

Impact of community forestry program on rural livelihood strategy under socioeconomic transition: A case study in the Central Dry Zone of Myanmar

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Abstract

Livelihood diversification is a common strategy to adjust to economic and environmental shocks and reduce poverty. This paper compared the livelihood strategies of community forest user group households with non-community forest households as a case study in the central dry zone in Myanmar. Employing data from field surveys with a sample size of 189 households through stratified sampling, scores were given for five livelihood assets with 18 decision variables, and sectoral classification of livelihood diversification was applied. Results suggested that the community forestry program ensured the secure use of local people's land rights and significantly contributed to the daily needs of community forest user group households. In addition, the community forestry program provided working capital to its members through working on natural assets such as agroforestry, livestock, and off-farm (jaggery). Social, natural, and human assets play an essential role in the diversification patterns of local people under rural transition. This analysis showed that the community forest user group households faced three entry barriers which are weakness in social networking, high mobility of its members, and an insecure financial support system to move to Community Forestry based small business.

Keywords: Central Dry Zone, Migration, Sectoral Livelihood Classification, Livelihood Asset, Community Forest

1. Introduction

Since the 1990s, different models of participatory forest management have become popular in South Asia and Southeast Asian regions. In Myanmar, the Community Forestry (CF) Program was established in 1995 and was designed to rehabilitate degraded forests and ensure that the benefits of the forest are shared with local communities. Recently, the new Community Forest Instruction (CFI) 2019 has considered livelihood opportunities with flexible tenure to operate enterprise development and thereby support the livelihood of local people (MoNREC, 2019).

Myanmar has experienced significant fluctuations in economic and political reform since 2011. In addition, a semi-arid climate, low agricultural productivity, and high poverty rates characterize the Central Dry Zone (CDZ). In recent decades, the key trends in rural transition in this region are migration, agricultural intensification, diversification of livelihood, and land use change (Pursch et al., 2017; Belton and Filipinski, 2019).

According to the national population census of 2014, the CDZ is one of the most populated regions in Myanmar, with 200 people per km², which is higher than the country's average of 83 people per km².

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This increasing population places demands on agricultural land in the CDZ, although the availability of agricultural land has declined by 10% compared with that held by the previous generation (Hein et al., 2017).

Previous research explored the contribution of dry forests to the livelihood of local people in the CDZ (Tint et al., 2011; Toe and Kanzaki, 2017; Khaing, 2018). Toe and Kanzaki (2017) explored the overall income and livelihood strategies based on the different rainfall availability in the CDZ. Khaing (2018) analyzed the challenges and opportunities for local people adopting the CF program in the CDZ. Tint et al. (2011) investigated the impact of CF on the livelihood of Community Forest User Groups (CFUGs) households, institutions, forest regeneration, forest biomass, and the environment. However, these previous studies did not consider the livelihood diversification aspect of the local people, particularly compared with non-CF households.

Considering the political and economic changes in Myanmar, the analysis of the relationship between household livelihood assets and livelihood diversification patterns, and how the CF can contribute to the livelihood strategy of the local community, is beneficial for policymakers and development practitioners for poverty reduction and rural development in one of the most populated regions in Myanmar.

The main research objective of this study was to determine the contribution of the CF program to local people's livelihoods during the rural socioeconomic transition in Myanmar by comparing the CFUG and non-CF household livelihood diversification strategies. First, we compared the occupational diversity and household income between CFUG and non-CF households. Then, five livelihood asset analyses were used to explore asset impact on the livelihood strategies of the two groups. Finally, the forest dependency of the two groups was analyzed to understand the role of CF in the livelihood of CFUG households.

2. Methodology

2.1 Study site

The CDZ is situated in the central part of Myanmar between latitude 19° 27' and 23° 16' north and longitude 94° 18' and 96° 24' east. The CDZ spans over 54,000km and includes 58 townships. It covers the lower Sagaing region, as well as the western and central parts of the Mandalay region and all parts of the Magway region. It is estimated that around 25% of the country's population is in the CDZ (DoP, 2015). While insufficient rainfall poses a risk, there are other potential hazards such as decreasing forest cover and soil erosion which can increase the likelihood of localized flash floods during heavy rain, putting communities at risk. The CDZ receives an average annual rainfall of 672 mm. The temperature ranges from 12°C to 42 °C.

As of January 2021, approximately 43% of the total CF area (152,201.761 ha of forest) has been handed over to 3,295 households in the CDZ of Myanmar, according to the internal data of the Forest Department (FD).

The study village is **called** Nnint Kyat Khwae and is located in Kyaukpadung Township in the Mandalay region in the CDZ. The study village was purposively selected based on the history of CF program implementation, customary forest management, and livelihood arrangements. This was informed by discussions during the pre-survey and previous research on human mobility and poverty reduction in the CDZ (Deshingkar et al., 2019).

In 2013, the FD implemented a departmental instruction to issue CF certificates to local informal landowners (described as “illegal encroachers into forest land” by the FD) if the land is in the Permanent Forest Estate (PFE)¹ to reduce the change in land use from forest to agricultural land. Consequently, interested customary forest owners in the study village applied for the CF certificate in 2017.

The CF certificates were issued in 2017 to eight user groups with a total area of 280.64 acres (113.57 ha). The CFUG households represent 78 out of 954 households in the study village. The type of CF in this study village is agroforestry, where CF members used nearby farmland for cash crops such as sesame, green gram, maize/sorghum, chickpeas, groundnuts, and pigeon peas. The study village in the CDZ is shown in Figure 1.

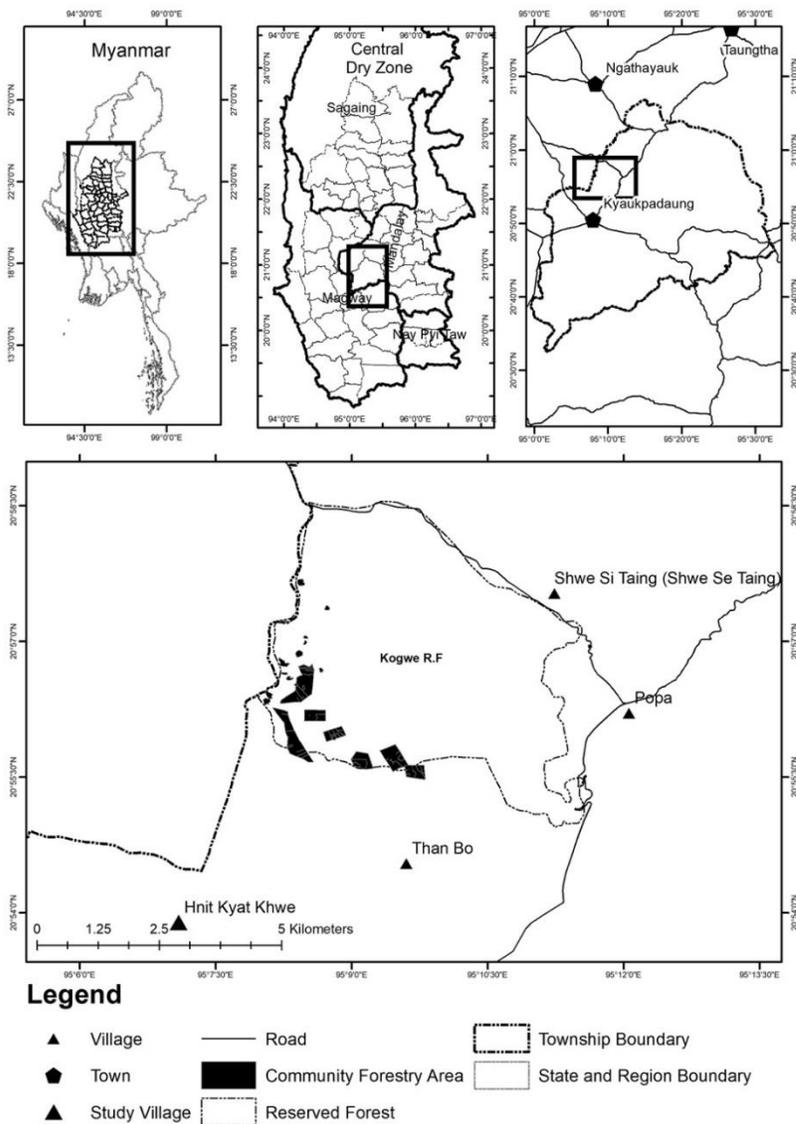


Figure 1: Study village in the Central Dry Zone of Myanmar

2.2 Research methodology and analysis

¹ PFE is a state-gazetted forest area, under the jurisdiction of Forest Department, which includes (1) Reserved Forest (priority areas for timber production), (2) Public Protected Forest (lower timber production priority, mainly for local use), and (3) Protected Area (for biodiversity conservation).

(a) Field survey

The pilot survey was conducted in September 2021 to collect basic information concerning the study village to fit the research objectives. The full field survey was then conducted from December 2021 to January 2022. The household survey (stratified random sampling) was performed using a structured questionnaire focusing on five livelihood assets, forest dependency, and household income sources of CFUG and non-CF households. The details of the field survey are presented in Table 1.

Table 1: Details of Field Survey

| Type of survey | Sub level | Type of data | Total |
|---|---|--------------|-------------------------------|
| Structural questionnaires with household survey | CFUG=78 Non-CF =111 | Quantitative | 189 (20% of total households) |
| FGD | CF chairman, Migrant returnees, Female CFUG members, customary forest owners (non-CF members) Toddy palm climbers, Non-CF households, carpenters, large agricultural landowners, small land agricultural landowners, agricultural landless, and local shop owners in town, CF household | Qualitative | 2 |
| KII | Township Officer of FD Village administration leader Non-CF household | Qualitative | 3 |

A case study was performed at the village level to carefully analyze a program, process, activity, event, or individual(s) in a real-life setting (Stake, 1995; Flyvbjerg, 2006; Yin, 2009). A case study is a research approach that examines a particular situation within its unique context. It aids in comprehending the variables at play in one or more cases and permits the analysis of individual cases or comparisons between them (Yin, 2009). Using a case study approach is the most effective way to understand how complicated histories and implementation processes affect the livelihood outcomes related to CF.

For the sampling size determination, a simplified Yamane (1976) Formula was applied as follows

$$n = \frac{N}{[1+N(e^2)]} \tag{1}$$

Where:

N= Population

n= Sample size

e= margin of error in % (here 6% of margin of error was applied)

A total of 189 households were interviewed; among them, 78 were CFUG households while 111 were non-CF households, representing 20% of the total households of the study village (Krejcie and Morgan, 1970).

In the detail of the selection of sample household selection, we discussed village heads and explained our study purposes and selection process to select the households. Then, we requested the list of households from them with their respective household livelihoods (large-scale farmers, small-scale farmers, the ownership of livestock, toddy palm farmers, engagement in non-farm, member of CF, customary forest owners, etc.). If the randomly selected household is not available, we choose a similar livelihood-type household in consultation with the village head. The criteria for the stratification of the CF membership is based on the data of the CFUG households list of FD.

Qualitative data collection, Focus Group Discussion (FGD), and Key Informant Interview (KII) used open questions to allow the participants' opinions to be heard, which aimed at verifying quantitative data of the household questionnaire survey (Marshall, 1996). FGD was created with six participants in each FGD. The detailed participants of each FGD are presented in Table 1. Selection of the different backgrounds of livelihood patterns allows us different insights into different opinions on changes in livelihood, livelihood strategies, and forest dependency, and the contribution of forests to their livelihood, which will free the main objective of the study. As different layer administrations within CFUGs, the normal CFUG household and Community Forest Management Committee (CFMC²) are selected in the same FDG to understand the benefit-sharing system of the user group transparently. In addition, the households with different agricultural land holding sizes are selected as participants in the same FDG to understand the livelihood coping strategies based on land holding size.

Additionally, KIIs were conducted with the township official of the FD, the village administration leader, and a non-CF household as presented in Table 1. The first two are key stakeholders in decision-making in CF establishment in the study village. The non-CF household is selected as the third key informant to understand different opinions about the CF program and dependency on forests for daily life, as the research is aimed to compare with CFUGs and non-CF households' livelihoods. According to (Kumar, 1989), a small number of KII is recommended to get insights from important people, such as decision-making persons for specific issues.

(b) Statistical analysis

The independent sample *t-test* was performed using SPSS version 28.0.0 to compare the occupational diversity, total income of each occupation, five livelihood assets, and forest dependency.

(c) Occupational diversity analysis

Occupational diversity is the total number of productive household activities using sectoral classifications (Barrett and Reardon, 2000). Many definitions exist for farm, nonfarm, and off-farm; however, (Ellis, 2000) distinguished between these activities as described in Table 2.

The categories and sub-categories of activity were as previously described (Ellis, 2000) and were modified to ensure the classification was purely sectoral and relevant to the local situation in the study village in the CDZ of Myanmar (Table 2).

(d) Livelihood analysis

In the livelihood analysis, "assets" refer to resources owned or accessed by household members and are often classified into five categories: human, physical, financial, natural, and social assets (DFID, 2000). The livelihood analysis considers the asset status of the household as fundamental to understanding the options available to them, accessible livelihood strategies, and vulnerable events they will face (Allison and Ellis, 2001). Different scholars have defined sets of criteria and indicators to analyze the outcomes of livelihood based on the context of the study (Reardon, 1997; Shivakoti and Shrestha, 2005; Martin and Lorenzen, 2016). Based on the study area's context and the study's objectives, 18 decision variables (shown in Table 4) are used in the asset analysis.

To analyze the livelihood assets at the household level, the following formula was used to calculate each livelihood asset.

² CFMC is the senior management level of CFUG, comprising four persons at least, including the chairman, secretary, accountant/finance, assistance chairman, etc. They are mainly responsible for coordinating with outsiders, mobilization of resources for CF activities, and benefit sharing among the groups.

$$\text{Asset} = \sum XiWi / N \tag{2}$$

Where Xi is the individual level of variables, Wi is the respective weight of each variable, and N is the number of respondents.

Table 2: Classification of the occupational sector

| Occupation sector | Sources of income | Type of productive activities |
|-------------------|------------------------|---|
| Farm | Agriculture | Dry land agriculture from dry agricultural land (Ya*) and agroforestry area (CF area). |
| | Livestock | Small-scale livestock breeding |
| Off-farm | Toddy palm | The Toddy palm sugar industry produces toddy sugar, toddy alcohol, and making furniture and roofing materials |
| | NTFPs | Selling of firewood, honey, bush meat, mushroom. |
| | Casual labor (farm) | Daily wage labor for agriculture, livestock, and toddy palm industry. |
| | Remittance | Receiving money from household members who are away from home. |
| Nonfarm | Small business | Commerce by local retailers and crafts, skilled trade (beans, oil seeds, toddy palm sugar), and food stalls. |
| | Casual labor (nonfarm) | Daily wage labor for construction, carpenter, loader in factory, local cigar industry. |

*Ya- Un-irrigated agricultural land, which cannot grow rice.

3. Results

3.1 Occupational diversity by the CFUG households and non-CF households

The occupation (livelihood activities) result from using livelihood assets, often combined, to generate income (Barrett and Reardon, 2000). According to FDGs, four of eight sources of income conventionally provide income for the villagers. Those traditional incomes are income from dry land agriculture, small-scale livestock, daily wage labor for farms, and toddy palms. However, since the early 1990s, the villagers started pursuing migration and non-farming livelihoods as risk mitigation strategies that became more popular after 2012.

It was found that CFUG and non-CF households pursued diverse livelihoods to meet household needs (Figure 2). The two groups did not significantly differ in the number of sources of income pursued ($p > 0.5\%$). Generally, both groups pursued from one to five occupations (with a medium of 2.5), although the diversification patterns between the two groups are different.

Regarding farm and off-farm income diversity, the CFUG households worked from one to three farm and off-farm occupations (with a medium of 2.0). Non-CF member households pursued up to three farm and off-farm income sources (with a medium of 1.5). Therefore, the two groups significantly differed ($p < 0.001\%$) in the number of farms and off-farm occupations worked, as assessed via an independent sample *t-test*.

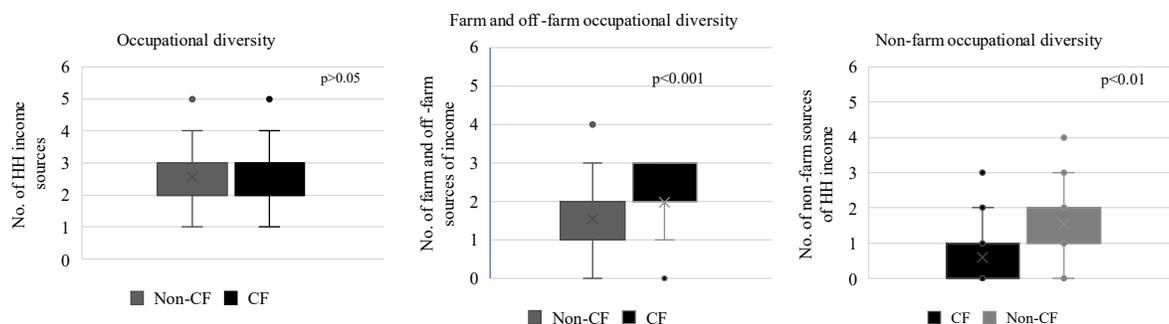


Figure 2: Comparison of income sources between CFUG and non-CF households

Regarding nonfarm sources of income diversity, the two groups significantly differed (at a 1% significant level) as assessed via *t-test*. Non-CF households worked from none to three nonfarm occupations (medium value was 1), whereas CFUG households worked in from none to two nonfarm occupations (medium value was 0.6).

3.2 Income diversity between CFUG and non-CF households

Household income at a given time is the most direct and measurable outcome of the livelihood process (Reardon, 1997; Ellis, 2000). For the CFUG household’s involvement in livelihood activity, farm-related occupations were found to be the most common activity, undertaken by almost all households (100%), followed by off-farm (79%), and nonfarm (34%) activities. The trend is similar with the non-CF members. The most popular occupations among non-CF member households were farm-related occupations, involving the majority of households (80%), followed by off-farm and nonfarm occupations (64% and 58% of households, respectively). The main difference between the two groups is the nonfarm occupation (Table 3), where more than half of the non-CF member households worked in nonfarm activities, whereas only one-third of the total CF members worked in this industry.

Table 3: Occupational income diversity between CFUGs and non-CF households

| Type of Income | CF member status | N | Mean | SD | t value | p value | % of HH | % to MTI ² |
|---------------------|------------------|-----|----------|----------|------------------|---------------|---------|-----------------------|
| ¹ USD/Yr | | | | | | | | |
| Off-farm | CF | 78 | 629.118 | 670.275 | t (187) = -1.650 | 0.05* | 79 | 32 |
| | Non-CF | 111 | 360.091 | 377.493 | | | 64 | 17 |
| Farm | CF | 78 | 846.406 | 657.599 | t(187) = -0.973 | 0.16 | 100 | 43 |
| | Non-CF | 111 | 737.910 | 816.376 | | | 80 | 33 |
| Nonfarm | CF | 78 | 512.581 | 817.390 | t(187) = 0.014 | 0.01** | 34 | 25 |
| | Non-CF | 111 | 1097.224 | 1276.896 | | | 58 | 50 |
| Per Capita income | CF | 78 | 544.093 | 324.802 | t(187) = 0.971 | 0.33 | | |
| | Non-CF | 111 | 544.130 | 320.130 | | | | |

Significance level: *5%, **1%, ***0.1

Sources: Field survey (2021)

¹USD = 1630 Myanmar Kyat in 2021

² MTI= mean total Income of household

Regarding total income received by the two groups, off-farm and nonfarm income differed at a 5% and 1% significant level, respectively. The mean income of off-farm occupations between CFUG and non-

CF households was significantly different ($p < 0.05$, $t(187) = -1.650$). The mean annual income of off-farm by non-CF households (360.091 ± 377.493 USD) was significantly lower than that of CFUG households (629.118 ± 670.275 USD). Off-farm income contributed (32%) of total household mean income in CFUG households. In comparison, 17% of the total mean income of non-CF households was contributed by off-farm incomes.

The mean income of nonfarm occupations between the CFUG households and non-CF households was also significantly different ($p < 0.01$, $t(187) = 0.014$). Specifically, 25% of the total income in CFUG households was contributed by nonfarm occupations, whereas 50% of the mean total household income was from nonfarm occupations in non-CF households. The mean annual income of off-farm non-CFUGs ($1,094 \pm 1,276.896$ USD) was significantly higher than that of CFUG households (512.581 ± 817.390 USD). However, the mean farm income and total per capita income between the two groups were not statistically different at a 0.5% significant level.

3.3 Livelihood assets between CFUG and non-CF households

The livelihood asset represents stocks of directly or indirectly productive factors that generate income for individual households in cash or kind. Assets can be defined as a logical subject in studying livelihood diversification behavior (Barrett & Reardon, 2000). Therefore, livelihood assets and income distributions of households are closely related. Hence, this study used comparative asset analysis of the CFUG and non-CF households (Figure 3). Table 4 aimed to explain each asset indicator score (asset decision variables) for a detailed understanding of each livelihood asset variable.

(a) Natural assets

We found that CFUG households possessed better natural assets than those of their counterparts. Natural assets, including forest and agricultural land, provided tangible and intangible benefits in a crisis through selling or taking credit if the user's right was strong and secure (FAO, 2006). The CFUG households' forest area and toddy palm tree indexes are significantly higher than those of non-CF households (Table 4). However, the agricultural land size of the CF members was less than that of the non-CF members at a 0.5% significant level. Therefore, the natural asset index value of the CFUG household was significantly higher than that of the non-CF household at $p < 0.001$.

(b) Social asset

The network of local people is strongly influenced by historical interactions that can also shape further interactions. Networking and social cohesion act as a bridge to find adaptation strategies and bargaining power in the commercialization of CF products. The involvement of outsiders, especially relevant government and NGOs, brings positive social capital to create favorable networks with external and more powerful groups with local people, for instance in Sri Lanka (De Zoysa and Inoue, 2016). However, the field survey found that non-CF member households had a better social asset index than that of the CFUG households at $p < 0.001$ (Figure 3.).

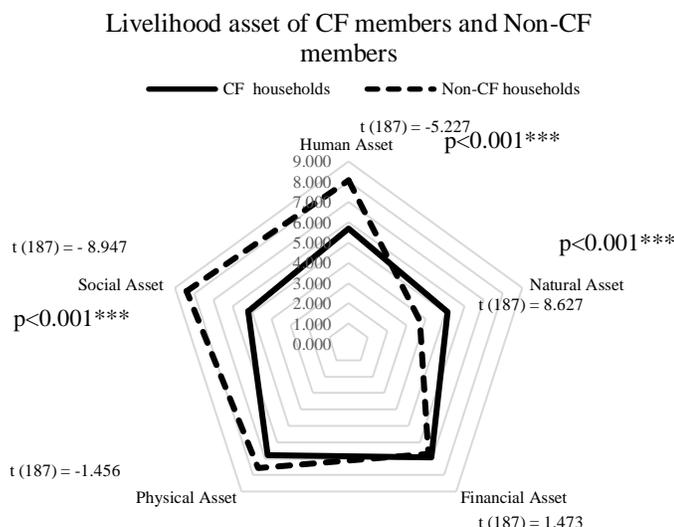


Figure 3: Comparison of five livelihood assets between the CF and non-CF households

(c) *Physical assets*

Physical assets, including transportation, buildings for storage, communication and mobility devices, and agricultural tools/machines, facilitate the accessibility of local people to the market to receive cash income and to produce value-added products. The field survey found no significant difference between CFUG and non-CF households. Furthermore, 90% of survey households had at least a motorbike for transportation, whereas less than 2% had a Htawlargyi (small tractor). The housing conditions and energy indexes of non-CF households were much higher than those of CFUG households. Although the village has access to the national grid line, several households (mostly CFUG households) stayed near the forest (not in the village settlement) and lacked this access. However, the physical access of index between CFUG and non-CF households is not statistically different at a 5% significant level as illustrated in Figure 3.

(d) *Financial assets*

The local people need working capital to make long-term investments in natural resource-based livelihood. For the credit availability index, the credit index score of CFUG households was less than that of non-CF members since most CF members are small agricultural owners and landless people.

In contrast, the CFUG household's livestock holding unit (LSU) index was higher than that of the non-CF households (Table 4). Livestock is a financial resource in this study area, and local people monetized the livestock in case of emergency. Furthermore, livestock was a means of traditional saving for local people when the banking system was not developed.

However, there was no statistical difference at a 5% significant level between the total household income index between the CFUG and non-CF households, as assessed via the *t-test*, (Table 4 and Figure 3).

(e) *Human assets*

Sustainable forest management and forest enterprise development can only be achieved with the necessary skills and knowledge of local people beyond the physical labor contribution by the CFUG households (FAO, 2006). Table 4 shows that CFUG households have lower scores in education than those of non-CF households.

In addition, the capacity-building accessibility index of CFUG households was less than that of non-CF households. This means the CF program must upgrade the informal education/skills of the CFUG households in the study village. In addition, non-CF households had a higher family labor index than that

of CFUG households. Therefore, non-CF households have a better human asset index than that of CF members at $p < 0.001$ as shown in Figure 3.

Table 4: Livelihood asset indicators

| Livelihood indicator/ index | CF member | | Non-CF member | | p-value |
|---|-----------|-------|---------------|-------|----------|
| | Mean | SD | Mean | SD | |
| Natural asset | | | | | |
| Agricultural land | 0.420 | 0.722 | 2.100 | 1.04 | 0.05* |
| Forest area | 2.620 | 1.920 | 0.260 | 0.652 | 0.001*** |
| Toddy palm trees | 2.090 | 1.443 | 1.340 | 1.533 | 0.01** |
| Social asset | | | | | |
| Communication with outsiders | 1.311 | 0.058 | 2.560 | 1.812 | 0.02* |
| Members of association/groups/organization /network | 1.321 | 0.654 | 1.310 | 0.658 | 0.184 |
| Participation in collective activities | 2.210 | 0.658 | 2.160 | 0.786 | 0.021* |
| Working away from home | 0.360 | 0.980 | 2.370 | 1.778 | 0.001*** |
| Physical asset | | | | | |
| Housing condition | 2.340 | 1.481 | 2.590 | 2.289 | 0.120 |
| Sources of energy | 2.090 | 1.481 | 2.600 | 1.216 | 0.130 |
| Means of transportation | 2.341 | 0.487 | 2.380 | 1.138 | 0.184 |
| Financial asset | | | | | |
| Livestock holding unit (LSU) | 1.810 | 1.380 | 0.190 | 0.654 | 0.01** |
| Total income | 2.920 | 1.256 | 3.580 | 1.288 | 0.300 |
| Credit availability/accessibility | 2.190 | 0.929 | 2.920 | 2.100 | 0.04* |
| Human asset | | | | | |
| Avg HH member school years | 1.450 | 0.847 | 2.380 | 0.863 | 0.001*** |
| Household head occupation | 2.160 | 1.246 | 2.210 | 0.833 | 0.002** |
| Family labor | 1.000 | 0.603 | 1.340 | 0.564 | 0.02* |
| Capacity building accessibility | 1.080 | 0.208 | 2.140 | 0.001 | 0.05* |

Significance level: *5%, **1%, ***0.1

3.4 Forest dependency between the CFUG and non-CF households

Historically, the forest is the source of firewood and cattle grazing for villagers livelihood, even before the CFUGs were established. Several respondents answered that the local people get bush meat and mushrooms seasonally for self-consumption. Figure 4 shows the dependency of local people on forests.

The study found that virtually all (99%) of the CFUGs households and most (87%) of the non-CF households used firewood for cooking. The majority of CFUGs households (79%) used toddy palm firewood while very few (5%) said that they sell firewood to other villagers, according to FGD; nearly half (46%) of non-CF households obtain firewood for the toddy palm industry.

The third most demanding product was small timber used to construct granaries or shelters for livestock. CFUG households saved money using small timber from the CF instead of buying from the market. A total of 73% of CFUG households used small timber, whereas only 25% of households from non-CF obtained this from the forest.

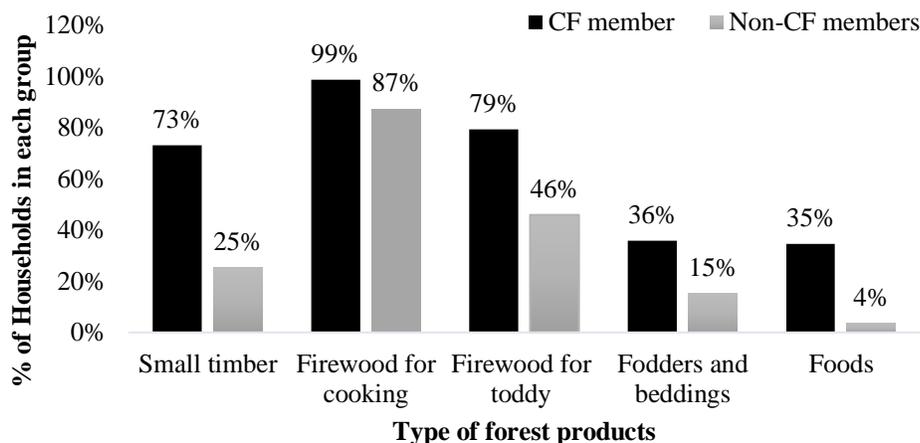


Figure 4: Use forest products by CF and non-CF households

The fourth important product was fodder and bedding for livestock. The local people used free grazing for the goats and female cattle. However, they used home feeding for the male cattle used in agriculture. If the livestock is home-fed, agricultural by-products were mainly used, which were less forest dependent. However, the local people relied on forest products such as tree leaves for home feeding during the summer when they could not get agricultural products. Fodder and bedding from the forest were used by 36% of CFUG households, whereas fodder from the forest was only obtained by 15% of the non-CF households.

Another forest dependency of local people is food, mainly for self-consumption, such as bush meat and mushrooms during the rainy season. The household survey found that 35% of CFUG households obtain food from the forest compared with only 5% of non-CF households obtaining food this way. Among the 35% of CFUG households, several mentioned selling bushmeat at the street stall near the road to Mt. Popa during FGD.

4. Discussion

The livelihood assets are the production factor that shapes the household's capacity to diversify livelihood activities (Reardon, 1997; Barrett and Reardon, 2000). In this study, livelihood diversification was common in CFUG and non-CF households, although diversification patterns were not the same.

First, the CF program significantly increased the natural assets of CFUG households. The CF program provided secure user rights of agroforestry land to its members, allowing for regular cash income from agricultural products. The result is similar to that (Kaskoyo and Inoue, 2017; Mawa et al., 2021) in Indonesia and Uganda; in addition to *de jure* right to forest land, the CFUG household owned planted trees and on-farm products than non-CF members. The field survey found that CFUG households owned an average of 5.5 LSU whereas non-CF households had 3 LSU only, which is one of the indirect benefits of natural assets from CF. This natural asset assists the members in obtaining the required working capital of the CFUG households, who worked more in farm and off-farm activities.

Second, the weakness of social assets among CFUG households is a limitation in diversifying livelihoods into nonfarm activities. The CF program is meant to increase people interaction and collective action in forest management, which is the basic requirement for success in common pool resources management (Ostrom, 1990).

The household survey found that CFUG household participation is relatively low in collective activities, such as pruning, nursery, and digging for planting. The institutional rule to strengthen the people's participation in forest management was not well-prepared at the beginning, leading to low participation of CFUG households in collective activities. During the summer (agricultural off-season), the high mobility of villagers is one issue in organizing the collective activities for the forest at this time. These limitations can impact moving toward a business approach for the CF.

Conversely, almost (50%) of non-CF households had at least one household member who worked outside of the township area. Non-CF households represent social activities in the city and within the village, including religious purposes, which supports rural development more than CFUG households because of the advantage of greater networking and education. The representation of the village also brings further exposure to outsiders, thereby accessing information to pursue nonfarm activities such as small-scale trading, grocery stores, motorbike repair shops, and agricultural machine rental services.

As a human asset, education is also a determining factor in pursuing high-earning nonfarm income. Non-CF households had a higher average school year than CF members. Therefore, non-CF households pursued nonfarm livelihoods, such as being school teachers and administration staff in government and private sectors when transportation and communication improved after 2011. Education is a long-term investment for the family. Hence, children of the poor toddy palm climbers leave after primary school as child labor is important for toddy climbing. Therefore, there is less priority for education among CFUG households with low-income nonfarm livelihoods during the agricultural off-season.

International migration also became an opportunity for rural people when the country opened; the Myanmar government signed bilateral agreements to send labor to Thailand, Singapore, Malaysia, South Korea, and Japan (Maung, 2020). According to an interview with one of the returnees from Malaysia, international migration is risky but has high-income returns. The family invested in sending the interviewee almost 1,500,000 MMK in 2013 (estimated to be approximately 1,000 USD), and he has returned to the village after five years of the contract; while working in Malaysia, he has regularly sent 300,000 MMK home monthly (approximately 350 USD).

If the household has agricultural land, this can be used as a collateral asset to obtain investment cash for the migration or education of the family members. According to Myanmar's current land legal framework, only agricultural land is entitled to be used as a collateral asset that has the intangible benefits of natural resources (claims and access) (Chambers and Conway, 1992).

According to a household survey, CFUG households owned 1.275 ± 0.916 ha, whereas non-CF households owned 1.310 ± 1.318 ha. Since non-CF members own relatively more agricultural land than those of CFUGs do, they use non-farm livelihood as a risk mitigation strategy.

The last determining asset in livelihood strategy is financial assets. Although the financial asset scores between the two groups did not statistically differ (Figure 3 and Table 4), the credit accessibility of the non-CF group was stronger. This is due to the fact that the CF members are typically small landowners and landless toddy palm climbers in the village, who have joined the CF for the formal land use right to their customary forest land. Considering the current legal framework, CF land is not acceptable as collateral to get a loan or to access the Cooperative Bank credit and Myanmar Agricultural Development Bank (World Bank, 2019), which is one of the issues for CFUGs to move to Community Forestry Enterprise. Access to credit program is important for livelihood development, for example, in Nepal (Dev et al, 2003). Thus, the

CFUG households worked more in off-farm livelihoods to acquire working capital in cash to invest in agricultural needs, such as seeds, labor, fertilizer, and machine rental.

In addition, toddy palm climbers are especially skilled laborers in the industry, and this is handed down from generation to generation. Almost half of the climbers from the early 1990s pursued urban and international migration because of the low price of jaggery. However, according to an FGD with one of the toddy climbers, half of them have returned to the villages and to work in the toddy industry because of their attachments to their village and the toddy industry when the jaggery price increased in recent years. These people constructed their livelihoods based on intangible assets, including special skills and creativity (Chambers and Conway, 1992). Thus, CFUG households with special skills in toddy climbing pursue off-farm livelihood more than non-CF households do. Furthermore, because of the poor education of CFUG households, these households work more in off-farm activities such as casual labor in farm activities to obtain working capital for agricultural investment.

5. Conclusion and recommendation

In recent decades, the rural areas of CDZ in Myanmar have been undergoing socio-economic changes such as migration, education, social relations, and empowerment since 2011, attributed to causing livelihood change. Livelihood diversification is a common phenomenon in the CDZ with a variety of patterns of diversification present. The livelihood diversification at the household level is based on their livelihood assets, particularly natural, social, and human assets. Furthermore, the intangible asset of tenure rights determines livelihood diversification patterns.

Taking advantage of favorable physical capital such as road accessibility, national grid line, and toddy palm skills, the potential exists to produce value-added non-timber forest products while the forest is regenerating. However, three entry barriers to increasing the income of CFUGs were found, which were the need for capacity-building programs (informal education/skill), networking and social cohesion, and proper financial support systems.

Although this case study only covered a sample population from the CDZ of Myanmar, these results can be applied to similar socioeconomic conditions in Myanmar, particularly the CDZ area, where most of the CF area is located.

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