

The Republic of the Union of Myanmar
Ministry of Natural Resources and Environmental Conservation
Forest Department



**Household Wealth Status and Utilization of Non-Timber Forest
Products (NTFPs) in Pinlaung Township, Shan State**



Kyi Lei Cho, M.Sc Student
Dr. Tin Min Maung, Professor
Dr. Nyein Chan, Lecturer
University of Forestry and Environmental Science

December, 2017

Table of Contents

စာတမ်းအကျဉ်းချုပ်-----	i
Abstract-----	ii
List of abbreviations-----	5
1. Introduction-----	6
2. Materials and methods-----	7
2.1 Study area-----	7
2.2 Data collection-----	7
2.2.1 Reconnaissance survey-----	7
2.2.2 Primary data collection-----	8
2.2.3 Secondary data collection-----	8
2.3 Sampling techniques-----	8
2.4 Data analysis-----	9
3. Results-----	9
3.1 Plant product categories-----	9
3.1.1 Food items-----	9
3.1.2 Medicinal items -----	10
3.1.3 Utensils and handicraft items -----	11
3.1.4 Construction material items-----	12
3.1.5 NTFPs for energy-----	13
3.1.6 ornamental items-----	14
3.2 Animal and animal product categories-----	14
3.2.1 Bushmeat-----	14
3.2.2 Honey-----	15
3.2.3 Medicines and other non-edible animal products-----	16
4. Discussion-----	16
5. Conclusion-----	17
6. Acknowledgement-----	17
7. References-----	17
8. Appendixes-----	-19

List of abbreviations

Focus Group Discussion	-	FGD
Participatory Wealth Ranking	-	PWR
Wealth Groups	-	WG
Number	-	No
Wealthy	-	W
Medium	-	M
Poor	-	P
Non-timber Forest products	-	NTFPs

အိမ်ထောင်စုအတွင်း ဆင်းရဲချမ်းသာကွာဟမှုနှင့် ကျေးလက်နေပြည်သူများ၏ သစ်မဟုတ်သည့် သစ်တောထွက်ပစ္စည်းများ၏ သုံးစွဲမှုပမာဏကို ဆန်းစစ်လေ့လာခြင်း

ကြည်လဲ့ချို၊ ဒေါက်တာတင်မင်းမောင်၊ ဒေါက်တာငြိမ်းချမ်း
သစ်တောနှင့်ပတ်ဝန်းကျင်ဆိုင်ရာ တက္ကသိုလ်

စာတမ်းအကျဉ်း

ဤစာတမ်း၏ ရည်ရွယ်ချက်မှာ ဒေသခံများ၏ အခြေခံလိုအပ်ချက်များအဖြစ် သုံးစွဲသည့်အပင်များ၊ တိရိစ္ဆာန်များနှင့် ၎င်းတို့၏ ထွက်ကုန်ပစ္စည်းများ၏ သုံးစွဲမှုပမာဏကို ဆင်းရဲချမ်းသာအလိုက် စာရင်းကောက်ယူရန် ဖြစ်ပါသည်။ သုတေသနကို ရှမ်းပြည်နယ်၊ တောင်ကြီးခရိုင်၊ ပင်လောင်းမြို့နယ်ရှိ သပြေကုန်းနှင့် ထိန်ပင်ကျေးရွာအုပ်စုတွင် သုတေသနပြုလုပ်ခဲ့ပါသည်။ ကျေးရွာအုပ်စု တစ်စုစီတွင် ရွာ(၃)ရွာ ကောက်ယူခဲ့ပြီး တစ်ရွာစီတွင် အိမ်ခြေ(၃၀)နှုန်းဖြင့် စုစုပေါင်း ရွာ(၆)ရွာအတွက် အိမ်ခြေ(၁၈၀)ကို စာရင်းကောက်ယူခဲ့ပါသည်။ သုတေသန ကောက်ယူရာတွင် ဆင်းရဲချမ်းသာခွဲခြားခြင်းကို ရပ်ရွာလူကြီးများ ပါဝင်ဆွေးနွေးခြင်း၊ ဈေးကွက် စစ်တမ်းကောက်ယူခြင်း၊ အိမ်ခြေအလိုက် စစ်တမ်းကောက်ယူခြင်း၊ သစ်တောသယံဇာတများကို မြေပုံဆွဲခြင်းနှင့် ရာသီအလိုက် ထွက်ရှိသော သစ်မဟုတ်သည့် သစ်တောထွက် ပစ္စည်းများကို စာရင်းကောက်ယူခြင်း စသည့် နည်းလမ်းများဖြင့် ပြုလုပ်ခဲ့ပါသည်။ သုတေသန၏ ရလဒ်များအရ ကျေးလက်နေပြည်သူများသည် အခြေခံလိုအပ်ချက်များကို ဖြည့်ဆည်းရန် အပင်များမှရရှိသော သစ်မဟုတ်သည့် သစ်တောထွက်ပစ္စည်း ငါးမျိုးနှင့် သတ္တဝါများမှရရှိသော သစ်မဟုတ်သည့် သစ်တောထွက်ပစ္စည်း လေးမျိုးတို့ကို အဓိကသုံးစွဲနေကြပါသည်။ ဒေသခံများသည် အပင်များမှရရှိသော သစ်တောထွက်ပစ္စည်းများကို အစားအစာအဖြစ် မျှစ်ကိုလည်းကောင်း၊ တပင်တိုင်မြန်နန်းကို ရိုးရာဆေးအဖြစ်လည်းကောင်း၊ လက်မှုပစ္စည်းအဖြစ် ဝါးမှပြုလုပ်သော ပစ္စည်းများကိုလည်းကောင်း၊ အမိုးအကာအဖြစ် သက်ကယ်ကိုလည်းကောင်း၊ ထင်းကို ချက်ပြုတ်ရာတွင် လောင်စာအဖြစ်လည်းကောင်း၊ အလှဆင်အပင်အဖြစ် သစ်ခွကိုလည်းကောင်း၊ သတ္တဝါများမှ ရရှိသော တောဝက်သားနှင့် ပျားရည်ကို လည်းကောင်း အသုံးပြုကြပါသည်။ လူတန်းစားခွဲခြားမှုနှင့် နှိုင်းယှဉ်ကြည့်မည်ဆိုလျှင် ချမ်းသာသူများသည် လက်မှုပစ္စည်းများ အနေဖြင့် တံမြက်စည်း (ဒေသအခေါ် ထမင်းဆိုင်းပင်)ကို တခြားလူတန်းစားများထက် အများဆုံးသုံးစွဲနေကြောင်း၊ ဆင်းရဲသူများသည် ဆေးဖက်ဝင်အပင်များအနေဖြင့် တောပန်းညိုကိုလည်းကောင်း၊ သတ္တဝါများမှရရှိသော ပစ္စည်းအနေဖြင့် ပျားရည်ကို သော်လည်းကောင်း၊ လောင်စာအဖြစ် ဝါးနှင့်ထင်းကိုလည်းကောင်း အများဆုံးသုံးစွဲ နေကြောင်း လေ့လာ တွေ့ရှိခဲ့ပါသည်။ ထို့အပြင် သာမန်လူတန်းစားများသည် လက်မှုပစ္စည်းအဖြစ် ကြိမ်ကိုလည်းကောင်း၊ ဆေးဖက်ဝင်အပင်များအနေဖြင့် တပင်တိုင်မြန်နန်းနှင့် တောရှောက်မြစ်ကို လည်းကောင်း သုံးစွဲလျက်ရှိပါသည်။ ဤသုတေသန၏ တွေ့ရှိချက်များ အရတိုင်းရင်းသား လူမျိုးများသည် သစ်မဟုတ်သည့် သစ်တောထွက်ပစ္စည်းများကို အခြေခံလိုအပ်ချက်များအား ဖြည့်ဆည်းရန်

နည်းအမျိုးမျိုးဖြင့် မှီခိုနေကြောင်း လေ့လာ တွေ့ရှိရပါသည်။ တောင်ပေါ်ဒေသများတွင် သစ်တောထွက်ပစ္စည်းများ၏ သုံးစွဲမှုပမာဏကို ကန့်သတ်မည်ဆိုပါက လမ်းပန်း ဆက်သွယ်ရေး ခက်ခဲမှုကြောင့် စားဝတ်နေရေး အခက်အခဲ တွေ့နိုင်ပါသည်။ ထို့ကြောင့် တောင်ပေါ်ဒေသများတွင် စဉ်ဆက်မပြတ် သစ်မဟုတ်သည့် သစ်တောထွက်ပစ္စည်းများ စီမံအုပ်ချုပ်မှုနှင့် ဆင်းရဲမွဲတေမှုလျော့ချခြင်းကို အကောင်အထည်ဖော်နိုင်ရန် ဒေသခံများ၏ အခြေခံ လိုအပ်ချက်များကို ထည့်သွင်းစဉ်းစားရန် လိုအပ်မည်ဖြစ်ပါသည်။

Household Wealth Status and Utilization of Non-timber Forest Products (NTFPs) in Pinlaung Township, Shan State

Kyi Lei Cho, Tin Min Maung, Nyein Chan

¹University of Forestry and Environmental Science, Yezin

Contact email: laypyaylay621@gmail.com

Abstract

This study was intended to explore wealth-related differences and similarities in the use of NTFPs for basic needs of local people. This study uses data from 180 sample households of the six villages in Pinlaung Township of the Taunggyi District. Data collection was carried out through focus group discussion (FGD), participatory wealth ranking (PWR), market survey, face to face household interview, resource mapping and seasonal calendar. This study found that there are five items in plant product categories and four items in animal and animal product categories for their basic needs. Bamboo shoot as food, *Vitis repens* as traditional medicine, other bamboo products as utensil and handicraft making, thatch as roofing material, firewood for energy in cooking and orchid as ornamental plants were commonly used in plant NTFPs, while boar as bushmeat and honey are used as animal and animal products. In terms of wealth status, poor households mostly collect NTFPs such as bamboo, *Eupatorium odoratum*, firewood and honey for basic needs. Medium households largely used rattans for utensils and handicraft makings, and *V. repens* and *Atalantia monophylla* as traditional medicines, even though not being significantly different among the groups. Wealthy households use commercialized products, especially *Thysanolaema maxima* (broom grass) not only for subsistence use but also for commercial purpose. This study suggests that traditional communities depend on NTFPs in various ways for their basic needs. If usage of NTFPs will be restricted in mountainous region, it can bring households into poverty because of poor transportation. Therefore, sustainable management of NTFPs and poverty reduction can be successful while basic needs of local people are taken into account.

Keywords: basic needs, non-timber forest products (NTFPs), poverty reduction, sustainable management, utilization, wealth status

Household Wealth Status and Utilization of Non-Timber Forest Products (NTFPs) in Pinlaung Township, Shan State

1. Introduction

Myanmar, the Republic of the Union of Myanmar, is endowed with rich natural resources. Total land area of the country is 676,577 sq.km and about 42.92% of the country area is still covered with forests of different types (Forest Department, 2016). The forest types are Tidal, Mangrove, Beach and Dune forests, Evergreen forests, Mixed Deciduous forests, Deciduous Dipterocarpus forests, Hill Evergreen and Sub-Alpine forests and Dry Thorn forests. According to Maung Maung Than (2015), logging for domestic consumption and exports, expansion of agriculture and tree plantations (especially rubber and oil-palm plantations), shifting cultivation, infrastructure development, and poverty are drivers of deforestation and forest degradation. Because of several factors, Myanmar became the third greatest annual forest area reduction in the world (FAO, 2015).

As 25% of the world's poor are directly or indirectly depending on forests for their livelihood (CIFOR, 2003), a rapid growth of interest in non-timber forest products (NTFPs) has emerged for rural development and conservation of natural resources because of these reasons (Marshall et al, 2003). Firstly, sustainable use of NTFPs could lead to a win-win situation for poverty reduction and biodiversity conservation (Golam et al.2008). Secondly, NTFPs can generate additional employment and income (Marshall et al, 2003). Finally, it can offer opportunities for NTFPs based enterprises (Subedi, 2006). Moreover, according to Saxena (2003), and Shiva and Verma (2002), NTFPs are more accessible to the poor and can also contribute to foreign exchange earnings. Furthermore, NTFPs harvesting is less ecologically destructive than timber harvesting and other forest uses (FAO, 2008). According to Gunatilake (1998), NTFPs harvesting needs to be done in an eco-friendly manner to augment rural income.

Forest-based activities in developing countries, mostly in NTFPs area, provide an equivalent of 17 million full-time jobs in the formal sector and another 30 million in the informal sector, as well as 13-35% of all rural non-farm employment (Duong, 2008). In traditional forest communities, many NTFPs may be used for subsistence while others are the main source of income (CIFOR, 2016). However, Belcher (2003) suggested that the lack of a common definition and terminology and the multiplicity of interest hinder research and development of NTFPs. The creation of a comprehensive and consistent classification system on NTFPs has been further limited (Belcher and Rulz-Perez, 2001). Among the many definitions of NTFPs, this research emphasizes on how people use forest resources and improving contribution of these resources to the livelihood of the world's rural people.

However, the extent of use (subsistence or commercialization), the quantities used and the value derived vary spatially and temporally depending on various household characteristics, including household wealth (Cavendish, 2000; Shackleton, 2006). As the suggestion of Ecological Economic Journal (2006), the dependence of farmers on NTFPs

mostly differs from region to region. Therefore, management, roles and dependence of different groups on NTFPs were given the highest priority in research (Ruiz et al., 1997). The research is focus on subsistence of NTFPs in comparison of household wealth status such as wealthy, medium and poor. The main objective of this paper is to explore wealth-related differences and similarities in the use of NTFPs for basic needs of local people, contributing to management of NTFPs while local livelihood is taken into account.

2. Materials and method

2.1. Study area

Pinlaung Township which is located in Taunggyi District, Southern Shan State was selected as case study for this research. It is in the Pa-O Self-Administered Zone of Shan State, Myanmar. Total areas of Pinlaung Township is 827,792 sq.km consisting of reserved forests, protected public forests, protected areas, land at the disposal of the government, farm land and other land. The majority of people living in Pinlaung Township are shifting-cultivators. Transport facilities had been improved by the government in 1996, especially Pinlaung-Pyinmana road. Bhamar, Kayin, Kayan and some other tribes are found in Pinlaung Township.

In 2003, Paunglaung Multi-purpose Dam was established in the east of Pyinmana 17.6 km away. Inundated acres were 9,708 acres due to the establishment of Paunglaung Dam. Before the establishment of Paunglaung dam, Thapyaykone and Htin Pin village tracts have 14 and 20 villages respectively. After the establishment of Paunglaung Dam in 2013, 10 villages and 13 villages in Thapyaykone and Htin Pin village tracts were water-logged respectively. These inundated villages were aggregated into Paunglaung Myo Thit. Evergreen forest and Upper-mixed deciduous forests consisting of many tree species like *Parashorea stellate* (Thingadu), *Xylia Xylocarpa* (Pyinkado) , *Hopea odorata* (Thingan), *Duabanga grandiflora* (Myaukngo), *Homalium tomentosum* (Myaukchaw) are found in Pinlaung Township.

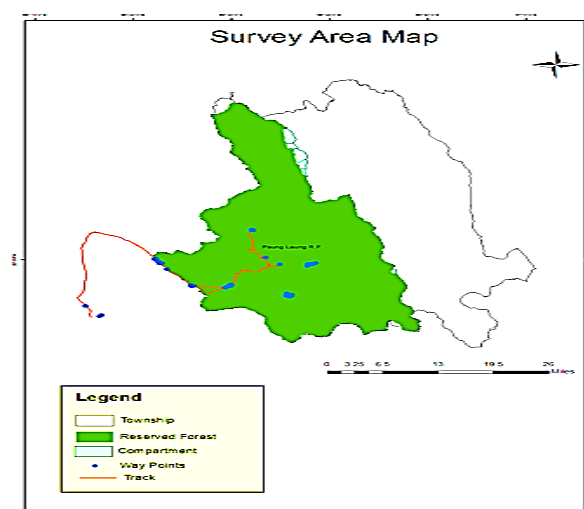


Figure 1 Location of case study villages

2.2. Data collection

2.2.1 Reconnaissance survey

Before the selection of village tracts and villages in Pinlaung Township, reconnaissance survey was carried out and structured questionnaires were tested in 20 households. Among the villages in Pinlaung Township, Taunggya, Kan Hla and Adin villages of Thapyaykone village tract and Lein Li, Kyaunk Moe and Yae Soe villages in Htin Pin village tract were purposively selected based on (1) many NTFPs dependency and local NTFPs trade activities and stakeholders (2) According to Aye Aye Tun (2007) , NTFPs collection is the secondary livelihood for the majority of people living in this area (3) reserved forest nearby (4) accessible and safety area and (5) constraints of time and funds of personnel.

2.2.2 Primary data collection

Field data collection was conducted from April to May in 2017. Both qualitative and quantitative methods were applied for data collection. These methods include market price method, participatory wealth ranking (PWR), direct observation, focus group discussion (FGD) consisting of 7 -12 people, resource mapping, seasonal calendar and household face to face interviews. Information such as available NTFPs in the area, places where they are collected, unit value of each NTFP, historical use of NTFPs and quantities of NTFPs collected per year for subsistence was collected in household surveys. During FGD, PWR was carried out including 10 to 15 villagers who are village heads, elder people, heads of the households and younger villagers. With the help of PWR, three groups of wealth status: wealthy, medium and poor were divided by the village members themselves according to their criteria. Combinations of multiple criteria together with the villagers' perception on each village were taken as determining factors for households' wealth classes and they were checked by direct observations. The main criteria of PWR include type of house, income per year, numbers of livestock that households possess and income earning opportunities (business or farming or labor).

2.2.3 Secondary data collection

Secondary data were collected from Government offices, including township level, district level and also head office of Forest Department.

2.3 Sampling techniques

In each case study village, 30 households were selected according to stratified random sampling with the use of participatory wealth ranking. In stratified random sampling, the sample size can be based on a comparatively small proportion of the target population. The survey managers may decide, to base the sample size, on being able to measure, reliably,

a characteristic held by 5% (or 10%) of the population – the exact choice dependent upon budget consideration (Neuman, 2006). The aim of the stratified random sampling is to reduce the potential for human bias in the selection of cases to be included in the sample result. This method provides us with a sample that is highly representative of the population, assuming there is limited missing data. Table 1 shows that total and sample households in six villages.

Table 1: Total households and sample size of six villages

Villages	PWR households			Sample households			Total
	Rich	Medium	Poor	Rich	Medium	Poor	
Kyaunk Moe	15	14	21	9	9	12	30
Yae Soe	16	52	77	3	12	15	30
Lein Li	18	30	123	3	6	21	30
Adin	4	43	32	3	15	12	30
Taunggya	52	170	78	5	15	10	30
Kan Hla	69	31	34	14	8	8	30

(Adapted from Neuman, 2006)

2.4 Data analysis

Firstly, descriptive statistics were also used for presenting quantities of NTFPs for subsistence used by local people. The results are presented and interpreted through text, tables and figures. Secondly, the differences of NTFPs usage and collection across the three different wealth strata were analysed by the use of non-parametric Kruskal-Wallis tests as data in this research showed to be deviated from normal distribution within variable groups (Dytham, 2011). Kruskal-Wallis test is to compare the scores on some continuous variable for three or more groups. This method compares mean rank for each group and it is a “between groups” analysis. Finally, multiple comparisons under post-hoc tests were applied for pairwise comparisons between two different wealth groups. All statistical analyses were done by using IBM SPSS statistical software version-20 with the aid of Microsoft Excel version 2010.

3. Results

Categories and description of NTFPs adapted from FAO (1995) and Shiva and Verma (2002) are described in Appendix 1 for that category, firewood and charcoal, the main source of energy for rural area has been added.

3.1 Plant product categories

There are five items of plant product categories used by local people for their subsistence in study villages.

3.1.1 Food items

Household survey shows that 15 plant foods (Appendix 2) are seasonally available in nearby natural forests for their basic needs. Of these, bamboo shoot (Various spp.), mushroom (Various spp.), myauk-u (*Dioscorea alata*) and gon min (*Amomum corynostachyum*) are mostly used as food in six villages. Of all, bamboo shoot is one of the most important NTFPs for both subsistence and commercialization. Fermentation is very simple and the shoots are kept in underground pits for a week. Wealth-related differences and similarities of food items used by local people are shown in table 2.

Table 2 Comparison of food items of NTFPs for subsistence by wealth groups

Products		Comparison between groups (two tailed, 95%)			
Common Name	Scientific Name	WG	No of HH	Amount of consumption (viss/yr)	K.Wallis Test
Bamboo Shoot	Various Spp.	W	27	68.41	0.068 ^{ns}
		M	51	79.98	
		P	61	62.36	
Mushroom	Various Spp	W	1	5.50	0.223 ^{ns}
		M	6	8.25	
		P	5	4.60	
Myauk-U	<i>Dioscorea alata</i>	W	3	5.67	0.454 ^{ns}
		M	5	9.70	
		P	7	7.79	
Gon Min	<i>Amomum corynostachyum</i>	W	2	7.75	0.310 ^{ns}
		M	5	4.40	
		P	4	7.13	

Note: ^{ns} is non- significant.

(Source: Field survey, 2017)

The test shows that bamboo shoot is the most used food among four products mentioned above. According to Kruskal-wallis test, it is found that there are no significantly different of bamboo shoot at 0.068 ($p > 0.05$), mushroom at 0.223 ($p > 0.05$), myauk-u at 0.454 ($p > 0.05$) and gon min at 0.310 ($p > 0.05$) across wealth groups. Therefore, there is no multiple comparisons in wealth groups for food items.

3.1.2 Medicinal Items

A total of 20 different medicinal plant species as shown in (Appendix 3) were reported to be used by households in study villages. Of all, the most commonly used medicinal species is *Tinoapora cordifolia* (Sin-tone-ma-nwe) which is used for hypertension and dysentery with total consumption at 54.00 times per year. The second commonly used medicinal species is *Atalantia monophylla* (Taw-shauk) which is mainly used for oedema and

antitoxic with total consumption at 29.29 times per year. The third is *Vitis repens* (Ta-bin-taing-mya-nan) which is mainly used for lympts and cysts (cancer) with total consumption at 22.36 times per year. The last is *Eupatorium odoratum* (Taw-pan-nyo) which is used for cuts and wounds with total consumption at 4.10 times per year .Three common names of *Eupatorium odoratum* such as taw pan nyo or sin visat or pan nyo in study villages can be found. Difference of NTFPs for medicinal items by wealth groups is also shown in figure 2 and comparison of medicinal items across wealth groups is shown in (Appendix 3).

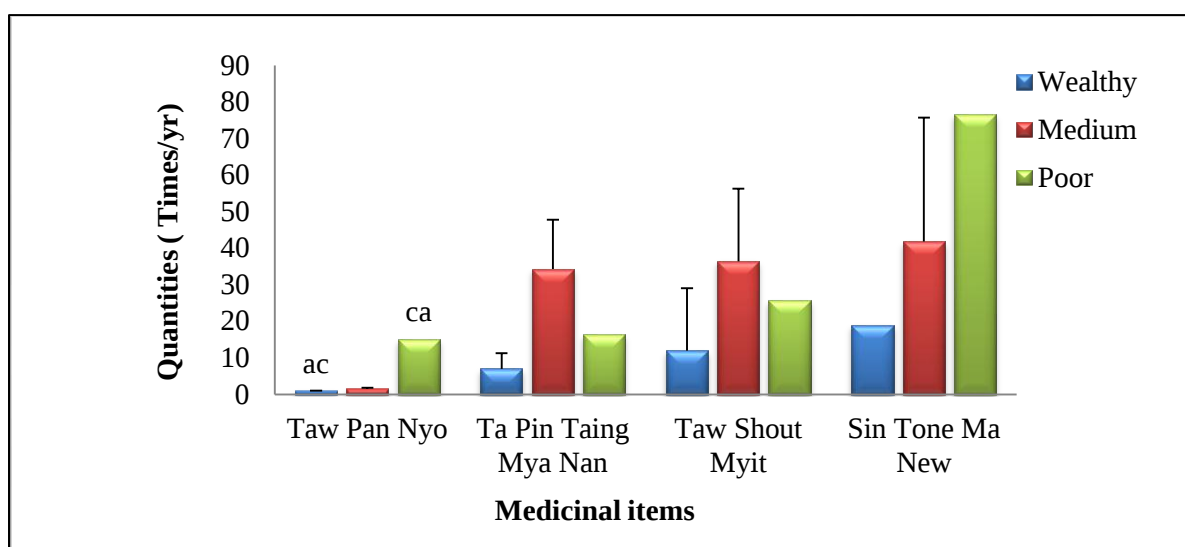


Figure 2 Difference of NTFPs for medicinal items by wealth groups

Note: ac and ca is significant at $p < 0.05$ between poor and wealthy groups

(Source: Field survey, 2017)

The results show that quantity of *Eupatorium odoratum* (Taw-pan-nyo) is found to be different across the wealth groups in study villages with significance levels at 0.039 ($p < 0.05$). There is no significant differences of *Vitis repens* (Ta-bin-taing-mya-nam), *Tinospora cordiolia* (Sin-tone-ma-nwe) and *Atalantia monophylla* (Taw-shauk). In order to understand the relationship between each wealth group of *Eupatorium odoratum* (Taw-pan-nyo), multiple comparisons show that there are significance levels of 0.033 ($p < 0.05$) between wealthy and poor suggesting that poor households have the highest score (9.50) than medium (5.40) and wealthy households (3.00). These results suggest that poor household used *Eupatorium odoratum* (Taw-pan-nyo) for medicine than the medium and the wealthy because these plants can be easily found in forests or besides the roads and are low cost. Local people in study villages know where to find medicinal plants and how to use these species for curing different diseases. As some medicinal plants grow in dense forests and some middlemen buy them in low price, villagers collect them in limited quantities and commercial production of medicinal plants cannot be found in study villages.

3.1.3 Utensils and handicraft items

According to direct observations, utensils and handicraft items are the most used items for subsistence use in study villages. A total of six different utensil and handicraft

items were reported in case study villages in (Appendix 4). The top five products across six villages are rattan, rattan products, bamboo, bamboo products and broom. There are four species of bamboo used for handicrafts can be found in the study area in table 3.

Table 3 Bamboo species found in study villages and their respective uses

Local name	Scientific name	Main uses
Kyathaung	<i>Bambusa polymorpha</i>	baskets and walling mat
Tin	<i>Cephalostachyum pergracile</i>	baskets
Thaik	<i>Bambusa tulda</i>	baskets, walling mat
Wa-nwe	<i>Dinochlo m` clellandi</i>	strip rope

Bamboo products are traditional usage in carrying things and tumeric in study villages. In addition to bamboo species, rattans are mostly used for main traditional uses especially strip rope (Kyein pa chew) and baskets, especially in Kan Hla village. Among 36 species of rattans found in Myanmar, six common species of rattan had been found particularly in study villages as shown in table 4. they are *Calamus Sp* (Toke-kyein), *Plectocomia macrostachya* (Kyein-phan), *Calamus robertsonianus* (Kyein kha), *Calamus latifolius* (Ya-ma-htar-kyein), *Calamus floribundus* (Ye-kyein) and *Calamus platyspathus* (Kyet-u-kyein). Only *Calamus robertsonianus* (kyein-kha) is readily available and abundant within a short distance from the villages. According to FGD, a rattan species takes for 10 years to be mature. However, the abundant of rattan species has gradually been decreasing due to over exploitation of outsiders. Moreover, broom is available from the plant of *Thysanolaema maxima* (broom grass) vernacularly known as thaminsine. Figure 3 and (Appendix 4) shows that comparison of NTFPs for utensils and handicraft items across wealth groups in study villages.

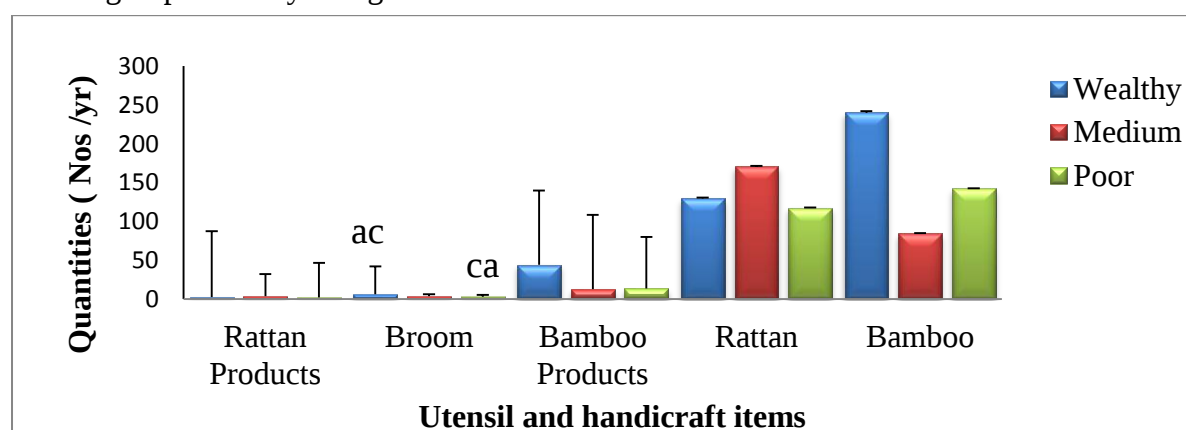


Figure 3 Difference of NTFPs for utensils and handicraft items by wealth groups

Note: ac and ca is significant at $p < 0.01$ between poor and wealthy households

(Source: Field survey, 2017)

Kruskal-Wallis test results show that quantities of broom per year is significantly different across wealth strata in case study villages at the significance levels of 0.004 ($p < 0.01$) and other products such as bamboo, rattan, rattan products and bamboo products are found not to be significantly different at 0.143 ($p > 0.05$), 0.443 ($p > 0.05$), 0.759 ($p > 0.05$).

and 0.278 ($p > 0.05$) respectively. For only subsistence consumption, mean ranks comparison by wealth groups in quantities of broom shows that wealthy households have the highest score (88.50) than medium (77.76) and poor households (60.82). These results suggest that wealthy households used more broom for their subsistence than medium and poor households.

In order to understand the relationship between each wealth group, multiple comparisons are applied under the Kruskal-Wallis test between each pair of wealth groups. The test results show that there are differences in usage of broom for subsistence between only wealthy and poor groups with significance levels at 0.005 ($p < 0.01$). This means that wealthy households used more broom than medium and poor households and medium and wealthy households because they not only collect but also buy broom grass for their basic needs. So, the production of this product is growing gradually from subsistence to trade in study villages as it grows naturally and can be seen even along the roads

3.1.4 Construction material items

The most commonly used non-timber forest products for construction materials include broad-leaved plants such as *Livistona jenkinsiana* (Taung Htan), *Imperata cylindrica* (Thekke) and *Phrynium capitatum* (Taung-zim-phet) as shown in (Appendix 5). Among them, the first two are mostly used by villagers in case study villages. According to FGD, roofing made of these plants lasts about 3 years and those of thatching grass lasts only 1-2 year. However, a person must take for one day to get leaves of *Phrynium capitatum* and the product can mostly produce in April. However, the production of these materials is gradually scarce and their collections are part-time for rural people because they are only available far away from the village. In study villages, *Dendrocalamus brandisii* (Wabo/Kyalo) and *Bambusa tulda* (Thaik) are rarely used for floor and house post. At current situation, corrugated galvanized iron sheets are now replacing instead of thatch, taung htan, thekke and bamboo in study villages. Table 4 shows that usage of construction materials across the wealth groups.

Table 4 Difference of construction material items across wealth groups

Products	Scientific Name	Comparison between groups (two tailed, 95%)			K.Wallis Test
		WG	No of HH	Amount of consumption (nos/yr)	
Taung Htan	<i>Livistona jenkinsiana</i>	W	-	-	0.107 ^{ns}
		M	1	12.00	
		P	11	6.00	
		W	1	23.50	
Thatch	<i>Imperata cylindrica</i>	M	9	11.11	0.198 ^{ns}
		P	18	15.69	
		M	15	10.70	
		P	7	17.14	

Note: ^{ns} is non-significant.

(Source: Field survey, 2017)

For construction material items, Kruskal- Wallis test shows that there are no significance differences across different wealth groups in study villages. Therefore, multiple comparisons show no significant differences between poor and medium, poor and wealthy and medium and wealthy groups. Table 4 shows that difference of NTFPs for construction and ornamental items across wealth groups in study villages.

3.1.5 NTFPs for energy

According to Shackleton.C.M, Pandey.A.K, and Ticktin.T, 2015, firewood and charcoal are used by the majority of rural and urban households across the developing world. Although firewood is the main source of energy in the villages, bamboos are also used for energy in cooking for poor households. The species used for firewood mentioned by villagers include *Castanopsis argyrophylla* (Thit-e), *Michelia champaca* (Sagawa), *Gmelina arborea* (Yemana), *Pterocarpus macrocarpus* (Padauk), *Dipterocarpus turbinatus* (Kanyin), *Vitex peduncularis* (kyet-yo), *Syzygium cumini* (Thabye), *Symplocos racemosa* (Dauk-yut) and *Lagerstroemia tomentosa* (Ieza). Local people in the villages use firewood for their basic needs and they do not sell them. Bamboo species, especially *Dendrocalamus brandisii* (wabo/kyalo) are also used for cooking in study villages. In the research, there are three products used for energy in cooking such as firewood, bamboo and charcoal. The first two are mostly used by villagers and charcoal is sometimes used by the wealthy people. Usage of bamboo and firewood among the wealth groups as shown in table 5.

Table 5 Usage and difference of firewood and bamboo by wealth groups

Products	Comparison between groups (two tailed, 95%)				Multiple comparisons (two tailed, 95%)		
	W G	No of HH	Amount of consumption (nos/yr)	K.Wallis Test	W&M	W&P	P&M
Bamboo	W	5	21.50	0.205 ^{ns}	-	-	-
	M	15	17.60				
	P	2	24.98				
Firewood	W	34	64.47	0.008**	0.006* *	0.190 ^{ns}	0.326 ^{ns}
	M	58	95.83				
	P	74	82.58				

Note: *p-value* estimate significance for differences between the three household categories: ** is significant at $p < 0.01$ and ^{ns} is not significant.
(Source: Field survey, 2017)

The results show that usage of bamboo for cooking is not significantly different but usage of firewood for cooking is significantly different across the wealth groups at a significance levels ($p < 0.01$). So, multiple comparisons is only needed for usage of firewood for cooking. It shows that the usage of firewood is significantly different between wealthy

and medium households only (p value=0.006) suggesting that medium people use more firewood for cooking than wealthy households because mean rank of medium households for firewood is 95.83 and that of wealthy households is 64.47.

3.1.6 Ornamental Items

In Ornamental items, only orchid species such as *Dendrobium aggregatum* (Yadanar-shwe-khet), *Dendrobium moschatum* (Lettan-she or waso-pan), *Dendrobium pulchellum* (Sinma-myet-kwin) can be found in the study area. *Paphiopedilum bellatulum* (Kun-mya-san), *Paphiopedilum spicerianum* (Hmwe-minthami) and *Paphiopedilum concolor* (Hmwe-minthar) can be seen as rare orchids. Local name of *Paphiopedilum bellatulum* is called quail orchid and these three species include in the endangered species of the IUCN Red List. In research, most villagers use orchids especially for home beauty but some villagers in Kyaunk Moe village sell orchids in suitable price in accordance with the species. Collection and usage of orchid among the wealth groups as shown in table 6.

Table 6 Usage and difference of firewood and bamboo by wealth group

Products	Scientific Name	Comparison between groups (two tailed, 95%)			K.Wallis test
		WG	No of HH	Amount of consumption (nos/yr)	
Orchid	Various Spp	W	4	17.63	0.066 ^{ns}
		M	15	10.70	
		P	7	17.14	
		M	15	10.70	
		P	7	17.14	

Note: ^{ns} is non-significant.

(Source: Field survey, 2017)

3.2 Animals and animal products

Household surveys reported that there are four items of animal and animal product categories such as honey, bushmeat, medicines and other non- edible products are used by local people for basic needs in animals and animal product categories.

3.2.1 Bushmeat

In the study area, a total of ten different wildlife species were reported to be captured in the last twelve months in (Appendix 6). Among them, six bushmeats are mostly eaten by villagers. Some households reported that some bushmeats are taken by villagers to eat if they are found in shifting cultivation area. The most commonly bushmeat in the last twelve months in each case study village are listed in Table 7.

Table 7 Total numbers of wildlife eaten by local people for their basic needs

Myanmar Name	English Name	Scientific Name	Comparison between groups (two tailed, 95%)			
			W G	No of HH	Amount of consumption (vaiss/yr)	K.wallis test
Taw wet	Wild boar	<i>Sus scrofa</i>	W	13	25.50	0.098 ^{ns}
			M	28	37.86	
			P	31	39.89	
Myauk	Monkey	<i>Rhinopithecus strykeri</i>	W	5	6.20	0.676 ^{ns}
			M	5	8.10	
			P	4	8.38	
Taung Seik	Goral	<i>Naemorhedus goral</i>	W	2	4.00	0.420 ^{ns}
			M	5	8.20	
			P	7	8.00	
Sat	Sambhun	<i>Cervus unicolor</i>	W	3	8.50	0.903 ^{ns}
			M	7	9.64	
			P	7	8.57	
Gyi	Barking deer	<i>Muntiacus muntiijak</i>	W	11	20.95	0.0603 ^{ns}
			M	18	26.14	
			P	19	25.00	
Phyu	Hedgehog	<i>Hippocampus spinosissimus</i>	W	4	6.25	0.209 ^{ns}
			M	4	7.75	
			P	3	3.33	

Note: ^{ns} is non-significant.

(Source: Field survey, 2017)

Kruskal-wallis test shows that there is no significantly different in total numbers of wildlife eaten by local people across different wealth groups in study villages because they are mostly found in rainy season and hunting is not a regular economic activity in study villages. So, the production level of bushmeat has never reached into commercial use. Also multiple comparisons show no significant differences between poor and medium, poor and wealthy and medium and wealthy groups in study village.

3.2.2 Honey

There are two common honey-bees in Myanmar, *Apis indica* and *A. dorsata* (Khin Maung Lwin, 1995). In study villages, wild honey can mostly collect in April. If someone firstly found natural bee-hives in the forests, that tree was owned by him and he could harvest wild honey from the tree. Other can harvest wild honey from the tree only the permission of the tree owner. This is the traditional culture in study villages. Colonies of honeybee are mostly found in the big trees of *Antiaris toxicaria* (hmya-seik), *Dipterocarps*

spp (ka-nyin), *Salmaalina malabarica* (let-pan) and *Salmaalina insignis* (Didu). Some households reported that production of wild honey depends on the environment. At current situation, production of wild honey is getting lesser as deforestation and forest degradation has gradually happened. Table 8 shows that collection of wild honey for their basic needs among the wealth groups.

Table 8 Collection and usage of wild honey among the wealth groups

Products	Scientific Name	Comparison between groups (two tailed, 95%)				Multiple Comparisons (two tailed, 95%)		
		W G	No of HH	Amount of consumption (bottle/yr)	K. wallis test	W& M	W& P	P&M
Honey	<i>Apis spp.</i>	W	10	5.90				
		M	23	1.00	0.016*	0.079	1.000	0.032*
		P	23	2.09				

Note: * is significant at $p < 0.05$

(Source: Field survey, 2017)

The result shows that usage of wild honey are found to be different across the wealth group in study villages with significance levels at 0.016 ($p < 0.05$). In summary, multiple comparison tests are also applied for each of the wealth groups in study villages. The test result shows that the difference in usage of wild honey is significant between poor and medium households only (p value=0.032) suggesting that poor households are the one who use and collect wild honey than medium households within the wealth group because they use wild honey not only for their medicine but also for commercial purpose.

3.2.3 Medicines and other non-edible animal products

In study villages, two households use hedgehog entrails for curing stomach and only one household uses peacock gall for liver disease. In other non-edible animal product items, one household reported that he uses leather of barking deer for loom and antler of sambhum for home beauty.

4. Discussions

Local people in study villages collect NTFPs mostly in off-farm season to supplement subsistence needs. In food items, bamboo shoot can be seen as a marketable product in study villages. But, local people do not know how to process them to get value-added products. In utensil and handicraft items, *Thysanolaema maximum* (broom grass) is exported to foreign market such as India and Bangladesh and local market as Tap-kon. The broom grass is

abundantly available and peak harvesting dose not adversely affect the rate of regeneration. In study villages, modern medicine and healthcare services are often difficult to access or sometimes unaffordable, therefore traditional medicines are important especially for poor population. As energy for cooking, electricity cannot be provided by government in study villages, firewood is therefore used by all wealth groups. Firewood substitutes should be taken into account to reduce excessive utilization.

Another problem is poor transportation and there is no direct market in study villages. Hence, local people have to sell their collected NTFPs to middlemen by unreasonable prices. In study villages, all of the respondents revealed that all of the NTFP resources are declining. This means that there was over-harvesting of the collectors (not only from native but also from outsiders) and unsystematic shifting cultivation practice. Some interviewees reported that if over-harvesting of outsiders and unsystematic shifting cultivation practice can be reduced or restricted, it will lead to sustainable use of NTFPs in this area.. This can bring traditional communities in mountainous area into sustainable management of NTFPs and poverty reduction.

5. Conclusion

The study intended to design sustainable management of NTFPs and poverty reduction through better understanding on subsistence use of indigenous people. As a summary, there are five items in plant product categories and four items in animal and animal product categories. Bamboo shoot in food items, bamboo products in utensil and handicraft items, thatch in construction material items, orchid in ornamental items, *V. repens* (ta-pin-taing-mya-nan) in medicinal items, firewood as energy for cooking and boar in bushmeat items are the most used NTFPs in all wealth groups. While considering comparison of wealth status, it is found that poor households mostly collect NTFPs such as honey, bamboo and *Eupatorium odoratum* (taw-pan-nyo) for basic needs. Besides, bamboo is useful NTFPs for poor households. Medium households in wealth status largely used the rattans for utensils and handicraft makings, and *V. repens* and *A. monophylla* as traditional medicines, even though not being significantly different among the groups. Wealthy households use commercialized products, especially *Thysanolaema maxima* (broom grass) not only for subsistence use but also for commercial purpose. Therefore, different wealth status has been used NTFPs for different purposes, showing dissimilar significance in dependency on NTFPs. If NTFPs will be restricted in study villages, it can lead to pressure on socio-economic status. In conclusion, it is important to understand the local condition to access to NTFPs and the availability of the resources for better NTFPs management. For better NTFPs management, the following actions are recommended:

- (1) Proper harvesting methods should be encouraged for sustainable product for sustainability

- (2) All stakeholders such as resource users, rural development workers and forest managers should have pro-active management and encourage suitable alternatives, value-added products, before over-exploitation occurs.
- (3) Forest management agencies need to recognize which NTFPs are harvested more than subsistence use, and integrate them into forest management, monitoring, and infrastructure planning
- (4) Participatory approach should be encouraged in NTFPs management.

6. Acknowledgements

Firstly, I thanks to my teacher, U Ohn Lwin, who advises me in writing research proposal. Secondly, I am thankful to Forest Department of Pinlaung Township in Taunggyi District for their help throughout field data collection. Secondly, I also thank to Forest Department, Ministry of Environmental and Forestry to participate M.Sc degree program. Finally, I am graceful to all my teachers at University of Forestry for giving thorough comments and kind feedback.

7. References

- Aye Aye Htun, 2007. Local Community and Environmental Conservation in Paunglaung Watershed Area. PHD Dissertation, Department of Botany, University of Yangon.
- Belcher B, Ruiz-Perez M 2001. An International comparison of cases of forest product development: An overview description and data requirements. Center for International Forestry Research (CIFOR) Working Paper 23. Bogor, Indonesia: CIFOR
- Belcher BM 2003. What isn't a NTFP? International Forestry Review Cavendish,
- W, 2000. Empirical regularities in the poverty-environment relationship of rural households: evidence from Zimbabwe.
- CIFOR 2003. Science of forest and people, CIFOR, Bogor, Indonesia. [www. Cifor.cgiar.org] site visited on 23/04/2011.
- Dytham, C. 2011. *Choosing and using statistics: a biologist's guide*. 3rd ed. Wiley-Blackwell Science, Garsington Road, Oxford, UK. xvi + 295pp.
- Food and Agricultural Organisation of the United Nations (FAO). 2015. Global Forest Resource Assessment. Food and Agricultural Organization of United Nations. Rome
- Food and Agricultural Organisation of the United Nations (FAO). 1995. Non-Wood Forest Products for Rural Income and Sustainable Forestry. Rome: FAO NWFPs 7.
- Food and Agricultural organization (FAO) 2008. An Information Bulletin on Non-Wood Forest Products. Non-Wood News, FAO, Vol 17, Rome, pp.12-21.
- Forest Department .2016. Facts about environmental conservation and forestry in Myanmar. Ministry of Environmental Conservation and Forestry, June 2016
- Golam R, Madhav K, Ram PS 2008. The role of non-timber forest products in poverty reduction in India:
- Khin Maung Lwin, 1995. Non-wood Forest Products in 15 Countries of Tropical Asia; An Overview
- Marshall E, Schreckenberg K, Newton A 2003. Commercialization of Non-timber forest products: First steps in analyzing the factors influencing success. *Int Fores Rev*, 2: 128-13
- Maung Maung Than. 2015. Drivers of forest change in the greater Mekong sub-region. Myanmar country report
- Neuman, W. L. 2006. *Basics of Social Research: Qualitative and Quantitative Approaches*.
- Shackleton, C.M., Shackleton, S.E., 2006. Household wealth status and natural resource use in the Kat River valley, South Africa
- Shackleton.C.M, Pandey.A.K, and Ticktin.T. 2015. *Ecological Sustainability for Non-Timber Forest Products: Dynamics and Case Studies of Harvesting*
- Subedi BP 2006. Linking Plant-based Enterprises and Local Communities to Bio-diversity Conservation in Nepal Himalaya. New Delhi: Androit Publi

Appendix 1

Plant product categories	
Categories	Description
Food	Vegetal foodstuff and beverages provided by fruits, nuts, seeds, roots
Fodder	Animal and bee fodder provided by leaves, fruits, etc
Medicines	Medicinal plants (e.g. leaves, barks, roots) used in traditional medicine and/or by pharmaceutical components
Perfumes and cosmetics	Aromatic plants providing essential (volatile) oils and other products used for cosmetic purposes
Dying and tanning	Plant material (mainly bark and leaves) providing tannins and other plant parts (especially leaves and fruits) used as colorants
Utensils, handicrafts	Heterogeneous group of products including thatch, bamboo, rattan, wrapping leaves, fibres (e.g. Arouma, Bwa Flo, Silk cotton floss, Screw pine)
Construction materials	thatch, bamboo, fibres
Ornamentals	Entire plants (e.g. orchids, ferns, philodendron) and parts of the plants (e.g. post made from roots) used for ornamental purposes
Exudates	Substances such as gums (water soluble), resins (water insoluble) and latex (milky or clear juice), released from plants by exudation
Animals and animal products	
Categories	Description
Living animals	Mainly vertebrates such as mammals, birds, reptiles etc.
Honey, beeswax	Products provided by bees
Bushmeat	Meat provided by vertebrates, mainly mammals
Other edible animal products	Mainly edible in vertebrates such as insects (e.g. caterpillars), crabs and other “ secondary “ products of animals (e.g. eggs, nests)
Hides, skins	Hide and skin of animals used for various purposes
Medicine	Entire animals or parts of animals such as various organs used for medicinal purposes (e.g. caterpillars, crab legs, snake oil)
Colorants	Entire animals or parts of animals such as various organs used as colorants
Other nonedible animal products	e.g. bones used as tools

Source: Adapted from FAO 1995; Shiva and Verma 2002

Appendix 2**Plant product categories
Relations of Food items with household wealth Status**

Food Items	Number	Mean	Standard Error	P value
Bamboo Shoot	139	31.53	6.511	0.068
Khat Cho Nyut	1	5.00	-	-
Mushroom	12	4.42	0.965	0.223
Inn U	2	1.00	0.000	1.000
Myaunk U	15	19.13	10.956	0.454
Kanyin U	1	1.00	-	-
Phan U	2	2.00	0.000	1.000
Gon Min	11	12.82	3.889	0.310
Kone Kyet Shar	10	13.50	3.868	-
Phat Si Ywet	3	7.00	0.577	-
Da Myit	5	5.80	1.020	-
Min Paw U	1	5.00	-	-
Da Yin Khout	1	2.00	-	0.516
Ka Top Thi	1	4.00	-	0.368
Za Yit Yoe	1	4.00	-	0.767

Appendix 3

Medicine Items	Number	Mean	Standard Error	P value
Nwe Cho	1	30.00	-	-
Mon Nyin Si	1	10.00	-	-
Taw Pan Nyo	10	4.10	1.969	0.039*
Kyet Le San	1	50.00	-	-
Ta Pin Taing Mya Nan	25	22.36	6.544	0.076
Sin Tone Ma Nwe	19	54.00	18.098	0.764
Than Ma Naing Kyaunk Ma Naing	2	7.50	4.500	-
Say Myin Khwar	7	4.57	1.429	0.098
Yin Pyar Myit	4	2.25	0.479	0.325
Taw Shout Myit	17	29.29	14.947	0.165
Kyaung Pyar U	3	5.00	3.512	-
Nant Tha Phyu	1	5.00	-	-
Nant Tha Ni	1	5.00	-	-
Meik Tha Lin	2	1.00	0.000	1.000
Wan Au Myit	3	49.00	47.501	0.221
Thet Yin Kyi Myit	4	10.50	8.529	0.102
Kalaw Pin	1	2.00	-	-
Kyar Ma Naing Myit	5	4.60	1.860	0.223
Ma Lein Ywet	1	2.00	-	-
Na Lin Kyaw	1	12.00	-	-

Comparison of medicinal items across wealth groups

Products	Scientific Name	Comparison between groups (two tailed, 95%)				Multiple Comparisons (two tailed, 95%)		
		W G	No of HH	Amount of consumption (times/yr)	K. wallis test	W& M	W& P	P&M
Sin-tone- ma-nwe	<i>Tinospora cordifolia</i>	W	2	7.75	0.165	-	-	-
		M	9	9.72				
		P	8	10.88				
Taw-shauk	<i>Citrus medica</i>	W	1	12.00	0.764	-	-	-
		M	7	6.29				
		P	9	10.78				
Ta-bin- taing-mya- nan	V.repens	W	5	7.00	0.076	-	-	-
		M	11	15.91				
		P	9	12.78				
Taw-pan- nyo	Eupatorium odoratum	W	3	3.00	0.039*	0.721	0.033	0.033*
		M	5	5.40				
		P	2	9.50				

Appendix 4

Relations of utensils and handicraft items with household wealth status

Utensils and handicrafts Items	Number	Mean	Standard Error	P value
Bamboo	62	137.66	27.693	0.143
Bamboo Products	152	18.79	6.661	0.278
Rattan	25	142.64	50.586	0.759
Rattan Products	24	2.75	0.435	0.443
Broom	144	3.88	0.427	0.004**
Shaw	2	9.50	0.5000	-

Comparison of utensils and handicraft items across wealth groups

Products	Comparison between groups (two tailed, 95%)				Multiple Comparisons (two tailed, 95%)		
	W G	No of HH	Amount of consumption (times/yr)	K. wallis test	W&M	W&P	P&M
Rattan	W	8	13.56	0.443	-	-	-
	M	10	11.70				
	P	7	14.21				
Rattan products	W	7	11.43	0.759	-	-	-
	M	9	14.78				
	P	8	10.88				
Bamboo	W	10	39.80	0.143	-	-	-
	M	22	26.55				
	P	30	32.37				
Bamboo products	W	28	64.75	0.278	0.721	-	-
	M	59	77.85				
	P	65	80.34				
Broom	W	32	88.50	0.004**	0.554	0.005**	0.153
	M	47	77.76				
	P	65	60.82				

Appendix 5**Relations of construction material items with household wealth status**

Construction Material	Items	Number	Mean	Standard Error	P value
Taung Htan		12	81.17	39.408	0.107
Taung Son		7	128.57	45.378	0.097
Thatch		28	117.43	17.602	0.198

Relations of fuelwood with household wealth status

Energy used for cooking	Number	Mean	Standard Error	P value
Firewood	166	7571.57	317.618	0.008**
Charcoal	15	22.53	4.152	0.159
Bamboo	43	1628.14	172.101	0.205

Relations of ornamental items with household wealth status

Ornamental Items	Number	Mean	Standard Error	P value
Orchid	26	2.15	0.371	0.066

Appendix 6

Relations of bushmeat with household wealth status

Bushmeat Items	Number	Mean	Standard Error	P value
Boar	72	8.87	1.328	0.098
Monkey	14	4.71	0.801	0.676
Gi	48	4.19	0.415	0.603
Bison	4	2.75	0.629	0.223
Hedgehog	11	4.00	0.632	0.209
Ring-worm	9	2.56	0.556	0.963
Ibex	14	3.64	0.912	0.420
Raccon	2	3.00	1.000	0.317
Barking Deer	17	3.59	0.613	0.903
Dry Barking Deer	1	1.00	-	-

Relations of honey item with household wealth status

Honey Items	Number	Mean	Standard Error	P value
Honey	56	2.32	0.726	0.016*

Relations of medicinal items with household wealth status

Medicine Items	Number	Mean	Standard Error	P value
Hedgehog Entrails	2	7.50	4.500	-
Peacock Gall	1	12.00	-	-

Relations of nonedible animal products with household wealth status

Other Nonedible Animal Products	Number	Mean	Standard Error	P value
Gi Leather	1	4.00	-	-
Sat Gyo	1	1.00	-	-

Note: * is significant at 0.05 confidence level

** is highly significant at 0.01 confidence level