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The Contribution of Non-timber Forest Products Income to the Local Communities Living in and around the Kyaikhtiyoe Wildlife Sanctuary in Mon State, Myanmar

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ကျိုက်ထီးရိုး တောရိုင်းတိရစ္ဆာန်ဘေးမဲ့တော အနီးပတ်ဝန်းကျင်တွင် နေထိုင်သော ဒေသခံပြည်သူများ၏ ဝင်ငွေအပေါ်တွင် သစ်တောထွက်ပစ္စည်းများ၏ အထောက်အပံ့ပေးနိုင်မှုကို လေ့လာခြင်း

တင်နှောင်းအေး၊ မဟာသိပ္ပံကျောင်းသူ
ဒေါက်တာတင်မင်းမောင်၊ ပါမောက္ခ
ဒေါက်တာငြိမ်းချမ်း၊ ကထိက
သစ်တောနှင့်ပတ်ဝန်းကျင်ဆိုင်ရာတက္ကသိုလ်၊ရေဆင်း

စာတမ်းအကျဉ်း

မြန်မာနိုင်ငံရှိ ကျေးလက်ဒေသနေ အိမ်ထောင်စုများအတွက် သစ်တောထွက်ပစ္စည်းများမှရရှိသည့်ဝင်ငွေသည် အရေးပါပါသည်။ ယခုစာတမ်းသည် ကျိုက်ထီးရိုး တောရိုင်းတိရစ္ဆာန်ဘေးမဲ့တောအနီး ပတ်ဝန်းကျင်တွင်နေထိုင်ကြသော ဒေသခံပြည်သူများ၏ ဝင်ငွေအပေါ် သစ်တောထွက်ပစ္စည်းများ၏ အထောက်အပံ့ပေးနိုင်မှုကို လေ့လာထားခြင်းဖြစ်ပါသည်။ ဒေတာ ကောက်ယူရာတွင်ကျေးရွာ (၅) ရွာမှ ဒေသခံအိမ်ထောင်စု (၁၅၀) စုတို့ကို ကျပန်းရွေးချယ်ခဲ့ပီး ကျေးရွာတစ်ရွာချင်းအလိုက် ဆွေးနွေးပွဲများပြုလုပ်ခြင်းနှင့် အိမ်ထောင်ဦးစီးများအား လူမှုစီးပွားအခြေအနေ၊ သစ်တောထွက်ပစ္စည်းများသုံးစွဲမှု အခြေအနေ

တို့နှင့်ပတ်သက်၍ အင်တာဗျူးများ ဆောင်ရွက်ခဲ့ပါသည်။ လေ့လာတွေ့ရှိမှုများအရ သစ်တောထွက်ပစ္စည်းများမှ ရရှိသောဝင်ငွေသည် စုစုပေါင်းတစ်နှစ်ဝင်ငွေ၏ (၄၂.၃) ရာခိုင်နှုန်းဖြင့် အများဆုံး ရရှိပြီး၊ အခြားပြင်ပလုပ်ငန်းများမှ ရရှိသောဝင်ငွေသည် (၃၂.၁၇) ရာခိုင်နှုန်းနှင့် စိုက်ပျိုးရေး လုပ်ငန်းမှရရှိသော ဝင်ငွေသည် (၁၉.၆) ရာခိုင်နှုန်း အသီးသီးရရှိပါသည်။ အသုံးအများဆုံး သစ်တောထွက်ပစ္စည်းများတွင် ဝါး၊ ထင်း၊ မျှစ်၊ ကဒက်ဥ၊ တောထဲမှရရှိသော ဟင်းသီးဟင်းရွက်နှင့် အသီးအနှံများ၊ ဆေးဖက်ဝင်အပင်များ၊ တောရိုင်းတိရစ္ဆာန်များ၊ မီးသွေးနှင့် ပျားရည်တို့ပါဝင်ပါသည်။ စုစုပေါင်းသစ်တောထွက်ပစ္စည်းဝင်ငွေ၏ (၇၂.၇၃) ရာခိုင်နှုန်းကို ဝါးမှရရှိသဖြင့် ဝါးသည် အရေးအပါဆုံး သစ်တောထွက်ပစ္စည်းဖြစ်ပါသည်။ တစ်နှစ်ဝင်ငွေ အနည်းဆုံးရရှိသောအုပ်စုတွင် ပါဝင်သည့် အိမ်ထောင်စုများသည် (၅၇.၅) ရာခိုင်နှုန်းဖြင့် သစ်တောထွက်ပစ္စည်းမှ ရရှိသောဝင်ငွေကို အများဆုံးမှီခိုနေပါသည်။ ထို့ကြောင့်ကျိုက်ထီးရိုး တောရိုင်းတိရစ္ဆာန်ဘေးမဲ့တောနှင့်သက်ဆိုင်သော စီမံကိန်းနှင့်မူဝါဒများ ချမှတ်ဆောင်ရွက် ရာတွင်

ဒေသခံများ၏အခြေခံစားဝတ်နေရေးအခြေအနေများကို ထည့်သွင်းစဉ်းစားပြီး နှစ်ဦးနှစ်ဖက်သမမျှတစေသော ကာကွယ်ထိန်းသိမ်းရေး နည်းဗျူဟာများကိုဖော်ထုတ်ရန် လိုအပ်ပါသည်။

The Contribution of Non-timber Forest Products Income to the Local Communities Living in and around the Kyaikhtiyoe Wildlife Sanctuary in Mon State, Myanmar

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Abstract

Income from non-timber forest products plays an important role to the livelihoods of rural households in developing countries especially in Myanmar. There is no background information regarding the income from NTFPs in Kyaikhtiyoe Wildlife Sanctuary. This study analyses how NTFPs income can contribute to the livelihoods of local communities living in and around the Kyaikhtiyoe Wildlife Sanctuary in Mon State, Myanmar. Focus Group Discussion and face to face interview were used for household survey in 5 villages. The data were collected from 150 sampled households through the semi-structured questionnaire. The results show that NTFPs income contributes 42.83%, off-farm income contributes 32.17% and farm income contributes 19.6% to total annual income of households respectively. The mostly used NTFPs include bamboo, firewood, bamboo shoots, kadat u (*Dioscorea* spp.), wild fruits and vegetables, medicinal plants, animals, charcoal and honey. Bamboo is the highest income share 72.73% of total NTFPs income. Households in low income group receive more NTFPs income than households in medium and high income groups. The income share of NTFPs in low income level households is 57.5% of total annual income. The study suggests that full protection and restrictions on the use of forest products can bring low

income level households depending necessarily on NTFPs into poverty. So, the socio-economic factors of households should be considered in designing the action plan that can bridge the livelihoods and conservation in the Kyaikhtiyoe Wildlife Sanctuary.

Key words: conservation, forest-based livelihood, NTFPs income, restrictions on forest resources, rural poverty

The Contribution of Non-timber Forest Products Income to the Local Communities Living in and around the Kyaikhtiyoe Wildlife Sanctuary in Mon State, Myanmar

1. Introduction

Myanmar, the Republic of the Union of Myanmar, presents a great variety of habitats and ecosystems, from snow-capped mountains to coral reefs. Total land area of Myanmar is more than 67.66 million hectares and total population is 51.419 million (Census, 2014). In last several decades, deforestation and biodiversity loss became a common event throughout the globe. This phenomenon is much more frequent in developing countries like Myanmar. According to Forest Department statistics, forest cover in Myanmar decreased from 58% in 1990 to 51.5% in 2000, 49.3% in 2005 and 47% in 2010 (Than, 2015). At current situation, about 42.92 % of the country is covered with the forest (Forest Department, 2016). Government has taken various initiatives to address the problem of forest and biodiversity loss. Protected area (PA) is one initiative to conserve forest and biodiversity in its natural context. By definition, a PA is an area where everything is prohibited unless permitted (SLORC, 1994). In Myanmar, there are currently 43 officially-recognized PAs (BANCA, 2011). The area of PAs reaches up to 5.75% of total country area (Forest Department, 2016).

Again, Non-timber Forest Products (NTFPs) have been recognized as a major role in household income and food security during the past few decades (FAO, 2014). NTFPs include all biological matter of wild plants and animals other than timber extracted from

forests, e.g. fruits, nuts, vegetables, game, medicinal plants, resins, barks, fibers, palms, grasses, small wood products and firewood (CIFOR, 2011). NTFPs can address the needs of local people both for consumption and market sale to improve household income (Tarigan, 2010). Many rural households in forest margins, especially in Asia, derive as much as 50–80 per cent of annual household income from NTFPs (CBD, 2014). The collection of NTFPs may yield low returns to labor but it only requires few skills and technology (Angelsen, 2003). Therefore, these characteristics of NTFPs collection make it an attractive and important income opportunity for rural poor living near the forest. According to Shackleton (2011), NTFPs are essential for about 60 million people while further 45 million people are artisans or employees transforming NTFPs into marketable products and between 500 million and 1 billion people manage remnant forests for subsistence or sale of NTFPs.

In Myanmar, 25% of total population falls under poverty line and 85% of total poor are in rural areas (UNDP, 2011). Ideally, a PA is established to conserve the forests and biodiversity. However, due to poor socio-economic background, people traditionally living near Myanmar PAs still exploit various forest resources such as timber and NTFPs (Soe, 2014). NTFPs reside in the livelihood of people living in forest dominant areas in Myanmar and play a vital role in their subsistence as well as income. Though NTFPs play an important role in the lives of forest dwellers for food and income, there are only a few studies focusing on the role of NTFPs income to local people living around a PA in Myanmar. This study focuses on the contribution of NTFPs income to local communities living in and around PA and tries to fulfill the knowledge gap in this study area. And this study aims to provide some basic information to forest managers and decision-makers for conservation and management of Kyaikhtiyoe Wildlife Sanctuary by assessing income from forests especially from NTFPs.

2. Problem Statement

It has been proposed that NTFPs extraction can contribute to sustainable forest management by providing economic benefits to poor rural households while simultaneously conserving biodiversity (Peters, 1989). However, excessive commercial harvesting of NTFPs can denude forest ecosystems by destructive collection practices for valuable target species (Shanker, 2005). Rural population of Myanmar is highly reliant on natural resources and these natural resource based livelihoods are often associated with extreme poverty (Than, 2015). Due to poverty, these livelihoods depend on and extract forest resources for subsistence and cash incomes. People living around the PAs in Myanmar exploit various forest resources for their income although access to these areas is prohibited by the law. Thus, there is an urgent need to investigate the role of NTFPs income to rural livelihoods residing around PAs in Myanmar.

Globally, there are a few studies focusing on the situation in PAs where, ideally, there is greater emphasis on conservation than on livelihoods (Gubbi, 2008). Since the local use of NTFP is very diverse both between locations and over time, more studies are needed in order to better understand the potential role of NTFPs income contribution to local communities.

Unfortunately, our knowledge and understanding about the role of NTFPs income to the livelihoods of local communities in PAS is still inadequate.

Kyaikhtiyoe Wildlife Sanctuary in Mon State is one of the officially recognized PAS in Myanmar. There are no studies on the role of NTFPs' income to local communities living in and around the Kyaikhtiyoe Wildlife Sanctuary. As such, this research is expected to contribute to the gap in the literature, and also illuminate the process of better understanding the interconnectivity between NTFPs and local people, particularly in the context of PAS and thereby prompting a rethinking about existing PA management system at the policy planners' level.

3. Objectives

The main objective of this study is to analyze the contribution of NTFPs income to local communities living in and around the Kyaikhtiyoe Wildlife Sanctuary. There are three specific objectives to support main objective. They are as follows:

1. To measure the contribution of NTFPs income to total annual income of rural households in the case study area
2. To find out the major NTFPs that the local people used for subsistence and sale
3. To assess the degree of dependency on NTFPs income by different income groups in the case study area

4. Research questions

1. What is the share of NTFPs income to total annual income of household in the study area?
2. What are the major NTFPs that the local people used for subsistence and cash income in the study area?
3. What is the degree of dependency on NTFPs income by different income groups?

5. Materials and Methods

5.1 Study Area

The Kyaikhtiyoe Wildlife Sanctuary (managed under IUCN PA management Category V) is situated in Kyaikhto Township, Thaton District in Mon State, Myanmar. It is situated between the Latitudes of 17 ˚ 24' N and 17 ˚ 34' N and the Longitudes of 97 ˚ 01' E and 97 ˚ 10' E (Figure 2). The site was proposed as a Wildlife Sanctuary in 1998 and gazetted in 2001 in order to conserve the flora and fauna of the surroundings of Kyaiktiyo Pagoda which is a National Heritage monument. It is situated between the altitudes of 50-1090 m above sea level. The area of wildlife sanctuary is 38600.36 acres which comprises the typical evergreen forest and moist upper mixed deciduous forest (BANCA, 2011).

It is far about 9 miles from Kyaikhto which is located in the northern part of the Tenasserim coast. Shwekyin Township is situated in the north, Bilin Township in the east and south, and Kyaikhto Township in the west respectively. The economy of local people living in and around the Kyaikhtiyoe Wildlife Sanctuary depends on agriculture as well as other

economic sectors. It has a favorable environment and climate condition for growing varieties of crops, especially for rice and rubber. Most people are engaged in commercial production such as rubber, orchard, small-scale livestock, mining and collection of NTFPs. And also some people are involved in transporting, processing and trade of local products. Principle crops are rubber, betel leaf, betel nut, groundnut, sesame, durian, danyin and taunghtan.

Average annual rainfall is 3,683 mm. April is the warmest month of the year, with an average temperature of 27.2 ˚C. January is the coldest month, with temperature averaging 20.5˚C. The Kyaikhtiyoe hill is 1,103 meter and Yathae hill is 972 meter. The topography of wildlife sanctuary is undulating with slopes and hills ranging from 50 to 1,090 meter above sea level.

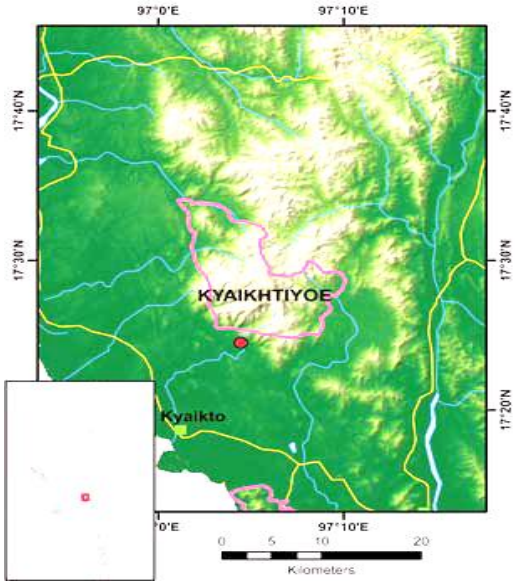

Figure 1: Location of Kyaikhtiyoe Wildlife Sanctuary

(Source: Myanmar Protected Areas, 2011)

The Kyaikhtiyoe Wildlife Sanctuary is very rich in flora and fauna. Identified species include 45 tree species, 13 medicinal plants, 20 birds, 19 mammals, 45 insects and butterflies, 34 reptiles and amphibians and 3 rattan species (NWCD, 2010). Some commonly found flora and fauna of Kyaikhtiyoe Wildlife Sanctuary (KWS) are described in table 1 and 2.

Table 1: Some commonly found flora in KWS

Types	Common Name	Scientific Name
Tree	Ananpho	*Crypteronia pubescens*
	Thitcha	*Quercur semiserrata*
	Mahlwa	*Markhamia stipulate*
	Taungthayet	*Swintonia floribunda*
	Myayar	*Microcos paniculata*

	Yone	*Anogeisus acuminate*
	Duyin	*Durio zibelthimus*
	Yemane	*Gmelina arborea*
	Pyinkado	*Xylia xylocarpa*
	Yethaphan	*Ficus glomerata*
	Kanasoe	*Baccaunca sapida*
Medicinal Plants	Taungtangyi	*Premna integrifolia*
	Phar Lar	*Elettaria cordamonum*
	Sintonemanwe	*Tinospora condifolia*
	Thetyingyi	*Croton oblonggifolius*
	Nga Yoke Kaung	*Piper nigrum*
Bamboo	Thaik Wa	*Bambusa tulda*
	Tin Wa	*Cephalostachyum pergracile*
	Wa Phyu	*Dendrocalamus membranaceus*
	Wa Nwe	*Oxytenanthera albociliata*
	Wabo Myat San Kywe	*Dendrocalamus hamiltonii*
	Wabo	*Dendrocalamus giganteus*
	Hmyin Wa	*Dendrocalamus strictus*
	Wanet	*Dendrocalamus longispathus*
	Nat Wa	*Gigantochloa nigrociliata*

Table 2: Some commonly found fauna in KWS

Types	Common Name	Scientific Name
Birds	Yit	*Lophura nycthemera*
	Taw Kyet	*Gallus gallus*
	Auk Chin	*Anthiacoceros albirostris*
	Boke	*Centropus sinensis*
	Deedoke	*Ketupa zeplonensis*
	Wayaung Nget	*Garrulax pectaralis*
Mammals	Kyarthit	*Pantera pardus*
	Gyi	*Muntiacus muntijak*
	Sug	*Cervus unicolor*
	Taw Seik	*Capricornis sumatrensis*
	Taung Seik	*Naemorhedus goral*
	Taw Wet	*Sus serofa*
	Thit Kyaung	*Prionailurus bengalensis*
	Kyaung Kadoe	*Biverricula indica*
	Kyaung Wunpipe	*Viverra zibetha*

5.2 Location of the study villages

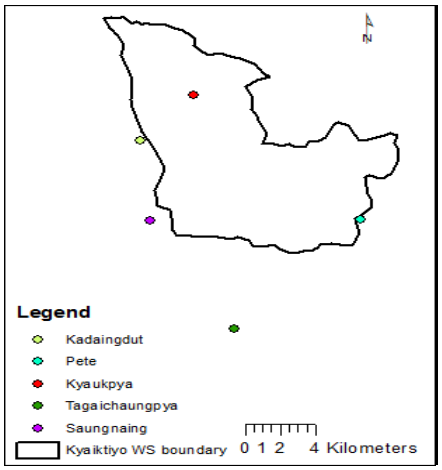

Figure 2: Location of the study villages

Five villages in and around the KWS were purposively selected for an in-depth investigation of the livelihood activities of inhabitants (Figure 2). These villages were selected based on (1) their representativeness of the region in and around the KWS, (2) accessibility, (3) commercial use of NTFPs for livelihoods of the villagers and (4) village size. Three villages are close to the boundary of KWS and one village is distant from the KWS. And the remaining one village is inside the KWS. The collection of NTFPs for commercial purposes from the KWS is prohibited by the law. However residents from these villages did collect some wild products such as bamboo, firewood, some tubers, fruits and vegetables both for subsistence and cash income. In each village, 30 households were randomly selected for household survey. This means that 20-50% of households present were taken in each village and the total sample size was 150 households (Table 3).

Table 3: Profile of the villages

Village Name	Total Households	Sampled Households
1.Kadaingdut	114	30
2.Kyaukpya	65	30
3.Pete	78	30
4.Saungnaing	135	30
5.Tagaichaungbya	105	30

5.3 Data Collection

Primary data sources were collected from household survey conducted during April-May in 2017. Family members were interviewed with the help of a structured questionnaire. The socio-economic information collected included household composition, age, education, land and livestock holdings, occupation of each family member, types and market prices of NTFPs, source and availability of NTFPs, access to market and forest and income generated from economic activities including collection of NTFPs. The information such as the prices of agricultural products and NTFPs were recorded based on the answers from household questionnaire survey. And they were cross-checked through the records from focus group

discussion and market survey. Focus group discussions (FGD) were done with the village heads, the elders, the staffs of Forest Department, survey team and the villagers. Each FGD in each village contained 5-8 people. During FGD, the information of the village such as population, migration, economic conditions, land use, major livelihood activities, major commercial NTFPs and their prices were collected. Secondary data were collected from Head Office of Forest Department, Kyaikhto Township Forest Office and Kyaikhto Township Wildlife Conservation Division.

5.4 Analysis of data

5.4.1 Stratification of households

In order to compare income groups regarding their dependency on NTFPs, the households were stratified into three income groups (low, medium and high) based on their total annual income by ascending order. This does not mean that high income group households may be the richest households in the study area. The total annual income is the sum of cash income earned by a household from all economic activities plus the computed income from subsistence activities.

5.4.2 Household income

Household income for each household was computed based on the information they provided in questionnaire survey.

Agriculture in the study area included the cultivation of commercial crops such as rubber, taung-htan (*Livistona jenkinsiana*), dog fruit (*Archidendeon jiringa*), durian (*Durio zibethinus*), sesame (*Sesamum indicum*), ground nut (*Arachis hypogaea*), cashew nut (*Anacardium occidentale*) and subsistence crops such as taungya rice, fruits and vegetables. Crop yields and sale prices of commercial crops were collected from individual households through the questionnaire survey. The prices of subsistence crops were omitted from the prices that they answered in questionnaire survey and local market prices. Income from commercial and subsistence agriculture were computed by multiplying the crop yields and prices. This is the net farm income because inputs (fertilizers, hired labor, marketing costs) are deducted from total income. Livestock keeping income was calculated by multiplying home consumption amount and sale amount by the prices obtained by questionnaire. And inputs (feeds value) are deducted from total income.

Earnings from wage employment were calculated by multiplying the number of days worked for the past 12 months by the daily wage rate. The number of days worked and daily wage rates various wage employment were obtained from family members through the questionnaire survey. Income from other sources of employment such as salaried staffs of company and government organization and own business were calculated by multiplying the salary amount by the working months during the past 12 months.

NTFPs in this study area included bamboo, bamboo shoots, firewood, charcoal, *Dioscorea* spp., honey, medicinal plants, animals, fruits and vegetables. The information

related to NTFPs types, collection style, selling and market prices were obtained from household. Income from NTFPs was estimated by multiplying all collection amounts for the past 12 months by the prices. The prices obtained from the questionnaire were cross-checked with the prices obtained from the focus group discussion. Income from firewood, some fruits and vegetables for subsistence use was calculated from the local market prices.

5.4.3 Analytical tools

Descriptive statistics (mean, standard deviation, etc.) was used for analyzing data of household income and socio-economic conditions in each village. Analysis of Variance (ANOVA) was used to compare the socio-economic profile, income and employment conditions among three income groups such as low, medium and high income groups. The data were analyzed using the Excel 2010 and SPSS version 20.

6. Results and Discussion

6.1 Socio-economic characteristics of households

Among the respondents, 36% had primary education, 10.66% got middle education, 4% had high school education, 39.33% were at the monastery education level and the rest were illiterates (Fig 3). The average educational level of the respondents was about 2 years (Table 4).

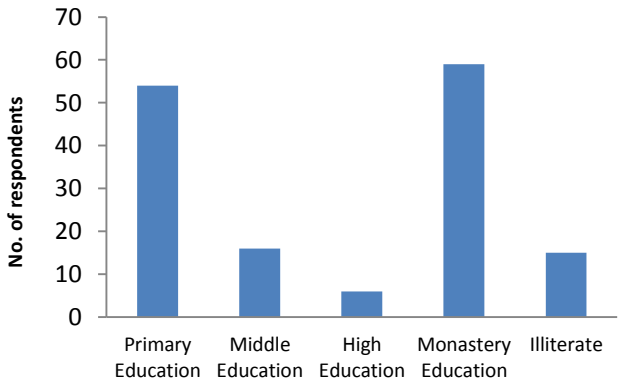

Figure 3: Education level of household head

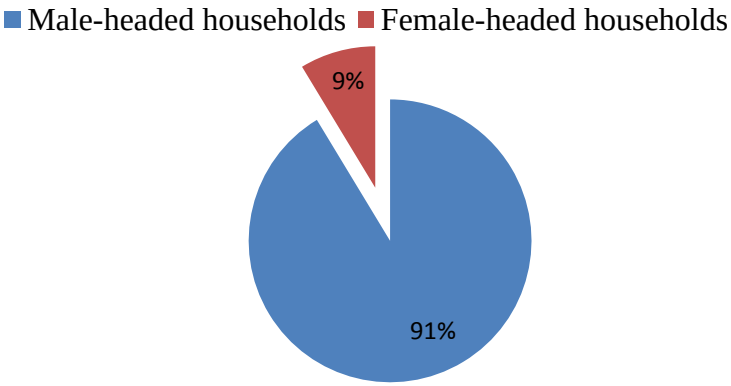

Figure 4: Male and Female-headed Households

91% were male and 9% were female household heads (Figure 4).The average family size of the sampled households was 4.99 (Table 4). The average age of household heads was about 46. In the study villages, 78% of the respondents were native and the rest 22% were migrants/ settlers from the other areas. The households owned the minimum, maximum and mean garden land acre of 0, 20 and 3.6 acre respectively. Some households practice taungya and the average taungya acre per selected household was 0.3. In these villages, there are some national and international financial sources that allow the villagers to use the money and then pay back in due time with a little amount of interest rate. So, 34% of households received credit from these sources. The main sources of credit were from UNDP and Myasaneyaung Program of the government. The forestry extension service in the area focused on training and teaching about forest management, forest development, forest and wildlife conservation and forest products. The extension service is offered by the staffs of Wildlife Conservation Division under Forest Department.

Table 4: Demographic and socio-economic characteristics of household

Household characteristics	Family size	Age (Yr)	Education (Yr)	Garden Land (Ac)	Taungya (Ac)
Minimum	1	23	0	0	0
Maximum	10	75	11	20	3
Mean	4.99	46.06	1.95	3.60	0.3
Std. deviation	1.707	11.572	2.940	4.209	0.599

6.2 Contribution of NTFPs income to total annual income of households

The income earning activities of households in the study area included farming, livestock breeding, collection of NTFPs and other off-farm activities such as wage employment, salaried staffs and own-businesses. The collection of NTFPs was the main income source and 100% of sampled households involved in this activity (Table 5). Agriculture was the second major income source as 72% of households involved. They were followed by wage employment which included as wage employers in rubber plantation, wood production and vendors in the Kyaikhtiyoe Pagoda.

Table 5: Household involvement in different income sources

Sources	Engaged Households	Percentage
Agriculture	108	72%
Taungya	38	25.33%
Wage Employment	69	46%
Salaried Jobs	14	9.33%
Own-business	38	25.33%
NTFPs	150	100%

Rural households in the study area conducted diverse sources of income, i.e. crop production, forest products extraction especially NTFPs, wage employment and own-

businesses. These finding concur with those of Wiersum (2003) who reported that many rural households diversify their livelihoods and combine various strategies to obtain food, consumer goods and income without focusing on a single activity. From such diversified livelihoods, collection of NTFPs played an important role. Income from NTFPs was the most important income source contributing about 48.23% of total household annual income in the year 2016/2017 (Table 6). This finding is similar with the other studies of Adilo (2007) and Kramer (1995). Adilo (2007) found that NTFPs contributed to an average of 49% of total household annual income in Ethiopia and Kramer (1995) reported that NTFPs contributed to 47% of total household income in Madagascar. This result is also consistent with those of Aung (2014) who reported that the major sources of subsistence and cash income for rural households earned from forest were about 50% in Natmataung National Park in Myanmar.

Off-farm income contributing to 32.17% of total annual income was the second major income source for rural people in this study area. Farming was also a common livelihood activity in this study area. The major crops included Taunghtan, Danyin, Durian, and Taungya Sapa. The contribution of farming to total annual income of the households was 19.6% in the production year 2016/2017. The productivity of agricultural products was unsatisfactory because the villagers were poor in advanced agricultural techniques. And some insects and pests infections occurred in the garden and taungya. Thus, households got primarily for home consumption amount of some fruits and vegetables from their gardens and taungya.

Table 6: Distribution of various income sources to total annual income of household (Kyats/HH/Yr)

Types of income	N	Minimum	Maximum	Mean	Std.deviation	Income Share (%)
Farm Income	150	0	5,608,000	438,026.00	705,601.771	19.60
Off-farm Income	150	0	3,720,000	719,210.00	892,338.669	32.17
NTFPs Income	150	87,600	3,606,400	1,078,096.33	807,471.968	48.23
Total Annual Income	150	741,400	5,717,500	2,235,332.33	953,638.070	100

6.3. Structure of NTFPs income

As shown in the above table, NTFPs played a very important role in households' livelihood activities. The major NTFPs included bamboo, firewood, kadat u (*Dioscorea* spp.,) and animals. Among them, nine categories of NTFPs mostly used by local communities for their subsistence and cash income were identified in my study (Table 7). Among these

NTFPs, bamboo contributed most as a share of (72.73%) of total NTFPs income, followed by firewood (12.6%), bamboo shoots (6.15%) and kadat u (*Dioscorea* spp.) (4.89%). These findings concur with those of Moe (2016) who found that various NTFPs especially bamboo and firewood were the major sources of income (both for subsistence and cash) for rural households. Firewood, wild animals, edible fruits and vegetables were used mainly for home consumption and sometimes they were used for getting cash money for households.

Table 7: Distribution of each NTFP to NTFPs income

NTFPs	Engaged Households	Income Share (%)
Bamboo	147	72.73
Firewood	150	12.6
Bamboo Shoots	46	6.15
Dioscorea spp.	8	4.89
Fruits and Vegetables	16	1.77
Medicinal Plants	9	0.87
Animals	7	0.54
Charcoal	4	0.36
Honey	2	0.09

6.4. Distribution of NTFPs income among three income groups

Different households at different income level (low, medium and high) depended on NTFPs differently. The purpose of stratification of income groups was to point out which income group of households depended on NTFPs more than others. The 150 sampled households were divided into three income groups by ascending order. 50 highest income earning households were assumed as high income group, 50 medium income earning households were assumed as middle income group and 50 lowest income earning households were labeled as low income group. It was not assumed as the high income group would be the richest group and the low income group would be the poorest households group in my study.

Analysis of income from three different income sources and total annual income from households were analyzed by ANOVA test. Considerable differences existed between households of three income groups (Table 8). Distribution of mean off-farm income, NTFPs income and total annual income were statistically significant at three income levels. Pairwise comparisons showed the significant differences of NTFPs income existed between the low income group and the high income group, and between the medium income group and the high income group, but not between the low income group and the medium income group. Mean rank comparison showed that low income group received the highest NTFPs income share (57.5%), followed by medium income group of (49.5%) and high income group of (43.8%) respectively. It can be suggested that households from low income group depend mostly on NTFPs. This is because medium and high income groups received more earnings from off-farm employments such as private shops, salaried staffs, etc. This result concurs

with the finding of Moe (2016) who reported that the lower income level households received more benefits from NTFPs than medium and highest income level households. And this result is similar with Jacobson (2012) who found that poor households were more beneficial from NTFPs than better off households in Bangladesh. This result is also in line with the findings of Asfaw (2013), Shackleton (2006) and Godoy (1993) who reported that poor households got significant benefits from forest resources than medium and better off wealth groups. But this result is contradictory with the result of Aung (2014), McElwee (2008) and Kamanga (2009) who reported that rich households received highest income from forest than the poor.

Table 8: Results of ANOVA for NTFPs income among three income groups

Income Sources	LIG		MIG		HIG		ANOVA result	Multiple Comparisons		
	Avg Income	%	Avg Income	%	Avg Income	%		LIG& MIG	MIG &HIG	LIG& HIG
Farming	333,610	26.1	350488	16.8	629980	18.9	p=0.061 F=2.852 df=2	0.992	0.115	0.088
Off-farm	209,510	16.4	703640	33.7	1244480	37.3	p=0.000 F=21.444 df=2	0.006	0.002	0.000
NTFPs	734,702	57.5	1033610	49.5	1465977	43.8	p=0.000 F=11.880 df=2	0.120	0.013	0.000
Total	1,277,822	100	2087738	100	3340437	100	p=0.000 F=288.52 df=2	0.000	0.000	0.000

Note: LIG=Low Income Group, MIG=Medium Income Group, HIG=High Income Group
***p<0.05, **p<0.01, ***p<0.001**

7. Conclusions

In conclusion, the research findings suggest that households in study villages in and around the Kyaikhtiyoe Wildlife Sanctuary depend mostly on forests for their livelihoods and income. It is found that NTFPs are the major sources of income for their livelihoods. Bamboo brings the largest share of NTFPs income, followed by firewood, bamboo shoots and *Dioscorea* spp. as the second, third and fourth largest share of NTFPs income respectively. Low income level households receive more income share from NTFPs and thus they depend more on NTFPs than medium and high income level households. However, NTFPs provide about 48.23% of total annual income of all sampled households. It imagines the high

dependency on NTFPs by the surrounding villages in the study area. It is suggested that conservation interventions should incorporate these determining factors in order to apply the actions and activities for balancing the conservation of KWS and livelihoods of local people. Complete protection and restriction of access will affect a number of households that depend on forest resources as a matter of necessity. And it may lead low income level households into poverty. The study results are important to inform the decision makers and the institution for designing participatory strategies that make a balance between conservation and development in and around the Kyaikhtiyoe Wildlife Sanctuary.

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