graze animals in the catchment of the water sources.
- Do not cut any existing standing trees including dead one.
- The members of CFUG can collect fallen branches as firewood.
- The members can collect non-timber forest products, such as mushroom and feather of peacock.
- The members can cut trees planted by CFUG in the 17 encroachment areas.

The rules proposed by the members will be further discussed and examined when they develop the forest management plan with technical assistance from the JICA Project Expert Team and Kalaw Township FD.

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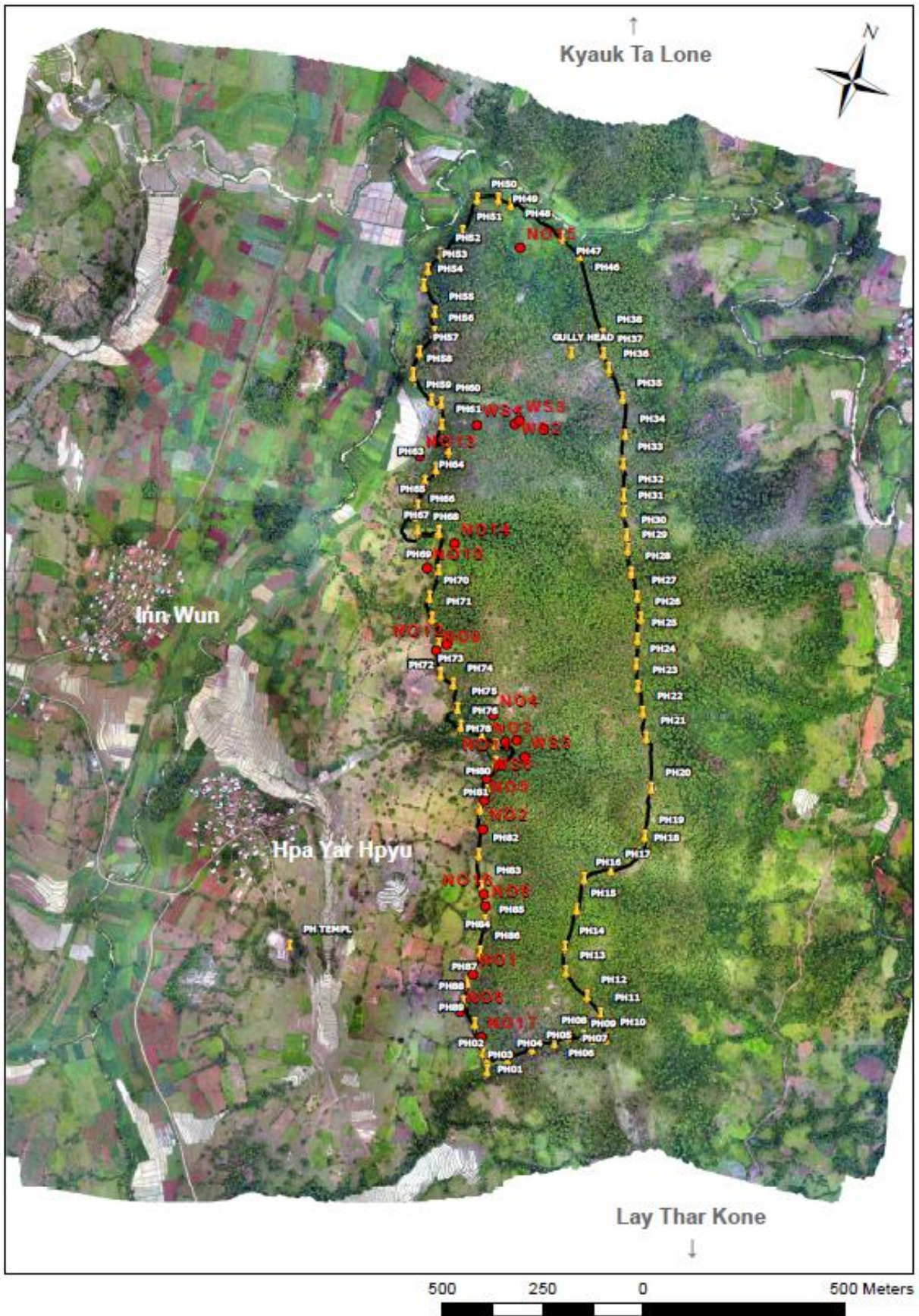


Figure 1 The Proposed Area for CF Establishment with the Boundaries

Appendix-1

Member List of Community Forest User Group in Pha Yar Phyu

ဒေသခံအစုအဖွဲ့ပိုင်သစ်တောအသုံးပြုသူများစာရင်း

No.	Name အမည်		Father's Name အဘအမည်		National Registration Card No. မှတ်ပုံတင်နံပါတ်		Address လိပ်စာ	Signature လက်မှတ်	
	Male (ကျား)	Female (မ)	Male (ကျား)	Female (မ)	Male (ကျား)	Female (မ)		Male (ကျား)	Female (မ)
1	ဦးစောစော	ဒေါ်အိမ်	ဦးကျော်	ဒေါ်အိမ်	၁၂/၀၀၀၅ (၂၀၁၆)	၀၂/၀၀၀၅ (၂၀၁၆)	ကျေးဇူးတင်ရွာ	ဦးကျော်	ဒေါ်အိမ်
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3	ဦးစောစော	ဒေါ်အိမ်	ဦးကျော်	ဒေါ်အိမ်	၁၂/၀၀၀၅ (၂၀၁၆)	၀၂/၀၀၀၅ (၂၀၁၆)	ကျေးဇူးတင်ရွာ	ဦးကျော်	ဒေါ်အိမ်
4	ဦးကျော်	ဒေါ်အိမ်	ဦးကျော်	ဒေါ်အိမ်	၁၂/၀၀၀၅ (၂၀၁၆)	၀၂/၀၀၀၅ (၂၀၁၆)	ကျေးဇူးတင်ရွာ	ဦးကျော်	ဒေါ်အိမ်
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10	ဒေါ်စောစောစော	ဒေါ်ခင်ခင်အေး	ဒေါ်ခင်ခင်	ဒေါ်အိမ်	၁၃/၀၀၅ (၂၅၆) ၀၈၆၆၃၇	၁၃/၀၀၅ (၂၅၆) ၁၀၆၀၀၂	လှ:အေး		
11	ဒေါ်စောစော	ဒေါ်အေး	ဒေါ်စောစော	ဒေါ်အေး	၁၃/၀၀၅ (၂၅၆) ၀၈၆၆၃၇	၁၃/၀၀၅ (၂၅၆) ၀၉၈၄၄၆	လှ:အေး		
12	ဒေါ်အေး	ဒေါ်အေး	ဒေါ်စောစော	ဒေါ်အိမ်	၁၃/၀၀၅ (၂၅၆) ၁၀၆၆၃၇	၁၃/၀၀၅ (၂၅၆) ၁၂၁၀၀၄	လှ:အေး		
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14	ဒေါ်အေး	ဒေါ်အေး	ဒေါ်စောစော	ဒေါ်အိမ်	၁၃/၀၀၅ (၂၅၆) ၀၉၈၄၄၆	၁၃/၀၀၅ (၂၅၆) ၁၂၁၀၀၄	လှ:အေး		
15	ဒေါ်အေး	ဒေါ်အေး	ဒေါ်စောစော	ဒေါ်အိမ်	၁၃/၀၀၅ (၂၅၆) ၀၉၈၄၄၆	၁၃/၀၀၅ (၂၅၆) ၁၂၁၀၀၄	လှ:အေး		
16	ဒေါ်အေး	ဒေါ်အေး	ဒေါ်စောစော	ဒေါ်အိမ်	၁၃/၀၀၅ (၂၅၆) ၀၉၈၄၄၆	၁၃/၀၀၅ (၂၅၆) ၁၂၁၀၀၄	လှ:အေး		
17	ဒေါ်အေး	ဒေါ်အေး	ဒေါ်စောစော	ဒေါ်အိမ်	၁၃/၀၀၅ (၂၅၆) ၀၉၈၄၄၆	၁၃/၀၀၅ (၂၅၆) ၁၂၁၀၀၄	လှ:အေး		
18	ဒေါ်အေး	ဒေါ်အေး	ဒေါ်စောစော	ဒေါ်အိမ်	၁၃/၀၀၅ (၂၅၆) ၀၉၈၄၄၆	၁၃/၀၀၅ (၂၅၆) ၁၂၁၀၀၄	လှ:အေး		
19	ဒေါ်အေး	ဒေါ်အေး	ဒေါ်စောစော	ဒေါ်အိမ်	၁၃/၀၀၅ (၂၅၆) ၀၉၈၄၄၆	၁၃/၀၀၅ (၂၅၆) ၁၂၁၀၀၄	လှ:အေး		

No.	Name အမည်		Father's Name အဘအမည်		National Registration Card No. မှတ်ပုံတင်နံပါတ်		Address လိပ်စာ	Signature လက်မှတ်	
	Male (ကျား)	Female (မ)	Male (ကျား)	Female (မ)	Male (ကျား)	Female (မ)		Male (ကျား)	Female (မ)
20	ဦးလှ	ဒေါ်ဝယ်	ဦးခေါင်	ဦးဆန်းချို	၁၃/၀၀၄(၂၅၆) ၀၆၂၆၇	၁၃/၀၀၄(၂၅၆) ၀၆၂၆၇	လှ:အုပ္ပါ	ဦးလှ	ဒေါ်ဝယ်
21	ဦးဆန်း	အိုစို	ဦးအို.လှ	ဦးအိမ်	KLV ၀၁၁၅၄	KLV ၀၁၁၅၄	လှ:အုပ္ပါ	ဦးဆန်း	ဒေါ်စို
22	ဦးပုဆောင်	အိုအေးအိ	ဦးအိ	ဦးအိမ်	၁၃/၀၀၄(၂၅၆) ၀၈၆၆၁	—	လှ:အုပ္ပါ	ဦးပုဆောင်	အိုအေးအိ
23	—	အိုအိ	—	ဦးအိ	—	၁၃/၀၀၄(၂၅၆) ၀၁၁၅၅	လှ:အုပ္ပါ	—	အိုအိ
24	ဦးဆန်းမောင်	အိုဆန်း	ဦးဆန်းမောင်	ဦးအိ	၁၃/၀၀၄(၂၅၆) ၀၆၀၁၄၀	၁၃/၀၀၄(၂၅၆) ၀၆၀၁၄၀	လှ:အုပ္ပါ	ဦးဆန်းမောင်	အိုဆန်း
25	ဦးမောင်စို	အိုစို	ဦးအိ	ဦးစို	၁၃/၀၀၄(၂၅၆) ၀၈၆၆၅	၁၃/၀၀၄(၂၅၆) ၀၈၆၆၅	လှ:အုပ္ပါ	ဦးမောင်စို	အိုစို
26	ဦးမောင်အိ	အိုအိ	ဦးအိ	ဦးအိ	၁၃/၀၀၄(၂၅၆) ၀၈၆၆၅	၁၃/၀၀၄(၂၅၆) ၀၈၆၆၅	လှ:အုပ္ပါ	ဦးမောင်အိ	အိုအိ
27	ဦးဆန်းစို	အိုအိအိ	ဦးမောင်	ဦးအိ	၁၃/၀၀၄(၂၅၆) ၀၈၆၆၅	၁၃/၀၀၄(၂၅၆) ၀၈၆၆၅	လှ:အုပ္ပါ	ဦးဆန်းစို	အိုအိအိ
28	ဦးအိအိ	အိုအိ	ဦးအိ	ဦးအိ	၁၃/၀၀၄(၂၅၆) ၀၈၆၆၅	၁၃/၀၀၄(၂၅၆) ၀၈၆၆၅	လှ:အုပ္ပါ	ဦးအိအိ	အိုအိ
29	ဦးမောင်စို	အိုအိအိ	ဦးအိ	ဦးအိ	၁၃/၀၀၄(၂၅၆) ၁၀၈၆၅	၁၃/၀၀၄(၂၅၆) ၁၀၈၆၅	လှ:အုပ္ပါ	ဦးမောင်စို	အိုအိအိ
30	ဦးမောင်စို	—	ဦးအိ	—	၁၃/၀၀၄(၂၅၆) ၁၀၈၆၅	၁၃/၀၀၄(၂၅၆) ၁၀၈၆၅	လှ:အုပ္ပါ	ဦးမောင်စို	—

No.	Name အမည်		Father's Name အဘအမည်		National Registration Card No. မှတ်ပုံတင်နံပါတ်		Address လိပ်စာ	Signature လက်မှတ်	
	Male (ကျား)	Female (မ)	Male (ကျား)	Female (မ)	Male (ကျား)	Female (မ)		Male (ကျား)	Female (မ)
31	ဦးမောင် ငယ်	အိန္ဒြေ	ဦးကျော်	ဦးအိန္ဒြေ	၁၃/၀၀၄ (၂၅၆) ၀၆၈၂၅၃	၁၃/၀၀၄ (၂၅၆) ၀၆၂၅၈	ဥပဒေကျွန်း	မောင်ငယ်	ဦး
32	ဦးကျော်	အိန္ဒြေ	ဦးကျော်	ဦးအိန္ဒြေ	၁၃/၀၀၄ (၂၅၆) ၀၆၂၅၀	၁၃/၀၀၄ (၂၅၆) ၀၆၂၅၈	ဥပဒေကျွန်း	ဦးကျော်	မောင်
33	ဦးကျော်စော	အိန္ဒြေ	ဦးစော	ဦးကျော်	၁၃/၀၀၄ (၂၅၆) ၀၆၈၂၃၅	၁၃/၀၀၄ (၂၅၆) ၀၆၂၅၈	ဥပဒေကျွန်း	ဦးကျော်	မောင်
34	ဦးကျော်စော	အိန္ဒြေ	ဦးစော	ဦးကျော်	၁၃/၀၀၄ (၂၅၆) ၀၆၈၂၃၅	၁၃/၀၀၄ (၂၅၆) ၀၆၂၅၈	ဥပဒေကျွန်း	ဦးကျော်	မောင်
35	ဦးကျော်စော	အိန္ဒြေ	ဦးစော	ဦးကျော်	၁၃/၀၀၄ (၂၅၆) ၀၆၈၂၃၅	၁၃/၀၀၄ (၂၅၆) ၀၆၂၅၈	ဥပဒေကျွန်း	ဦးကျော်	မောင်
36	ဦးကျော်စော	အိန္ဒြေ	ဦးစော	ဦးကျော်	၁၃/၀၀၄ (၂၅၆) ၀၆၈၂၃၅	၁၃/၀၀၄ (၂၅၆) ၀၆၂၅၈	ဥပဒေကျွန်း	ဦးကျော်	မောင်
37	ဦးကျော်စော	အိန္ဒြေ	ဦးစော	ဦးကျော်	၁၃/၀၀၄ (၂၅၆) ၀၆၈၂၃၅	၁၃/၀၀၄ (၂၅၆) ၀၆၂၅၈	ဥပဒေကျွန်း	ဦးကျော်	မောင်
38	ဦးကျော်စော	အိန္ဒြေ	ဦးစော	ဦးကျော်	၁၃/၀၀၄ (၂၅၆) ၀၆၈၂၃၅	၁၃/၀၀၄ (၂၅၆) ၀၆၂၅၈	ဥပဒေကျွန်း	ဦးကျော်	မောင်
39	ဦးကျော်စော	အိန္ဒြေ	ဦးစော	ဦးကျော်	၁၃/၀၀၄ (၂၅၆) ၀၆၈၂၃၅	၁၃/၀၀၄ (၂၅၆) ၀၆၂၅၈	ဥပဒေကျွန်း	ဦးကျော်	မောင်
40	ဦးကျော်စော	အိန္ဒြေ	ဦးစော	ဦးကျော်	၁၃/၀၀၄ (၂၅၆) ၀၆၈၂၃၅	၁၃/၀၀၄ (၂၅၆) ၀၆၂၅၈	ဥပဒေကျွန်း	ဦးကျော်	မောင်

Appendix-2

**By-Laws
of
the Community Forest User Group of Pha Yar Phyu Village**

Section 1: Scope and Definition

- 2.1 The Community Forest User Group of Pha Yar Phyu village (Pha Yar Phyu CFUG) is a community organization formed by all the community members living in Par Yar Phyu Village located in Kalaw Township, Taunggyi District, Shan State, to protect forests in the CF area allocated to Pha Yar Phu CFUG in a sustainable manner.
- 2.2 The following terms used in this document, unless otherwise specified herein, shall have the meanings described below.
- (1) “Community Forestry (CF)” means sustainable forest management and utilization activities to be carried out by local communities in collaboration with Forest Department. It aims to improve and maintain natural ecosystem as well as environmental conditions in the locality while improving local livelihoods through creation of income generating opportunities or ensuring of food security.
 - (2) Community Forestry User Group (CFUG) means a group formed by households who have lived continuously for at least five years within five miles from the CF area as stipulated in 2019 Community Forestry Instruction (2019 CFI). Members of CFUG are truly dependent on forests in the CF area and their ecosystem services for their livelihoods. The distance and timeline of settlement may be relaxed, if local communities have traditionally and customarily managed forests in the CF area or if District Forest Department Office concerned justifies the change in the conditions based on the local settings.
 - (2) “Forest Management Plan” means a work plan prepared by the CFUG which determines, tending of seedlings planted, maintenance and protection of forests in the CF area.
 - (3) “Chairperson” means the person who shall bear overall responsibilities for CF-related activities carried out by CFUG and lead CFUG as well as its members toward fulfillment of missions of CFUG.
 - (4) “CF activities” means the activities conducted in the Community Forest area with an aim to protect and manage the CF area, particularly forests in the area, in a sustainable manner.

Section 2: Vision, Mission and Function of Pha Yar Phyu CFUG

- 2.1 The vision, missions and function of Pha Yar Phu CFUG are shown in Attachment-1.

Section 3: Membership

- 3.1 The household representatives who resides in Pha Yar Phyu village, namely, one male and one female from each household, shall be the members of Pha Yar Phu CFUG.

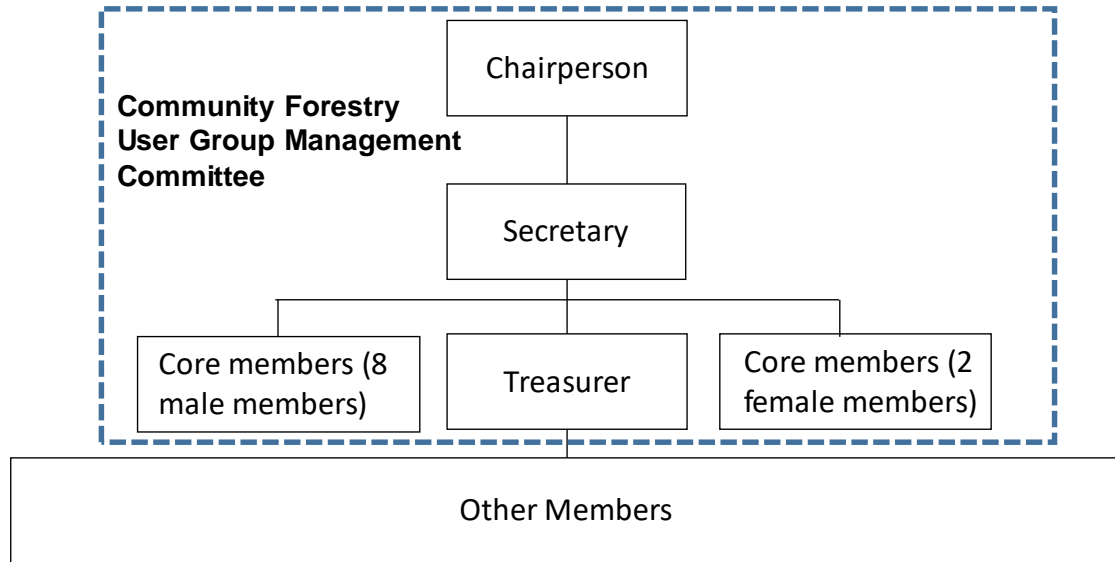
Section 4: Organization

- 4.1 A management committee, namely the Community Forest User Group Management Committee (CFUGMC), is formed in Pha Yar Phu CFUG to establish a unit responsible

for leading other CFUG members and coordination with Township Forest Department office concerned for development and implementation of its Forest Management Plan.

4.2 CFUGMC shall be composed of one (1) Chairperson, one (1) Secretary, one (1) Treasurer, 10 core members including two (2) female members.

4.3 The organizational structure of CFUG including CFUGMC is shown as follows.



Source: JICA Project Expert Team

Figure Organizational Structure of the Community Forest User Group

4.4 All the members of CFUGMC shall fulfill the roles and responsibilities given to the respective positions to which they are appointed. The table below indicates the roles and responsibilities of the respective members of CFUGMC as well as ordinary members of CFUG.

Roles of Responsibilities of the Members of the Community Forest User Group

Position	Roles/Responsibilities
Chairperson	<ul style="list-style-type: none"> ● Convene the regular and ad hoc meetings of CFUG and CFUGMC; ● Chair the meeting of CFUG/CFMGUC by facilitating and directing discussions, ensuring basic rules in discussions, and announcing decisions; ● Set agenda of the meeting; ● Submit a progress report of CF activities, such as forest operations, harvested quantity, distribution of wood, and financial statement, to FD officers concerned on an annual basis; ● Responsible for development and implementation of the Forest Management Plan in collaboration with other members; ● Encourage the members of the CFUG to engage in CF activities in accordance with the Forest Management Plan; and ● Communicate with FD officers concerned, other government agencies, local and international organizations, etc., to secure the necessary support for implementation of Forest Management Plan.
Secretary	<ul style="list-style-type: none"> ● Assist Chairperson in convening the meeting, inviting the members, and handling the meeting; ● Document and keep the records of CF activities, such as forest operations, harvested quantity, distribution of wood, and benefit sharing, ● Help Chairperson communicate with FD offices concerned, other government agencies, local and international organizations, etc., to secure the necessary support

Position	Roles/Responsibilities
	for implementation of Forest Management Plan.
Treasurer	<ul style="list-style-type: none"> ● Open the CFUG bank account jointly with Chairperson and Secretary; ● Keep the petty cash in accordance with the decision by CFUGMC; ● Keep an account of income and expenditure of CFUG; ● Report the financial status at every meeting of CFUGMC and half-yearly meeting of CFUG; ● Issuance of the sales vouchers/ receipts for the sales of forest products from CF and keep the copies; ● Assist Chairperson in the preparation of the progress report, particularly the part for financial statement; ● Make payment for the activities decided by CFUG, such as those for forest operations, community development, and benefit sharing; and ● Help the members of CFUG share the benefit from CF equitably in accordance with the Forest Management Plan.
Core members (10 members)	<ul style="list-style-type: none"> ● Participate in the CFUGMC meetings; ● Share ideas and exchange opinions actively in the meetings as representatives from other members of CFUG; ● Help Chairperson and Secretary introduce/ explain the decisions made by CFUGMC to other members; ● Act as intermediates between CFUGMC and other members; and ● Encourage other members of CFUG to actively participate in CF activities.
Other members	<ul style="list-style-type: none"> ● Participate in the CF activities in accordance with the Forest Management Plan ● Attend the meetings of CFUG to participate in the discussions actively

Source: JICA Project Expert Team

4.5 Pha Yar Phyu CFUG could be assisted by any competent organizations, such as Forest Department, other government agencies, and national and international organizations, for implementation of Forest Management Plan.

Section 5: Meetings

5.1 CFUG meetings shall be convened at the monastery in Pha Yar Phyu village in principle. The venue and schedule of the meeting shall be discussed and agreed on by the members participating in the preceding meeting of CFUG.

5.2 The following CFUG meetings shall be convened on a regular basis.

(1) CFUGMC Management Meeting on a monthly basis (once a month)

(2) CFUG Plenary Meeting on a quarterly basis (once a quarter)

5.3 The monthly meeting shall be held at the begging of the month with the participation of all the members of CFUGMC. In the meeting, CFUGMC members shall discuss the progress of the Forest Management Plan, the financial status of CFUG, and any issues and concerns to be addressed for smooth operations of CF activities and protection of forests in the CF area.

5.4 The quarterly meeting shall be held every quarter of the year (e.g., at the beginning of March, June, September, and December), with the participation of all the members of CFUG. In the meeting, the plan and progress of the Forest Management Plan as well as CF activities planned in the coming three months shall be shared with the members. CFUGMC shall share issues and concerns handled in the monthly meeting of CFUGMC with other members and report the financial status of CFUG in the meeting.

5.5 Special meetings of CFUG may be called at any time when Chairperson or a majority of

CFUGMC members deem/s it necessary to do for the interest of CFUG and its members.

- 5.6 Notices of the meeting shall be distributed to all the members at least one (1) week before the date set for the meeting. The notice shall state the objectives/purposes, time and venue of the meeting.
- 5.7 In case any of the members is not able to attend the meeting, he/she shall designate a proxy for the meeting.
- 5.8 The meeting requires the presence of more than 50% of the members (or more than 25 persons for CFUG meeting/ seven persons for CFUGMC) including their proxies, especially when making a decision or resolving to take any action. If the participants are less than 50% of the members, the meeting may be adjourned and rescheduled.

Section 6: Decision Making

- 6.1 Resolutions and any decisions of CFUG/CFUGGC shall be made, adopted, and effective with the approval of more than two third (2/3) of the participants in the meeting duly convened with the sufficient number of the members and the presence of Chairperson or Secretary.
- 6.2 Any decision made without the presence of Chairperson or Secretary shall be deemed invalid.

Section 7: Benefit Sharing

- 6.1 Any CFUG members shall possess a right to benefit from the forest ecosystem services and products produced in the CF area in accordance with the benefit sharing mechanism stipulated in the Forest Management Plan developed by Pha Yar Phyu CFUG. Major products or forest ecosystem services which the CF area might produce are listed below.
 - Water from natural springs in the CF area
 - Non-timber forest products
 - Fruits and agricultural crops produced in open areas in the CF area in accordance with the Forest Management Plan of CFUG
 - Firewood from plantations developed in open areas in the CF area in accordance with the Forest Management Plan of CFUG
- 6.2 CFUG shall hold its gain from benefits from the products produced in the CF area. The ratio of the CFUG's share to the members shall be determined in the Forest Management Plan of CFUG.

Section 7: Amendments

- 7.1 These bylaws may be altered, amended, repealed or added to with the approval of more than 75 % of the official members of CFUG

**Attachment: Vision, Missions and Functions
of
the Community Forest User Group in Pha Yar Phyu Village**

Section 1: Vision Statement

The Community Forestry User Group of Pha Yar Phyu village (Pha Yar Phyu CFUG) is the community organization which aims to protect and improve forests in the CF area so that communities in Pha Yar Phyu village can enjoy the benefits from ecosystem services of forests in the CF area (such as water and non-timber forest products) and agroforestry products produced in open space in the CF area.

Section 2: Missions

The missions of Pha Yar Phyu CFUG are set as follows:

- 2-1 to protect existing forests in the CF area from further degradation and encroachment, through prohibition of any exploitation of existing trees in the CF area except for thinning for sustainable forest management or cutting trees planted by CFUG in open spaces in the CF area;
- 2-2 to rehabilitate and restore degraded forests in the CF area;
- 2-3 to manage forests in the CF area in a proper and sustainable manner;
- 2-4 to produce wood and non-wood forest products in open space in the CF area to meet the basic needs of members of CFUG;
- 2-5 to encourage members of CFUG to participate in forest protection, management, and restoration activities in the CF area; and
- 2-6 to contribute to the improvement of local livelihoods in Pha Yar Phyu village through enhancement of ecosystem services provided by forests in the CF area.

Section 3: Functions

Pha Yar Phyu CFUG shall perform the following functions necessary for protection and management of the CF area in a sustainable manner.

- 3-1 to conduct patrolling works to prevent encroachment or illegal exploitation of forests in the CF area in collaboration with Kalaw Township FD;
- 3-2 to make firebreak lines to protect forests in the CF area from forest fires;
- 3-3 to report any cases of forest degradation and deforestation, such as encroachment, illegal logging, and forest fires.
- 3-4 to plant seedlings of timber and non-timber species including fruit trees in open spaces in the CF area in accordance with the forest management plan approved by FD and technical guidelines given by Kalaw Township FD;
- 3-5 to maintain and protect seedlings planted in open spaces in the CF area in a proper manner;
- 3-6 to develop long-term (5 years) and annual forest management plans in collaboration with

Kalaw Township FD;

- 3-7 to monitor collection of non-timber forest products in the CF area and control harvesting of trees planted by CFUG in open spaces in the CF area in accordance with the forest management plan;
- 3-8 to develop rules on forest management in the CF area and those on benefit sharing among/between members and CFUG;
- 3-9 to control and supervise the benefit sharing among/between members and CFUG;
- 3-10 to use benefits or cash income shared with CFUG for operations and management of CFUG;
- 3-11 to keep records and a book of account of CFUG relating to incomes and expenditures of the group; and
- 3-12 to report to and communicate with Kalaw Township FD any changes in the membership.

Attachment 20
Forest Management Plan of
Pha Yar Phyu Village

Forest Management Plan of the Proposed Area for CF

1. Introduction

Pha Yar Phyu village located in Lei Kyar village tract in Kalalw Township has protected the part of Aungbang Reserved Forest, where the village has customarily used and managed before the establishment of the reserved forest in 1987. The reason behind local communities in Pha Yar Phyu village have protected the reserved forests is that they have obtained significant benefits from the area, such as provision of drinking and irrigation water, provision of non-timber forest products (mushroom and feather of peacock), and fallen branches as firewood.

Aungbang Reserved Forest has faced a threat of forest degradation by human activities done by local people living in the surrounding villages, such as illegal logging, extraction of pine resin, wildfires caused by animal hunting, etc. Under such circumstances, village leaders of Pha Yar Phyu village decides to apply for Community Forestry (CF) registration of the part of Aungbang Reserved Forest with technical assistance from the JICA Project¹, although Aungbang Reserved Forest is registered as the commercial reserved forest, which is not suitable for allocation as CF in principle.

Since August 2019, village leaders and local communities in Pha Yar Phyu village have had a series of discussions with assistance of FD Kalaw Township office and the JICA Project Team and made the following preparations for application for CF.

- Development of a list of members of CFUG
- Selection of members of CUG Management Committee (CFUGMC) and determination of roles and functions of CFUGMC
- Determination of vision, missions, and functions of CFUG
- Development of the bylaws of CFUG
- Collection of georeferenced data of the proposed boundaries of the proposed area for CF
- Development of a proposal for introduction of CF in Pha Yar Phyu village

As a part of the preparatory works, they have also discussed key points of forest management, such as i) rules on forest management, ii) areas to be restored and rehabilitated, iii) activities to be carried for restoration and rehabilitation, and iv) roles of CFUG and FD in forest restoration and management in November and December 2019. They also conducted a simple field survey in the proposed area for CF in the same period. This document, the forest management plan of the proposed area for CF, was prepared by compiling the results of such activities done by village leaders and local communities in Pha Yar Phyu village.

2. Objectives of the Forest Management Plan

The main objective of the forest management plan is to provide local communities in Pha Yar Phyu village, namely the members of CFUG of Pha Yar Phyu village, technical guidelines for sustainable management and restoration of the proposed area for CF in collaboration with Forest Department (FD) as well as other external assisting organizations. Specifically, the forest management plan aims to:

¹ Component 2 of the Project for Sustainable Natural Resource Management (FDSNR)

- a. provide the rules and regulations on forest management;
- b. indicate the necessary forest management activities and areas to which restoration and rehabilitation activities should be applied;
- c. clarify the roles and responsibilities of CFUG, FD, and other organization for sustainable forest management;
- d. indicate the standard work schedule as well as annual targets of the forest management activities; and
- e. clarify the rules/ mechanism on management of benefits generated by CFUG.

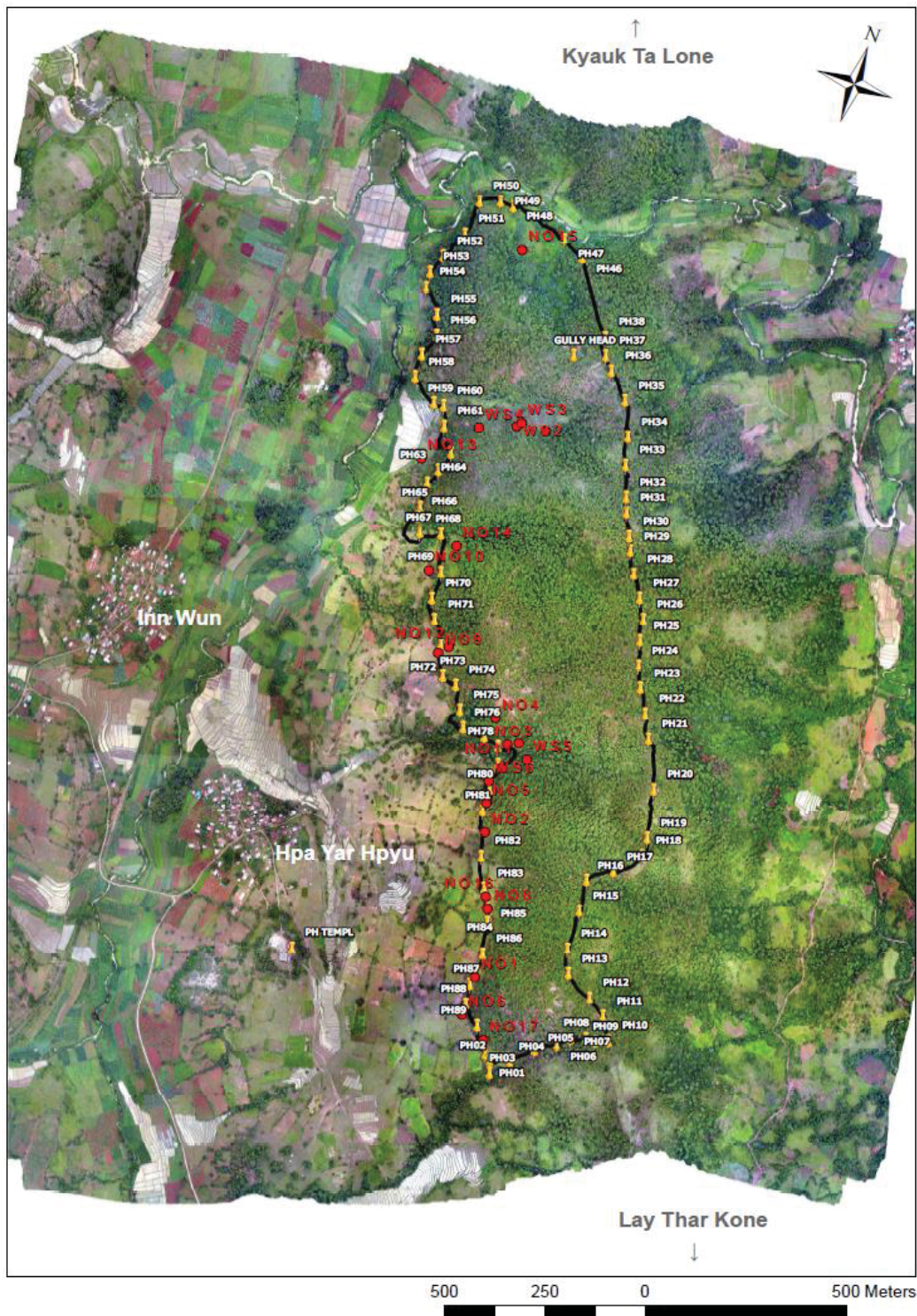
3. Location of CF Target Area

The the proposed area for CF is the part of Augnbang Reserved Forest near Pha Yar Phyu village. Administratively, the area is located in Lei Kyar village tract, Kalaw Township. The locations of Pha Yar Phyu village and the proposed area for CF are shown in the google earth map below.



Location of the Proposed Area for CF

Local communities in Pha Yar Phu village took the georeferenced data of the proposed boundaries of the CF area using GPS with technical assistance from the JICA Project in September 2019. A base map was developed by combining the georeferenced data of the proposed boundaries with a drone map (aerial photography map taken by a drone) as shown below.



Base Map of the Proposed Area for CF

As show above, Kalaw river and foot paths in the reserved forest are the boundaries of the proposed area for CF in the north and east to eastern-south, respectively, while the existing pillars and private farms are the same in the west to western-south. The total area of the proposed area is estimated at about 78 ha or 193 acre.

4. Present Natural Conditions of the CF Area

4.1 Climate (Temperature and Rainfall)

The whole area of Kalaw township falls in the sub-tropical climate zone because of its altitudinal location. In general, the area has three (3) distinct seasons: i) summer season (March – Middle of May); ii) rainy season (Middle of May – October); and iii) winter season (November – February).

Temperature in the proposed area for CF is affected by the monsoon winds, which lead to significant drops in temperature during the rainy season, particularly June and July. April is the hottest month before the monsoon winds enter into Myanmar. The majority of rainfalls, about 80% of the annual rainfalls, occurs in the rainy season between May and September, while the less precipitations are observed in the winter season, particularly in January. The following table shows the climate data collected at Heho between 1988 and 2012.

Average Climate Data near Pha Yar Phyu Village (from 198 to 2012)

Average data	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Rainfalls (mm)	3	8	13	53	144	144	183	240	184	154	72	10	1,208
Ave temperature	14.7	16.7	20.4	23.1	23.1	22.6	22.3	22.2	21.9	21.3	18.6	15.4	20.2
High temperature	24.2	26.7	29.6	31.0	28.2	26.7	26.1	26.0	26.2	26.7	24.8	23.9	26.7
Low temperature	5.2	6.7	11.1	15.6	17.9	18.5	18.6	18.5	17.6	15.9	12.3	6.9	13.7

Source: Meteorology Department, Heho

The average annual rainfall is 1,208 mm. The mean temperature is 20.2 °C ranging from 5.2 °C (the lowest in January) to 31.0 °C (the highest in April).

4.2 Topography

Kalaw township is situated on Shan Plateau with an average height of 1,000 m above sea level. The topographic features of the township can be broadly divided into four types, namely: i) Western mountain area, ii) Northwest valley area, iii) Central plateau, and iv) Eastern valley area. Among others, Central plateau occupy the largest part in the township (about 70% of the area).

The proposed area for CF also lies on the this topographic type (Central plateau) at altitudes between 1,290 m and 1,350 m. The lowest part of the area is located near Kalaw river flowing along the northern boundary of the proposed area, while the highest peak is hill top along the foot path running on the western boundary of the proposed area. The dominant topographic condition in the proposed area is hilly terrains with gentle to steep slopes ranging from 2~3 % to about 20 %.

4.3 Soil Type

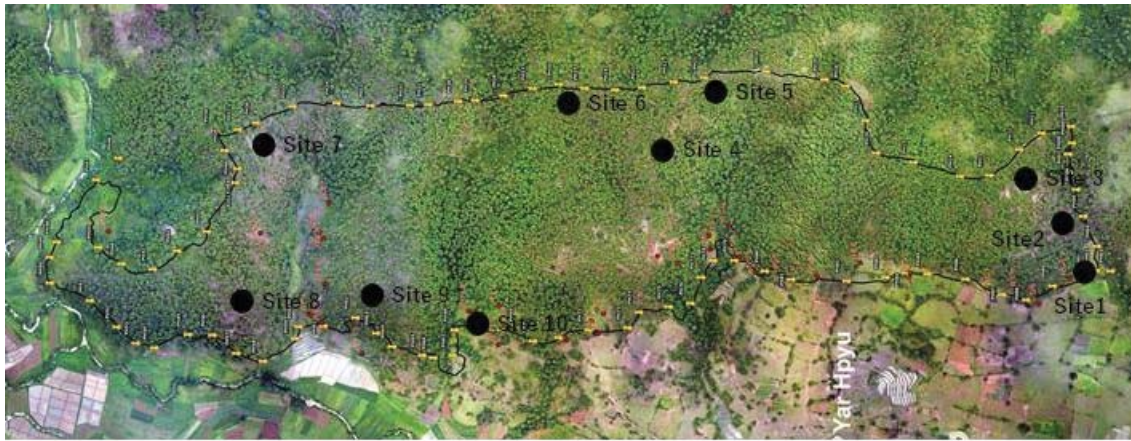
In general, the soil types in Kalaw township are classified into five soil types, namely i) Red Earth, ii) Mountain Red Earth, iii) Dark Yellow Earth, iv) Meadow Yellow Earth, and v) Meadowish Peaty Soil and Swamp Meadow Soil. Among others, Red Earth dominantly occupies the hilly areas in the township, while Mountain Red Earth is found in mountainous part in the same. Consequently, Red Earth and Mountainous Red Earth are the dominant soil types in the proposed area, which are rather acidic and less fertile weathered soils.

4.4 Vegetation Conditions

The dominant tree species growing in the proposed area for CF is pine tees (*Pinus lehasya*), which were mainly planted in 1986/ 1987. Other species found in the area are: *Eupaterium odoratum*, *Embllica officinalis*, *Schima Wallichii*, and banyan tree.

4.4 Results of the Simple Field Survey




A simple field survey was conducted in the proposed area for CF to confirm the site conditions, such as soils (soil pH), slope, existing vegetation (existing tree species) and its conditions (density and height of existing trees) in the selected locations in the proposed area. The locations where the simple survey was conducted and the results of the survey are shown below.



Location of Sites of the Simple Field Survey

Results of the Simple Field Survey

No.	Existing Vegetations	Soil pH	Slope	Density	Tree height	Location	Photo
1	Schima Wallichii, Pinus lehasya and Eupaterium odoratum	Too hard to measure.	7%	Low	2.5 ft	20°34'21.78"N 96°38'43.65"E	
2	Terminalia belerica, Emblica officinalis, Pinus lehasya,	ditto	20%	Low	30 ft	20°34'26.14"N 96°38'47.70"E	
3	Pinus lehasya, Terminalia belerica, Emblica officinalis, Quercus serrata,	ditto	10%	Low	25~30 ft	20°34'26.80"N 96°38'48.76"E	
4	Pinus lehasya, Emblica officinalis, Terminalia belerica, Schima Wallichii	pH 6~7	9%	Low	40~50 ft	20°34'37.65"N 96°38'46.43"E	
5	Pinus lehasya, Emblica officinalis, Terminalia belerica, Schima Wallichii, Eriolobus indica, Eugenia spp;	Too hard to measure.	6%	Medium	35~40 ft	20°34'39.70"N 96°38'49.38"E	
6	Pinus lehasya, Emblica officinalis, Terminalia belerica, banyan tree (Ficus), Eugenia spp;	ditto	8%	Low	40 ft	20°34'45.08"N 96°38'48.79"E	
7	Pinus lehasya, Emblica officinalis, Terminalia belerica, Schima Wallichii, banyan tree (Ficus)	ditto	13%	High	7~ 10 ft	20°35'2.32"N 96°38'36.55"E	

No.	Existing Vegetations	Soil pH	Slope	Density	Tree height	Location	Photo
8	Pinus lehasya , Terminalia belerica, Schima Wallichii, Eriolobus indica,	ditto	4%	Low	35~ 40 ft	20°34'51.06"N 96°38'29.53"E	
9	tea plant , Schima Wallichii, Terminalia belerica, bamboo, Eriolobus indica,	ditto	8%	Tea plantation	3 ft	20°34'45.06"N 96°38'35.81"E	
10	Pinus lehasya , bamboo, Eriolobus indica,	ditto	10%	Low	40~50 ft	20°34'37.50"N 96°38'36.56"E	

In the proposed area, there are some open spaces or areas with less vegetation covers, which need to be restored or rehabilitated. In general, soils in such area are rather compacted and not necessarily suitable for plantation establishment. However, reforestation still seems to be feasible with application of proper planting techniques even in such areas to restore the vegetation cover.

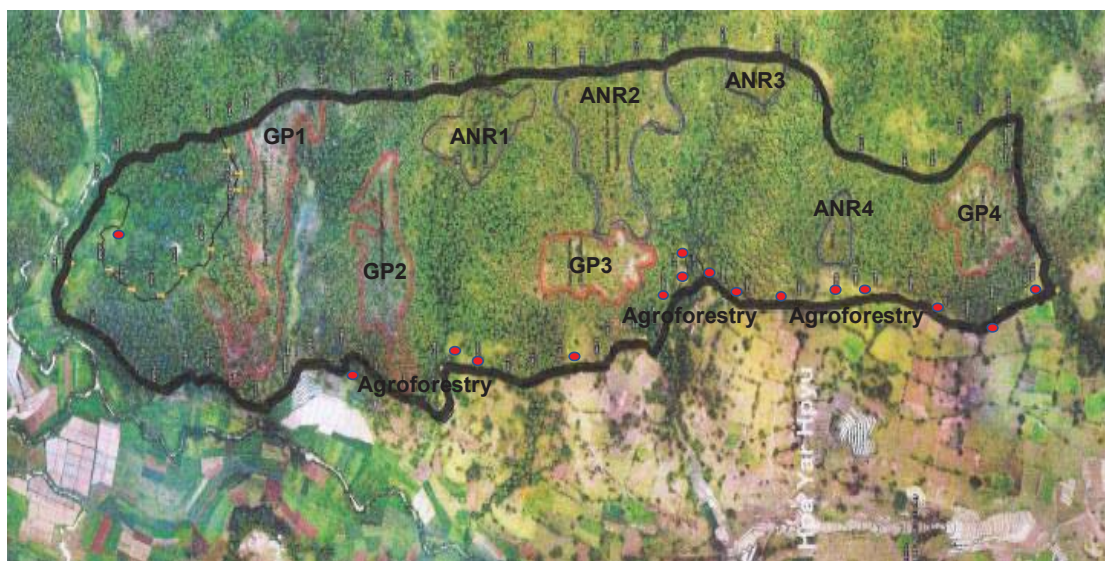
5. Forest Management Plan

5.1 Proposed Forest Management Activities and Target Areas of the Activities

It was agreed by local communities in Pha Yar Phyu village (or the members of CFUG in Pha Yar Phyu village) that the following forest management activities should be carried out by CFUG for protection, maintenance, and improvement of existing forests in the proposed area.

- Gap planting/ Reforestation in open area
- Assisted natural regeneration in degraded forest
- Agroforestry in 17 encroachment areas
- Protection works (e.g., patrolling and firebreak line making)

They also identified the target areas of the respective forest management activities except the protection works. The drone map below shows the target areas of the respective forest management activities.



Target Areas for the Forest Management Activities

The total size of the respective target areas in the proposed areaa are measured as below.

Size of the Target Areas for the Forest Management Activities

Forest Management Activities	Total Area (Acre)
Reforestation/ Gap planting	29.3
ANR	22.8
Agroforestry	15.5

5.3 Procedures for the Forest Management Activities

Each forest management activities will be carried out in accordance with the procedures described below.

Size and Number of Plots of the Target Areas for the Forest Management Activities

FM Activities	Proposed procedures
Gap planting (Reforestation)	<ol style="list-style-type: none"> 1. Determination of area and number of seedlings required 2. Development of a proposal/ request for seedlings to be used for reforestation 3. Preparation of the area for planting seedlings, such as cleaning/weeding, staking and measurement, and hole digging 4. Transportation of seedlings from FD nursery to the village 5. Planting of seedlings in the selected area 6. Tending of the planted seedlings for two years after planting
ANR with supplemental planting	<ol style="list-style-type: none"> 1. Determination of area for ANR and number of seedlings required for supplemental planting 2. Development of a proposal/ request for seedlings to be used for supplemental planting 3. Conducts of ANR activities (e.g., weeding, vine cutting and mulching) and preparation for planting (e.g., weeding, staking, and hole digging) 4. Transportation of seedlings from FD nursery to the village 5. Planting of seedlings in the selected area 6. Tending of the planted seedlings and conducts of ANR activities for two years
ANR without supplemental planting	<ol style="list-style-type: none"> 1. Determination of area for ANR 2. Conducts of ANR activities (e.g., weeding, vine cutting and mulching) once a year for three years
Protection of forests, particularly in the important catchment	<ol style="list-style-type: none"> 1. Determination of the route of the patrolling 2. Walking through the pre-determined route for the patrolling once a month by a group of members (CFUG members shall be divided into several groups and each group shall rotate the patrolling task) 3. Determination of the area where fire break lines shall be developed 4. Weeding and clearing along the line pre-determined as fire break lines before the dry season 5. Continuation of the protective works
Agroforestry in the encroachment areas	<ol style="list-style-type: none"> 1. Selection of the plot/s to be developed 2. Determination of the agroforestry design introduced in the selected plots with technical assistance from FD, DoA, and other organizations 3. Determination of types and number of seedlings planted in the selected plots 4. Development of a proposal/ request for seedlings to be used for agroforestry development 5. Preparation of the area for planting seedlings, such as cleaning/weeding, staking and measurement, and hole digging 6. Transportation of seedlings from the nursery to the village (if necessary) 7. Planting of seedlings in the selected plots 8. Planting of annual crops in the selected plots

5.4 Key Players for the Forest Management Activities

It is not realistic that CFUG will carry out the forest management activities at its own expenses. CFUG expects to conduct almost all the forest management activities in coordination and collaboration with FD as well as other supporting organizations, such as DoA, NGOs, and International Organizations. The following table shows the roles and responsibilities to be shared by CFUG, FD and other supporting organizations in the forest management activities.

Roles and Responsibilities of CFUG, FD, and Other Organizations in Forest Management

FM Activities	CFUG	FD	External Organization
Reforestation	<ul style="list-style-type: none"> ◆ Identify the locations for reforestation. ◆ Determine the number and type of species required for reforestation in collaboration with FD. ◆ Transport seedlings from FD nursery to the village as well as the locations for reforestation. ◆ Conduct the following reforestation activities with technical assistance from FD. <ul style="list-style-type: none"> - Clearing - Sticking - Hole digging - Planting - Tending 	<ul style="list-style-type: none"> ◆ Assist CFUG in the identification of the areas for reforestation. ◆ Assist CFUG in the determination of the number and type of seedlings to be planted in the identified areas. ◆ Prepare and provide the number and type of seedlings that CFUG requires for reforestation. ◆ Assist CFUG in the conducts of the reforestation activities. 	<ul style="list-style-type: none"> ◆ Facilitate the process and discussions for identification of the areas for reforestation, determination of the number and types of seedlings. ◆ Procure seedlings that FD can not provide. ◆ Assist CFUG in the transportation of seedlings from FD nursery to the village. ◆ Assist CFUG and FD in the conducts of the reforestation activities in a proper manner.
ANR with or without supplemental planting	<ul style="list-style-type: none"> ◆ Identify the locations for ANR. ◆ Decide which trees should be left in the identified areas with technical assistance from FD. ◆ Conduct the following ANR activities with technical assistance from FD. <ul style="list-style-type: none"> - Weeding around trees - Vine cutting - Mulching (if necessary) - Thinning (if necessary) - Supplemental planting (if necessary) ◆ Determine the number and type of species required in case supplemental planting is required. ◆ Transport seedlings from FD nursery to the village as well as the locations for supplemental planting. 	<ul style="list-style-type: none"> ◆ Assist CFUG in the identification of the areas for ANR. ◆ Assist CFUG in the identification of wildings and trees to be maintained in the identified areas. ◆ Assist CFUG in the selection and conduct of the necessary ANR activities. ◆ Assist CFUG in the determination of the number and types of species for supplemental planting ◆ Prepare and provide the number and type of seedlings that CFUG requires for supplemental planting. ◆ Assist CFUG in the conducts of the supplemental planting activities. 	<ul style="list-style-type: none"> ◆ Facilitate the process and discussions for identification of the areas for ANR. ◆ Assist CFUG in the transportation of seedlings from FD nursery to the village. ◆ Assist CFUG and FD in the conducts of the supplemental planting activities in a proper manner.
Patrolling and preparation of firebreak lines	<ul style="list-style-type: none"> ◆ Decide the patrolling routes and the frequency of patrolling works. ◆ Identify the areas prone to 	<ul style="list-style-type: none"> ◆ Assist CFUG in the determination of the locations where firebreak lines should be 	<ul style="list-style-type: none"> ◆ Facilitate the process and discussions for identification of the locations of firebreak

FM Activities	CFUG	FD	External Organization
	forest fires and existing forests to be protected from fires. ◆ Determine the locations where firebreak lines should be developed. ◆ Conduct the patrolling works and firebreak ◆ Report any illegal case found during the patrolling works.	placed. ◆ Conduct a field investigation when CFUG reports any illegal case.	lines.
Agroforestry in the encroachment areas	◆ Design the agroforestry models introduced in the encroachment areas including types of fruit or other valuable trees with technical assistance from FD. ◆ Request FD or other organizations to provide seedlings of fruit and other valuable trees. ◆ Transport seedlings from the nursery (if necessary). ◆ Plant seedlings according to the design by conducting the following activities in a proper manner. - Clearing - Sticking - Hole digging - Planting - Tending ◆ Plant annual crops according to the design (if necessary).	◆ Assist CFUG in designing the agroforestry models introduced in the encroachment areas in collaboration with DoA and other organizations. ◆ Coordinate with any external organization/s to assist CFUG in the procurement of seedlings of fruit and other valuable trees. ◆ Assist CFUG in planting fruit and other valuable trees in a proper manner.	◆ Assist CFUG in designing the agroforestry models in collaboration with FD and DoA. ◆ Provide seedlings of fruits and other valuable trees in coordination with FD and DoA. ◆ Assist CFUG in planting CFUG in planting fruit and other valuable trees in a proper manner in collaboration with FD and DoA. ◆ Assist CFUG in planting annual crops according to the design in collaboration with DoA.

5.5 Work Plans of the Forest Management Activities

The members of CFUG develop a 3-year work plan of the forest management activities with the physical target of the respective activities as shown below.

Work Plan of the Forest Management Activities for the Next 3 years

Work Items	Target for 3 years (Acre)	1 st Year				2 nd Year				3 rd Year			
		1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
Gap planting	15.0	■	■	■	■	■	■	■	■	■	■	■	■
ANR w/ or w/o planting	15.0	■	■	■	■	■	■	■	■	■	■	■	■
Protective works	-	■	■	■	■	■	■	■	■	■	■	■	■
Agroforestry development	15.5	■	■	■	■	■	■	■	■	■	■	■	■

The standard work schedule of the respective forest management activities is also developed as shown below. The activities will be carried out in accordance with the schedule in principle.

Standard Work Schedule of the Forest Management Activities

Work Items	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6
1. Gap planting																		
1) Determination of area	■												■					
2) Development of a proposal/request for seedlings	■												■					
3) Preparation of the area for planting seedlings.			■												■			

Work Items	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	
4) Transportation of seedlings from FD nursery					■														
5) Planting of seedlings in the selected area						■													
6) Tending of seedlings f									■			■			■				
2. ANR with/without planting																			
1) Determination of area	■												■						
2) Development of a request for seedlings (if necessary)																			
3) Conducts of ANR activities	■	■	■										■	■	■				
4) Preparation for planting (If necessary)			■												■				
5) Transportation of seedlings (If necessary)				■													■		
6) Planting of seedlings in the selected area						■													■
3. Patrolling and Firebreak line																			
1) Determination of the route	■																		
2) Walking through the route for the patrolling	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
3) Determination of the area where fire break lines shall be developed	■																		
4) Weeding and clearing along the line as firebreak lines		■												■					
4. Agroforestry development																			
1) Selection of the plot/s	■																		
2) Determination of the design	■																		
3) Development of a proposal/request for seedlings	■																		
4) Preparation of the area for planting seedlings,			■												■				
5) Transportation of seedlings from nursery					■													■	
6) Planting of seedlings in the selected area						■													■
7) Planting annual crops						■													■
8) Tending of seedling									■			■			■				■

6. Rules and Regulations of CFUG

6.1 Mission, Visions and Functions of CFUG

The vision, missions, and functions of CFUG, which are shown in the table below, are adopted by CFUG as guiding principles of the group.

Vision, Missions, and Functions of CFUG

Items	Descriptions
Vision	The Community Forestry User Group of Pha Yar Phyu village (Pha Yar Phyu CFUG) is the community organization which aims to protect and improve forests in the CF area so that communities in Pha Yar Phyu village can enjoy the benefits from ecosystem services of forests in the proposed area for CF (such as water and non-timber forest products) and agroforestry products produced in open space in the proposed area.
Missions	<ol style="list-style-type: none"> 1) to protect existing forests in the CF area from further degradation and encroachment, through prohibition of any exploitation of existing trees in the proposed area for CF except for thinning for sustainable forest management or cutting trees planted by CFUG in open spaces in the proposed area. 2) to rehabilitate and restore degraded forests in the proposed area. 3) to manage forests in the CF area in a proper and sustainable manner.

Items	Descriptions
	4) to produce wood and non-wood forest products in open space in the proposed area to meet the basic needs of members of CFUG. 5) to encourage members of CFUG to participate in forest protection, management, and restoration activities in the proposed area. 6) to contribute to the improvement of local livelihoods in Pha Yar Phyu village through enhancement of ecosystem services provided by forests in the proposed area.
Functions	1) to conduct patrolling works to prevent encroachment or illegal exploitation of forests in the CF area in collaboration with Kalaw Township FD. 2) to make firebreak lines to protect forests in the proposed area from forest fires. 3) to report any cases of forest degradation and deforestation, such as encroachment, illegal logging, and forest fires. 4) to plant seedlings of timber and non-timber species including fruit trees in open spaces in the CF area in accordance with the forest management plan approved by FD and technical guidelines given by Kalaw Township FD. 5) to maintain and protect seedlings planted in open spaces in the proposed area in a proper manner. 6) to develop long-term (5 years) and annual forest management plans in collaboration with Kalaw Township FD. 7) to monitor collection of non-timber forest products in the proposed area and control harvesting of trees planted by CFUG in open spaces in the proposed area in accordance with the forest management plan. 8) to develop rules on forest management in the proposed area and those on benefit sharing among/between members and CFUG. 9) to control and supervise the benefit sharing among/between members and CFUG. 10) to use benefits or cash income shared with CFUG for operations and management of CFUG. 11) to keep records and a book of account of CFUG relating to incomes and expenditures of the group. 12) To report to and communicate with Kalaw Township FD any changes in the membership of CFUG, the structure of the management committee, and the forest management plan.

6.2 Basic Rules on Management of the Proposed Area for CF

In order to protect and manage forest resources in the proposed area in a sustainable manner, CFUG determines the following acts to be prohibited in the CF area.

- Logging of existing standing trees without permission of FD
- Cutting of branches of standing trees without permission of FD
- Collection of pine resin in the area
- Burning of the area
- Opening of a new farm in the area
- Grazing livestock animals in the catchment of the water source
- Hunting of wild animals in the area
- Planting of annual crops/ fruit trees in the area except the 17 registered encroachment areas

On the other hand, CFUG decides that the members of CFUG should be allowed to conduct the following activities in the proposed area for CF.

- Planting of seedlings for restoration/ rehabilitation in collaboration with FD
- Protection works (patrolling and firebreak line establishment)
- Weeding and cutting unnecessary plants for ANR
- Collection of fallen branches
- Collection of non-timber forest products, namely mushroom and feather of peacock
- Planting of annual crops/ fruit trees in the 17 registered encroachment areas

- Cutting and harvesting of trees planted in the 17 registered encroachment areas

7. Budget and Profit Management of CFUG

Since the main mission of CFUG is to protect and conserve existing forests in the proposed area, the expected benefits to be generated from the CF or forest management activities are rather limited in the case of Pha Yar Phyu, unlike other CF cases in the country. CFUG expects that it might be able to obtain some profits from agroforestry products (e.g., timber, firewood, fruits, etc.) produced in the 17 registered encroachment areas. The group, therefore, defines the rule or mechanism on management of cash income gained by CFUG as follows.

- i) Type of Profit: Net profit of the sales of agroforestry products (e.g., fruit, timber trees, firewood, agricultural products, etc.) produced in the 17 encroachment areas
- ii) Management of budget Net profit or cash income gained by CFUG will be kept in a bank account opened in a bank at Augbang. Chair person, Secretary, and Treasurer of CFUGMC must be the signers of the account so as to avoid the abuse of the profit.
- iii) Use of budget: Net profit or cash income will not be shared with members, but be used as a village fund for development or rehabilitation of village infrastructure, such as road, water supply system, school, etc. The same (cash income) can also be used for the forest management activities, such as labor and material costs for reforestation and ANR and transportation cost of seedlings for reforestation.
- iv) Daily management: Treasurer of CFUGMC is responsible for daily management of cash income, while Chairperson of CFUGMC bears overall responsibility of cash management of CFUG.
- v) Reporting: Treasurer will report the financial status of CFUG budget including income and expenditures to other members of CFUGMC in the monthly CFUGMC meeting.

Chairperson will report the financial status of CFUG budget to other members of CFUG in CFUG quarterly meeting.

8. Conclusion

As described in the vision and missions of Pha Yar Phyu CFUG, the main aim of the CF area management is to protect and conserve existing forests in the proposed area for CF as they have produced important forest ecosystem services, namely supply of drinking and irrigation water and important sources of livelihoods, for local communities in Pha Yar Phyu village. Village leaders and local communities of Pha Yar Phyu village have protected the same forests since before and are willing to do the same in the future even without official allocation of CF certificate.

Although communities of Pha Yar Phyu village have made efforts to protect the proposed area, the area has faced significant threats of forest degradation caused by local people from the surrounding villages. It is, therefore, important to empower communities of Pha Yar Phyu

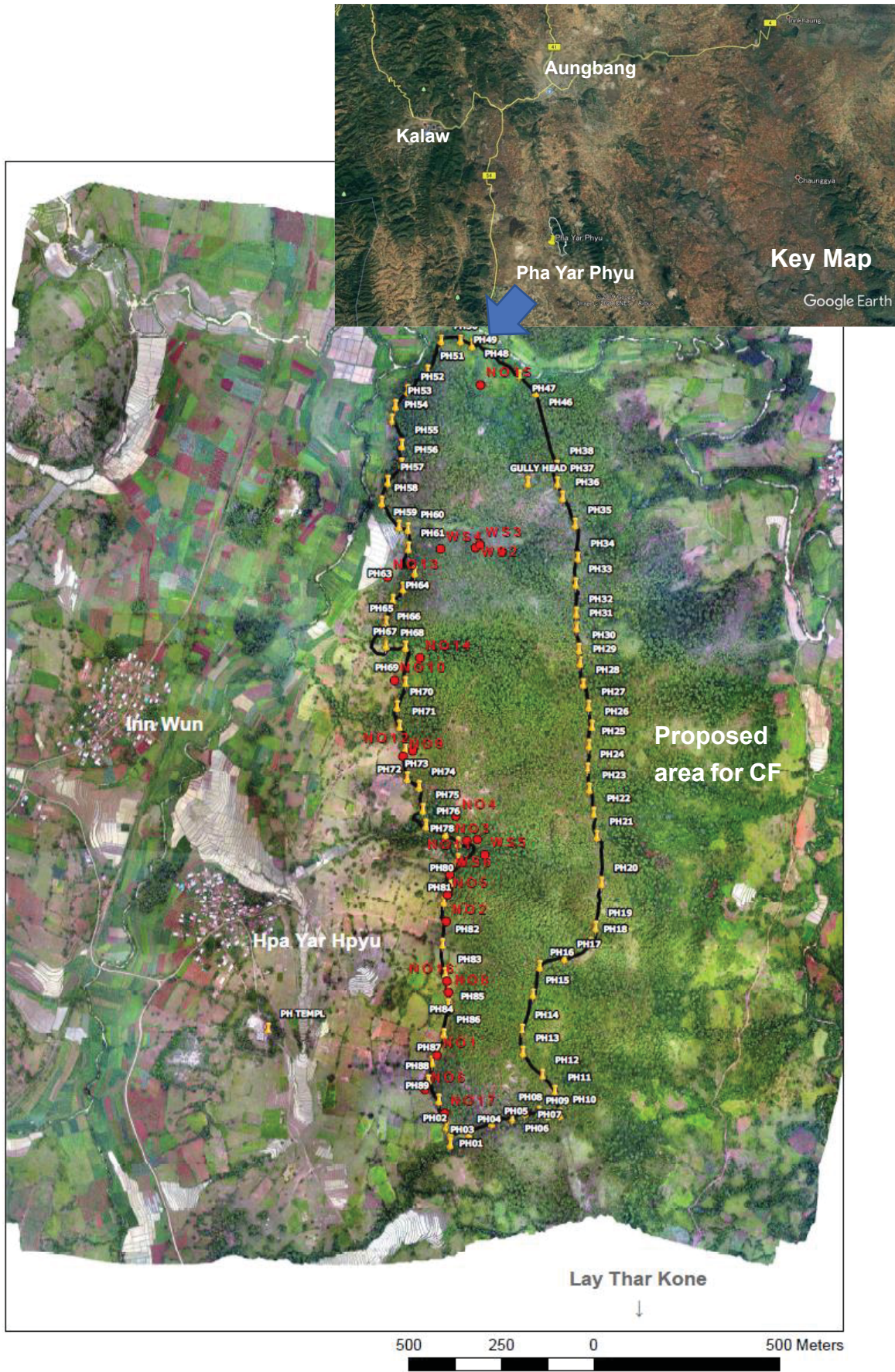
village to protect and manage the proposed area in collaboration with FD by allocation of CF certification to the village.

Furthermore, the introduction of CF and approval of this forest management plan will help local communities of Pha Yar Phyu village to wisely use the 17 registered encroachment areas to gain profits which could be used for improvement of living conditions in Pha Yar Phyu village and continuation of the forest management activities in the proposed area.

Finally, the CF in Pha Yar Phyu village can be the proto-type of collaborative protected area management or joint forest management of the reserved forest. The on-going JICA project has provided technical assistance to FD as well as Pha Yar Phyu village in the introduction of this type of CF, and can further assist FD in the legalization of the same type of CF through development of the standard operation procedures and/or draft legislative document for introduction of this type of CF in the future.

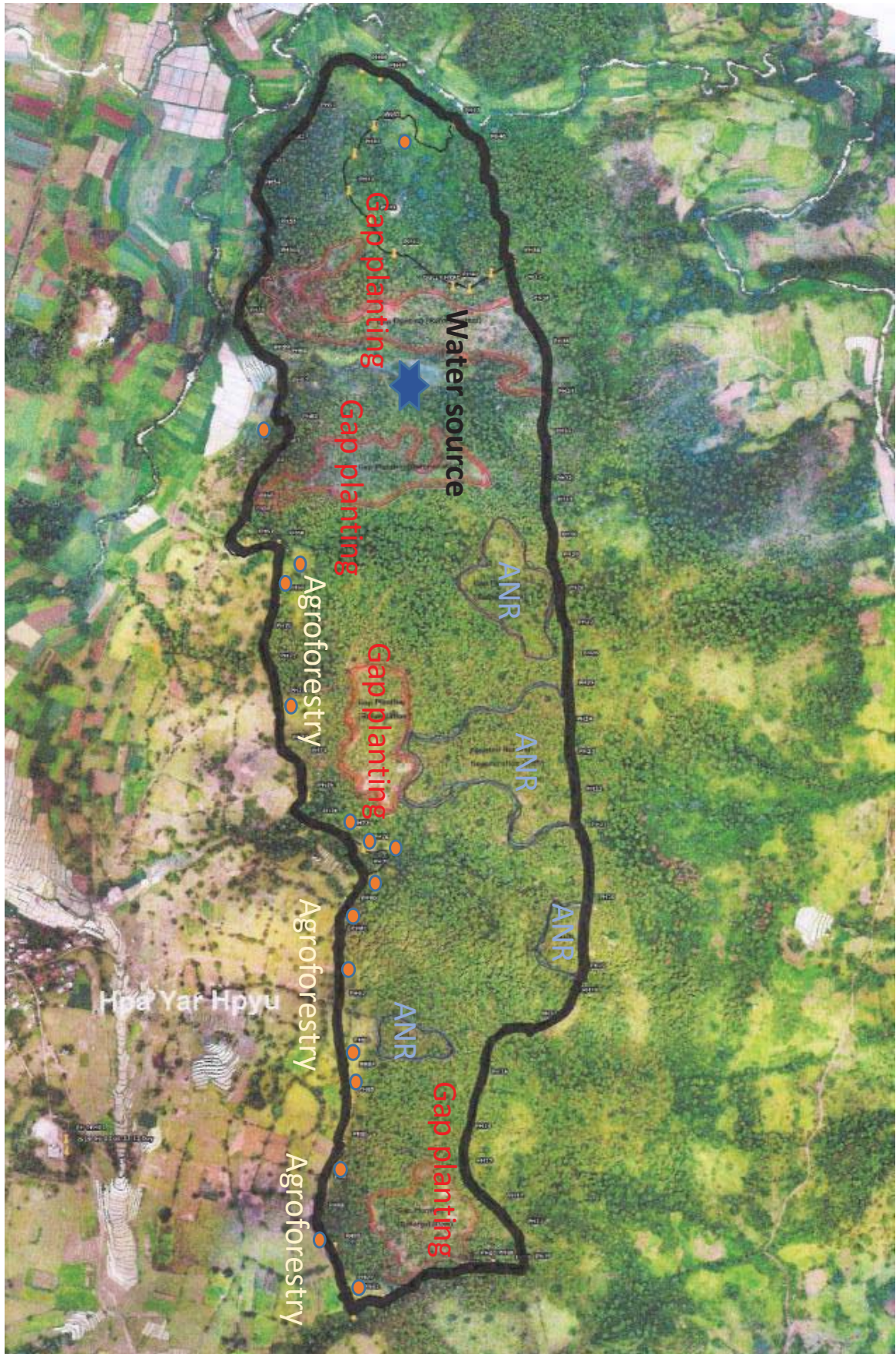
Annexes

Annex-1: Location Map



Location Map of the Proposed Area for CF

Annex-2: Management Map



Forest Management Map in the Proposed Area for CF

*Annex-3: List and Schedule of the
Forest Management
Activities by Year*

3-Year Work Plan of the Forest Management Activities

Work Items	Target for 3 years (Acre)	1 st Year				2 nd Year				3 rd Year			
		1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
Gap planting	15.0	■	■	■	■	■	■	■	■	■	■	■	■
ANR w/ or w/o planting	15.0	■	■	■	■	■	■	■	■	■	■	■	■
Protective works	-	■	■	■	■	■	■	■	■	■	■	■	■
Agroforestry development	15.5	■	■	■	■	■	■	■	■	■	■	■	■

Annual Standard Work Schedule of the Forest Management Activities

Work Items	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6
1. Gap planting																		
1) Determination of area	■												■					
2) Development of a proposal/request for seedlings	■												■					
3) Preparation of the area for planting seedlings,			■												■			
4) Transportation of seedlings from FD nursery					■													
5) Planting of seedlings in the selected area						■												
6) Tending of seedlings f									■			■			■			
2. ANR with/without planting																		
1) Determination of area	■												■					
2) Development of a request for seedlings (if necessary)																		
3) Conducts of ANR activities	■	■	■										■	■	■			
4) Preparation for planting (If necessary)			■												■			
5) Transportation of seedlings (If necessary)				■												■		
6) Planting of seedlings in the selected area						■												■
3. Patrolling and Firebreak line																		
1) Determination of the route	■																	
2) Walking through the route for the patrolling	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
3) Determination of the area where fire break lines shall be developed	■																	
4) Weeding and clearing along the line as firebreak lines		■												■				
4. Agrocorestry development																		
1) Selection of the plot/s	■																	
2) Determination of the design	■																	
3) Development of a proposal/request for seedlings	■																	
4) Preparation of the area for planting seedlings,			■												■			
5) Transportation of seedlings from nursery					■												■	
6) Planting of seedlings in the selected area						■												■
7) Planting annual crops						■												■
8) Tending of seedling									■			■			■			■

Attachment 21
Results of the Survey on
Evaluation of Pilot Activities for
CF and Introduction of
Agroforestry Model

Summary of Interview on Evaluation of Pilot Activity on Introduction of Community Forest

1. General features of the Participants

Sex	No	%
Male	21	80.8%
Female	5	19.2%
Total	26	100.0%

Age	No.
-20	1
21-30	7
31-40	9
41-50	7
51-60	1
61-70	1
71-80	0
SUM	26
Average	37.7

2.1. Training Activities Participated

Topic	Participatns	%
a. Determination of the vision, missions and functions of CF user group	24	92.3%
b. Selection of CFUG members committee and determination of their roles and responsibility	26	100.0%
c. Determination of CF boundary	21	80.8%
d. Development of the bylaws of CFUG	26	100.0%
e. Development of Forest Management Plan	26	100.0%
Average	24.6	94.6%

2.2. Importance of CF documents

Topic of CF activities	Importance			Reason of Evaluation
	High	Fair	Low	
a. CFUG By-laws (vision, missions, and functions of CFUG and roles and responsibilities of CFUGMC)	26	0	0	- Important/basis for CFUG - Can deepen the understandings on the roles and responsibilities
	100.0%	0.0%	0.0%	
b. Map of the target area for CF	26	0	0	- Can know the CF location
	100.0%	0.0%	0.0%	
c. Forest management plan	25	1	0	<u>High</u> - Can understand the CF activities and timeframe - Clarify the benefit sharing <u>Fair</u> - The volume of document is too much to go through
	96.2%	3.8%	0.0%	

2.3-2.5 Understanding level of the CF documents

CF documents	a CFUG by-laws			b. Forest Management Plan		
	High	Fair	Low	High	Fair	Low
Understanding level	25	1	0	23	3	0
	96.2%	3.8%	0.0%	88.5%	11.5%	0.0%
Reason of above answer	- We have sufficient discussions on the document before making the same -The document is simple with few pages.	- The content of the document is difficult to understand.	-	- The document is important; therefore, I have read the same until I understand. - We have sufficient discussions on the document before making the same.	- The document is too long to read.	-

2.6 Appropriateness of design of Pilot Project

Topic	Well	Fair	Less	Others	Total
a. Timing of training	76.9%	23.1%	0.0%	0.0%	100.0%
b. Duration of training session	92.3%	7.7%	0.0%	0.0%	100.0%
c. Way of guiding at the training	100.0%	0.0%	0.0%	0.0%	100.0%

2.6 Other Comments

No.of answers	Comments/No. of answer	
1	Timming of sessions for introduction CF should be earlier	1

Summary of Interview on Evaluation of Pilot Activity on Introduction of Agroforestry Model

1. General features of the Participants

Sex	No
Male	38
Female	0
Total	38

Age	No.
-20	1
21-30	7
31-40	9
41-50	11
51-60	7
61-70	3
71-80	0
Total	38
Average	42.8

2.1. Training Activities Participated

Topic	Participatns	%
a. Training in Land Preparation	31	81.6%
b. Training in Planting Seedlings	38	100.0%
c. Training in making liquid fertilizier	37	97.4%
d. Training in tending seedlings	28	73.7%
e. Training in application of liquid fertilizier	35	92.1%
Average	33.8	88.9%

2.2 No. of seedlings planted _____ 5.1 seedlings/person

2.3 Application status of techniques learnt at the training

Topics ot training	a. Land preparation (hole digging by the size instructed, and application of organic compost (bokashi))	b. Protection of the seedlings planted with net	c. Weeding and mulching	d. Pet bottle irrigation	e. Preparation and application of liquid fertilizer to the avocado seedlings	Average	f. Application of liquid fertilizer to other crops
People Applied/ % of total participants	37 97.4%	38 100.0%	35 92.1%	35 92.1%	37 97.4%	36.4 95.8%	22 57.9%
Reason for not applying			There was not much weed to be pulled out	They were busy			They would like to wait for results of other members who applied the techniques

Type of crops to which the community applied liquid fertilizer on own initiatives

i) Name of crop	No. of person applied
Cabbage	6
	22.2%
Cauliflower	5
	18.5%
Local Avocado	1
	3.7%
Mustard	14
	51.9%
Tomato	1
	3.7%
Total	27
	100.0%

ii) Reason of application to other crops	No. of Answers
Easy to apply	16
	69.6%
Interested in using liquid fertilizer	7
	30.4%
Total	23
	100.0%

iii) Effect of liquid fertilizer in the crop production as compared to the chemical fertilizer	No. of answers
Better	22
No answer	5

2.4 Willingness to continue replication of techniques

	a. Land preparation (hole digging by the size instructed, and application of organic compost (bokashi))	b. Protection of the seedlings planted with net	c. Weeding and mulching	d. Pet bottle irrigation	e. Preparation and application of liquid fertilizer to the avocado seedlings
People who would like to continue/	38	38	38	38	38
	100.0%	100.0%	100.0%	100.0%	100.0%
Reason for willingness	Easy to apply	Effective result on the pilot project	Effective result on the pilot project	Effective result of the pilot project	Effective result of the pilot project
	76.3%	47.4%	55.3%	68.4%	10.5%
	Effective result on the pilot project	Technically easy to conduct	Technically easy to apply	Technically easy to apply	Technically easy to apply
	23.7%	52.6%	42.1%	31.6%	36.8%
	-	-	-	-	Interested in using liquid fertilizer for vegetable farming
-	-	-	-	52.6%	

2.5 Appropriateness of design of Pilot Project

Topic	Well	Fair	Less	Others	Total
a. Timing of training	55.3%	36.8%	7.9%	0.0%	100.0%
b. Duration of training session	89.5%	7.9%	2.6%	0.0%	100.0%
c. Way of guiding at the training	94.7%	5.3%	0.0%	0.0%	100.0%
d. Materials provided at the training	94.7%	5.3%	0.0%	0.0%	100.0%
e. Support by the field staff for application of the techniques	94.7%	2.6%	0.0%	2.6%	100.0%

2.6 Other Comments

No.of answers	Comments/No. of answer	
5	Timing of training for introduction agroforestry(land preparation) should be earlier (before rainy season).	3
-	Want to get more big watering can and big pet bottle.	1
-	Sometime it was difficult to join the activities due to some traditional events.	1

Attachment 22
Monitoring Plan of
Soil Erosion and Influx Sediment

1. Monitoring Plan of Soil Erosion and discharge of Sediments

1.1. Monitoring of Soil Erosion

1) Monitoring of Progress of Gully Erosion by Trail Cameras

The chronological progress gully erosion should be monitored to reveal the mechanism of occurrence of gully erosion by trail camera as described below.

Monitoring items	Contents	Method	Frequency	Place	In charge
Gully progression mechanism	Visual verification of existing gully progression	Monitoring by trail cameras	Data collection: Once a month	Kone Ni village and Ein Yar village	Working group/ FD staff

2) Soil Water Pressure Measurement and Shear Test on Soil Types

As a result of in-situ observation, gully erosion occurs due to the fact that the river water level increases by temporary increase in precipitation, the pore water pressure in the soil increases at the foot of riverbank, and the ground bearing capacity is lost, resulting in gravity collapse. In order to verify this, it is planned to install a soil pressure gauge at the head of the gully and measure the soil water pressure during rainfall.

In addition, shear test shall be conducted by each soil type respectively. Soil shear test is to take a sample of soil extracted at the field and proceed laboratory analysis. In laboratory, artificially saturated state of water content shall be reproduced and measure the shear resistance force at that time.

1.2. Monitoring of discharge of Sediments

1) Monitoring of Water Discharge

Water level, water flow velocity and cross-section profile data are required for the purpose of understand total water discharge by individual river. In light of this, water level data of the four rivers, such as Kalaw, Namlet, Negya and Upper Balu, will be collected through a year. At the same time, cross-river profile has to be clarified by leveling survey and the water flow velocity will be measured manually by water velocity meter. However, the utilization of automated measurement should be taken into consideration since the influence by seasonal flow velocity change is radical and not able to measure by manually.

Based-on series of data collection mentioned above, the amounts of water discharge from 4 rivers to Inle lake will be monitored.

Below table shows water discharge monitoring activities.

Monitoring item	Contents	Method	Frequency	Place	In charge
River water discharge	-Measurement of water level*1	Automatic measurement	Every an hours	4 rivers	Working group /IWUM D staff
	-Measurement of Water flow velocity	Manual measurement	(during peak flow)	4 rivers	

Source: JICA survey team

*1) Measurement of water level: Install water level gauge in each river and collected data is stored into data logger automatically.

*2) Measurement of Water flow velocity: Data shall be collected manually by using electronic magnetic water velocity gauge. In one monitoring site, several measurement points have to be distributed over cross-section and calculate average flow velocity.

2) Monitoring of Total Sediment Solid (TSS)

Annual total SS will be monitored including rainy season in the 2nd phase. Sample collection setting has to be changed from current mode, which is to collect samples once a day, to another mode, which is to collect water samples with a trigger such as rainfall intensity, flow velocity at a monitoring point or water level raise in heavy rainfall event. Appropriate sampling frequency should be planned based on water flow amount especially high flow season. Sampling frequency cannot be set at this moment for rainy season, but it is temporary set as once per two weeks.

Below table shows a monitoring plan of water sampling by auto-water sampler and analysis.

Monitoring items	Contents	Method	Frequency	Place	In charge
TSS amount in the Kalaw river and selected one specified river.	SS analysis collected by auto-water sampler	Regular sampling by auto-water sampler and analysis at a laboratory	[Dry season] -Once per 24 days -Collected samples will be sent to the laboratory for the analysis when the samples were collected enough amount.	Sampling will be done at the middle basin of Kalaw river and selected one specified river. Analysis will be ordered to FRI.	Working group/FD staff
			[Rainy season] Water level will be considered as trigger to collect samples. Once the level reach to the certain height, sampling will be done with certain frequency. Temporally, once per two weeks will be set to collect samples. Analysis will be done by same method with dry season.	Ditto	Ditto

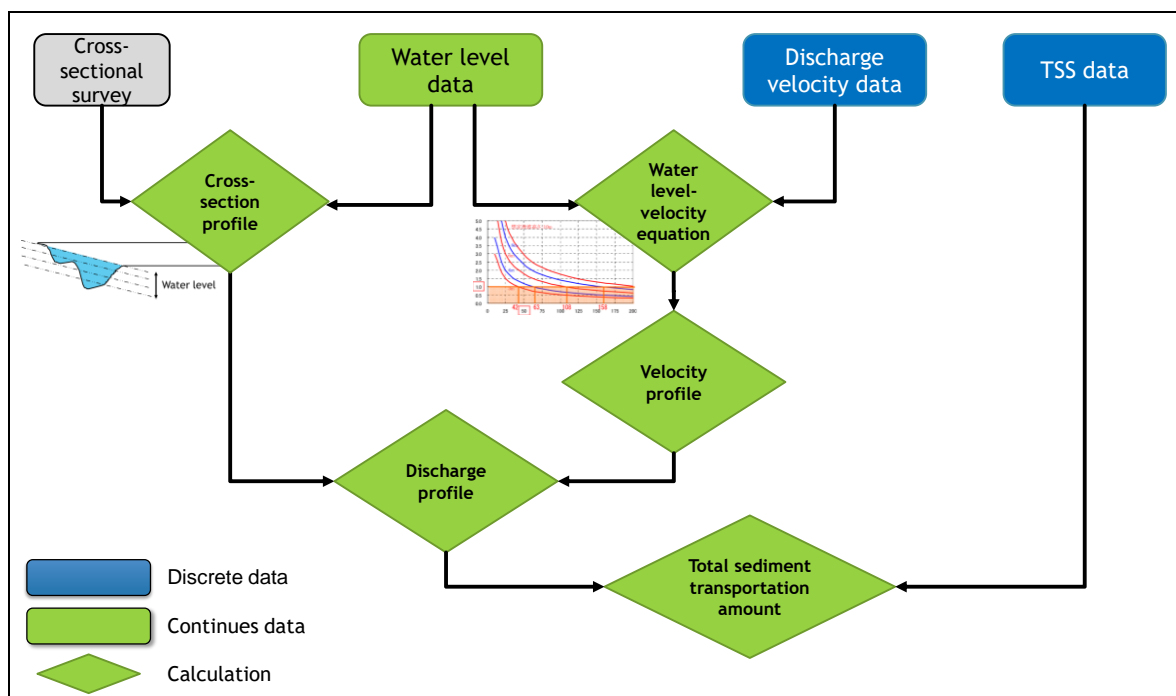
Source: JICA survey team

As mentioned above, samples will be collected with the interval of once per 24 days during dry season and once per 14 days during rainy season by operating auto-water sampler. This is for analyzing TSS amount within the river flow. Although its analysis is done by Forest Research Institute (FRI) in the 1st phase, this is not sustainable system for 2nd phase and afterwards from the viewpoints of shipping cost and FRI's work load. This is, therefore, sampling and TSS analysis done by field level staff dispatched around Inle lake is indispensable to monitor TSS by using auto-water sampler for a long time period. The establishment of a simple experimental facility to analyze TSS within the project area such as Nyaung Shwe district is proposed.

3) Estimation/Calculation of Volume of TSS discharge

Work flow for TSS estimation and basic data collection is described as follow. In combination with water level data and cross-section area, cross-section profile specified by water level will be determined. At the same time, water level data and water flow velocity data enable to generate water level-velocity equation and velocity profile.

Next steps, applying cross-section profile and velocity profile, discharge profile will be obtained. Concurrently, concentration of SS will be arranged by taking water sample. Finally, unit of SS concentration and discharge profile is used for estimation of total SS transportation amount.



4) Verification of Sedimentation Condition at Alluvial Fun and Inle Lake

Soil core samples around the exit area of limestone cave will additionally collected in order to verify the condition insisted by the analysis in the 1st phase. Furthermore, soil core samplings at tributaries from alluvial fan to floating garden areas in which samplings have not done yet during the 1st phase will be conducted. Moreover, core samples at the bottom of the lake around the estuary of Nam Lat river will be additionally collected, and granulometry and C-14 absolute dating test will be done. Sampling depth will be changed from 60 cm at 1st phase to 100cm to 200cm.

Below table shows sedimentation monitoring activities.

Monitoring item	Contents	Method	Frequency	Place	In charge
Condition of sedimentation at alluvial fan and Inle lake	-Sedimentation at alluvial fan -Sedimentation at Inle lake	Granulometry and C-14 absolute dating method of soils at the bottom of the lake	One time	-Kalaw alluvial fan -Floating garden -Kalaw/Nam Lat river estuary	Working group/FD staff

Source: JICA survey team

5) Monitoring of Condition of Sedimentation from River

Visual materials to explain the dynamics of river will be made by using consecutive photographing data through a year, which include not only dry season but also rainy season. The entrance of Kalaw river limestone cave will be added as an additional monitoring point. Morphing process is applied to recorded consecutive photograph and showing time-series change of Kalaw river status as an evidence.

Below table shows the monitoring plan by trail cameras.

Monitoring items	Contents	Method	Frequency	Place	In charge
Condition of sedimentation from Kalaw river	Visual verification of eruct condition at exit area of the limestone cave, lower Kalaw river, during rainy season.	Monitoring by trail cameras	Data collection: Once a month	Exit area of the limestone cave at lower Kalaw river	Soil

Source: JICA survey team

6) Development of Sedimentation Discharge Model

From the above, the amount of TSS discharge from the Kalaw River is clarified, and it will be scientific data for studying future measures to control erosion. In addition, it is desirable to utilize these data from the viewpoint of integrated watershed management to contribute to the watershed management plan. As one of them, it is recommended to construct a

discharge model that combines land use/land cover, topography, precipitation, and measured TSS discharge values.

2. Institutional arrangement for river monitoring

The monitoring plan is supposed to be implemented with the cooperation between Japanese expert team and working groups in the 2nd phase of the project (component 2). Through these monitoring activities in the coming phase, sustainable monitoring implementation structure will be built by coordinating suggestions and proposals and cooperation among stakeholders and related institutions as an exit strategy.

Furthermore, as a future perspective, it is important to establish a river monitoring system in cooperation with line agency when performing integrated watershed management. Specifically, a proposal would be to have the Forest Department and the Irrigation Department play a central role, with the Forest Department as the main body for river monitoring, especially in the upstream and middle reaches of the watershed, and the Irrigation Department as the main body for river monitoring in the downstream of the watershed. Moreover, the data sharing mechanism required to promote the sharing of collected data is also an important factor.

In addition, building a data sharing house to share the collected data is also an important element.

Attachment 23
Overall Plan for
Sediment Control

Overall Plan of Gully Erosion Control

February 2020

**Japan International Cooperation Agency
(JICA)**

**NIPPON KOEI CO., LTD./Japan Forest Technology Association/
Asia Air Survey Co., Ltd.**

1. Gully types and distribution of gullies in Inle Lake Basin

1.1 Gully length and sub-basin wise distribution

Gully is one of the land erosion phenomena caused by rainfall, its shape is groove. The sizes of the gullies in Inle Lak basin shows variety of small to large. In accordance with the satellite image analysis by the JICA project team, 1,700km length of gullies in total is confirmed as table below.

Sub-Basin wise Gully Length			
Sub-basin	Area (ha)	Total Gully Length (m)	Density (m/ha)
Namlet	119,509.98	650,786	5.45
Negya	25,594.19	235.897	9.22
Kalaw	76,385.14	566,122	7.41
Upper Balu	72,007.20	242,480	3.37
Total	293,496.51	1,695,285	5.78

Source: JICA Project Expert Team (2019)

The characteristics of density, distribution of gullies in each sub-basin and gullies' feature in the concentration area of sub-basin are shown below.

Sub-basin wise Characteristics of Gully Distribution and Features			
River Basin	Density of Gully	Feature of Gully Distribution	Feature of Gullies in high concentration area
Namlet	Low	On the north-western area of the upper side of the sub-basin has gully concentration area	The gullies in the concentration area are distributed in the mountainous area and have steep slopes. Gullies' width is relatively narrow and have vegetation.
Negya	Highest	—	—
Kalaw	high	Gullies are concentrated in the southeast area	The southeast area is a hill side with gentle slope. The shape of most of the gullies has a main stream and many branches. Some of them are relatively big , deep, and wide.
Upper Balu	Low	—	—

Source: JICA Project Expert Team (2019)

1.2 Gully types

The gullies are classified as 6 types as below.

Gully Types				
Gully Type	Place of Occurrence	Width	Vegetation Condition	Remarks
1. Natural waterway type	Flat	About 2m	Grass, shrub, and bare land (some patterns)	
2. Mountain type	Mountain	-	-	Includes those with severe surface erosion
3. Medium-sized vegetation mold	Hilly area	5~15m	Grass, shrub & tall trees	Those whose depth can be confirmed comparing with 1 and 2
4. Medium-sized vegetation-free type	Ditto	Ditto	Bare land	
5. Large-scale vegetation mold	Ditto	More than 15m	Grass, shrub & tall trees	
6. Large-scale vegetation-free	ditto	ditto	Bare land	

Note : Type 3 & 4 Includes variety of size from very small, small, medium their depth is under 15m.

Type 5 & 6 are very big with more than 20m dept and 20m width.

Source: JICA Project Expert Team (2019)

The 4 sub-basin wise total length of gullies are shown below.

Sub-basin wise Total Length of Gullies

Gully type	Sub-Bsin				Unit:(m)
	Namlet	Negya	Kalaw	Upper Balu	Total
1. Natural waterway type	494,896	28,054	32,162	53,928	609,040
2. Mountain type	142,074	69	11,347	4,998	158,488
3. Medium-sized vegetation mold	13,815	74,417	83,872	64,658	236,762
4. Medium-sized vegetation-free type	0	16,637	21,633	9,989	48,259
5. Large-scale vegetation mold	0	80,316	262,922	87,144	430,382
6. Large-scale vegetation-free	0	36,404	154,186	21,762	212,352
Total	650,785	235,897	566,122	242,479	1,695,283

Source: JICA Project Expert Team (2019)

1.3 History of gully development, forecasting future and necessity of countermeasures

The aerial photo of 1980s shows same situation of gully distribution in Inle Lake Basin, especially the concentration of gullies in Kalaw sub-basin was found in the aerial photo. It is assumed that 40 years has passed since that time, but the number of gullies has been increasing but never decreasing. In accordance with filed check, many same aged trees are found in gullies. The major ages of trees in gullies are 5 years or 10 years. It can be estimated that i) heavy rain would be occurred with 5 or 10 years return period, ii) new gullies have been generated by the heavy rains, and iii) the existing gullies develop by the heavy rains. The gully erosion starts from the gully bed and expands horizontally time by time. The geology of Kalaw sub-basin is composed with limestone mainly, it is estimated the sediment of the lake bottom in ancient period. Therefore, the area of Kalaw sub-basin is much vulnerable to erosion. With consideration these, the gully erosion in Inle Lake Basin is estimated to increase but will never decrease naturally.

The gully erosion and its expanding cause i) loss of farmland and ii) sediment flowing into Inle Lake. ii) doesn't cause direct damages currently, because most of the sediment are piled on the bottom of canal and sediment in the canal has been dredging by the public agency (IWUMD) and private farmers, dredged sediment are returned on the existing farmland by the farmers or specific areas by IWUMD. However, the cost of dredging is huge and the capacity of farmland or dumping area have limitation and IWUMD and farmers will need to continue dredging, means budget use has no limitation. In case of shortage of budget or dumping areas will cause un-balance between supply and dredging of sediment, and the risk of increasing of sediment into the lake will become bigger. Inle Lake is one of the most popular sightseeing places in Myanmar. If the water area of the lake will be decreased by the sediment inflow, it will lead worse environment surrounding the lake area. It means reducing the value of tourist resources of Inle Lake, and equal to the Nation property loss. Therefore, reduce or stop the progress of gully erosion is quite important and required for the Government of Myanmar.

2. Basic policy of overall plan for gully erosion control

The basic policy of overall plan for gully erosion control is shown below.

1. Countermeasures based on current (as of 2019) technical level and capacity of Myanmar side to realistic feasible plan
2. Maximum effect by minimum input by utilization of natural recovery power

(1) Technical level

The Forest Department (FD) is the only one agency who takes projects of gully erosion control currently (as of 2019) but there are not concrete systemized techniques and most of the case, single drystone check dam construction is common. On the other hand, the essential construction technique of check dam construction by both drystone and masonry has been established in FD and IWUMD (Irrigation and Water Utilization Management Department). On the sustainable project implementation aspect, the limitation of budget and human resource are one of the biggest issues but it can not be ignored. Introducing any quite new and high techniques will not work for the sustainable development due to establishment and sustainable improvement of technique in Myanmar is required. Therefore, the plan will be prepared based on the current technical level and capacity of Myanmar side.

(2) Support the natural recovery power

There are a lot of number and the huge total length gullies in Inle Lake Basin and the budget amount is limited. Therefore, large budget for one gully is not realistic. Meanwhile, if a gully bed is fixed and no erosion occur on the bed, slope foot can become stable and natural vegetation develops on the bed and slope, then strengthen the slope of gully and the gully is getting better condition. This is confirmed on the lower section of the big gully in Ein Yar village. Therefore, the following strategy/policy is appropriate; i) stop the erosion by minimum input using the natural recovery power and ii) accelerate natural vegetation recovery, and iii) finally some year after the gully will be recovered. This strategy/policy is used for the mountain conservation project in Japan. It means the Japanese technology will able to contribute to the development of Myanmar. The Japan Forest Conservation Technical Guideline described “The forest conservation aims to bring out the potential functions forest to contribute to the public benefit. The forest potential functions are saving water, prevention of properties’ damages by slope failure and sediment outflow, strong wind, inundation, drought, avalanche, stone falling.”

3. Basic policy of countermeasure for each gully type

3.1 Concept of countermeasures for each gully type

The table below shows summary of countermeasures for each gully type.

Summary of Countermeasures

Gully Type	Major Erosion Mechanism	Outline of Countermeasure
------------	-------------------------	---------------------------

1. Natural waterway type	Both sides are eroded by water flow	Revetment and girde to support revetment
2. Mountain type	Gully bed is eroded by water flow vertically,	Water channel: gully bed protection
3. Medium-sized vegetation mold	↓	
4. Medium-sized vegetation-free type	Slope foots become unstable,	Check dam: support water channel, protect gully bed and slope foot
	↓	
5. Large-scale vegetation mold	Small scale slope failure at lower side of slope	Check dam: protect gully bed and slope foot, support revetment
6. Large-scale vegetation-free	Slope failure expands to upper side	
	↓	Revetment: slope foot stability
	Gully expand both of horizontally and vertically	

Source: JICA Project Expert Team (2019)

3.2 Construction cost estimation for each gully type

(1) Methodology of construction cost estimation

In the JICA Project (FDSNR) in 2019, 2 project sites were selected, 2 design works and 1 construction work were taken as below.

Summary of Pilot Activities in 2019 by FDSNR (Component-2)

No.	Name	Gully Type	Outline of Pilot Activity	Related Cost estimation
1	Kon Ni	4. Medium-sized vegetation-free type	Survey, ground survey, design, construction, construction supervision	<ul style="list-style-type: none"> ➤ Work quantity per unit ➤ Cost of material ➤ Direct cost estimation
2	Ein Yar	6. Large-scale vegetation-free	Survey, ground survey, design	Direct cost estimation based on Koni Pilot Project

Source: JICA Project Expert Team (2019)

(2) Method of cost estimation

The unit cost of construction was carried out by methodologies using the results of pilot activity, and the results are shown below.

Unit Cost and Estimation Methodology

Gully Type	Pilot Project used as cost estimation basis	Methodology of Cost Estimation	Cost
1. Natural waterway type	Ein Yar Project	Use cost estimation of Ein Yar pilot project	62,919 (MMK/project)
2. Mountain type	Kon Ni Project	Cost of Kon Ni pilot project x1.2	6,374 (MMK/project)
3. Medium-sized vegetation mold	Kon Ni Project	Cost of Kon Ni pilot project x1.5	7,968 (MMK/project)
4. Medium-sized vegetation-free type			
5. Large-scale vegetation mold	Ein Yar Project	Use cost estimation of Ein Yar pilot project	112,055 (MMK/project)
6. Large-scale vegetation-free			

Source: JICA Project Expert Team (2019)

There are 2 types of construction implementation such as i) direct force account, ii) contract out. The methodology is currently not clear. Therefore, in this plan the direct force account method is used for cost estimation.

4. Overall plan for gully erosion control

4.1 Whole plan

(1) Construction amount

The construction amount is estimated based on the assumptions below.

1. Target Length of construction: 80% of gully length is used, 20% of length would be non-construction section
2. Target length of cost estimation: 80% of gully length is used, not 100% (perfect) construction is not necessary.

The target amount of construction based on above assumption is shown below.

Target amount of Gully Construction

Gully Type					Unit: (m)
	Namlet	Negya	Kalaw	Upper Balu	Total
1. Natural waterway type	317,000	18,000	21,000	35,000	391,000
2. Mountain type	91,000	0	7,000	3,000	101,000
3. Medium-sized vegetation mold	9,000	48,000	54,000	41,000	152,000
4. Medium-sized vegetation-free type	0	11,000	14,000	6,000	31,000
5. Large-scale vegetation mold	0	51,000	168,000	56,000	275,000
6. Large-scale vegetation-free	0	23,000	99,000	14,000	136,000

Source: JICA Project Expert Team (2019)

(2) Total cost estimation

Total cost of construction of whole gullies based on the target amount and unit cost above is shown below.

Whole Cost Estimation of Whole Gullies

Gully Type					(Unit: ' 000MMK)
	Namlet	Negya	Kalaw	Upper Balu	Total
1. Natural waterway type	79,781,292	4,530,168	5,285,196	8,808,660	98,405,316
2. Mountain type	9,667,840	0	743,680	318,720	10,730,240
3. Medium-sized vegetation mold	1,195,200	6,374,400	7,171,200	5,444,800	20,185,600
4. Medium-sized vegetation-free type	0	1,460,800	1,859,200	796,800	4,116,800
5. Large-scale vegetation mold	0	22,859,220	75,300,960	25,100,320	123,260,500
6. Large-scale vegetation-free	0	10,309,060	44,373,780	6,275,080	60,957,920

Source: JICA Project Expert Team (2019)

4.2 Consideration of prioritization

5 criteria for prioritization below are assumed.

- (1) Emergency, (2) Risk of damage on property, (3) Workability of construction
- (4) Safety of construction, (5) Construction experience/ contractor

(1) Emergency

If a gully has aggressive erosion source/ power, it will be prior, e.g. gully without vegetation is prior to the gully with vegetation.

(2) Risk of damage on property

The properties which will be protected against gully erosion are, i) farmland, ii) houses and farmland surrounded the gully, and iii) Inle Lake. The distance between the gully and property is one of factors to indicate the significance of damage risk. For example, the mountain type gully is far from the properties. Therefore, the priority of mountain type is low in this aspect.

(3) Workability of construction

The accessibility to the gully is one of the biggest impacts for construction workability, if the location is far from the existing road or the depth of gully is deep, it takes long time for material transportation. Especially, in case of a big gully with 15m or more depth makes much difficult to bring in a mixing machine and it affects on the construction period and cost. Therefore, such gullies are set as lower priority.

(4) Safety of construction

Depth of gully, slope angle, water flow, risk of slope collapse are the factors which affect on the safety of construction. In case of the big gully like the one in Ein Yar Village, the depth of gully is 25m and slope collapse risk is much high. The risk of damages on the workers is estimated high because of material transportation to the bottom of the gully from the top, especially the heavy mixing machine by man power have a lot of risk. With consideration of the current construction experience and capacity, such construction of a big gully is evaluated as high risk.

(5) Construction experience and contractors

In Myanmar, only the Forest Department has experience of erosion control construction, but the target gully is limited as the small type and single check dam with dry stones. IWUMD has contract-out type of construction but it is also limited in rivers/ stream area only, but no experience of gully itself. There are major contractors in Yangon or Mandalay but their construction is concentrated in flat place (town or surrounded areas) and targeting the big bridge, high building. Therefore, the construction of the gullies are not attractive for them, because the gully construction especially the big one located in remoted area includes a lot of

high risk. Therefore, there are possibilities no contractor will join to the tender.

(6) Prioritization of each gully type with current situation

The priority evaluation on each gully type is shown below.

Evaluation of Priority for Each Gully Type	
Gully Type	Evaluation of Priority
1. Natural waterway type	<p>○Emergency: The major erosion is occurred on both side expansion speed is not high.</p> <p>⊙Risk on property: Both side of gully is farmland, gullies are near Inle Lake.</p> <p>△Workability, safety: The workability is low, because water flow control or diversion will be required.</p> <p>○Construction experience: IWUMD has work experience and contractor too.</p>
2. Mountain type	<p>○Emergency: The erosion is expanding both horizontal and vertical side</p> <p>× Risk on property: gully is located far from the property</p> <p>○Workability, safety: Location is in mountain but, the slope is not much steep.</p> <p>○Work experience: FD has experience.</p>
3. Medium-sized vegetation mold	<p>△Emergency: Erosion progress speed is expected slow but some of them has potential risk due to underground water.</p> <p>Others are same as below.</p>
4. Medium-sized vegetation-free type	<p>⊙Emergency: Erosion speed is high.</p> <p>○Risk on Property: Gully is surrounded by farmland, gully is located near Inle Lake</p> <p>○Workability, safety: Risk is not high, because depth is under 10m</p> <p>○Experience: FD has work experiences</p>
5. Large-scale vegetation mold	<p>△Emergency: Erosion progress speed is expected slow.</p> <p>Others are same as below.</p>
6. Large-scale vegetation-free	<p>⊙Emergency: Erosion speed is high.</p> <p>○Risk on Property: Gully is surrounded by farmland, gully is located near Inle Lake</p> <p>○Workability, safety: Risk is much high, because depth is more than 20m. The construction in the deep gully is evaluated as high risk.</p> <p>○Experience: FD, IWUMD have no experience, and appropriate contractors can not be found.</p>

Note: The construction of this type has high risk based on current capacity in Myanmar. It is recommended to start this type after the capacity of Myanmar will be developed

Source: JICA Project Expert Team (2019)

Summary of Evaluation of Each Gully Type						
Gully Type	Emergency	Risk on Property	Workability	Safety	Experience	Total Evaluation
1. Natural waterway type	○	⊙	△	△	○	○ (-)
2. Mountain type	○	×	○	○	○	△
3. Medium-sized vegetation mold	△	○	○	○	○	○
4. Medium-sized vegetation-free type	⊙	○	○	○	○	○ (+)
5. Large-scale vegetation mold	△	○	×	×	×	×

6 . Large-scale vegetation-free	◎	○	×	×	×	×
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Source: JICA Project Expert Team (2019)

We have to say that countermeasures on the large type gully is too early based on the current situation in Myanmar such as work experience, candidates of contractor, safety of construction, workability. And the mountain type's priority is low because of location, far from the protected property.

As the results, medium type, especially small size gully, and natural waterway type are appropriate for tackling within short term period based on consideration of construction implementation with current Myanmar resources. Getting experience and developing capacity by the countermeasure implementation of these gully types within some years, then, techniques related to the gully countermeasures will be systemized. After that, implementation of the medium size gully will be challenged. Then, finally challenging to the large size gully will start. For these activities, not only capacity of the client side such as planning, design, construction supervision but also the construction skills of the contractors or local workers/ skilled workers shall be developed. This approach seems a long way around but actually it can be the shortest and the best way.

Based on this approach, the project amount of the 1st 5-year and 2nd 5-year plan are considered as below.

Construction Project Amount for 1st and 2nd 5-year plan

FD/IWUMD	1 st 5-Year Plan			2 nd 5-Year Plan		
	Natural waterway	Small size	Medium size	Natural waterway	Small size	Medium size
Kalaw FD	-	50	-	-	50	3
Nyaunshwe FD	10	15	-	15	15	3
Nyaunshwe IWUMD	5	10	3	2	3	5
Total	15	75	3	17	68	11

Source: JICA Project Expert Team (2020)

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