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1. Background

In Myanmar, community forestry was introduced in 1995 through the Community Forestry Instructions – CFI (1995) which was reviewed and revised in 2016 by the National Community Forestry Working Group – CFNWG composed of multi-stakeholders represented by government departments, NGOs and INGOs. Although the revised CFI was ready to be issued in 2016, the Forest Law revising was ongoing and some CF relevant sections were revised. The revised CFI, thus, was officially announced in 2019 after the revised Forest Law was published in 2018. On ground, the revised CFI was exercised since 2016, so that most CFs received CF certificates in 2017 were complied with the revised CFI.

The policy targets for CF is 919,000 ha by 2030 as per the National Forestry Master Plan (FD, 2020). As of November 2021, a total of 7,010 user groups comprising of 178,462 members were empowered to manage the forest area of 390,761 ha across the country (FD, 2021)., The current CF achievement is about 42%. There are gaps to achieve the policy target and more support of policy and decision makers, and development organizations are still needed to develop the community forestry in Myanmar, for which the evident research showing the impacts of community forestry is indeed necessary.

The study on certified mangrove CFs mainly focused in four townships; Pyarpon, Labutta and Bogale of Ayeyarwaddy and Kungyangon of Yangon Region. The reasons why mostly focusing on mangrove CFs rather than the upland ones, are the fact that Mangroves are a particularly important asset in environmental conservation and livelihood protection in several ways: they sequester vast amounts of carbon, protect communities from storm surge, and serve as nurseries of the sea providing fish to support the nutrition and incomes of local people. Due to overexploitation and conversion of land use, most of the mangrove forests in Myanmar have been degraded and denuded for more than three decades, especially the Ayeyarwaddy delta.

Establishment of Community Forestry (CF) was started in the Ayeyarwaddy delta where mangroves mainly occur in Myanmar right after Community Forestry Instructions (CFIs) was issued by the Forest Department in 1995. In the beginning of the CF establishment in the delta, the Human Development Initiative (HDI) project by FAO/UNDP supported many communities to be able to establish CFs nearby their communities in accordance with CFIs. Forest Resource Environment Development and Conservation Association (FREDA), a local NGO, had facilitated the establishment of CFs in Pyarpon Township of the delta in collaboration with a Japanese NGO called “Action for Mangrove Reforestation (ActMANG)” since 1999. Under the project support, there were a total of 7 villages awarded CFCs in 2001.

This study examined the impact of the certified mangrove forests through comparing the conditions before and after CF certification by spatial analysis and socio-economic survey. As per the available secondary information, there are a total of 73 mangrove CFs in Ayeyarwaddy and Yangon Regions, of which, focus group discussions were conducted with 46 CFs, of which, the household interview was carried out through meeting with 132 respondents. This report presented the findings of 46 focus group discussions and household interviews.

2. Objectives of the assessment

In this assessment, there are two main portions; spatial analysis done by the National University of Singapore – NUS, and socio-economic survey/ ground truth/ collecting coordinate points of CF boundary carried out by RECOFTC Myanmar. The specific objectives for RECOFTC Myanmar are;

- To generate the shapefiles of certified mangrove CFs established in Ayeyarwaddy and Yangon Regions through collecting the track lines or coordinate points of CF boundary for spatial analysis
- To assess the impact of certified mangrove CFs on socio-economic conditions of CF members and forest resources management by comparing the situations before and after they received certificates
- To explore the performance of CF members, challenges and disturbances for CF management so as to support for spatial analysis

3. Methodology

3.1 Data collection

In consultation with the Landesa Myanmar and the District Forest Department (before military coup – February 2021), a list of certified mangrove CFs was collected along with the available CF management plans and certificates. The shapefiles or coordinates of the CF boundary are very limited available, but only location maps of some CFs available from the CF plans.

3.1.1 Remapping of CF area

Although some CF location maps are available from the CF plans, it was observed that there are some discrepancies in location and extent of CF area. Hence, the survey team tried to remap the CF boundary by collecting the track lines or coordinate points with the assistance of the GPS. In order to have the reliable the CF boundary, the following steps were applied in the field;

- i. Drawing resource map
Local communities, particularly CF members (6-10 people), were asked to draw the resource map covering their CF area, with the assistance of the field survey team. The resource map were applied not only in CF mapping, but for focus group discussion on CF history, condition of forest, disturbances, distance from the village, etc.
- ii. Discussing by using the satellite image
Once after having the resource map, the CF members were aware of their resources including the location and extent of their CF. The CF boundary developed in the resource map is very draft and it is still hard to follow on ground. To make sure of the CF boundary on ground, the survey team discussed the printed satellite image with CF members through asking the questions; where is your CF? what is the extent of your CF area? Are there any artificial boundary posts or marks? Does your CF follow the natural streams, roads or ranges?
- iii. Drafting the CF boundary on the printed satellite image
After enough discussion on the printed satellite image and resource map, the CF members are asked to draft their CF boundary on the image. In this case, the location maps mentioned in the CF management plan (if available) need to be brought in to make sure of the CF area. Based on the draft CF boundary developed by the CF members, the survey team needs to check or calculate the area which should be neither too small nor big compared to the CF area approved in the CF certificate.

iv. Ground survey

The survey team with one or two CF members who were involved in the previous steps went to the CF sites, and collected the track lines and coordinate points of the CF boundary. Along the way, the survey team needs to check with CF members whether they are going the right way that they discussed in step (iii). The survey team recorded the start and end way points without confusion with coordinates of other CFs.

3.1.2 Focus group discussion - FGD

In Ayeyarwaddy Region, there are a total of 66 certified mangrove CFs and a total of 7 certified ones in Yangon Region. It was observed that some villages have more than one CF, so that a total of 51 villages have been managing their forests under the CF mechanism. Although intended to conduct the FGD per village, the survey team organized 46 FGDs, of 51 villages. The remaining 6 villages are left because of the different reasons; CF has been already converted to agriculture land, CFUGs have collapsed, CF has disappeared due to coastal erosion, severe climate conditions and security issues to visit there.

During the FGDs, the survey team discussed with representatives of CF members on the context of their CF covering historical timeline and basic CF information, equity, efficiency, sustainability and CF impacts through exploring five livelihood assets; financial, natural, human, social, and physical. In addition with CF members, the survey team tried to discuss with non-CF members to understand their perspectives for CF establishment. A set of performance indicators that were discussed with CF and non-CF members are described in Table 1, and the very detailed FGD questionnaires are attached in the Annex 1.

Table 1: A set of performance of indicators

Parameters	Indicators
A: Context of CF	1. Basic CF information 2. Historical timeline of CF
B: Equity	3. Level of participation space for community members in decision making 4. Level of participation space for women in decision making 5. Equitable sharing of benefits to women, poor headed HHs and non-CF members
C: Efficiency	6. Level of collaboration and participation within community 7. Leadership level on forest resources management 8. Performance of forest management activities 9. Management of disturbances/ threats 10. Transformation of resource use conflict 11. Collaboration with external agencies
D: Sustainability	12. Compliance with rules and regulations with regard to forest resources management 13. Legal support for forest resources management 14. Adaptive management on forest resources 15. Perspectives on changes of forest conditions
E: Impacts of CF on CF members	16. Financial 17. Social 18. Natural 19. Physical 20. Human
F: Perspectives of non-CF members on CF	21. Demarcation of CF area 22. CF membership status 23. Benefit sharing 24. Availability of forest products

For each indicator, the relevant questions were developed for having discussion with respondents and each indicator was also designed on a 10 point scale, where 1 represents the worst possible scenario and 10 is the best possible scenario, to judge by respondents themselves where they were and are before and after CF. For every given score, the respondents are encouraged to provide the justifications or reasons. The number of FGDs respondents in each township are provided in Table 2.

Table 2: Number of FGD respondents in each studied township

Township	No. of CFs (FGDs)	CF area (ha)	CF members		CF committee members		FGD respondents	
			Male	Female	Male	Female	Male	Female
Pyarpon	25	4,387	1,192	93	179	34	153	20
Labutta	11	1,341	419	12	59	0	64	2
Bogale	3	34	113	10	19	2	17	1
Kungyangon	7	314	881	211	35	4	30	15
Total	46	6,076	2,605	326	292	40	262	38

3.1.3 Household survey

The assessment covered the four different townships; Pyarpon, Labutta, Bogale and Kungyangon, so that four CFs or villages, one from each township, were selected for household survey with the criteria of the oldest CF within the township so as to see the visible impact and easily accessible to the site. The survey was conducted with a total of 132 households from four villages. The list of households was made available by the village leaders and CF chairperson, and 30% of total CF members were randomly selected, but at least 30 households were interviewed if the population (no. of CF members) is small. A total of 10 performance indicators of equity, efficiency and sustainability is applied to see the difference before and after CF. In addition, the socio-economic information is also discussed with respondents. The list of selected villages and number of respondents was provided in Table 3 and the detailed household survey questions are attached in Annex 2.

Table 3: List of selected villages for household survey

Village	CF established year	CF area (ha)	Total Households	CF Households	30% of total CF members	Selected sample size
War Kone	2001	101	90	56	17	30
Kwin Pauk	1995/ 2021	184	320	46	14	30
Shwe Pyi Thar	2012	20	117	105	32	32
Kan Hylar Shey	2015	37	468	132	40	40
Total		342	995	339	102	132

3.2 Data analysis

Quantitative data from the survey were analyzed with the statistical program R and Microsoft excel. Descriptive statistics were used and all diagrams were drawn with R and with Microsoft excel.

For statistical analysis to know whether the median perceived scores against different indicators are significantly different or not before and after CF, the Wilcoxon Signed Ranks Exact Test was used since the perceived scores are non-normalized.

4. Overview and context of studied CFs

In Ayeyarwaddy and Yangon Regions, there are a total of 73 certified mangrove CFs established by 56 villages from 1995 to 2001. Of 73 CFs, 14 CFs are not well functioned since CF user groups are collapsed and less interested in CF, some CFs and CF members were destroyed by the Cyclone Nargis so FD revoked the CF certificate, one CF was disappeared by river bank erosion, and some CFs were converted to agriculture land by receiving the Form – 7 issued by the Department of Agriculture Land Management and Statistics – DALMS. Hence, the Focus Group Discussion – FGD was conducted in 46 CFs and the household interview was carried out in 4 CFs. Site histories for individual CFs have been collected and documented.

4.1 Studied CF sites

All 73 certified mangrove CFs are located across the four townships; Pyarpon, Labutta, Bogale and Kungyangon. Pyarpon occupied a total of 44 mangrove CFs, followed by 19 CFs in Labutta, 7 CFs in Kungyangon and 3 in Bogale. A total of 3,677 households were empowered to manage a total of 8,774 mangrove forests through issuing a 30-year land lease CF certificate. The detailed information and locations of studied sites are described in Figure 1 and Table 4.

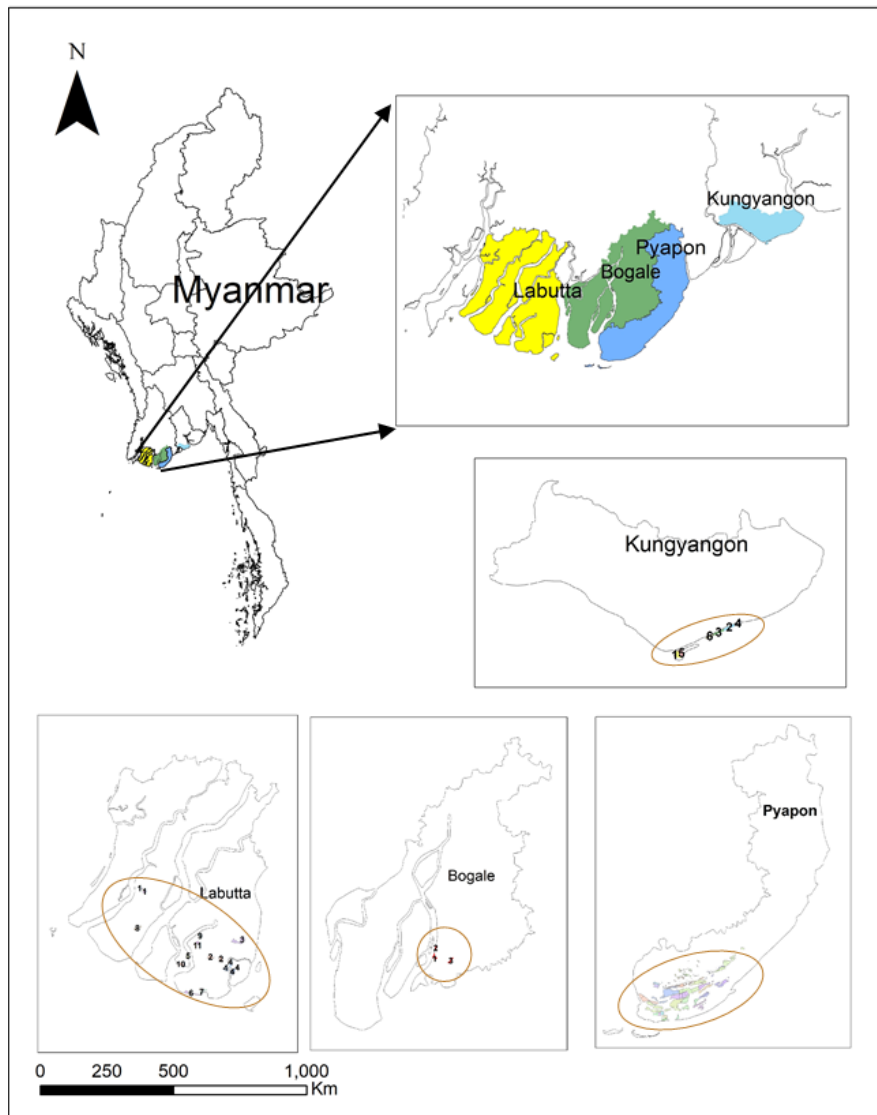


Figure 1: Location map of studied CFs in Townships

Table 4: Information of studied CF sites in Townships

Township	No. of CFs	CF area (ha)	CF members		CF committee members	
			Male	Female	Male	Female
Pyarpon	44	6,065	1,631	129	281	48
Labutta	19	2,361	618	95	95	6
Bogale	3	34	113	10	19	2
Kungyangon	7	314	881	211	35	4
Total	73	8,774	3,243	445	430	60

4.2 Trends of CF establishment in Ayeyarwaddy

The earliest CFs were established and received the CF certificate in 1995, right after the Community Forestry Instructions – CFI was issued by the Forest Department – FD. As per the trend of CF establishment shown in Figure 2, it was observed that there are three peaks in 2001, 2015 and 2017. Before 2001, the Forest Resources Environment Development and Conservation Association – FREDA initiated the mangrove forest restoration in collaboration with local communities, particularly in Pyarpon Township (formerly Bogale). In 2021, the FREDA coordinated with the FD for issuing the CF certificates for the villages where the mangrove reforestation was implemented.

In 2013, the FD set up one policy direction, suggested by the parliament, for the agricultural land encroached into the Reserve Forest – RF and Protected Public Forest – PPF. For encroached upland farms, the FD discussed with the local people to establish agro-forestry under the CF mechanism, but for lowland farms (paddy field), the FD wiped out those encroached lowland farms and transferred them to the DALMS. However, in Ayeyarwaddy Delta there are many lowland agriculture farms and shrimp ponds in the RF and PPF. In this case, the FD facilitated the local people to establish aqua-forestry through issuing the 30-year land lease certificate in 2015.

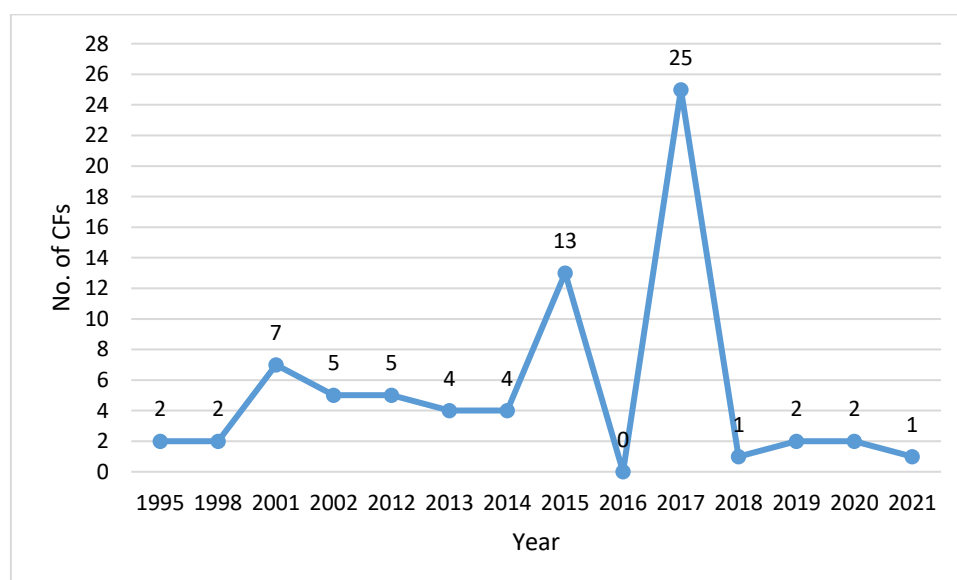


Figure 2: Numbers of studied CFs in year

From 2015 to 2018, the RECOFTC Myanmar implemented a project titled “Scaling Up Community Forestry – SUComFor Project ” across 7 Regions/ States including the Ayeyarwaddy Region. By this project, a total of 22 communities received the CF certificates in 2017 to manage a total of 4,159 ha mangrove forests in Pyarpon Township. In fact, the FREDA organization has been implementing the

mangrove reforestation activities in Pyarpon Township since 1999, so that it can be said that some CFs started the reforestation activities before receiving the CF certificate.

4.3 CF sizes

Of 73 CFs, the extent of smallest CF is about 6 ha established in 2018 and the largest one is 534 ha in 2017. With regard to size, it was observed that there are various sizes in Pyarpon and Labutta Townships, which might depend on the number of studied sites since the studied sites in Bogale and Kungyangon are less than 10. In Pyarpon and Labutta, most CFs fall into the range of 50-100 ha, whereas most CFs in Bogale and Kungyangon are less than 50 ha. It was also noticed that the pattern of size distribution in Pyarpon and Labutta is more or less the same.

In Pyarpon, 18 CFs are in the range of 50-100 ha, followed by 9 CFs with the range of 101-150 ha and over 200 ha. In Labutta, 8 CFs fall into the range of 50-100 ha, then followed by 4 CFs with less than 50 ha and over 200 ha. In Bogale, all three CFs are under 50 ha, while 4 CFs are less than 50 ha and 3 CFs in the range of 50-100 ha in Kungyangon.

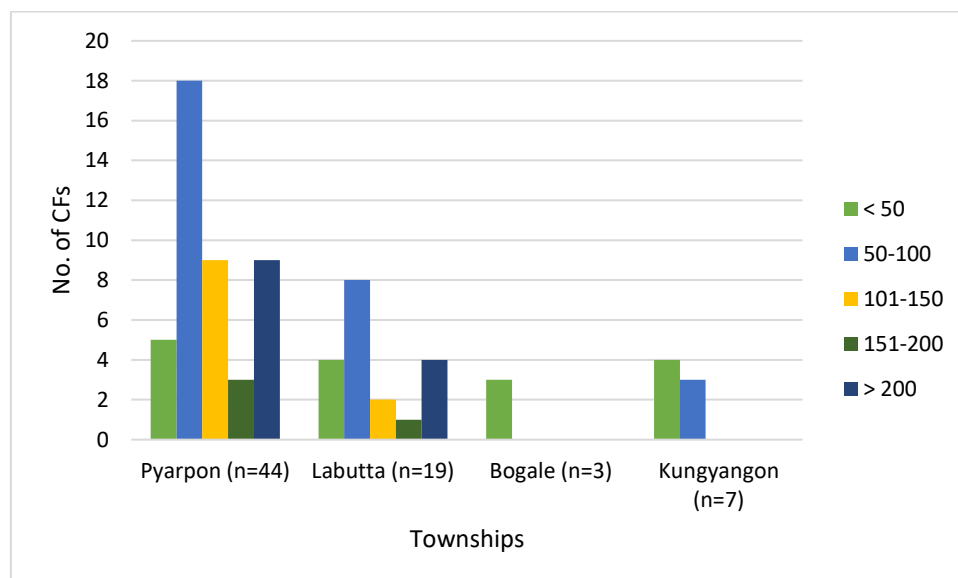


Figure 3: CF size distribution in Townships

4.4 CF management modalities

The concept of the CF is promoting good governance and meaningful participation in decision-making through working, contributing and benefiting together over forest resources management. So the CFI (1995) has more flavor on collective ownership and management through building capacity of local communities on transparency, accountability, rules of law and participatory decision making. On ground, however, there is a traditional ownership in the state-owned land under the management of the FD and DALMS. In the case of Ayeyarwaddy, local communities have customarily or traditionally owned some parts of land within the Reserve Forest – RF and Protected Public Forest – PPF for many years, and cultivated the paddy. Because of saline water intrusion and land degradation, the paddy fields had been abandoned and left as fallow land and subsequently, CFs were established.

Basically, there are three CF management modalities respecting the customary rights of local communities; 1) individual ownership with collective management, 2) collective ownership with collective management and 3) mixed of both. Individual ownership means the individual CF

members are allocated the plot based on their traditional ownership inside the whole CF area, while collective ownership means all CF members owned the whole CF area and it can be found of CF established in state-owned forests where there is no customary owned area. The last one is mixed type where partly owned by individual members and partly by all members. In Pyarpon and Labutta, about 80% of a total CFs are individual ownership with collective management, followed by mixed type and collective ownership. In Bogale, 67% of total CFs are collective ownership, followed by 33% of mixed type, while almost all CFs are collective ownership in Kungyangon Township of Yangon Region.

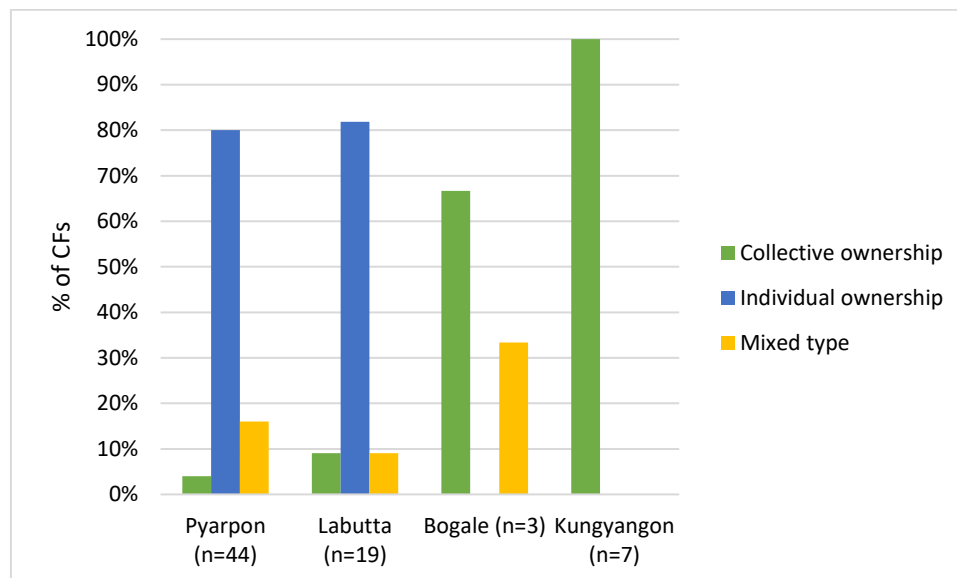


Figure 4: CF modalities in Townships

4.5 Status of CFs

As of 2021, over 7,000 CFs in the whole country have been awarded the CF certificates by the FD since 1995, but there is very limited research or study on how many CFs are well functioning and how many are not. In case of certified mangrove CFs of Pyarpon, Labutta, Bogale and Kungyangon Townships, average about 19% of studied CFs (16% in Pyarpon and 37% in Labutta as shown in Figure 5) are not active because of the following reasons;

- **Poor performance of CF groups:** Aqua-forestry CF – local communities conducted shrimp farming inside the Reserve Forest and the FD encouraged aqua-forestry through conserving mangrove forest. But, local communities did not follow the management plan agreed by the FD and focused more on shrimp farming rather than mangrove conservation. For this reason, the FD revoked the CF certificate and established the state-owned mangrove plantation.
- **Conversion to agriculture land:** Some CFs established in 1998 were converted to agriculture land both by CF members themselves and outsiders. Although the CFs were inside the Permanent Forest Estate – PFE (Reserve Forest and Protected Public Forest) which is under the administration of the FD, it was found that the encroached agriculture land was entitled the Form – 7 issued by the DALMS.
- **Coastal erosion:** One CF which was about 20 ha and close to the river was disappeared due to coastal erosion.

- Destroyed by natural disasters:** Some CFs established in Labutta by 2002 were destroyed by the Cyclone Nargis in 2008 and some CF key members were passed away during the Nargis. Due to the lack of CF management practices, most CF areas were converted to agricultural land. Hence the FD revoked the CF certificates in 2009.

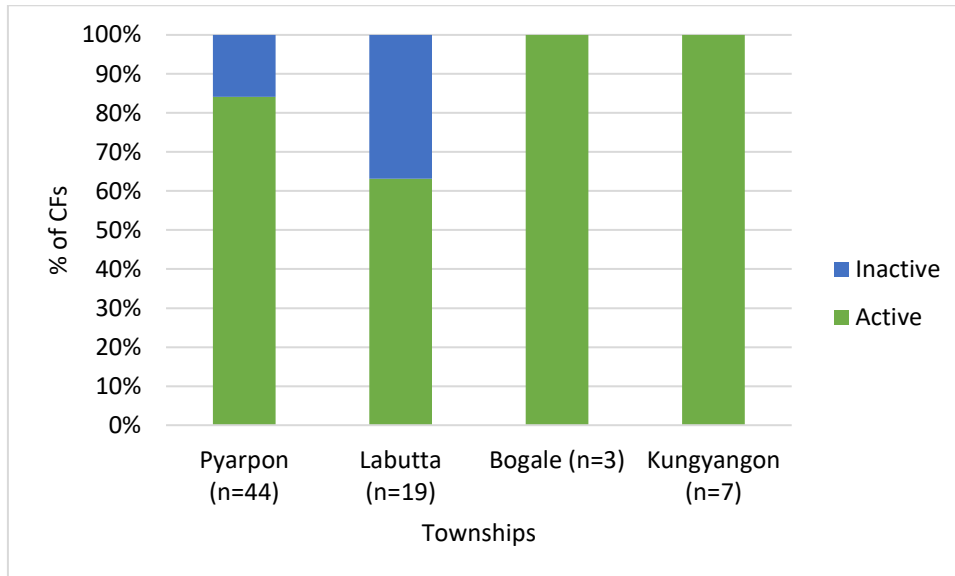


Figure 5: Proportion of active and inactive CFs

4.6 Women representation in CFUG and CFMC

Across the country of Myanmar, whenever asking the household heads for any registration such as household registration, Form (7), CF certificate, the men’s names are given and appeared in the certificate, except for the widow households and the households in which man went to outside for jobs.

Overall, 34% of studied CFs have no women headed households and the remaining 66% have women representation in CF user group. Among four villages, all CFs of Kungyangon Township have women representation (Figure 6), since some CFs in this township have received gender awareness programs from development organizations such as Landesa Myanmar.

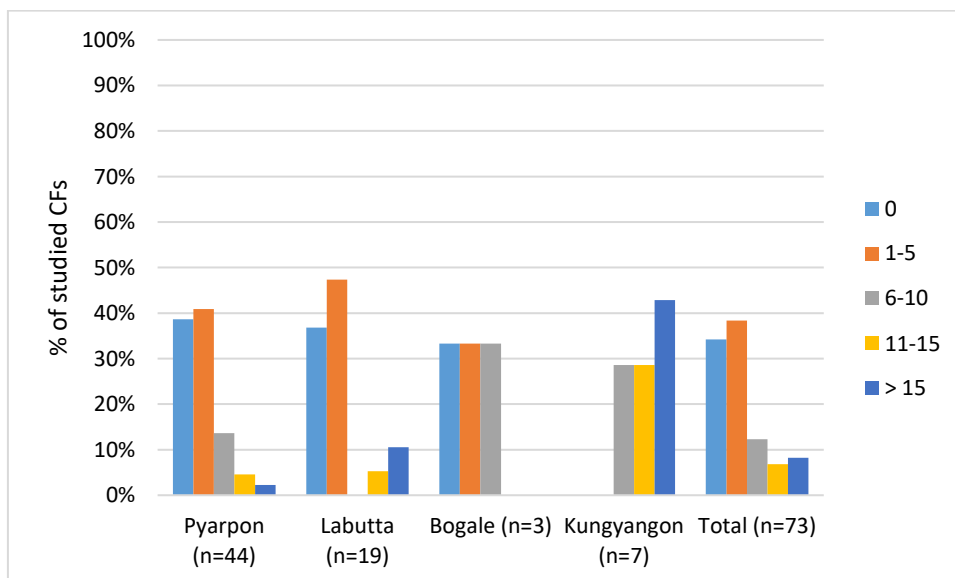


Figure 6: Women representation in CF user groups of studied CFs

Basically CF management committee - CFMC is formed by at least 5 members as instructed by the national CFI (2019), but it was found that the number of CFMC members ranging from 5 to 15 in the studied CFs. Looking at women representation in CFMC, 60% of CFMCs in all studied CFs do not include women representatives, and the remaining 40% have women representation. The detailed findings are described in Figure 7.

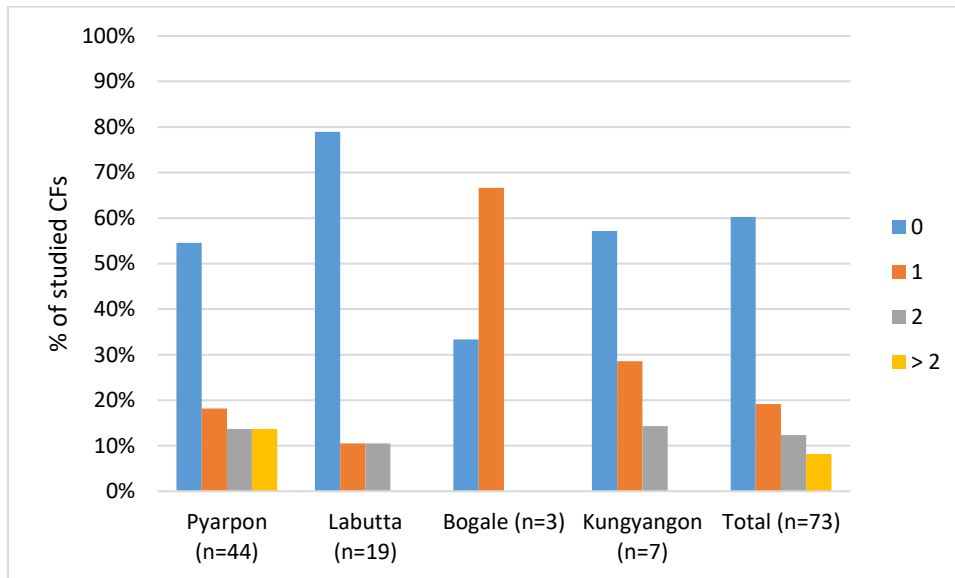


Figure 7: Women representation in CF management committee of studied CFs

Community Forestry Instruction – CFI (1995) was reviewed and revised in 2016, but publicly issued in 2019 after the revised Forest Law (2018). Before 2016, there were a total of 42 certified mangrove CFs in Ayeyarwaddy and Yangon Regions, of which about 80% of CFs did not give space for women representatives in the formation of CFMC. After 2016, 65% of 31 certified mangrove CFs were formed the CFMC with women representatives (Figure 8). Hence, it was observed that there was visible impact of revised CFI, and legal transformation and effective implementation of legal instruments are also important for CF development.

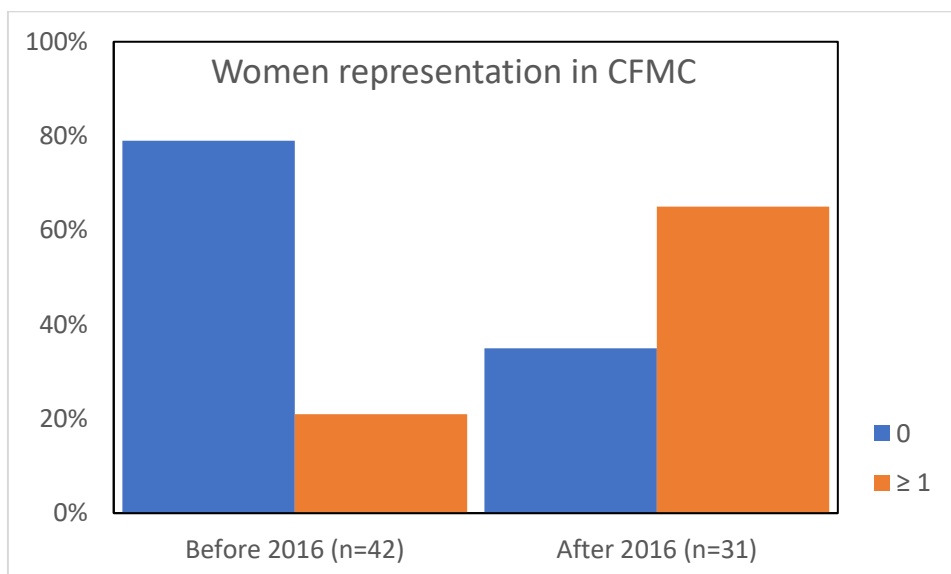


Figure 8: Impact of revised CFI (2016-2019) on women representation of CFMC

5. Socio-economic conditions of respondents

5.1 Characteristics of respondents

The household survey was conducted with 132 respondents from four CFs (in 4 villages) with the proportion of 40% from Kan Hylar Shey, 24% from Shwe Pyi Thar and 23% each from War Kone and Kwin Pauk respectively. Of total respondents, 51% are male respondents and 49% are female. 64 % of total respondents are at the age range of 40-60 years, followed by 23% who are under 40 years and 14% of over 60 years.

With regard to the household size, it was found that the majority of respondents (68%) have 4-6 family members, while 17% of respondents occupied over 6 family members and 15% with less than 4 family members. In terms of education status, only 5% of respondents are illiterate, and the remaining were able to access their education up to primary and secondary level. Most villages in Ayeyarwaddy have primary schools in their villages, but the secondary schools are mostly located at the village tract level. Hence, children from villages are hard to access the secondary schools, particularly in the raining season while high schools are far away for most villages.

In terms of primary income sources, it was observed that there are eight different income sources; CF products, agriculture farming, livestock, fishery, home garden, casual labor, small business and remittance. It was not surprising that about 44% of respondents are earning their main income from collecting fishery products, followed by casual labor with 14%. It was found that only 7% of respondents have the main incomes from selling CF products. The detailed information is mentioned in Table 5.

Table 5: Characteristics of respondents

Descriptors	Attributes	Frequency	Percentage
Location	War Kone	30	23
	Kwin Pauk	30	23
	Shwe Pyi Thar	32	24
	Kan Hyar Shey	40	40
Gender	Male	67	51
	Female	65	49
Age	< 40 years	30	23
	40 – 60 years	84	64
	> 60 years	18	14
Household size	< 4	20	15
	4 – 6	90	68
	> 6	22	17
Education	Illiterate	7	5
	Able to read	41	31
	Primary	52	39
	Secondary	29	22
	College/ University	3	2
Primary occupation	CF	9	7
	Farming	15	11
	Livestock	1	1
	Fishery	58	44

Home garden	2	2
Casual labor	18	14
Small business	14	11
Remittance	15	11

5.2 Economic conditions and coping strategies

Individual respondents were asked their total incomes against different income sources, and expenditures for health, education, food consumption, clothing, entertainment, transportation and communication, house repair and purchasing for productive assets for the last 12 months. When comparing the total income with the total expenditure, it was found that there are three groups; surplus (income is higher than expenditure), balance (income and expenditure are same) and deficit (income is lower than expenditure).

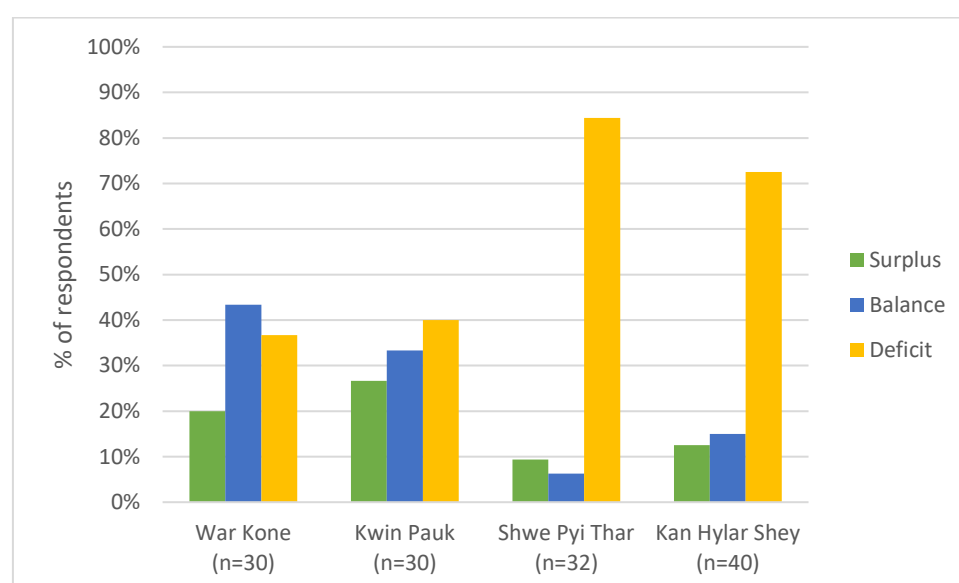


Figure 9: Economic conditions of respondents

As per the information received from respondents in Figure 9, over 70% of respondents from Shwe Pyi Thar (Bogale) and Kan Hylar Shey (Kungyangon) are in the deficit condition, while about 40% of respondents from War Kone (Pyarpon) and Kwin Pauk (Labutta) are facing economic deficit situation. Among the four villages, it was noticed that the War Kone and Kwin Pauk which occupied over 20 years old CFs are better than others in economic conditions.

It was found that a total of 76 households (about 57% of 132 total respondents) are facing economic issues as depicted in Figure 10. When observing the coping ways over the deficit economic conditions, the respondents are practicing three main different ways; selling their household assets such as livestock and gold, collecting CF products (both forestry and fishery products) for selling to outsiders or local traders, and borrowing money from the micro-credits within the village. Overall, 11% of deficit households tried to address their financial issues by selling CF products, 67% by borrowing money from micro credits and 22% by selling household assets.

In War Kon village, 36% of deficit households have been trying to address their economic issues by selling CF products, while 17% and 10% of deficit households in Kwin Pauk and Kan Hylar Shey are addressing their financial crisis by selling CF products. It was found that no respondents from Shwe

Pyi Thar village considered CF as one of coping strategies over the financial crisis, since their CF (20 ha for 105 CF households) established in 2012 is too small to use for economic purposes rather than subsistence use.

Most villages received loans and grants for revolving funds or community-based credit schemes from the development organizations and government departments. It was noticed that there are a couple of micro-credits in one village, so that the local communities can easily access to micro-credits whenever they need money or face financial crisis. It was also observed that there are advantages and disadvantages of being accessible to micro-credits within their communities. The advantage is that local communities can easily borrow money for their initial investment with low interest rate, but some community members could not use the borrowed money in a proper way not lose the capital. Instead of investing in their agriculture or fishery or any productive works, some members used the borrowed money for purchasing foods, clothes and other household consumptions, so they are in debt. It was found that the revolving fund or community-based credit schemes are getting bigger and bigger, but the productivity of individual community members has not increased and they are in the debt vicious circle (borrow from micro-credit A, then pay to B and borrow from B, then pay back to A).

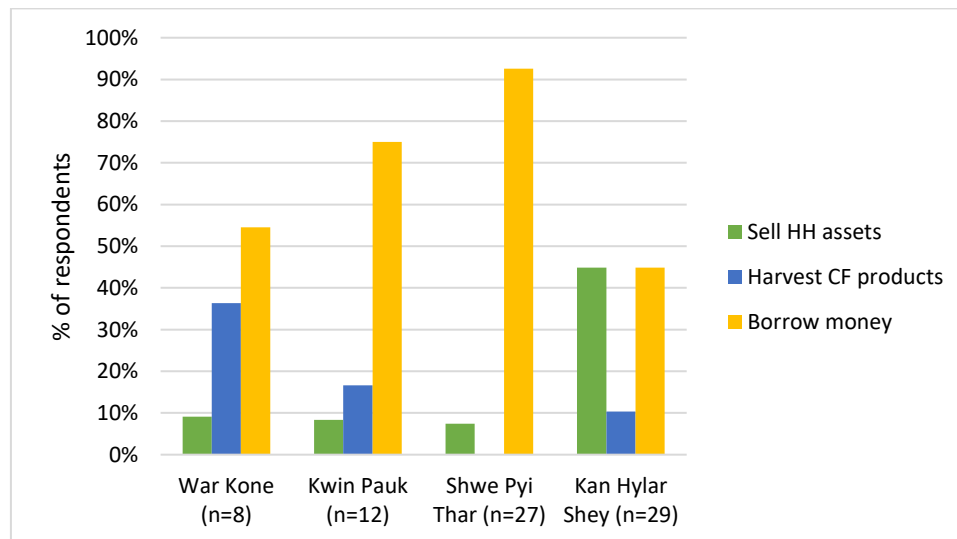


Figure 10: Coping strategies over economic issues

5.3 Participation of respondents

Three key indicators; participation in the village group, in village meetings and in network and their roles in the collective activities are applied to evaluate the social cohesion of CF villages. Most villages in Ayeyarwaddy have different development groups such as micro-credit groups, youth and women groups, religious groups, CF groups, etc. When discussing communities' participation to village groups, village meeting and networks with 132 respondents, about 90 % of respondents involved in the different village groups, whereas about 75% of respondents attended the village meetings and 45% of respondents joined the network groups which are formed by other adjacent villages. It can be assumed that the social cohesion of local communities is relatively good and the existence of CF might, to some extent, affect their social asset because they received the capacity building training along the way of CF establishment. The detailed findings are depicted in Figure 11.

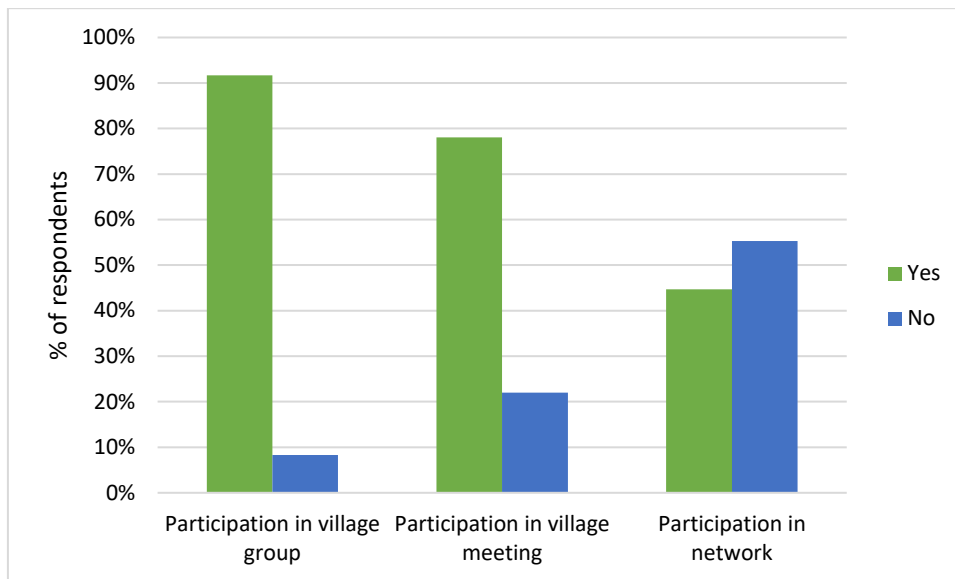


Figure 11: Participation of respondents in village group, meeting and networks

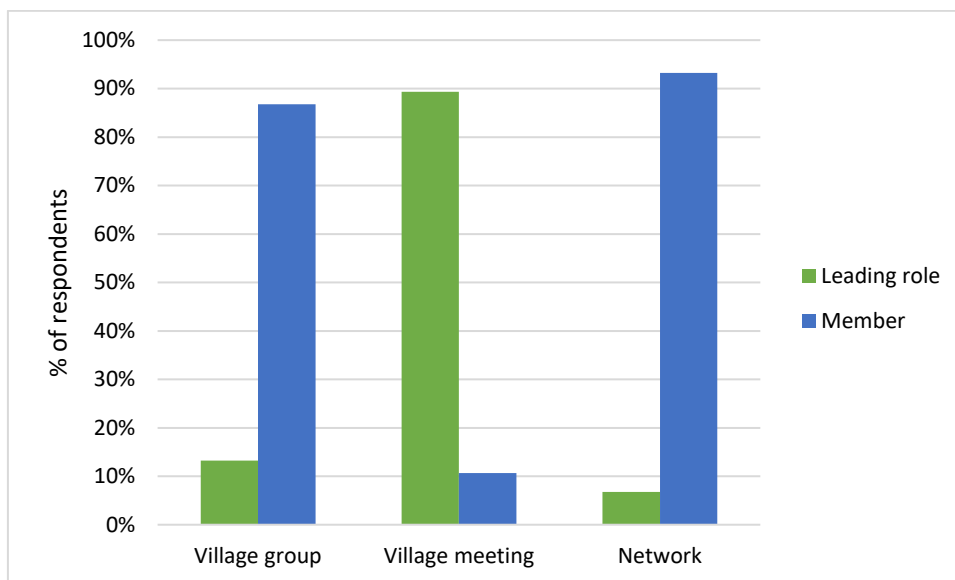


Figure 12: Participation roles in village group, meeting and networks

Looking at the participation role of respondents, the majority of respondents are participating as members in village groups and network meetings, but over 70% of respondents reported that they are leading in organizing, discussing and decision making of the village meetings. It was observed that only one township (Pyarpon) formed the CF network composed of 22 CF user groups with the technical assistance of RECOFTC Myanmar in 2017. The network is responsible to oversee the CF development fund of each CF, facilitate between CF user groups and the FD for annual reporting and taking harvesting permission, and provide assistance in preventing illegal harvesting. The network basically organizes quarterly meetings for sharing and learning on CF development activities, challenges and opportunities among network members. It was found that the CF network of Pyarpon Township is effectively contributing to the development of CFs, so that they should have the CF network in other townships.

5.4 Physical asset owned by respondents

In all four studied villages, the communities are mostly relying on the fuelwood and charcoal for cooking and for lighting; the majority of respondents can access the solar panel and battery. The respondents reported that they usually collect the fuelwood mostly from their home garden and partly from the CF for CF members and from the state-owned forests for non-CF members. Over 70% of respondents have no access to the national electric grids and about 25% of respondents from Kungyangon Township of Yangon Region can access the electricity.

In terms of transportation, it was found that the communities used both water and land lines to reach the nearest towns in every season. Ten years ago, traveling by boat to the city was the only way in the rainy season and roads could be used in the dry season. Motor bike is an important asset for traveling and transporting their products to towns.

Regarding communication and information sharing, about 90% of respondents are accessible to the mobile networks, but the mobile connection is still challenging during the rainy season because of storm wind and heavy rain. It was observed that the accessibility of mobile networks is highly beneficial to CF members in informing illegal cutting, taking technical inputs from government departments and development organizations, and receiving the market information for forestry and fishery products. The detail respondents' answers are provided in Figure 13.

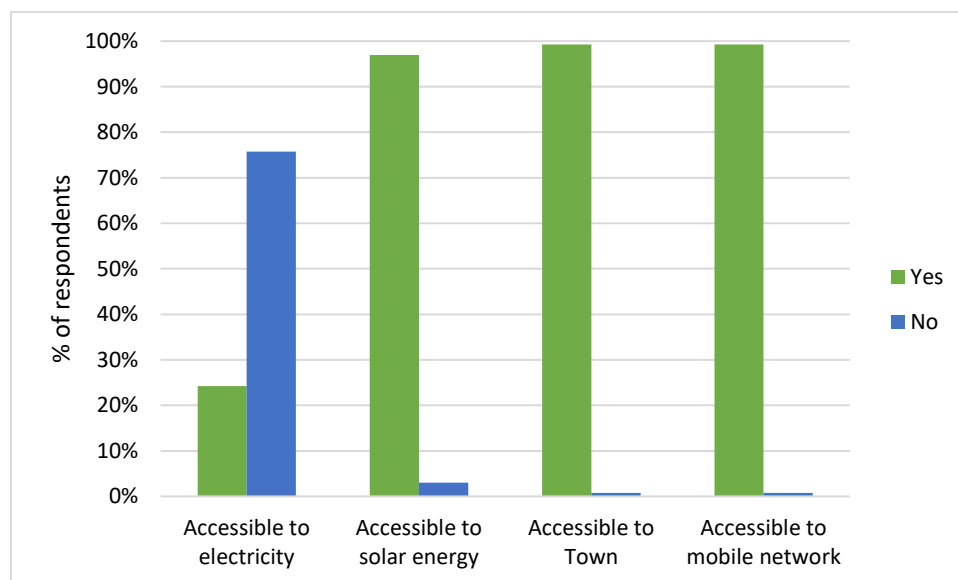


Figure 13: Percentage of accessibility to electricity, solar energy, town and mobile networks

In order to support the livelihood of local people, six different physical assets; cattle, motorbike, mobile, ploughing machine, generator and fishing gear are discussed with household respondents. As their livelihoods are mainly relying on the fishery rather than agricultural farming, nearly 60 % of respondents have fishing gears, while nearly 90% of respondents do not own cattle. It was observed that some community members cultivate sea sesame in their home garden which is close to the mangrove forests, but they rarely use cattle for land preparation. A few respondents who owned the agricultural land (low land for paddy) also used ploughing machines, instead of cattle. Figure 14 showed that about 10% of respondents have a ploughing machine and generator for agricultural farming.

For transportation and communication, a motorbike is a very important asset, but about 30% of respondents reported that they have motorbikes, while nearly 90% of respondents are using mobile networks. What physical assets owned by the community depends on what their main livelihoods

are. It can be assumed that providing fishing gears and electricity for cooking to communities could reduce the deforestation of mangrove forests and enhance the livelihoods of local people.

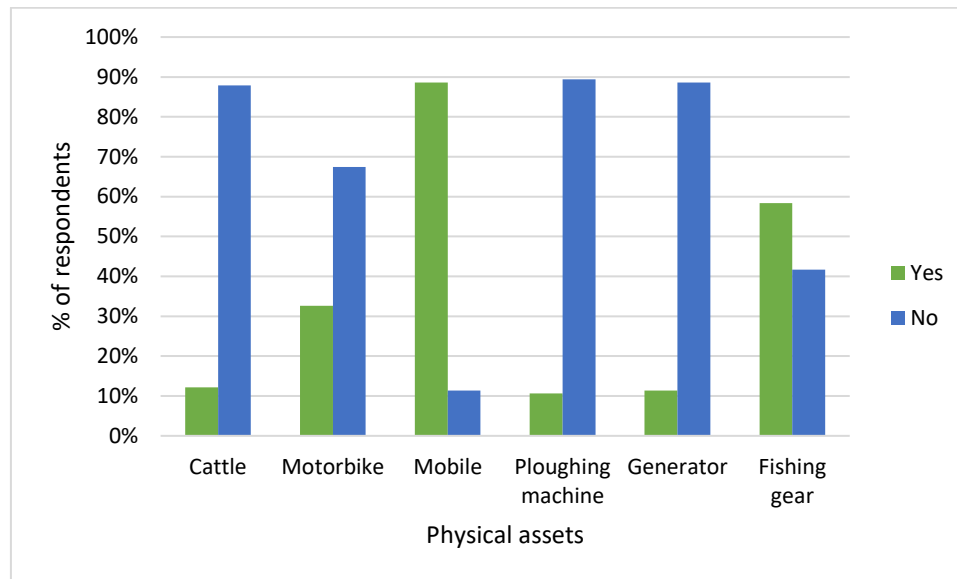


Figure 14: Physical assets owned by respondents

6. Effectiveness of community forests – CFs

6.1 Perceptions of CF outcomes

The survey team interviewed 132 respondents from four villages and asked them to give the score with reasons or justifications against the performance indicators. As per median perceived indicator score and statistical results analyzed by using a Wilcoxon exact match-pair signed rank test, it was found that there are significant differences in equity performance indicators; level of participation space for community and women in decision making, before and after CF (Table 6). In the preparatory stages before receiving a CF certificate, the CF members basically received training regarding forest governance, institutional strengthening and CF concepts, so that the CF committee members know how to seek views from all CF members in making any decision regarding to the CF related cases.

The median perceived scores for two equity performance indicators are 1 before CF and 4-5 after CF out of 10 point scales. This suggests that there are spaces to be improved to reach the highest point (10 which is the best level of performance).

All five efficiency performance indicators significantly improved after CF establishment, namely level of collaboration within community, leadership level on forest resources management, performance level of forest resources management, managing encountered disturbances and threats, and transforming forest use conflicts (Table 6). The median perceived indicator scores are around 4 and 5 after CF, so that it indicates that efficiency performance of community members still needs to be improved for better CF management. Among four villages, respondents from one village named Kan Hylar Shey which received the CF certificate in 2015 perceived that there were no changes in managing disturbances and threats, and slightly improved in transforming forest use conflicts. Some respondents from this village reported that they did not receive any training regarding conflict transformation.

Three sustainability performance indicators; namely compliance rules and regulations, legal support from the FD for forest resources management, and perspectives on changes of forest conditions, are

also significantly improved, but legal support and changes of forest conditions had median values of 4 and 5 which are still far to reach the best position. It was found that local communities highly complied with rules and regulation set by themselves since the performance indicator of rules and regulations compliance had the median values of 7 after CF. The legal support from the FD is not reached to the satisfactory level, hence most CFs are facing illegal cutting that is not possible to address by CF members without external support.

Overall, there are statistically significant differences in all performance indicators of equity, efficiency and sustainability, but the median values are less than or equal to 5 – meaning that there are rooms to be improved so as to see the effectiveness of CF.

Table 6: Median perceived indicator scores compared before and after CF establishment (n=132). The P value refers to the significance of a Wilcoxon exact matched-pair signed rank test.

Performance indicators	War Kone (n=30)		Kwin Pauk (n=30)		Shwe Pyi Thar (n=32)		Kan Hylar Shey (n=40)		Total		P value
	B	A	B	A	B	A	B	A	B	A	
Level of participation space for community in decision making	1	5	1	5	1	5	1	3	1	5	< 0.0001
Level of participation space for women in decision making	1	6	1	5	1	5	1	3	1	4	< 0.0001
Level of collaboration within community	1	5	1	5	1	5	1	4	1	5	< 0.0001
Leadership level on forest resources management	1	5	1	6	1	5	1	5	1	5	< 0.0001
Performance on forest resources management	1	5.5	1	5	1	6	1	3	1	4	< 0.0001
Management on disturbances/ threats	1	5	1	4	1	4	1	1	1	4	< 0.0001
Transformation on resources use conflict	1	4	1	4	1	4	1	2	1	4	< 0.0001
Compliance with rules and regulations	1	7	1	6	1	7	1	7	1	7	< 0.0001
Legal support for forest resources management	1	4	1	4	1	4	1	3	1	4	< 0.0001
Perspectives on changes of forest conditions	1	5.5	2	5	1	4	1	6	1	5	< 0.0001

6.2 Enhancement of communities' knowledge and skills

All studied villages basically received the four different training programs; CF concepts (covering facilitation, participation, about CFI, and process how to apply CF), forest management (techniques how to establish nursery and plantation, assistance natural regeneration activities, and basic silvicultural treatment), agroforestry (including aqua-forestry which is more friendly with mangrove

forests), and leadership skills (which is a part of institutional strengthening training). In addition to these training programs, some CF members from Pyarpon Township got a chance to build their capacity in conflict transformation, natural disaster risk reduction, and efficient cook stove making provided by MSN (Mangrove Service Network), FREDA, Metta Development Foundation and RECOFTC.

As per the results discussed with respondents on usefulness level of received training (1 – very low usefulness, 2 – low usefulness, 3 – medium usefulness, 4 – high usefulness, and 5 – very high usefulness), all respondents reported that all training programs were not considered as very high usefulness since they need more training to be practiced effectively and some CF members have not received yet capacity building training. It was also observed that most training programs were organized at the village tract and township level rather than village level. This suggests that the training program should give opportunities to all CF members if they would like to learn.

All four studied villages perceived that the knowledge and skills obtained from CF concepts and agroforestry training were somewhat useful and being practiced in their CFs. In terms of agroforestry, most CFs of Pyarpon Township including War Kone are implementing aqua-forestry through building fencing for crab fattening inside mangrove forests, while there is less opportunity to practice agroforestry systems in the CF of Shwe Pyi Thar as the CF area (20 ha) is small for 105 CF members.

Regarding the forest management training, respondents from three villages; Kwin Pauk, Shwe Pyi Thar and War Kone, reported that they could apply, to some extent, the knowledge and skills what they learned, while respondents from Kan Hylar Shey could not apply the knowledge and skills because they just naturally conserve mangrove forests through preventing illegal cutting.

The knowledge and skills gained from the leadership training were useful for CF management committee members who are responsible to lead CF members in implementing CF management plans in Kwin Pauk, Shwe Pyi Thar and Kan Hylar Shey, but somewhat useful for War Kone village. The main reasons why all provided training were not high and very high useful are that one time training for communities is not enough to exercise on the ground, and the training coverage is not more than five community members. Hence, it would be suggested that the training delivery approach should be at Township level first where 2 or 3 village representatives are invited, then dive into the village level where most interested CF members can be trained.

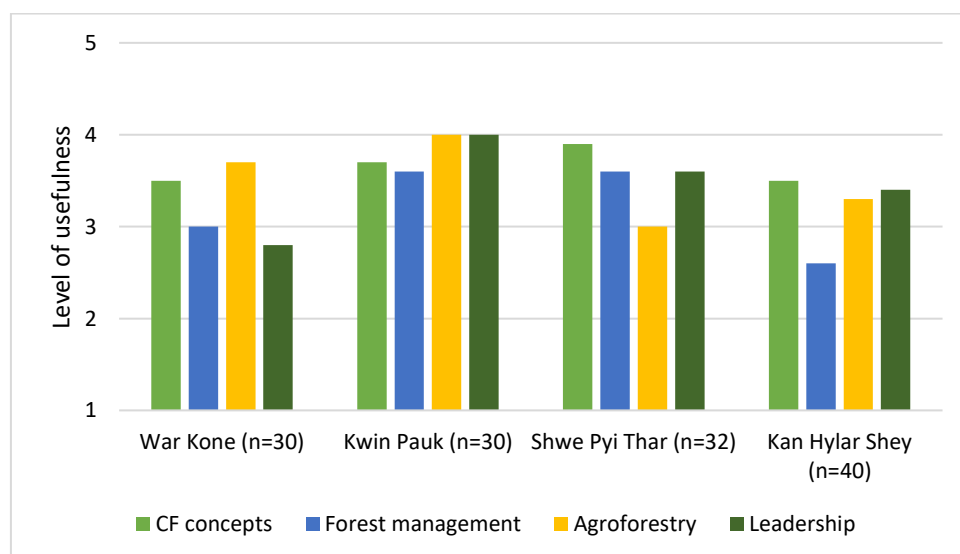


Figure 15: Received training and their usefulness for communities

When looking at the differences before and after CF establishment, there were statistically significant differences in knowledge and skill performance indicators (Table 7). Understanding on CF concepts, agroforestry and forest management had the perceived median value of 1 before CF and 5/6 after CF. Hence local communities' understanding on those performance indicators are quite improved, but it was observed that the median values are not close to the best step (10). In the case of leadership skills, the median values were 2 before CF and 4 after CF. It would mean that the local communities knew how to lead the group in development activities, but the provided leadership training could not make them much improvement.

Overall, the local communities need a capacity building program to effectively manage their CF and well organize CF groups without social and resource use conflicts, though there were significant differences before and after CF.

Table 7: Median perceived indicator scores compared before and after CF establishment (n=132) (The P value refers to the significance of a Wilcoxon exact matched-pair signed rank test)

Performance indicators	War Kone (n=30)		Kwin Pauk (n=30)		Shwe Pyi Thar (n=32)		Kan Hylar Shey (n=40)		Total		P value
	B	A	B	A	B	A	B	A	B	A	
Understanding on CF concepts	1	6	1	4	1	4	1	4.5	1	5	< 0.0001
Leadership skills	1.5	5	2	4	2	4	2	4	2	4	< 0.0001
Understanding on agroforestry	1	7	1	6	1	7	1	3	1	6	< 0.0001
Understanding on forest management	1	7	1	6	1	7	1	2	1	6	< 0.0001

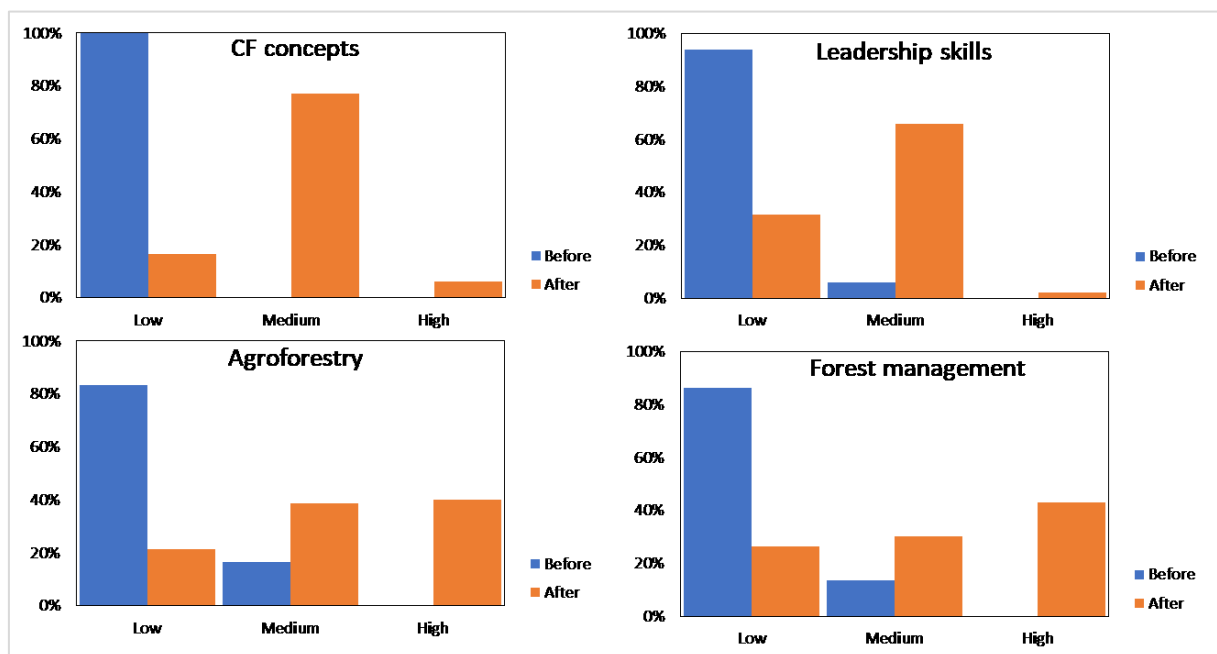


Figure 16: Level of understanding on different capacity building program

Figure 16 also showed that less than 5% of respondents perceived that their understanding on CF concepts and leadership skills are high after CF, while about 40% of respondents reported that their understanding level on agroforestry and forest management are high. Majority of respondents

whose understanding levels are low and medium still need to improve their knowledge and skills regarding CF related topics. Hence, the capacity building programs are indeed necessary for CF members to be able to manage their mangrove forests in a sustainable manner.

6.3 Availability of forestry and fishery products

A total of eight performance indicators covering five for forestry products and three for fishery products were identified to assess the availability of forestry and fishery products compared before and after CF establishment. As per discussed with 132 respondents from four villages, there were statistically significant differences in all performance indicators of forestry products (Table 8). However it was observed that the median values of perceived performance indicators were less than or equal to 3 out of 10 point scales after CF. The results indicated that the mangrove forest conditions were, to some extent, improved after CF, but the availability for commercialization would be still low, particularly of poles/ posts and timber. This suggests that CF members need to take the time to get benefits from CFs and need to conserve their mangrove forests without further deforestation and forest degradation.

For the timber, majority of respondents reported that they have to take time, at least 10 years, to harvest from their CFs, but fire wood, Nipa which is one of important natural asset used for roofing and walling for poor communities, and seeds/ propagules, which can be sold to the private plantation companies and the FD, are available mostly for household use and partially for commercialization.

With regard to the availability of fishery products, the Wilcoxon exact matched-pair signed rank test indicated that there were no significant differences in all three performance indicators; availability of fish, shrimps and crabs (Table 8) compared before and after CF. It was surprising that the availability of fishery products decreased after CF, particularly of shrimps and crabs, though the mangrove forest conditions are getting better off. The key reasons reported by the respondents are that there are many households who collect fishery products, market opportunities are there (local traders basically come to buy fishery products in the village), and the persons who received permission from the Fishery Department have authority to manage the streams/ creeks across the CF area. Considering the concepts of the more mangrove forests the more fish, the fishery products may be increased after CF, but their availability is relatively low due to the fact of over exploitation caused by many collectors.

Table 8: Median perceived indicator scores compared before and after CF establishment (n=132) (The P value refers to the significance of a Wilcoxon exact matched-pair signed rank test)

Performance indicators	War Kone (n=30)		Kwin Pauk (n=30)		Shwe Pyi Thar (n=32)		Kan Hylar Shey (n=40)		Total	P value	
	B	A	B	A	B	A	B	A	B	A	
Availability of fuelwood	2	4	2.5	3	2	3	1	3	2	3	< 0.0001
Availability of Nipa	2	4	3	3	2	2	2	3	2	3	< 0.0001
Availability of poles/ posts	2	4	2	3	3	1	1	2	1	2	< 0.0001
Availability of seeds/ propagules	2	4	2	3	3	2	1	2	1.5	3	< 0.0001
Availability of timber	1	2	2	2	2	1	1	1	1	1	< 0.0001
Availability of fish	3	2	3	3	2	2	2	3	3	3	> 0.05

Availability of shrimps	3	2	3	3	2	2	2	3	3	2	> 0.05
Availability of crabs	3	2	3	3	2	2	2	3	3	2.5	> 0.05

Figure 17 depicts the availability of forestry and fishery products against different levels; low, medium and high before and after CF based on the perceived indicator scores given by 132 respondents. It was found that no respondents reported that the availability of forestry and fishery products are highly abundant after CF. About 20% of respondents perceived that the availability of four forestry products; fuelwood, Nipa, poles/ posts and seeds are fairly good, although not reached to the level of highly abundant. On the contrary, the availability of timber, fish, shrimp and crab are not significantly changed before and after CF. The reasons or justifications are provided above.

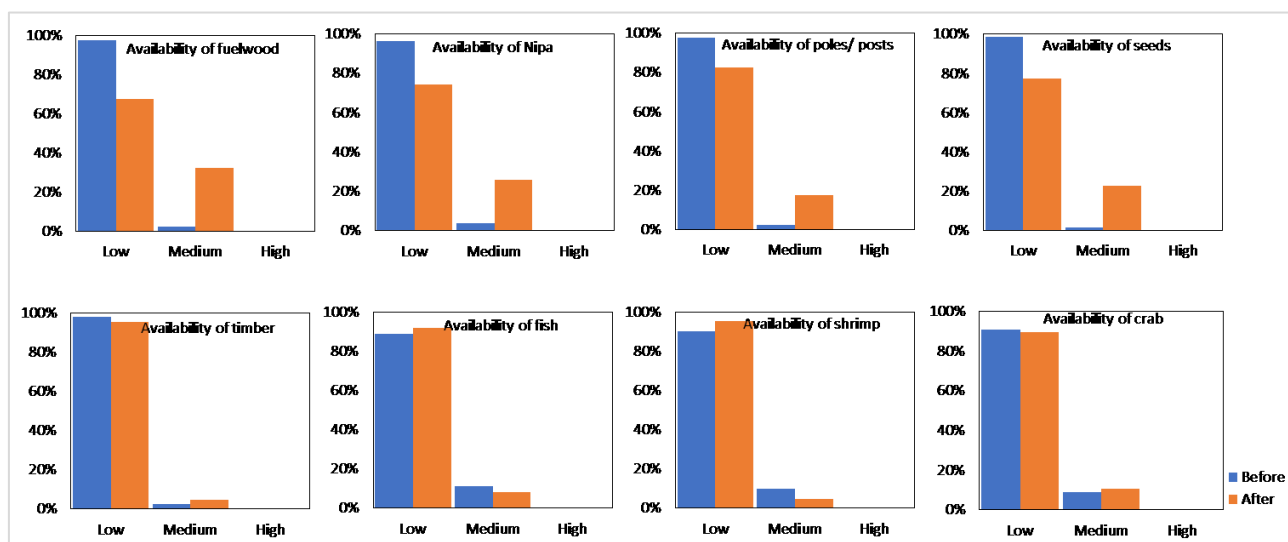


Figure 17: Availability of forestry and fishery products

6.4 Contribution of CF into household income

As per interview with 132 respondents, there are basically eight different types of occupations across the four studied villages. They are collecting CF products, cultivating agricultural farm (particularly for paddy cultivation), livestock raising (mostly poultry and pig), fishery (mostly from the offshore and partially from onshore or mangrove forests), home garden, casual labor for road construction, infrastructure, harvesting paddy fields, and state-owned and private-owned plantation establishment, small business (mostly grocery shop and fishing gears shop), and remittance.

Overall, fishing occupation is being practiced by 44% of respondents as primary and 16% as secondary, while casual labor is considered by 27% of respondents as primary and 14% as secondary (Figure 18). Hence, those two occupations are said to be important occupations for the livelihood of local communities. However, casual labor is not a stable occupation, hard to get regular income and depends on ad-hoc jobs created by community members and outsiders. Basically the activities created locally are road construction, infrastructure, harvesting paddy, state-owned and private-owned plantations establishment.

Other primary occupations are agricultural farming (11%), remittance (11%), small business (11%), CF product collection (7%), home garden (1%) and livestock raising (1%). Other secondary occupations are CF products (16%), home garden (13%), remittance (12%), livestock raising (8%), small business (4%) and agricultural farming (3%) (Figure 18).

Among secondary occupations, the CF products collection is standing at second position together with fishing occupation. Mangrove CF is, to some extent, supporting the availability of fishery which is mainly relied on by local communities as primary occupation. Some respondents reported that the mangrove CF will be considered as primary and secondary if the forest conditions are enough to harvest for commercialization.

This assessment of primary and secondary occupations suggests that providing fishing gears, creating job opportunities such as landscape restoration activities by private companies and government departments and building the capacity to culture crabs with mangrove forests are indeed necessary for livelihood development of local communities and CF improvement.

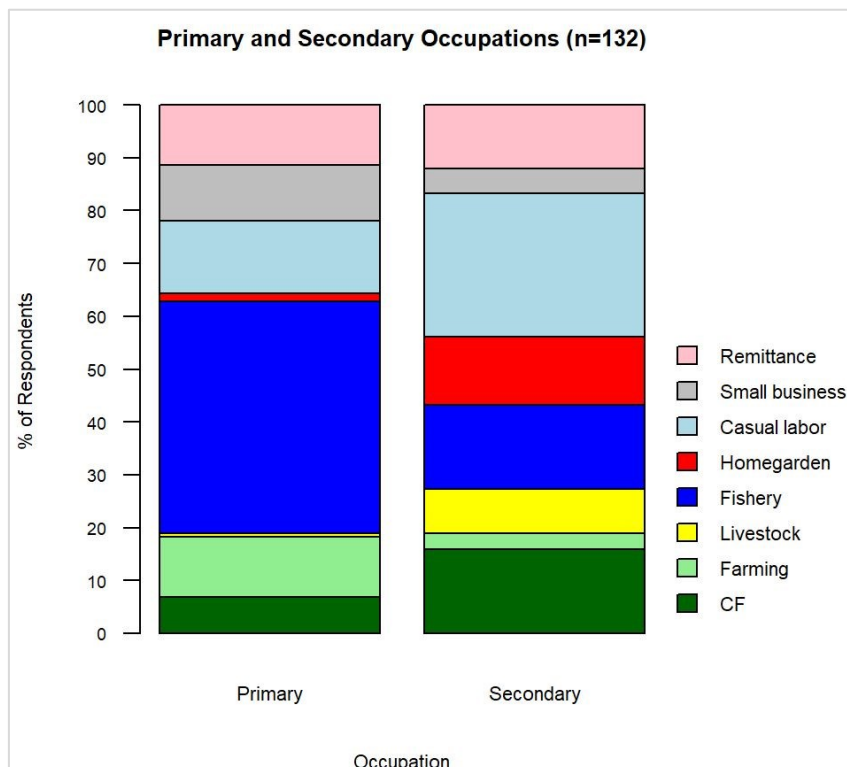


Figure 18: Primary and secondary occupation

Aggregated household income (n=132 * 100%) is from fishery (30%), remittance (15%), agricultural farming (14%), small business (14%), casual labor (12%), CF products (8%), home garden (3%) and livestock raising (3%). The CF income is substantial for 39 households covering 8 households from Kwin Pauk village, 9 households from Kungyangon village, and 22 households from War Kone village. A total of 39 CF dependent households covers poor households (49%), medium income households (28%) and rich households (23%). For those, 30% of total income is from CF products, followed by fishery (29%), casual labor (13%), remittance (12%), home garden (5%), small business (5%), livestock (3%) and agriculture farming (2%).

The biggest remarkable differences are between War Kone and other three villages with regard to CF income. It was found that the War Kone village is regarded as a success story of CF in the Ayeyarwaddy Region, since almost half of the community's income is derived from the CF products (Figure 19). Unlikely, other three villages are mainly relying on fishery as their main income source. It was not surprising that there is no CF income in Shwe Pyi Thar which has 20 ha of CF area received CF certificate in 2015 and established along the river bank with the aim of preventing river bank

erosion, and strong wind. In addition to the fishery, farming is also the main income source for Shwe Pyi Thar.

Income contributions from livestock and home gardens are low since most communities rarely consider the livestock as their income source, instead they see for household consumption. Having a home garden depends on the location of the village and extent of the house compound. Most home gardens are mostly planted with coconut and the coconut price is not stable.

It was observed that most youths went to the cities and abroad for jobs, so that about 20% of total income is coming from remittance in War Kone, Kwin Pauk and Kan Hylar Shey. Out-migration may affect the CF activities for the long term since new generations may not be interested in mangrove forests conservation in future. The opportunity costs of CF implementation for youths may be high if they can easily find jobs in cities and if CF benefits are not visible for them. This suggests that the capacity building program and awareness raising should be considered for youths including women for long term mangrove CF development in Ayeyarwaddy Delta.

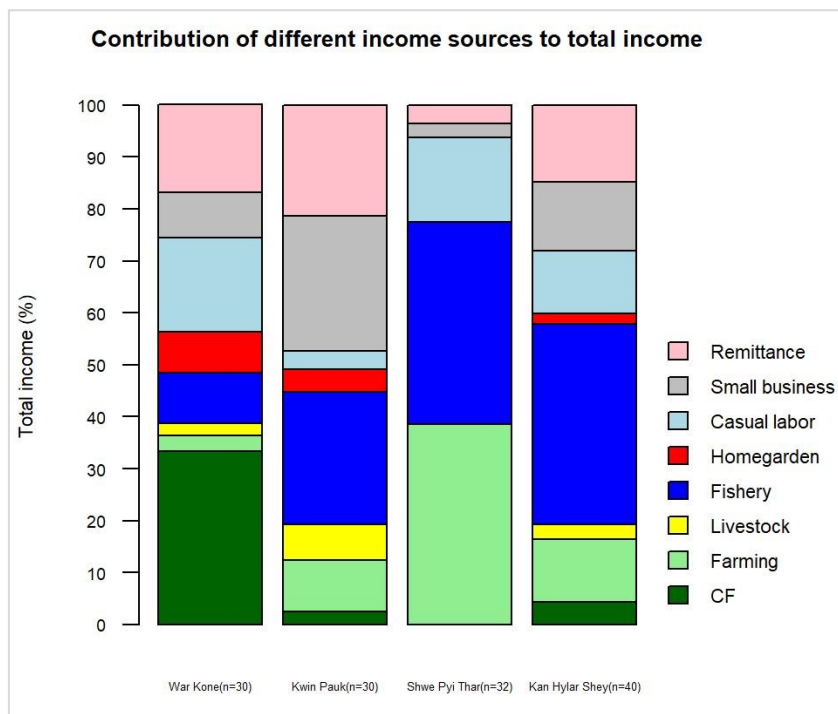


Figure 19: Contribution of different income sources to total household income

Out of four studied villages, three villages; War Kone, Kwin Pauk and Kan Hylar Shey benefited from CF, particularly from non-timber forest products such as seeds, fuelwood, poles/ posts, Nipa, fish and crabs. In War Kone, 46% of total CF income goes to the middle income group since the middle income group occupied a large extent of the CF area, followed by the rich income group (37%) and poor income group (18%). Contrary to the War Kone, the majority of total CF income contributes to the poor income group with 67% in Kwin Pauk and 40% in Kan Hylar Shey (Table 9).

It was found that the CF income is very important for poor households for their livelihood, whereas middle and rich income households have to use the CF products when they face the shocks such as loss of crops and less availability of fishery products from their private farm or offshore. Hence the CF can be supposed as an important natural asset to offset the loss of other income sources and to address the financial crisis encountered by local communities.

Table 9: Contribution of CF to the income of different wealth groups

Studied villages	% of CF income contribute to different wealth groups		
	Poor	Middle	Rich
War Kone (n=30)	0.18	0.46	0.37
Kwin Pauk (n=30)	0.67	0.11	0.22
Shwe Pyi Thar (n=32)	0.00	0.00	0.00
Kan Hylar Shey (n=40)	0.40	0.31	0.29

6.5 Perspectives of CF and non-CF members on CF establishment

The survey team discussed CF member and non-CF member groups in 46 CFs covering 25 CFs in Pyarpon, 11 CFs in Labutta, 3 CFs in Bogale and 7 CFs in Kungyangon. For the different variables, FGD respondents are asked to indicate the appropriate value out of 10 point scales, with justifications or reasons why they perceived this value. To assess their satisfactory level, the 10 point scales are divided into three levels; dissatisfied (1-3), neutral (4-6) and satisfied (> 6). The detailed perceived satisfactory level of CF and non-CF members are depicted in Figure 20 and 21.

6.5.1 Perspectives of CF members

A group of CF members in 46 villages was facilitated to know their perceptions on effectiveness of CF against different five variables namely; expansion in forest area (e.g. through conservation of degraded forest, afforestation or reforestation in the gaps of CF area), halt in loss of forests (e.g. preventing illegal logging, agricultural land and shrimp pond expansion, and set up rules and regulations in the harvest of forest products), improving forest quality (e.g. increased tree density and high), improvement in biodiversity (e.g. new or extinct species seen back, or density of endangered species increased), and restoration of land (e.g. improvement of soil quality through forest restoration or conservation).

Over 50% of studied CFs, but not more than 70%, perceived that they are satisfied on expanding forest cover, combating loss of forests and improving forest quality, since CF groups planted mangroves in their CF areas, prevented the illegal logging and expansion of agricultural land and shrimp farming in taking assistance from village head and government authorities, and conducted the assisted natural regeneration to improve naturally the degraded forests. It was found that half of studied CFs are trying to follow their CF managements agreed by the FD for receiving the CF certificates. With regard to preventing illegal activities, CF groups reported that they have not received effective legal support from government departments, and they themselves tried to address the illegal issues.

About 45% of studied CFs reported that enrichment of biodiversity was improved because of CFs. CF members from War Kone said that one fish species which is relying on mangrove forests was gone before CF as the land was abandoned after unproductive agriculture, and now they found back this fish species in their CF. Regarding land restoration or halting degradation, about 50% of studied CFs are in a natural position, satisfied by only 30% of CFs and dissatisfied by nearly 20%. Before CF, the majority of CFs were highly deteriorated in forest and soil conditions reported by FGD respondents, so that land restoration may take time.

Overall, CF establishment improved the extent of forest areas, prevented loss of forests or trees and increased forest density and high, while improvement of biodiversity and land restoration are somewhat increased after CF.

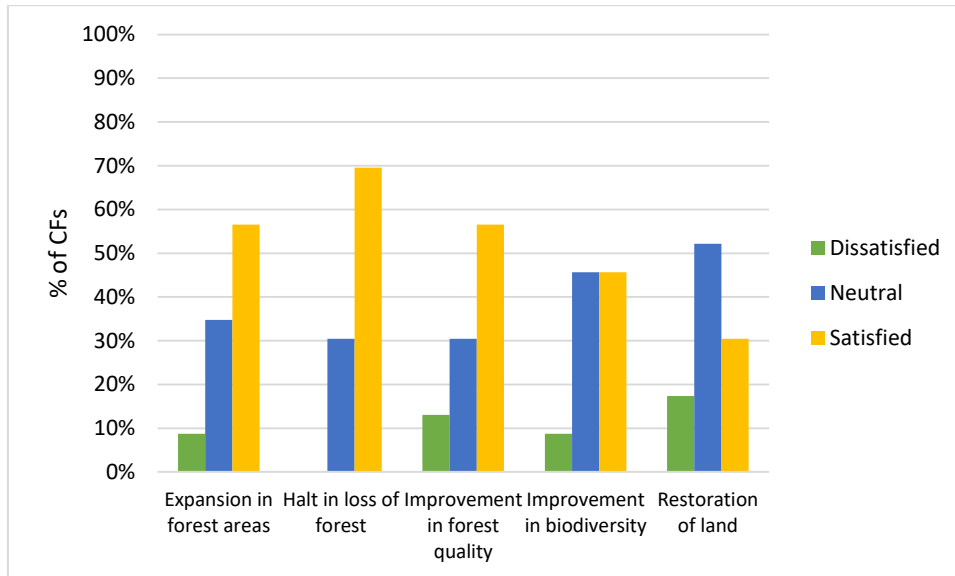


Figure 20: Satisfactory level of CF members on CF impacts

6.5.2 Perspectives of non-CF members

In Ayeyarwaddy Delta, all households were not involved in CF user groups because some households were not interested in CF and mangrove forests conservation, some do not have the owned land if CF was established in customarily or traditionally owned land, and some do not have enough human resources to contribute into CFs. There will be many reasons why some households are not CF members, so that the assessment team discussed non-CF member to explore their perception on CF establishment based on four variables; demarcation of CF area (e.g. having enough state-owned or village owned forest area for non-CF members), CF membership status (e.g. happy with criteria for CF membership, and how easy to be a member if non-CF members wish to be), benefit sharing (e.g. permission to collect non-timber forest product for home consumptions), and availability of forest products (e.g. easy to get or collect forest products after CF).

Overall, non-CF members from above 70% of studied CFs are satisfied on demarcation of CF area, membership status and availability of forest products after CF establishment, while 31% of CFs did not share benefit or allow non-CF members to collect forest and fishery products from CFs (Figure 21). Non-CF members from about 5% of studied CFs are not satisfied with the demarcation of CF area. This means that non-members faced difficulties to collect fuelwood, Nipa and other forestry and fishery products for their household consumption after CF establishment. Although the majority of CFs have not big issues with non-CF members, the perceived results of non-CF members suggests that formation of CF user groups and boundary demarcation of CF area needs to be explicitly consulted with all village members and outsiders from adjacent villages who are currently relying on the proposed CF area. Otherwise, there will be social and resource use issues or conflicts along the way of CF establishment that might affect the CF development in the long term.

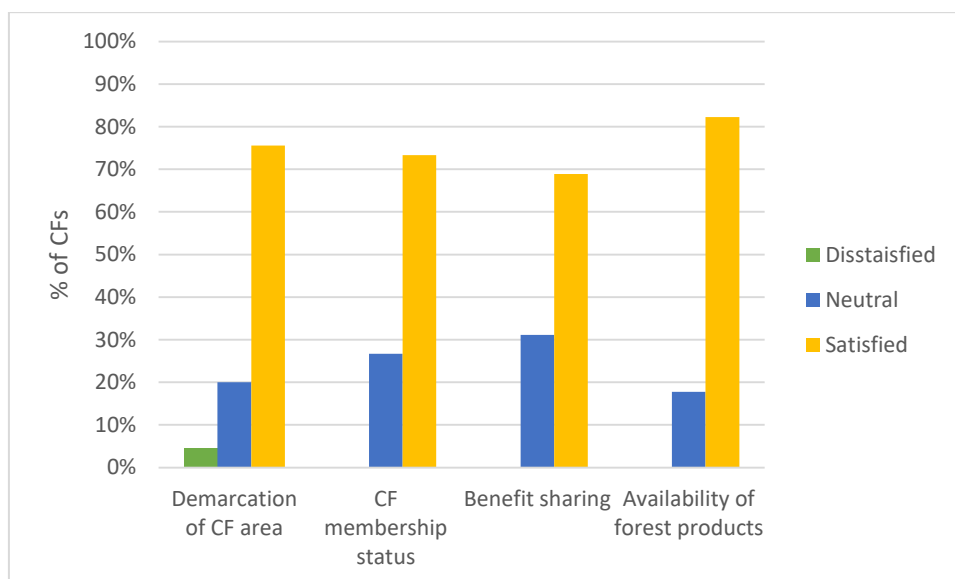


Figure 21: Satisfactory level of non-CF members on CF establishment

6.6 Sustainability of community forests

As the community forestry management is a long term process, it is not easy to judge the sustainability of CFs. But the current status of studied CFs can be weighed by comparing with Ostrom’s 8 rules for managing the commons (Ostrom 1990), by completing the following Table 10. Although the assessment team did not discuss all principles with relevant specific indicators and/ or questions with communities, the following results and justifications came from the focus group discussion – FGD and research team observations.

Table 10: Sustainability of CFs according to Ostrom’s principles

Principles	Current status of studied CFs	Sustainability
1 Clearly defined boundaries	CF boundaries were mostly recognized and some demarcated in the beginning of the CF establishment process. In case of CFs in Ayeyarwaddy Delta, individual plots were also clearly defined, in addition to the outer CF boundary. But some CFs need to put up the marks such as boundary posts, notice boards and sign boards to clearly notify for outsiders.	Yes
2 Rules should fit local circumstances	The rules and regulations for CF members are required by the Community Forestry Instructions – CFI (2019). While developing the CF management plan, CF members basically developed specific rules, regulations, roles and responsibilities for CF members and CF management committee through considering their local context.	Yes
3 Participatory decision making	How far all members can participate in decision making depending on personal attitude and capacity of CF members and CF management committee. Some CFs having limited capacity and could not practice participatory decision making. They also did not know how to exercise it. It was clear that non-CF members who are not interested in non-timber forest products did not participate in the decision making process regarding CFs.	Partially yes
4 Effective monitoring	Basically monitoring has to be taken by the Forest Department – FD and CF communities. The FD rarely conducts the monitoring on established CFs to know what had been done over the last year and what to do in the next calendar year. CF members have	No

	limited capacity to do monitoring on their own, but some CFs were trained with the tools of participatory monitoring and evaluation by RECOFTC.	
5 Sanctions for rules violators	The FD revoked the CF certificates if the CF members could not follow their CF management plan and violate the CFI (2019). Within communities, the CF management committee had to set up the rules and regulations in consultation with all CF members. If a CF member violates these rules and regulations, there are some punishments such as 1 st time warning, 2 nd time fine, and 3 rd time for membership removal, but only a few CFs are enforcing their rules.	Partially yes
6 Effective conflict transformation	In all studied CFs, there were no internal conflicts among the CF members, but it was observed that resource use conflicts between CF members and non-members occurred. The CF management committee tried to resolve these issues by negotiating and taking assistance from the village administration head, but this is still happening in some CFs.	Partially yes
7 Recognition of local rules by higher local authority	The CF management committees adapted the rules and regulations suggested by the CFI (2019) and clearly mentioned in their CF management plan which was agreed by the FD. This means that the higher local authority recognized the rules and regulations set up or adapted by the CF members.	Yes
8 Effective networking with outsiders	The CF user groups network comprised of 22 CFs were established at Pyarpon Township, out of four studied Townships with the aims of sharing and learning of achievements, challenges and opportunities among CFs. This CF network is taking responsibility for coordinating with government departments and CF practitioners.	Partially yes

According to the results of comparing Ostrom's principles which are key for sustainable use of common-pool natural resources like CFs, it was alarmed that effective monitoring by the FD and communities themselves is urgently necessary to be introduced and practiced in all studied CFs. Other principles namely; participatory decision making, sanctions for rules violators, effective conflict transformations and effective networking with outsiders still need improvement, though these principles are partially practiced on ground.

7. Conclusions and recommendations

7.1 Conclusions

The assessment covered a total of 73 certified mangrove CFs, of which 46 CFs were conducted by the focus group discussion – FGD and 4 CFs were selected for household interview. It was found that 19% of studied CFs were not well functioning because of four main reasons; poor performance of CF members, conversion to agricultural land, loss of CF area by river bank erosion and natural disasters such as Nargis Cyclone. For the first two reasons, effective monitoring and revitalization of CF groups are indeed necessary for the remaining CFs for long term sustainability.

In assessing the equity, efficiency and sustainability of CF performance, it was found that there were significant differences in two equity performance indicators, in five efficiency performance indicators, and in three sustainability performance indicators. However, the median perceived indicators' values are less than or equal to 5, out of 10 point scales (where 1 represented the worst possible scenario and 10 is the best), which means that all 10 performance indicators still need improvements by CF members (need to exercise participatory decision making more, effective performance on resources management), by CF supported organizations (need to assist in capacity building for communities in leadership skills, conflict transformation skills and participatory monitoring), by government departments (need to provide legal supports to prevent illegal cutting).

All studied CFs basically received four different trainings namely; CF concepts, forest management, agroforestry techniques and leadership skills. It was observed that all trainings were useful for communities, but these training programs could not cover all CF members as most trainings were organized at township level or village tract level through inviting 2 or 3 representatives, rather than village level in which all interested community members can access. As per statistical analysis, the knowledge and skills of CF members were significantly improved after CF established if compared to before CF.

Regarding the availability of forestry products; fuelwood, Nipa, poles/ posts, seeds/ propagules, timber, it was found that these were statistically significant in all five performance indicators before and after CF. It was, however, observed that the median values of perceived performance indicators were less than or equal to 3, this suggests that CF members need to invest in restoring and conserving their mangrove forests through preventing further deforestation and forest degradation. Contrary to forestry products, there were no significant differences in performance indicators of fishery products before and after CF. The key reasons reported by the respondents are; increasing fishery products collected by households, accessible to market and giving fishery licenses to outsiders for the streams/ creeks across the CF area by the Fishery Department. It was noticed that CF members are not happy with the fishery license for streams/ creeks inside the CF area issued by the Fishery Department.

CF communities have household incomes from eight different income sources namely; CF products, agricultural farming, livestock raising, fishery, home garden, casual labor, small business and remittance. It was found that CF income is substantial for 39 households covering poor households (49%), medium income households (28%) and rich (23%). For those, 30% of total income is from CF products, followed by fishery (29%), casual labor (13%), remittance (12%), home garden (5%), small business (5%), livestock (3%) and agricultural farming (2%). Regarding CF income contribution to different wealth groups, it was observed that most CF income goes to poor households rather than medium and rich income households. Hence the CF income is very important for the poor for their daily livelihood, while medium and rich income households normally use CF products when they face

the shocks such as loss of crops and less availability of fishery products. Thus, CF can be said as an important natural asset in addressing the financial crisis encountered by local communities.

With regard to the effectiveness of CFs, CF members perceived that the extent of forest cover, increasing forest density and height, and preventing loss of forests or trees were improved by CF management, but biodiversity and land restoration still needs improvement. Non-CF members are also satisfied with the demarcation of CF area, membership status and availability of forest products after CF, but some non-CF members are not happy with benefit sharing. This suggests that explicit consultation should have been conducted with all village members and outsiders from adjacent villages who are directly or indirectly relying on the proposed CF area.

When assessing the sustainability of studied CFs by comparing Ostrom's 8 principles, it was found that effective monitoring by the FD and communities themselves is urgently necessary to be introduced and practiced in all studied CFs. Other principles namely; participatory decision making, sanctions for rules violators, effective conflict transformations and effective networking with outsiders still need improvement, though these principles are partially practiced on ground.

7.2 Recommendations

The recommendations provided in this section are based on the findings from the course of this assessment conducted in 46 CFs for focus group discussion and in 4 CFs for household survey, and understanding of the assessment team. It would be best if the findings and recommendations are shared with communities and CF practitioners working in Myanmar for their review, comments and feedback.

1. **Need improvement of CFUGs' performance:** It was found that there were significant differences in performance indicators of equity, efficiency and sustainability before and after CF, but the medium perceived values were less than or equal to 5, out of 10. It would suggest that the CF user groups with the guidance of CF management committee need to improve their performances on practicing participatory decision making, resolution of resource use conflict, managing disturbances/ threats and implementing CF management plan (*Table 6*).
2. **Effective legal support:** Most CFs have been encountering the illegal cutting and encroachment of agricultural land and shrimp ponds into the CF area. CF management committees tried to address these illegal activities through directly negotiating with illegal cutters and taking assistance from the village tract administration head. The communities reported that they do not receive effective legal support from government departments with the evidence of medium perceived values for legal support for resources management was 4 after CF. Hence, it would suggest that relevant government departments should provide proper and effective legal support to CF groups. Otherwise, their interest or contributions to CF activities would be lost if illegal cuttings continue (*Table 6*).
3. **Capacity building program:** CF members reported that most capacity building programs were organized at Township and village tract level through inviting two or three representatives from each village and did not provide to all interested CF members. This suggests that the capacity building program should be first at Township or village tract level, then should go to village level with the assistance of trainees who attended at Township or village tract level. As per assessment's results, the capacity needs for communities are CF

concepts and leadership skills, but still need to provide agroforestry systems towards CF based enterprise development skills and forest management (*Table 7 and Figure 16*).

4. **Revitalization of CF groups:** It was observed that about 19% of CF user groups in studied CFs are not well functioning and do not know about the CF management plan and boundary of their CF areas. For those CF groups, mobilization activities such as awareness raising, learning their challenges, facilitating group meetings and assisting in developing or revising CF group rules and regulations, if necessary revising CF management plan, should be provided (*Figure 5*).
5. **Formation of CF network:** It was found that CF user group network established in Pyarpon Township is effective in coordinating with government departments and CF practitioners such as CSOs, NGOs/ INGOs, and assisting network members in preventing illegal cutting. Hence, Township level CF networks are suggested to form with the technical and financial assistance of development organizations and government departments (*Figure 11 and Figure 12*).
6. **Enhancing livelihood of local communities:** As per results of this assessment, the first primary occupation is fishery and collecting of CF products was considered as the third primary occupation. At the moment, the majority of CFs could not provide the visible benefits to CF members, but contributes to household consumptions. Hence, providing fishing gears, technical and financial support for mangrove friendly aqua-forestry systems and CF enterprises, and providing CF development fund or community-based credits scheme should be considered (*Figure 18 and Figure 19*).
7. **Remapping of CF area:** This assessment found that the CF area mentioned in the CF certificate and the on-ground measurements of CF boundary are not correct, particularly in CFs established before 2016. The location of the CF area known by CF members and the location mentioned in the map of CF management are also not aligned. Thus, the remapping of the CF area should be conducted in consultation with CF members and government authorities (as per spatial analysis results).
8. **Possible further researches:** By doing this study, the assessment team came to know that the medium perceived indicators' values were less than or equal to 5 for equity, efficiency and sustainability, and less than or equal to 3 for the availability of forestry and fishery after CF establishment. This assessment tried to find the basic reasons or justifications upon the given perceived scores, but still need to explore what the key reasons, challenges and opportunities are, so as to find or recommend the possible interventions/ solutions for CF development and livelihood enhancement for local communities (*Table 6 and Table 8*).

Although the assessment team tried to compare with Ostrom's 8 principles to assess the sustainability of CF management, it was not enough to argue how far the CF management was sustainable. Hence, the further research on assessing each principle by developing relevant indicators and guiding questions is suggested to conduct (*Table 10*).

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