Community Based Management for Forest Conservation and Livelihood Improvement: A Comparative Analysis from Forests in Myanmar

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Abstract

Myanmar has the world's third largest deforestation rate with one of the major causes being peoples' dependency on forest products. Fuelwood is still used in large amounts for various household activities in rural areas of Myanmar. This paper deals with the categorization of forest into conserved forest and open access and the study of fuelwood dependency in these two access regimes in the Taunggyi district of Myanmar. A significant difference is observed in the aboveground biomass levels and fuelwood consumption in these two access regimes. Various socio-economic parameters and forest indicators were also evaluated using field derived information. The study recommends the establishment of community forestry management system for improving forest condition and livelihood opportunities.

Keywords: Community forestry, fuelwood dependency, forest condition, Myanmar, REDD+

INTRODUCTION

Reducing emissions from deforestation and forest degradation, along with sustainable forest management, conservation and enhancement of carbon stocks (REDD+) is a climate change mitigation strategy which provides compensations for reductions in the rate of deforestation and forest degradation and paves way for lower carbon emissions and higher carbon storage. REDD+ is also a climate change adaptation strategy that supports rural livelihoods while maintaining vital ecosystem services and preserving globally significant biodiversity. The purpose of the REDD+ strategy is to guide the development of a set of policies and programs for addressing the drivers of deforestation and forest degradation and improving the carbon sink capacity of the forests (MoFSC 2015).

In the Hindu Kush Himalayan (HKH) region, forests cover around a quarter of the total area, making it an integral part of rural as well as urban environment. Forests are responsible for conserving biodiversity, connecting various ecosystems, providing forest products and protecting against probable natural disasters. Despite acknowledging the importance of forests in adapting and mitigating the impact of climate change, forest ecosystems have continued to degrade and fragment in the last couple of decades (ICIMOD 2018a).

DEFORESTATION AND FOREST DEGRADATION IN MYANMAR

Myanmar has the highest forest area in Asia-Pacific with 48 per cent of forests covering the total land area (FAO/

RECOFTC 2016). Unfortunately, according to Global Forest Resource Assessment the deforestation levels in Myanmar has been reported as the third highest in the entire world, following Brazil and Indonesia (FAO 2015).Between 2010 and 2015 Myanmar had the third largest forest loss in the world, equivalent to an annual loss of 546,000 hectares (1.7 per cent annual rate) (UNODC 2015).A substantial loss such as this is sure to leave devastating outcomes at its wake. Forests also have a major role in limiting climate change as they have the potential to absorb about one-tenth of global carbon emissions projected for the first half of this century. Continuing to lose such an important size of land every year — more than half a million hectares of forest coverage each year since 2010 — would put the country in even more vulnerable condition to climate change and the extreme weather events that have already caused a lot of damage to the country (FAO 2016)With the introduction of growth-oriented targets to generate foreign exchange under the socialist era from 1962-1988, forest loss accelerated as commercial logging of teak increased above the annual allowable cut, driving roads into formerly inaccessible areas, and exacerbating conversion for food and wood energy production from primary subsistence agriculture (Macqueen 2012).

According to a report on the drivers of deforestation and forest degradation (Myint 2017) there are seven major direct drivers of deforestation and forest degradation in Myanmar. These are:

- Agricultural expansion
- Shifting cultivation
- Over exploitation of timber
- Fuelwood consumption (including charcoal)
- Infrastructure development
- Mining
- Forest fire

According to the fuelwood consumption study paper in the Taunggyi district, it was found that the main causes of deforestation and forest degradation is fuel wood collection (60 per cent) and others including agricultural expansion, wildfire, mining, increased population, illegal logging, shifting cultivation (Myint 2017).

Myanmar has 0.6 ha of forest land per person and it has been estimated that more than 70 per cent of rural households are dependent on forests for basic needs (FAO/RECOFTC 2016).The per capita forest in Myanmar is equal to that of the world average. There are, however, large differences among countries. Asia has very little forest per capita, whereas Oceania and South America have a substantial forest area per person (FAO 2000). The demand for fuelwood for the whole country is about 18 million tons within which only 900,000 tons is supplied by the government, which means that the remaining 17.1 million tons of fuelwood is harvested from unknown and potentially unsustainable sources (Myint 2017). Agriculture is considered to be a key driver of Myanmar's economy as this sector contributed around 36 per cent of Myanmar's Gross Domestic Product (GDP) in 2010 and still contributes to around 70 per cent of total employment as well 30 per cent of the country's exports (Faust 2016). The Government of Myanmar still relies on forest resources for foreign exchange earnings and most of its forest areas are under intense pressure from timber harvesting and extraction of various other forest products (FAO/ RECOFTC 2016).

Such high rate of deforestation and forest degradation calls for an effective forest monitoring and conservation efforts. Monitoring, reporting, and verification (MRV) is included in the Cancun Agreement under the United Nations Framework Convention on Climate Change (UNFCCC) as one of the critical elements necessary for the successful implementation of any REDD+ mechanism. MRV involves both collection of baseline information and measurements over time to identify changes in the forest carbon stocks, both locally and nationally. The amount of carbon stored in a forest depends on a number of factors including the total area and the biomass per hectare. In general, forest biomass consists of above-ground and below-ground living mass, including trees, shrubs, vines, roots, and the dead mass of fine and coarse litter associated with the soil. Most research on biomass estimation focuses on above ground biomass (AGB), which contains almost 80per cent of total biomass (Gilani *et al.* 2015).

INTRODUCTION TO BEST PRACTICES

Best practices in forestry refer to those activities that ensure the conservation of forest values as well as a continuous flow of forest products through minimizing environmental damage during tree harvesting which will bring short-term as well as long-term economic benefits to the landowners (The Regional Municipality of Halton 2006). The main aim of REDD+ has been the overall, long-term sustainable conservation of forests and carbon stock enhancement, and this objective will come to a fruition only when users at the local level understand the importance of forest conservation. Observing various cases of forest management from around the world, we understand that community forestry system has been successful in managing forest and its resources in a sustainable manner. In the mid-hills of Nepal, community forestry programs have played an important role in improving forest condition by adopting better forest protection and management measures. Through forest management, users are generating incomes that are used in community development activities. (Joshi n.d.) By handing over the reins of managing the forest resources to the forest dependent communities, this system has achieved in lowering the levels of deforestation, while simultaneously, improving local livelihoods, making it a best practice to be followed in forest dependent communities. In community forestry, Forest User Groups (FUGs) are responsible for controlling and managing the local forests along with harvesting and pricing of all forest products. Local forest users can gain membership that encourages them to practice sustainable conservation. Community-based forestry emphasizes collaborative, participatory and holistic management in local stewardship, local needs and local knowledge (K.C. 2016). Community forest management (CFM) has been recognized over the past two decades as a potential approach for achieving forest sustainability (Little, 1996). It can be said that community forestry can be regarded as an effective tool towards ensuring best practices in forestry. Thus, community forestry based practices should be encouraged and replicated in areas with higher deforestation rates.

The study region of Taunggyi in Shan state of Myanmar has two distinct forest-use practices and management systems. Some of the forests were managed under the conservation regime of safeguarding water resource and are considered as areas of religious significance is termed as conserved forest while the others followed no such conservation or management scheme is called open access forest in our study. These two broad contrasting characteristics observed in the field have been analyzed in the study.

METHODOLOGY

Study Area

After the consultation with the Forest Research Institute (FRI), Myanmar, the Taunggyi district of Shan state was selected as the study area (Figure 1). The deforestation rate of Shan state was 0.93 per cent per annum which is higher than the national average and had the largest net forest loss (5647.7 km^2) during 2001-2010 (Wang and Myint 2016). Due to deforestation and forest degradation, Shan State was responsible for emitting 6.86 million tons of carbon per year from 2005 to 2015 (FAO/RECOFTC 2016).

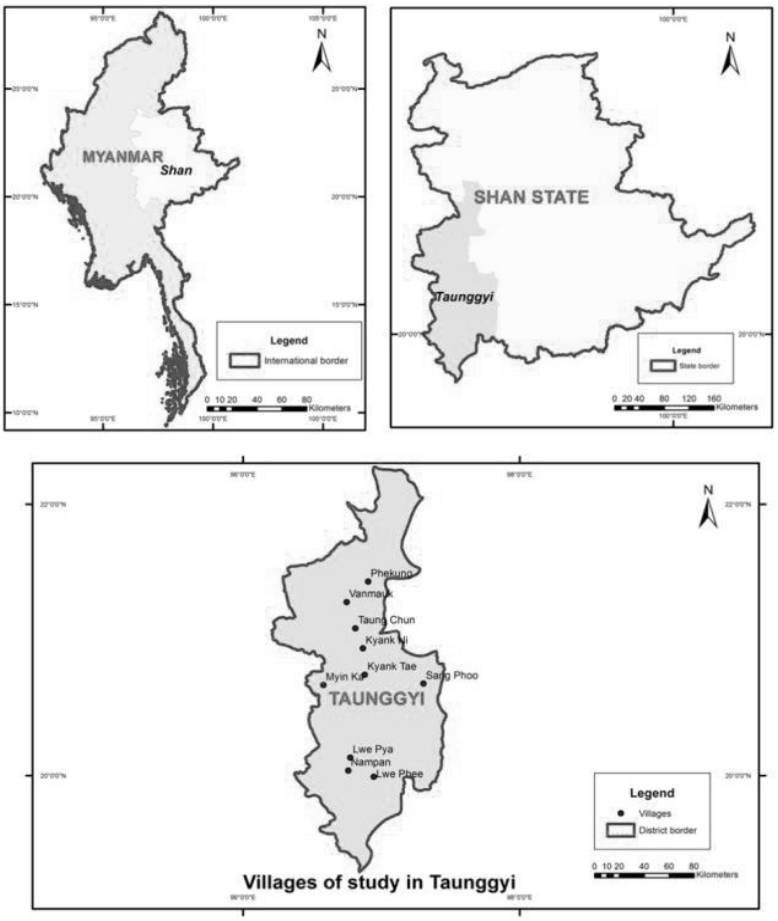

Figure 1: Map of the Study Area

Taunggyi district has been listed as the first priority district for organizing and establishing REDD+ activities by the ICIMOD-GIZ REDD+ Project report (Myint 2017).The total area of Taunggyi district is approximately 9317.9 sq. miles. (MONREC 2016) According to the 2014 Myanmar Population and Housing Census, the total population of Taunggyi district is 1,701,338.

Data Collection Procedures

In order to assess the forest conditions and dependency of the local population on forest resources, a survey was undertaken between 9-24 December 2017 in 10 different villages and their respective forests of the Taunggyi district (Table 1). A stratified random sampling was applied to collect the forest data whereas random sampling was used for the household survey.

Table 1: Description of the Number of Households/Forest Plots Surveyed in Each Township

S. N.	Villages	Township	Estimated no. of house-holds	Households surveyed	Participatory forest survey	
					Plot surveyed	No. of foresters/ locals involved
1	KyaukTae	Taunggyi	120	34	9	1 Forester, 5 locals
2	SanPhoo	Hopong	200	12	3	4 Foresters, 4 locals
3	KyaukNi	Taunggyi	382	20	4	4 Foresters, 2 locals
4	NamPan North	Pinlaung	70	10	2	2 Foresters, 3 locals
5	LwePhwe	Pinlaung	83	15	6	3 Foresters, 3 locals
6	LwePya	Pinlaung	90	11	3	2 Foresters, 2 locals
7	TaungChun	Yaksawk	140	8	3	4 Foresters, 4 locals
8	VanMauk	Yaksawk	244	15	3	4 Foresters, 4 locals
9	Phekung	Yaksawk	102	12	3	4 Foresters, 4 locals
10	Myinka	Kalaw	140	13	6	2 Foresters, 2 locals, 1 University Student

Altogether, 150 household questionnaires were completed to understand the trend of firewood collection and the economic status of the households. Similarly, a participatory forest survey was conducted to collect forest biomass related data from 42 samples. The guidelines for measuring carbon stocks in community-managed forests, published by Joshi *et al.* (2012) has been followed for determination of plot size and calculation of above ground tree biomass. A circular plots of size 8.92m were laid down for trees, sub plots with a 5.64m radius were established for saplings; a sub-plot with a 1m radius was established for counting regeneration.

The forest type identified were: Moist Upper Mixed Deciduous Forest, Dry Upper Mixed Deciduous Forest, Evergreen Forest, Dry Hill forest, Indaing forest and Pine forest.

Data Analysis and Interpretation

Considering management status of forest, the study area was divided into two broad access regimes viz; i) Conserved forest and ii) Open access forest.

Conserved Forest

This included community forest, proposed community forest, and reserved forest. The villages were involved in the conservation of their surrounding forests using it as a sustainable source, and thus contributing to higher quality of their forests.

Open Access Forest

This included natural forest without any specific conservation and management. In these forests, there are no restrictions for locals to use the forest and its resources.

Subsequently, the whole data sets of both household and forest are segregated into these access regimesand analyzed.

Villages with conserved forest: MyinKa, Vanmauk, Nam Pan North, San Phoo, and Lwe Pya

Villages with open access forest: Taung Chun, LwePhwe, Kyauk Ni, Kyauk Tae, and Phekung

Data collected from household surveys were coded and analyzed using Statistical Package for Social Sciences (SPSS)-Version 14. MS-Excel has also been used for graphical descriptions and additional analyses.

Biomass Estimation

The above ground tree biomass (AGTB) is calculated by using (Chave *et al.* 2005) equation as:

$AGTB = 0.0509 * r * D^2 * H$ ..... (i)

$AGTB = 0.112 * (r * D^2 * H)\ 0.916$ ..... (ii)

Where, AGTB= above ground tree biomass r=tree specific gravity (g/cm^3)

H= Height of the tree (in meters)

D= Tree diameter at breast height (in centimeters)

R= the biomass stock density is attained in kg/m^2

Equation. (i) is good for moist forest stand and equation. (ii) is for dry forest stand.

RESULTS AND DISCUSSION

Fuel Wood Consumption and Household Characteristics

The average household firewood collection for all the ten villages from this study is 1 ton with 46.3 per cent of these respondents collecting even less than one ton (Figure 2). Among these, 40.8 per cent of respondents collect an amount more than 1 ton but less than 2 tons. Fuelwood consumption carries 80 per cent of total energy use in Myanmar. Previous studies have stated a slightly higher fuelwood collection in Taunggyi district as households have estimated annual household firewood consumption of 1.34 tons (Sein *et al.* 2015).

From the chart, it is seen that 8.8 per cent of respondents do not consume fuelwood at all. The reason for a lower fuelwood consumption amount is the availability of electricity in some of these villages. More than 50 per cent of the respondents stated using electricity for daily household activities.

Villagers in Taunggyi district use fuelwood mainly for cooking purposes. In townships like Pinlaung where the temperature goes below 15^0C, households use wood for space heating. In most of the villages, harvesting took place only once a year (summer season) with villagers storing fuelwood for later use in the year. In some villages, however, households collect firewood from the nearby forest in small clusters which increased the frequency of forest visits up to twice in one month.

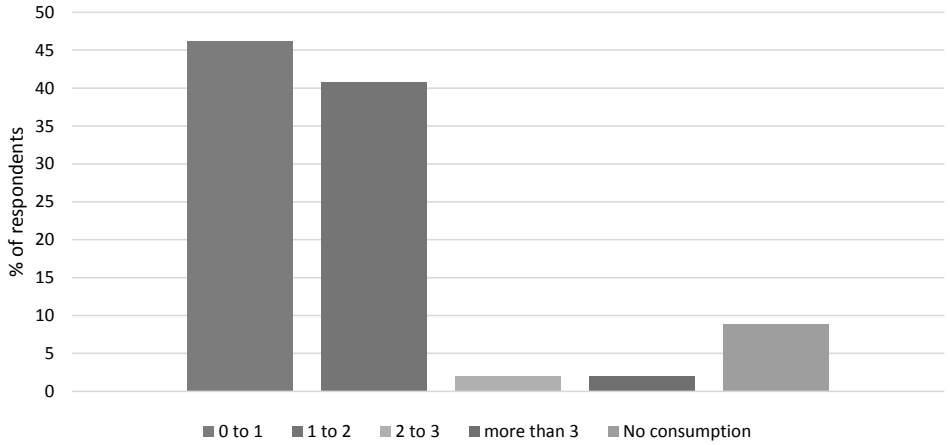

Figure 2: Annual Household Firewood Consumption (in tons)

Table 2: Comparative Analysis of the Socio-economic Status and the Trend of Firewood Consumption between the Two Regions

Villages		Conserved forest	Open access forest
		Taung Chun, LwePhwe, Kyauk Ni, Kyauk Tae, Phekung	Taung Chun, LwePhwe, Kyauk Ni, Kyauk Tae, Phekung
Number of households		744	827
Income Range (%)	< = 1200 USD	65.5	71.0
	> 1200 to < = 2400 USD	25.9	16.0
	> 2400 to < = 3600 USD	5.2	8.0
	> 3600 to < = 4800 USD	1.7	4.0
	> 4800 USD	1.7	1.0
% of respondents engaged in firewood collection		75.9	90.0
% of respondents who buy firewood		5.2	8.0
Annual household firewood collection (Ton)		0.89	1.08
Cost of firewood collection per ton (USD)		20.70	23.14
Days taken for a local to collect firewood		0.77	3.52
Price of firewood (USD per ton)		8.66	18.49
Availability of electricity (%)		70.7	22.0
Availability of solar panels (%)		19.0	37.0

Some villagers stated that they used corn cobs as a substitute for firewood whenever it was deemed necessary. Corn was observed to be the most favorable crop in Myanmar as corn production and consumption occurred in 7 of the 10 villages studied for the survey. In a similar fashion, some villages involved in green tea production used firewood for processing of the tea leaves. However, a significant difference in fuelwood consumption cannot be observed between households involved in either corn or green tea production.

Segregating the villages surveyed into two regions according to the access regimes helped to understand whether there is any difference in the annual consumption of firewood in these two regions, and if there are, then what are the probable reasons behind those. Table 2 shows a general summary of the data related to household income and annual firewood consumption in the two distinguished regions.

By comparing the average fuelwood consumption of these two categories, there is not a significant difference in annual firewood collection between the two groups of villages. The data collected through household questionnaire show us that the annual collection of firewood in the conserved forest is merely 0.89 ton per household. The collection for the other group of villages is 1.08 ton per household. The difference between this, as analyzed through individual T-tests, is showed in Table 3. Although the annual household firewood collection in the conserved forest is lower than that in the open access forest, the difference is found to be insignificant ($p = 0.22$ at 95 per cent confidence interval). One of the reasons for lower household firewood consumption in the conserved forest is the availability of electricity in the villages defined for this region, since 70 per cent of respondents stated having electricity in their homes.

Most forest dwellers collected firewood for consumption from the nearby forest on their own or by hiring extra help. However, some villagers bought the required amount of firewood from accessible markets. The amounts of firewood bought and collected is slightly higher in the conserved forest, but their differences are insignificant (Table 3). The labor days invested for firewood collection and its subsequent cost, however, is higher for the open access forest. These differences are still insignificant ($p = 0.16$ and $p = 0.55$). The reason for the higher labor cost is the higher frequency of forest visits that locals make in the open access forest. In Phekung village, respondents stated that they visit the local forest up to 5 times in a month to collect small clusters of firewood. The locals in the open access forest have to collect small clusters of firewood because of the lack of high quality timbers found in their neighboring forest.

Table 3: Results of T-tests of Various Factors in Conserved and Open Access Forest (at 95% Confidence Interval)

Differences in	Annual average fuelwood consumption per household (tons)		Amount of firewood bought for household consumption (tons)		Amount of firewood collection from the forest for household consumption (tons)		Cost of firewood collection ($/tons)		Days taken for a labor to collect firewood	
	CONSERVED	OPEN ACCESS	CONSERVED	OPEN ACCESS	CONSERVED	OPEN ACCESS	CONSERVED	OPEN ACCESS	CONSERVED	OPEN ACCESS
Mean	0.89	1.08	1.17	1.06	1.09	1.00	20.70	23.14	0.77	2.63
Variance	1.14	0.51	0.33	0.31	1.25	0.88	305.93	461.67	0.95	79.33
P(T<=t) two-tail	0.22		0.79		0.70		0.55		0.16	
t Critical two-tail	1.987		2.78		1.99		1.99		2.01	

Forest Condition

The most common type of trees observed in the case of moist deciduous and mixed evergreen forest of Sang Phoo, Nampan, Lwe Pya are Thit-e (*Castaneopsis spp*) and Gaw (*Quercus spp*). These species of chestnut have moderate to high wood specific gravity ranging from 0.63 to 0.82 g cm^3. (Hidayat and Simpson 1995) These species have been reported to be used for construction of agricultural equipment like spades. In drier regions of TaungChun, LwePhwe, KyaukTae and KyaukNi Indaing forest of species Inn, Ingyin (*Shorea siamensis*) and Yindaik (*Dalbergia cultrata*) and Thit-ya (*Shorea robusta*) are observed. *Dipterocarpus tuberculatus* is an important species of Myanmar that falls within the "Near Threatened" category of International Union for Conservation of Nature (IUCN) Red List. The species is threatened by habitat loss as a consequence of agricultural expansion. It is also at risk from selective logging for the timber trade (IUCN 2017). These woods are used to produce furniture, flooring and construction (Meier 2015). This species is also used as firewood. The species can be tapped for oleoresin (Shiva and Jantan, 1998), this is of particular commercial importance in Myanmar (The

IUCN Red List of Threatened Species, 2017). Ingyin (*Pentacme siamensis*), Inn (*Dipterocarpus tuberculatus) teak (Tectona grandis*), pyinkado (*Xylia xylocarpa*), and nabe (*Lannea coromandelica*), zibyu (*Phyllanthus pomiferus*) are frequent species. An undergrowth of grass is common in some areas where the forests are open (Davis 1964). Species of Thit-ya (*Shorea robusta*) was observed in mostly open forest of LwePhwe, KyaukTae and KyaukNi villages in combination with other Dipterocarpus trees. This specimen falls under the category of "Critically endangered" list of IUCN Red list. The specimen has also been widely reported in the use as fuelwood and household construction during the field survey.

Forest health conditions are determined using indicators such as tree species diversity, number of tree, sapling and regeneration presence, canopy coverage and existing biomass. The tree species diversity is significantly higher in conserved forest than open access forest at $p < 0.01$. Knowing tree species diversity is useful to understand the health of forest ecosystem (Naidu and Kumar 2016) and it may vary with location, biogeography, habitat, and disturbance (Whitmore 1998). Biodiversity indices are generated to bring the diversity and abundance of species in different habitats to a similar scale for comparison and higher the value, the greater the species richness. (Naidu and Kumar 2016) The Shannon's index values for tree species diversity for this study ranges from 0.71 in conserved whereas 0.48 in open access forest with a significance of 0.0001 at $p < 0.05$. Documenting the patterns of tree diversity and their distribution provides a good database, useful for management measures in these forests.

The comparative data (Table 4) revealed higher number of tree and regeneration are present in conserved forest than in open access forest and the difference is significant at $p < 0.05$. Similarly, the case is same for saplings but the difference is not significant at $p < 0.05$. Canopy cover is an important indicator that is becoming commonly used to understand the forest health (Barron *et al.* 2016). Canopy cover as a stand-alone indicator measures the proportion of the forest floor covered by the vertical projection of tree crowns. Canopy cover, when combined with other indicators, can provide valuable information for forest structural conditions and how current stands compare to a desired condition (Huffman and Meador). Large portions of conserved forest showed characteristics of high percentage of canopy cover during the survey. The average canopy of conserved forest was calculated to be 70 per cent whereas it measured only 40 per cent in the open access forest. Canopy cover may have varying significance on underlying soil and vegetation conditions. Because different sites will have different environmental constraints, they will therefore have different optimal levels of tree canopy cover, and these levels must be identified for each afforestation species and site through site-specific research (Cao *et al.* 2017)

Many naturally regenerated forests are primarily managed for timber or environmental services such as soil and water protection (e.g. watershed management) (FAO n.d). Forest regeneration can therefore be regarded as a good measure of health of forest habitat. It provides proof that the forest is capable of producing young trees in case of the canopy trees being cut down which gives an indication that the forest is vibrant and sustainable.

Table 4: Results of T-tests of Various Factors Between Conserved and Open Access Forest

	Tree species Diversity Shannon's Index*		No. of Trees (per hec)		No. of Sapling (per hec)		No of regen-eration (per hec)		Canopy Coverage (%)		Biomass (ton/hec)	
	CONSERVED	OPEN ACCESS	CONSERVED	OPEN ACCESS	CONSERVED	OPEN ACCESS	CONSERVED	OPEN ACCESS	CONSERVED	OPEN ACCESS	CONSERVED	OPEN ACCESS
Mean	0.71	0.48	1089.411	684.70	455.70	358.59	104705.9	34705.88	71.88	47.05	142.53	34.24
Standard Deviation	0.13	0.18	457.93	333.43	356.55	201.98	51734.62	34117.01	7.30	16.20	108.85	30.96
P(T<=t) two-tail	0.0001^		0.003^		0.16		0.000035^		0.00000861^		0.00086^	
t Critical two-tail	2.04		2.04		2.05		2.04		2.07		2.093	

^Significant at 95 per cent confidence interval

Shannon's Index formula $H = -\sum ik = pi \log (pi)$,where pi denotes the proportion in group k. (National Institute of Standard and Technology, 2016). It is clear from Task 4 that the forest health conditions is statistically proven to be better in case of conserved forest than open access forest. The distinction observed between the categories in turn supports our concept of having forest under the two categories. The marked difference of P ($t <= 0.05$) two tailed was observed in all categories except the sapling numbers. The number of trees with Diameter Breast Height (DBH) less than 5 cm was similar in both the categories. Most of the trees observed in open access forest saplings resulting from rotational cutting of the forest for firewood once they reach a certain age and diameter. Species diversity shows higher trends in conserved forest resulting for fair competition and subsequent growth of different types of species. The AGB calculated from the two forest regimes are also highly different, determined by type of forest management, fuelwood extraction and conservation practices in the forest. These ecological indicators can hence give a quantitative idea about forest condition and provide for design of forest

management and conservation strategy to be made by local community, stake holders and policy-makers.

Establishment of community forestry in the areas priotized by the indicators can prove to be beneficial in controlling and improving of forest conditions. A recent paper by Gurung *et al*. (2012) revealed that the intervention of forestry projects in the studied CFUGs (Community Forest User Groups) has improved the forest conditions as well as increasing the awareness of forest degradation among local users in selected areas of Nepal. Restoration of degraded land and improving forest conditions are the major benefits of community forest. Apart from environmental services, improved forest conditions increases the availability of forest products to the local users thereby improving their livelihoods (Gurung *et al.* 2012).Various studies have demonstrated a significant increase in forest conditions under community forestry showing that it is a proven model for deforestation and forest degradation. (K.C *et al.* 2013)

EFFECT ON LIVELIHOOD DUE TO LIMITED BIOMASS

The major differences in the conserved forest and the open access forest are seen through the differing biomass levels and differing household fuelwood consumption. The open access forest has been seen to have lower aboveground biomass with mean of 34.2 ton/hec whereas the conserved forest accounts to average of 142.53 tons/hec of above ground biomass resulting from level of fuelwood extraction and conservation strategy followed. It is also seen from above Table 4 how the forest indicators also significantly differ between the two regimes. Also, the open access forest has a higher fuelwood consumption with higher cost of collecting fuelwood and higher number of days spent for firewood collection. In other words, the fuelwood dependency of the open access forest is higher than the conserved forest resulting from lower forest health conditions and limited biomass. The higher fuelwood dependency has caused a decline in the quality of the forest resources. Scarce forest resource induces the forest dependent communities to look for alternative opportunities, causing them to turn to nearby markets for their firewood demands. As foreseen, the percentage of respondents buying firewood is higher in villages with open access forest (8.0%). At the same time, degrading forest quality forces the locals to spend longer time in the forest, looking for better quality firewood amongst the scarce resources. This increases the cost of collecting firewood, which means a higher expenditure for the households, which leads to lower annual savings for these households. The local users, then, will have no option but to use the scarce forest resource for sustenance given its easier accessibility as well as their lower income, thus completing this circle of degradation. Figure 3 shows the complete cycle of degradation of forests and local livelihoods described above.

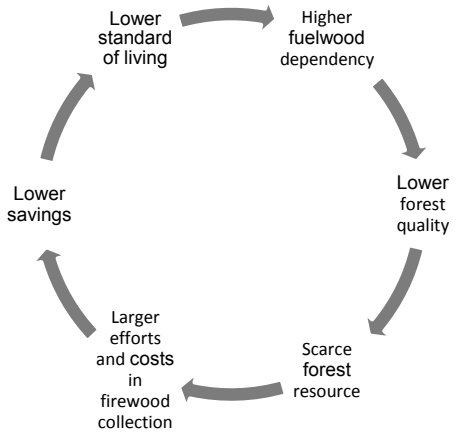

Figure 3: Cycle of Degradation of Forest and Local Livelihoods

From this observation, we can obtain important insights about the next steps that can be taken by the local communities as forest users, and how REDD+ can play an important role in supporting them. Compared to the conserved forest and its local inhabitants who are faring well, given the various conservation activities taking place in and around this forest, there is an immediate need for carrying out conservation activities in the open access forests. Thus, in order to improve the quality of the degraded forest and to reduce the ongoing emissions, one of the solutions is in relation to proper forest management practice and encouraging local level participation.

IS COMMUNITY BASED FOREST MANAGEMENT AN EFFECTIVE SOLUTION TO CONSERVE FOREST RESOURCE AND IMPROVEMENT IN LIVELIHOOD?

Until recently, all types of forests in Myanmar were owned by the state except for some community forests which are under long-term lease agreements with the government. As deforestation and forest degradation became apparent in the late twentieth century, it was agreed that one of the main causes is lack of forest dwellers' participation and understanding of forest conservation, management and benefit sharing. To mitigate this weakness, Community Forestry Instructions (CFI) was issued by the Forest Department in 1995. This step was considered as a major breakthrough in the Myanmar forestry sector as it shifted the previously centralized forest management system to a more decentralized one (FAO/RECOFTC 2016). Most CF implementations are located in the Shan state, Mandalay, Magway and Ayerwady divisions, where severe deforestation and fuelwood shortage have been a prevalent and persistent problem (Lin 2004).

Forest Rules and CFI 1995 regulate sustainable forest management and forest plantation, and promote community participation. Importance is given to public participation in forest management and private sector involvement is highlighted in CFI (FAO/RECOFTC 2016). Community Forest Management initiatives are often the manifestation of rural communities' response to forest degradation, meaning degradation creates an incentive for forest communities to invest traditional knowledge and practices in conservation, reforestation, control of forest fires, and fighting illegal forest exploitation and encroachment. Communities are in the best position to manage and protect forests if they participate in decision-making about the sustainable use of forest resources (Jashimuddin and Inoue 2012).

Establishment of Community Forests has been a promising way to rehabilitate

degraded landscapes, improve farming through enhanced soil and water quality to supply the basic needs (fuelwood and fodder) of the rural poor. Since participatory forest management has been widely applied in many developing countries, the local communities and management of their forest and resources should be treated within a decentralized framework and appropriate regimes such as secure land tenure and well-defined forest user rights (Lin 2004). According to Myint (2017), establishment of community forestry is one of the top three priorities to address the drivers of deforestation and forest degradation in Taunggyi. It further goes on to state that to address forest degradation, it is reduction in the dependency on natural resources. In particular, it is essential to tackle poverty and provide alternatives to local communities, in order to sustain the forest resources.

Compared to other Asian countries, the implementation of community forestry in Myanmar has been slow. At the end of 2003, the coverage of community forestry established across the country had reached only 34,000 ha, representing a mere 0.1 per cent of the country's forestland (Lin 2004). This last decade, however, has seen increased commitment by the state to community-oriented forest management. Till 2012, a total of 47,203 ha of CF had been established under the 1995 CFI (FAO/RECOFTC 2016).

Nepal's community forestry program has achieved notable successes in terms of improving the forest conditions and rural livelihoods. (Acharya 2002) Myanmar can learn vital lessons from Nepal's community forestry program as it has been successfully regulating itself for the last three decades. According to the Department of Forests in Nepal, about 29.2 per cent of forest area has been managed and is benefitting 40 per cent of households through local employment generation and enhanced empowerment of many civil society organizations (FAO/RECOFTC 2016). Community forests have increased the participation and incomes of the rural poor, women and *Dalits* (lower-caste groups). It has also enhanced the capacity of local people for planning and implementing forestry and other development work. Similarly, community forests have created natural capital in the form of new forests, and improved existing forest conditions and biodiversity. According to (MoFSC 2013), forest conditions have improved overall since the handover to CFUG with 86 per cent showing improvements in forest conditions (Pandey and Paudyal 2015).

With some conservation activities at hand, the biomass observed from Lwe Pya village, from this study, turns out to be the highest (354.42tons/ha). San Phoo village has established a proposed community forestry system and it has the potential of storing 254.5tons of carbon per hectare. These villages however have the lowest annual household income (USD 618.32 and USD 408.5 respectively), drawing the need for improvement in living standard of the rural population. This will be possible by providing income generating opportunities to these villages through establishing a sustainable forest management system.

Villages with open access forest have the potential of converting into a CF management and improving livelihoods of local people. This will improve the

forest condition by passing over some responsibility to the forest users so that they can become more aware about using the forest resources sustainably and be responsible about the type and extent of forest activity that they practice.

Role of REDD+ in Promoting Community Forestry in Myanmar

While REDD+ as a results-based payment mechanism focuses on avoiding deforestation and forest degradation, conservation and enhancement of carbon stocks and reducing emissions, it simultaneously also promotes local participation in forest management activities as these contribute to emission reductions and enhancement of sinks. Conservation of forest and sustainable forest management are now recognized as important strategies for sustaining growth. Providing better livelihood options to forest-dependent mountain communities through incentives that enhance ecosystem services is now the new paradigm. This result-based management of forest resources is the basis for REDD+ (ICIMOD 2018b). REDD+ has been helping forest dependent communities in Nepal to improve their livelihoods by providing participatory forest management opportunities. At this point, it seems vital to provide the local communities in Myanmar with similar opportunities to participatory approach in forest management. Only a few proposed community forestry systems exist in Taunggyi district and so necessary steps are required to convert this proposed system into a full-fledged management system.

It is possible to be optimistic about the future of community forest management system in Myanmar as we see locals actively participating in activities related to sustainable forest management. In addition, a higher rate of women participation in forest management activities was observed during the survey which, despite having three decades of community forestry experience, is not even witnessed in Nepal. Among those interviewed for this study, 50.3 per cent were female respondents, proving that women were more enthusiastic to engage in participatory activities. The observations derived from this study highlight the need of a proper participatory management system. As seen from above the insignificant difference between firewood consumption, but a large significant difference in biomass results shows that the quality of forests could be improved with a sustainable management system similar to a community-based forest management.

CONCLUSION

Myanmar is regarded as one of the richest countries in Asia in terms of biodiversity. Environmentalists fear that the country's rapid economic liberalization since the late 1980s will lead to uncontrolled environmental degradation. Additionally, lack of clear legal frameworks and growth objectives, along with poor governance, could threaten the future of Myanmar's wealth of resources. Taunggyi district is reported to be the top priority in establishing REDD+ activities since various drivers of deforestation and forest degradation are prevalent here.

From this study, we observe that people's dependency on forests differs in conserved and open access forests as households consume 0.89 tons and 1.08 tons of fuelwood respectively. Similarly, the forest conditions in terms of tree

diversity, canopy coverage, regeneration and aboveground biomass are significantly better in the conserved forest. There is a need for effective conservation practices that link community participation to forest management, since a majority of the households (68.71%) surveyed have an annual household income of less than USD 1,200. Adopting efficient participatory forest practices in these areas can bring improvements in local livelihoods as well as forest condition. Mobilization of community forestry can lead to enhanced income and revenue generation through fair and equitable distribution of benefits within the CFUGs which in turn reduces poverty and dependency on forests.

REDD+ has been looking for opportunities of improvement in forest management in various rural communities of developing nations. Taunggyi district of Myanmar is one such place with the highest potential possible for improved use of their natural resources. With household firewood consumption of 1 ton each year, the villages are dependent on firewood especially for daily household purposes. The local communities who are forest dependent are aware about the important of forest conservation. Local villagers are also conserving their forest as a source of water and in the name of religious beliefs. They are increasingly using alternative options for firewood like corn cobs and pigeon pea plants. There is a potential for forest conservation and development in Myanmar, especially with inclusion of the locals. Thus, it is vital in the case of Myanmar to promote local participation to improve the wellbeing of the forest dependent communities through improving the wellbeing of the natural forests. To bring increasing number of forest under community forestry is important not only for sustainable management of forest resources but also for livelihood development of local community and long-term improvement in forest conditions. Community forestry, in this context has the potential to capture synergies between local community and government bodies Thus, Community based forest management system can be effectively implemented in the rural communities of Myanmar to explore the best practices of forestry most suitable for these areas.

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