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**Resource Utilization at Enclave Settlements: Impacts thereof for
Forest Reservation**
**(Case study in Zawgyi Reserved Forest, Ywangan Township,
Myanmar)**



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ရှမ်းပြည်နယ်(တောင်ပိုင်း)၊ ရွှင်မြို့နယ်၊ ဇော်ဂျီကြိုးဝိုင်းအတွင်း အခြေချနေထိုင်သူများ၏
သစ်တောသယံဇာတအပေါ် မှီခိုအသုံးပြုမှုများကြောင့် သစ်တောကြိုးဝိုင်းများအပေါ်
သက်ရောက်မှုများအားလေ့လာခြင်း

စုမြတ်မွန်၊ တောအုပ်ကြီး

စာတမ်းအကျဉ်း

သစ်တောနယ်မြေများအတွင်း အခြေချနေထိုင်သူ ဒေသခံပြည်သူတို့၏ လူဦးရေတိုးတက်မှုနှင့် လူမှုစီးပွားရေးအခြေအနေများသည် သစ်တောမြေအသုံးချမှုနှင့် သယံဇာတများအပေါ် တိုက်ရိုက်အကျိုးသက်ရောက်လျက်ရှိပါသည်။ သို့ဖြစ်ပါ၍ သစ်တောသယံဇာတများ စနစ်တကျ စီမံအုပ်ချုပ်နိုင်ရေးအတွက် ဇော်ဂျီကြိုးဝိုင်းအတွင်းရှိ ကျူးကျော်အိမ်ထောင်စုများ၏ မြေအသုံးချမှုပြောင်းလဲလာပုံနှင့် သယံဇာတ ထုတ်ယူသုံးစွဲမှုများ၊ ၎င်းတို့အပေါ် သက်ရောက်သည့် အခြေအနေများနှင့် တိုးပွားလာသည့် လူဦးရေနှင့် စားဝတ်နေရေးအတွက် မြေယာချဲ့ထွင်နိုင်မှုနှင့် သစ်တောသယံဇာတများအပေါ် မှီခိုမှု အလားအလာများအား လေ့လာခဲ့ပါသည်။ သုတေသန လေ့လာတွေ့ရှိချက်များအရ စာရင်းကောက်ယူခဲ့သည့် ကျေးရွာများသည် ကြိုးဝိုင်းမဖွဲ့စည်းမီ အချိန်ကပင် တည်ရှိခဲ့သည့်အတွက် ကြိုးဝိုင်းဖွဲ့စည်းချိန်၌ ဆိုင်ရာဆိုင်ခွင့်သတ်မှတ်ပေး၍ ရွာမြေနှင့် လယ်မြေများအား ကြိုးဝိုင်း ဧရိယာအတွင်းမှ ချန်လှပ်ခဲ့သော်လည်း လူဦးရေ တိုးပွားမှုလာမှုကြောင့် ကျေးရွာမြေနှင့် လယ်မြေများ ထပ်မံချဲ့ထွင် နေထိုင်လျက်ရှိပါသည်။ စိုက်ပျိုးရေးသည် အခြေခံစားဝတ်နေရေးလုပ်ငန်းဖြစ်ရာ မြေယာဖော်ထုတ်ခြင်း၊ သစ်တောဧရိယာအချို့ ခုတ်ထွင်ရှင်းလင်း၍ ကော်ဖီစိုက်ပျိုးခြင်းနှင့် ယခင် ဆိုင်ရာဆိုင်ခွင့် သတ်မှတ်ချက်များထပ်မံမရှိ၍ တရားမဝင်သစ်ထုတ်ယူခြင်းများ ဆောင်ရွက်လျက်ရှိကြောင်း တွေ့ရှိရပါသည်။ တောင်ကျချောင်းရေ စီးဆင်းမှုအပေါ် မူတည်၍ လယ်မြေတည်မြဲမှုမရှိခြင်း၊ သွားလာရခက်ခဲခြင်းတို့ကြောင့် လူမှုစီးပွားရေးအတွက် သစ်တောဧရိယာအချို့ ခုတ်ထွင် ရှင်းလင်း၍ ကော်ဖီနှင့် ဥယျာဉ်ခြံ စိုက်ပျိုးခြင်း၊ တရားမဝင်သစ်ခုတ်ခြင်းများအပေါ် အဓိကမှီခိုလျက်ရှိရာ ဒေသခံများအတွက် အလုပ်အကိုင် အခွင့်အလမ်းများဖန်တီးပေးခြင်း၊ ဒေသခံပြည်သူများ ပူးပေါင်းပါဝင်သော သစ်တောထိန်းသိမ်းခြင်း၊ သစ်တောသယံဇာတများစနစ်တကျ ထုတ်ယူသုံးစွဲခြင်း စသည်များ ဆောင်ရွက်ပေးရန် လိုအပ်ကြောင်း လေ့လာတွေ့ရှိရပါသည်။

**Resource Utilization at Enclave Settlements: Impacts thereof for Forest Reservation
(Case study in Zawgyi Reserved Forest, Ywangan Township, Myanmar)**

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Abstract

Peculiarities of enclave settlements are limited livelihood options and direct impacts on land use change with the growing population. This study aimed to examine land use and resource use patterns in enclave settlements. Moreover, determinants of agricultural expansion and illegal logging were also clarified. Two villages that are enclave settlements situated inside the Zawgyi Reserved Forest and which were engaging in illegal logging were selected as study sites. Face to face interview was conducted to every household in both villages to collect the household data of resource utilization and land use. Major subsistence base was farming and illegal logging was alternative option. Current farmland cannot supply the increasing population and thus forest land became the option for the solution of land shortage. Villagers were clearing forest for coffee plantation as alternative livelihood. Another options for household income source was illegal logging which was introduced to this area by external conditions like dam construction and logging concessions. Either landless households or land holders were engaging on the income from illegal logging because their alluvial cultivation land is unstable for regular income and no income was recorded from hillside plantation yet. Thirty six households (48%) of local people were engaging in illegal logging from which 6 HHs (16 %) were farmers. Likewise, farmers and wage workers are relying on the illegal logging as alternative. Neither land ownership nor household characteristics was related to the household decision for illegal logging. For their future livelihood development, 53% of population wanted to change their livelihood to agricultural production while the remaining households including illegal loggers wanted to continue their current livelihood activities. Majority of land owners responded that their farmland was not adequate for their subsistence. Therefore, potential demand for forest land clearing and illegal logging were expected to be continued in the study areas. Trade-off between forest land clearing and local illegal logging had become a challenge for the policy makers.

Keywords: Agricultural expansion, Clearing forest land, Encroachment, Illegal logging, Livelihood limitation

**Resource Utilization at Enclave Settlements: Impacts thereof for Forest Reservation
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1. Introduction

Myanmar faces the second highest rate of forest loss in Southeast Asia, following Indonesia. Agricultural expansion and over exploitation of forest resources are major driving forces of deforestation in Myanmar (Htun, 2009). Agricultural expansion into the forest such as slash-and-burn is the main activities of cultivating landless people and also is a result of decrease in crop production and increase demand of households (Hlaing et al., 2017). Agriculture expansion is at the expense of forest cover (Angelsen et al., 2014) and leads a significant loss of forest areas. Population dynamics such as population density, fertility, household demographic composition and in-migration cause forest land conversion to other land use (Hurtt et al., 2006).

Agriculture and forest income are alternative developments (Angelsen et al., 2014). Forests contribute 33% -55% of household income especially for food, livestock fodder, energy and cash income (Aung, Adam, & Pretzsch, 2014; Hlaing & Inoue, 2013; Hlaing, Kamiyama, & Saito, 2017; Htun, Wen, Chan, & Ko, 2017; Khaine, Woo, & Kang, 2017; Moe & Liu, 2016; Oo, Park, Woo, Phonguodume, & Lee, 2011). Hlaing et al., (2017) founded in her research that illegal logging is usually committed by the outsiders and negatively effects on the collection of forest products of local people. But in some cases, local people are observed that engaging in illegal logging activities because of their lower socio-economic status and harvesting machines like chainsaw, are also easily available in market with reasonable price. Illegal logging mostly happens in remote areas where less law enforcement is intense, and it is explained by poverty, lack of alternative income, and high transaction cost for local small holder illegal logging (Amacher, Merry, & Bowman, 2009).

Moving forward to classify legal forest land in line with the national target, however, highly forested areas still remain as unclassified land category and open access. In rural Myanmar, legally classified forest areas are threatening from local people's encroachment and land use conversion to agricultural land. Since land use is prioritized inter alia in policy measures to oversee overall existing land use in a country with a full enforcement of forest law to regulate any forest land misuse, forest encroachment happens to not only open access unclassified forest but also the gazette land. Actually, those encroachments were mostly caused by the forest dependent population living frontiers and or inside natural forest areas. The proximity to the forests and remoteness from the government control may cause uncontrolled utilizations of forest resources.

Majority of local people are forest dwellers living around the forests, so their role in land use and resources utilization are needed to be well understood in formulating the regulations to deal with the management of the forest and land resources. Therefore, this study focus on local land use pattern and forest resource utilization to find out the determinants of land expansion and smallholder illegal logging taking two enclave villages inside a "State-owned Reserved Forest". The above literature review on the given situation for illegal logging and forest encroachment in Myanmar have reached the following research question: How the land use and livelihood have developed at the enclave settlements? And, whether the current management policy can cope with local conditions?

2. Objectives

Peculiarities of enclave settlements are that livelihood options are limited and population growth directly results in a land use change from forest to non-forest. Existence of an enclave may trigger further migration inside the forest. Overall objective of this research is to understand the local dependency on forest and land resources in order to develop a management scheme that harmonizes the rural development and national forest management. By addressing the following specific objectives:

1. To assess the current land use and resource utilization of the enclave communities in reserved forest and local determinants.
2. To examine the potentials of local encroachment and forest resources dependency for recommendation of resource management in the study area.

3. Methodology

In this chapter, general information of the study site and the historical background of selected areas were explained and followed by the data collection and data analysis.

3.1 Study Site

The research was conducted in two villages which are located in the external boundary of Zawgyi Reserved Forest (RF) in northern part of Ywangan Township which is situated in the southern Shan State, Myanmar. Zawgyi RF was established in 1910 during British colonial periods (1824-1948) with area coverage of 1,891 km² exclusive of the villages inside the external boundary and their belonging cultivated land dotted along the bank of Tadani stream that was the western boundary line. Zawgyi RF involves the forest areas situated in the States (the term change to Township after colonial era) of Ywangan, Maw, Lawksawk and Pangtara, of the southern Shan State (Burma Gazette, 1910). Maw state was later combined with the Ywangan Township.

The study villages have been resided in this area before Zawgyi RF was designated. These two villages were included in the part of Maw State which became a Myogyi Beat, which is a smallest forest management unit. The elders in the villages said in the interview that these villages were formed by the resettlement of six founders in Village A and three brothers in village B. So the villages have a history of more than 100 years. Later and later, population had increased to nine households (HH) in Village A and fourteen households in Village B at the time of reservation. In addition to the areas exclusion, their rights admitted and privileges granted in the Zawgyi were described in the gazette.

As a result of population increase, though, their settlement areas had expanded and encroached again into the RF though forest clearing and building were prohibited within the RF. By the time the data was collected in 2017, Village A had 53 households with the population of 257 and Village B had 22 households with the population of 86. There were immigrants households in each village.

Villages were in a remote area from market place and the government services. It took one and a half hours across the Dam which is about 13.7 km distance by motor boat and four hours to travel 9.99 km by foot path crossing stream against with the water current and along the edge of the forests, but sometimes it took longer when the water current is strong. The location of the study areas and transportation conditions are shown in Figure 1 and 2.

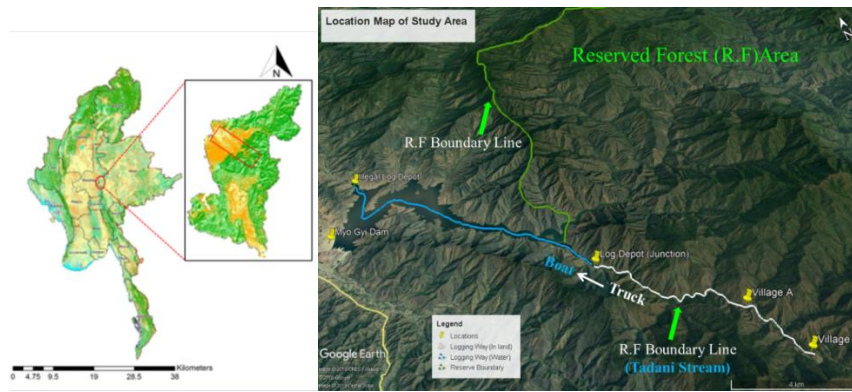


Figure 1. Locations and accessibility conditions of study villages (Google earth map)
(Source: Land cover map of Myanmar and Ywangan Township collected from Forest Department in Myanmar at 26-10-2017 and Google map of the study site was accessed by 13-5-2017)

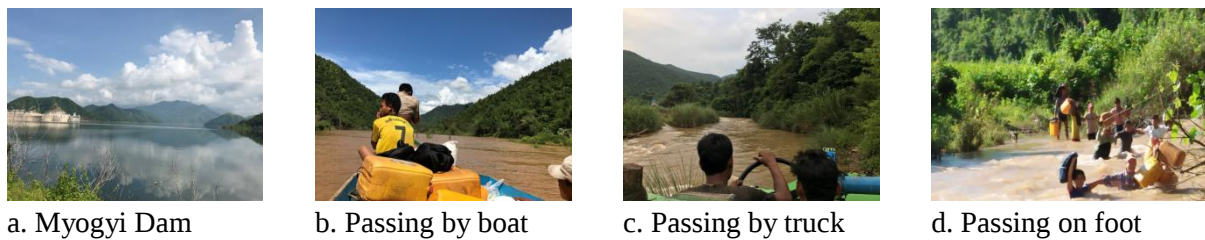


Figure 2. Myogyi Dam and transportation conditions of water way and inland

3.2 Data Collection

Secondary data was collected from township forest department. Key informants interview was made with township officers to know the general information of the encroached settlements and illegal logging. The village's livelihood activities and the information of resource utilizations were gathered through informal discussion with local people, village head, village affair committee members, and youth group.

Household interviews were conducted face to face by using semi-structured questionnaire which was dividing into three main parts: 1) demographic characteristics, 2) land use and livelihood conditions, and 3) future livelihood option and possible solution for land requirement. The whole survey was done in September 2017.

The respondents are the household heads or their spouse (if the household head is absent) or other adult members. Two HHs staying in the villages less than six months were not considered in the household interview.

3.3 Data Analysis

All the socioeconomic data obtained from household interviews were analyzed using Microsoft Excel 2010 and IBM SPSS 24. Land use pattern was checked with field observation. Since basic demographic characteristics of Village A and B were not different as shown in following Table 1, both villages were considered as a whole population for further analysis.

The income sources were categorized into four main groups; agricultural income, forest income, wage income and income from other activities. Annual household incomes were calculated by the sum of net income from all sources through the respondents' recalls. The descriptive data were mainly used in analysis and interpretation of the results.

SPSS was used for *Spearman's correlation* and *chi-square* test to reveal the relationship of HHs characteristics with agricultural land size and logging income, and, the association between land ownership and illegal logging. Finally, the potential for land expansion and illegal logging was discussed based on the descriptive analysis of the survey data.

Table 1. Demographic information of Village A and B

Household Characteristics (mean value)	Unit	Village A n=53	Village B n=22	Total N=75
HH size	person	4	4	4
Age of HH head	year	43	43	43
School years	years	4	4	4
No. of adult labor	person	3	3	3
No. of Male adult labor	person	2	2	2
Resident years	years	31	31	31
Settlement land size	m ²	600	600	600
Agricultural Land size	m ²	6000	6000	6000

4. Results and Discussion

This chapter will explain current land use condition of the villages and resource utilization at the villages where illegal logging become livelihood importance. Relationship between land ownership and illegal logging are also examined. Local people's perception for their livelihood development is expressed by descriptive analysis.

4.1 Local Land Use and Expansion

Different land uses such as human settlement, farmland, home garden, orchard and Ya were observed in the study areas.

Village A was a cluster settlement type and Village B was linear type. Homestead areas were normally created by clearing the forests on the gentle slope but some families share the existing settlement area with their parents.

Paddy fields, formed of alluvial soil deposits, were dotted along the bank of the Tadani stream, which is the boundary line of the reserve. There were Kaing (in local term) on which annual crop such as maize, sesame and other kitchen crop like tomato, egg plants were cultivated.

Total 47 HHs had land for cultivation in which 36 HHs had farmland with an average land size was 7000 m² per HH, 2 families had Ya which was 22,000 m² per HH and 9 families had both farmland and Ya with their average land size was 18,000 m² per HH. Land ownership and average area by land categories were shown in Table 2.

Table 2. Land use category and land size in villages

Land category	No. of HH	Minimum area (m ²)	Maximum area (m ²)	Mean area (m ²)
Settlements	75	10	10,000	700
Upland paddy	36	2,000	1,800	7,000
Hillside cultivation(ya)	2	4,000	44,000	22,000
Both type	9	8,000	64,000	18,000

According to the topographical conditions and barriers of their spiritual control forest, settlement area expansion was reported to the eastern edge of the RF areas and migration between villages was also found.

The bank of the stream was fully occupied by paddy fields belonging to both villages. Paddy field area can easily be altered by the yearly water current; some paddy fields were become larger, some were newly formed and some were destroyed. Therefore, clearing the forest for coffee plantations became local adaptation for land shortage. Table 3 compares the land area recorded in 2013(National encroachment survey) and data collection time in 2017.

Table 3. Population, land use and land expansion between 2013 and 2017

	Unit	2013 survey		2017 data collection	
		Village A	Village B	Village A	Village B
No. of HH	HH	58	13	53	22
Population	person	257	47	233	86
HH size	person	4	4	4	4
Village settlement area	m ²	42,694	11,695	48,830	22,182
Farm land area	m ²	122,417	32,375	23,000	88,000
Other land use(ya , orchard)	m ²	0	0	60,000	72,000

4.2. Livelihood Importance and Resource Utilization

Major livelihood base was agriculture. Four livelihood activities were observed: farming, forest resource extraction, wage labour and others such as carpenter, a compounder, and shopkeepers. Farming (agriculture and livestock raising) and illegal logging represent 47% and 40% of total households while wage HHs was 12% and 1% relied on income from other activities. However, rural livelihood in reality is diverse and local people are relying upon alternative livelihood activities to make their household income sufficient.

Among farm HHs, 6HHs were engaging in illegal logging, 16 HHs in wage, 5 HHs do others activities and collect NTFP. 26 HHs of loggers were farmers and 21 HHs were wage labours while 1 HH were doing other activities and 7 HHs collecting NTFP. In total, 36 HHs representing 48% were engaging illegal logging. Likely, though 9 HHs' major income earned from wage work, farming and NTFP collection were their secondary income sources. There was one HH who mainly depends on the other livelihood activities.

Farm income was the highest at 473 USD per HH per year followed by logging income which was 454 USD per HH per year. Wage income, others activities and NTFP were 50 USD, 7 USD and 1 USD respectively. Farming and illegal logging were important for the local livelihood. The seasonal calendar in Figure 3 shows the livelihood opportunities of study areas throughout a year.

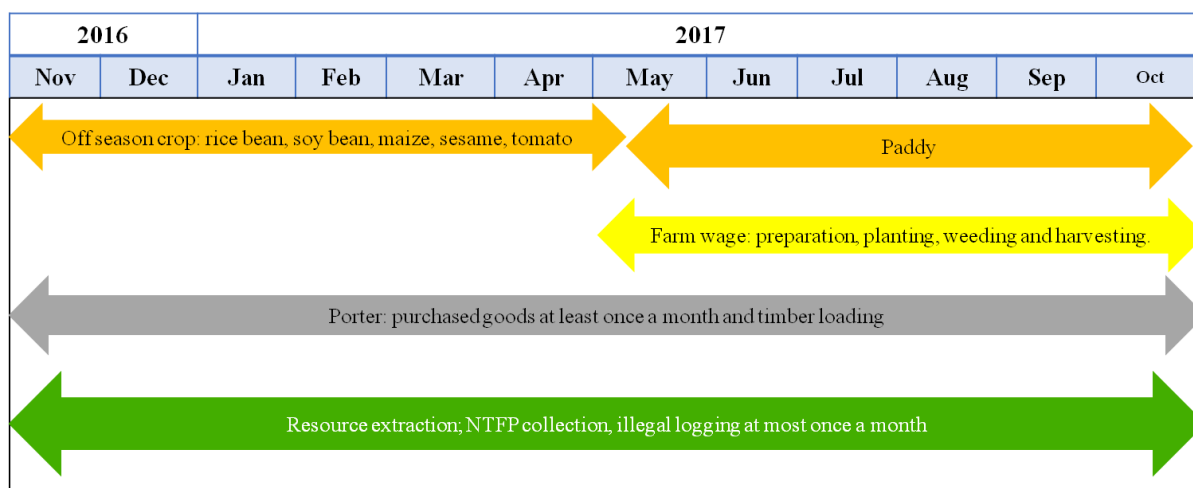


Figure 3. Village livelihood calendar

Illegal logging was the second importance livelihood activity in villages. The species mostly harvested were Thitya(*Shorea obtusa*), Ingyin(*Shorea siamensis*), In (*Dipterocarpus tuberculatus*). The total harvested volume of timber was approximately 230 m³(cubic meter) per year. Illegal logging is the major forest resource utilization though they collected NTFP.

Illegal logging started in this area eight years ago, when the concession companies enter for logging in the Zawgyi RF as sub-contractors under Modified Procedure (MP) system. Chainsaws leftover in the concession areas were then used by local people for firewood collection and later felling trees and processing. A truck, taken over from the company was now used for timber transportation from villages to water frontier where timbers were brought by motor boat passing through a Myogyi Dam. Dam became a barrier for local access to market, however, log transportation became easier by the water way. Illegal logging path was shown in Figure 4.

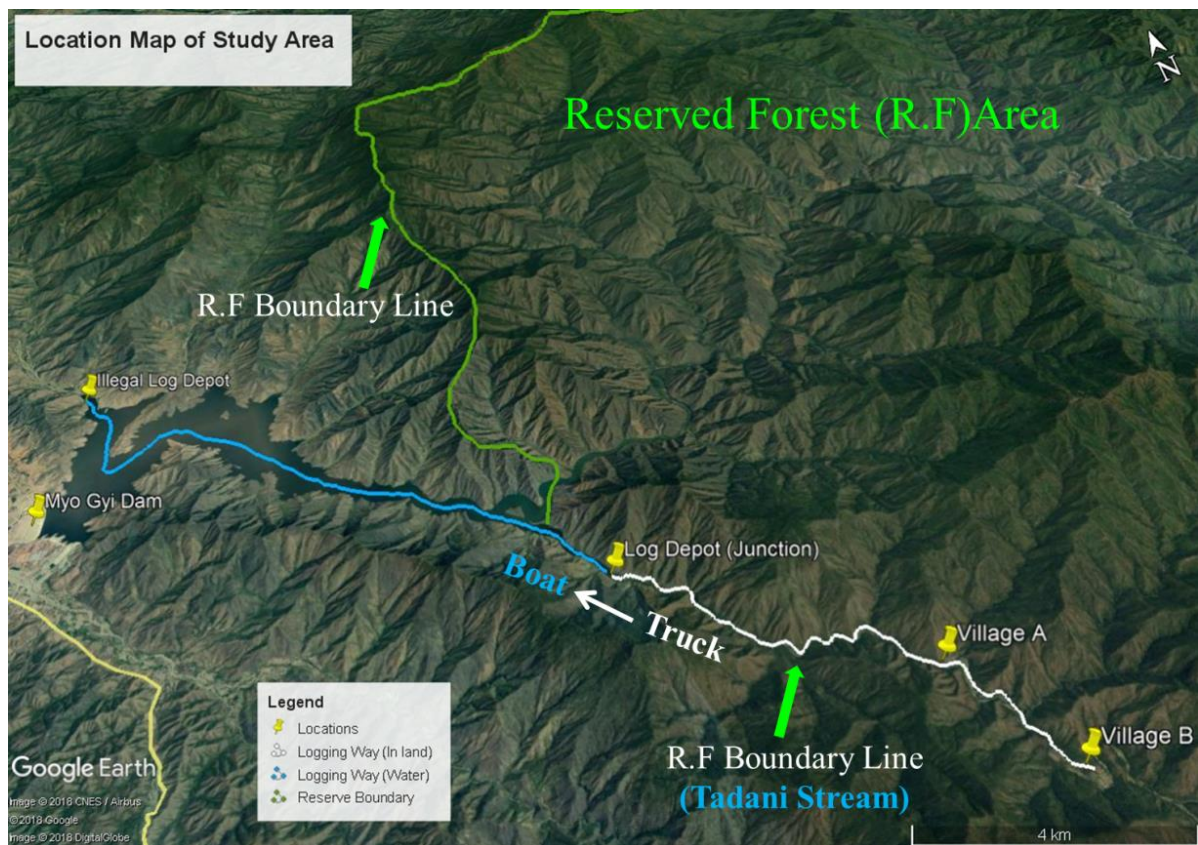


Figure 4. Location map of villages, dam and logging path (Google earth map)

4.3 Local Determinants for Land Expansion and Illegal Logging

Clearing of forest areas and logging without prior permission were legally prohibited. However, no regulations were enforced in these enclave villages. Moreover, there is no relationship between land holding and illegal logging meaning that land ownership has no impact on the livelihood decision of engaging in illegal logging (see Table 4).

Again in correlation analysis table (Table 5), the significant was found with age of HH head and resident years in negative relationship with logging income. So, younger HHs and new comers were more likely to engage in illegal logging. Likewise, regarding farmland, age of HH head, their resident years, adult labour and male labour show significant relation with the land size. Younger HHs and new comers were highly possible to be land less, so impacts of land ownership on illegal logging can be indirectly expected. Though, it was not significant, very weak negative relation was found with agricultural land size in analysis table.

There were other external factors like natural conditions (unexpected but need to find put the causes), infrastructure development and logging concession. Is that small scaled logging destructive to natural forest? Impacts of illegal logging cannot be directly illustrated since forest inventory was the limitation in this study and the author was not accompanied to logging sites. Negative impacts of logging activities could be pointed out from respondents' answers. Those who collected NTFPs like Intwel and Pwenyet cannot completely rely on these products because of less host tree such as *Dipterocarpus tuberculatus* and *Shorea siamensis* from which they collected. Those who relied on NTFPs changed their livelihood because of the scarcity host tree and they were now engaging in illegal logging. Not only NTFP collectors become hard to find products but also loggers were going further into the forests for logging.

Table 4. Effects of land ownerships on illegal logging

	Non-loggersn=39	Loggersn=36
Land holding HHs(n=47)	27	20
Land less HHs(n=28)	12	16

No association was found between land ownership and logging activities. ($\chi^2 (1) = 2.06, p > 0.05$)

Table 5. Correlation analysis of socio-economic characteristics with logging income

	HH size	Age of HH head	HH adult	Male labour	Resident years	Agricultural land size	Logging income
HH size	1						
Age of HH head	0.137	1					
HH adult	0.629**	0.537**	1				
Male labour	0.549**	0.493**	0.859**	1			
Resident years	-0.041	0.509**	0.206*	0.163	1		
Agricultural land size	0.196	0.483**	0.433**	0.394**	0.456**	1	
Logging income	0.136	-0.258*	0.002	0.013	-0.282*	-0.067	1

** Significant at $p < 0.01$ (2-tailed)

* Significant at $p < 0.05$ (2-tailed)

4.4. Future Livelihood Decision

Local people were willing to increase their agricultural production. They proposed to have more land for cash crop and expected the support of agricultural technique. Better accessibility was also recommended for trading their agricultural goods. Majority of them responded that they wanted to change their livelihood to agricultural base, but 35 HHs representing 47% of HHs responded that they will continue current livelihood, among then 13 HHs were illegal loggers.

For their livelihood development, the role of land resources became essential. Thirty-seven percent of the respondents answered that the current land is adequate for their households while 63% demand more land for cultivation. Ten HHs answered that there was no more land that can be expanded, while 16 HHs want to find land in the forest area. Only one household answered that permission was needed from the authority concerned. So there is a potential of forest encroachment to the reserve.

5. Conclusion

Current reservation policy has weakness; although permanently used lands (settlements and farmlands) were excluded from classified forests at the final demarcation process, the fact of still continuing expansion suggests the boundary does not always function and population growth is one of the major factors to be considered in forest reservation. Since local people rights and privileges were legally described in notification at the time of reservation, the evident of agricultural expansion and illegal logging revealed that local livelihood strategy should be considered in forest demarcation.

Illegal logging is more likely to be carried out by the poor that do not have non-farm income, have larger area in forest reside far away from the urban centers (Amacher, Merry, et al., 2009). High

transaction cost to exploit timber legally and lower risk of being caught and criminalized are incentives for local people to engage in illegal logging (Amacher, Koskela, & Ollikainen, 2009; Mejia, Pacheco, Muzo, & Torres, 2015). Amacher, Merry, & Bowman, 2009 stated that smallholder decision to comply with the law or not is not only depend on the small holder characteristics, but also depends on the access to the timber market and institutional factors, mainly regulation. Agricultural expansion is not always the reason for livelihood development, legal procedure for local people to enter in legal timber market should be considered to control deforestation and rural development. Legalizing small scale illegal logging and improving agricultural practices can be the options to improve rural livelihood in this area.

Local response to land shortage and livelihood adaption show that site specific conditions are needed to be considering in further land reform and resource management policy. Again in current land re-classification process, population factor and local specific condition and livelihood strategy should not be underestimated.

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References

- Amacher, G. S., Koskela, E., & Ollikainen, M. (2009). Deforestation and land use under insecure property rights. *Environment and Development Economics*, 14(3), 281–303. <https://doi.org/10.1017/S1355770X0800483X>
- Amacher, G. S., Merry, F. D., & Bowman, M. S. (2009). Smallholder timber sale decisions on the Amazon frontier. *Ecological Economics*, 68(6), 1787–1796. <https://doi.org/10.1016/j.ecolecon.2008.11.018>
- Angelsen, A., Jagger, P., Babigumira, R., Belcher, B., Hogarth, N. J., Bauch, S., ... Wunder, S. (2014). Environmental Income and Rural Livelihoods: A Global-Comparative Analysis. *World Development*. <https://doi.org/10.1016/j.worlddev.2014.03.006>
- Aung, P. S., Adam, Y. O., & Pretzsch, J. (2014). Distribution of forest income among rural households : a case study from Natma Taung national park , Myanmar, (November), 37–41. <https://doi.org/10.1080/14728028.2014.976597>
- Babigumira, R., Angelsen, A., Buis, M., Bauch, S., Sunderland, T., & Wunder, S. (2014). Forest Clearing in Rural Livelihoods: Household-Level Global-Comparative Evidence. *World Development*, 64(S1), S67–S79. <https://doi.org/10.1016/j.worlddev.2014.03.002>
- Bryant, R. L. . (1997). *The Political Ecology of Forestry in Burma*. UK: Hurst & Company. Hurst & Company.
- Coomes, O. T., Barham, B. L., & Takasaki, Y. (2004). Targeting conservation – development initiatives in tropical forests : insights from analyses of rain forest use and economic reliance among Amazonian peasants, 51, 47–64. <https://doi.org/10.1016/j.ecolecon.2004.04.004>
- Hlaing, E. E. S., & Inoue, M. (2013). Factors affecting participation of user group members : comparative studies on two types of community forestry in the Dry Zone , Myanmar. *Springer*, 18, 60–72. <https://doi.org/10.1007/s10310-011-0328-8>
- Hlaing, Z. C., Kamiyama, C., & Saito, O. (2017). Interaction between Rural People ' s Basic Needs and Forest Products : A Case Study of the Katha District of Myanmar, 2017. <https://doi.org/10.1155/2017/2105012>
- Htun, T. T., Wen, Y., Chan, A., & Ko, K. (2017). Assessment of Forest Resources Dependency for local livelihood around Protected Area : A Case Study in Popa Mountain Park , Central Myanmar. <https://doi.org/10.18483/ijSci.1176>
- Hurt, G. C., Frolking, S., Fearon, M. G., Moore, B., Shevliakova, E., Malyshev, S., ... Houghton, R. A. (2006). The underpinnings of land-use history: Three centuries of global gridded land-use transitions, wood-harvest activity, and resulting secondary lands. *Global Change Biology*, 12(7), 1208–1229. <https://doi.org/10.1111/j.1365-2486.2006.01150.x>
- Khaine, I., Woo, S. Y., & Kang, H. (2017). A study of the role of forest and forest-dependent community in Myanmar. *Forest Science and Technology*, 10(4), 197–200. <https://doi.org/10.1080/21580103.2014.913537>
- Khin Htun. (2009). *Myanamar Forestry Outlook Study*.

- Luckert, B. M. C. , M. K., Cavendish, W., Veeman, M., Beckley, P. C. B. and T., Luckert, T. S. V. and, K, M., Bev Sithole, P. F., T. S. V. (2002). *Uncovering the Hidden Harvest, Valuation Methods for Woodland and Forest Resources*. (B. M. C. and M. K. Luckert, Ed.).
- Mejia, E., Pacheco, P., Muzo, A., & Torres, B. (2015). Smallholders and timber extraction in the Ecuadorian Amazon: amidst market opportunities and regulatory constraints. *International Forestry Review*, 17(1), 38–50. <https://doi.org/10.1505/146554815814668954>
- Moe, K. T., & Liu, J. (2016). Economic Contribution of Non-timber Forest Products (NTFPs) to Rural Livelihoods in the Tharawady District of Myanmar. <https://doi.org/10.18483/ijSci.904>
- Oo, T. N., Park, Y. D., Woo, S. Y., Phonguodume, C., & Lee, K. (2011). Contributions of Community Forestry to the Rural livelihoods and Watershed Conservation : A Case Study in Ywa Ngan Township , Shan State , Myanmar.
- Panayotou, T., & Sungsuwan, S. (1994). *The Causes of Tropical Deforestation*. (K. Brown & D. W. Pearce, Eds.). England: University College London.
- Vasco, C., Torres, B., Pacheco, P., & Griess, V. (2017). Forest Policy and Economics The socioeconomic determinants of legal and illegal smallholder logging : Evidence from the Ecuadorian Amazon. *Forest Policy and Economics*, 78, 133–140. <https://doi.org/10.1016/j.forpol.2017.01.015>