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Study on consumption of fuel wood and its impacts to forest resources in Taungyi District

[*1]Chaw Chaw Sein, [2]Zaw Min Aye, [3]Bam H. N. Razafindrabe

[1]Forest Research Institute Ministry of Environmental Conservation and Forestry, Myanmar
[2]Tharant University, Dresden, Germany
[3]Department of Subtropical Agro-Environmental Sciences, Faculty of Agriculture, Japan

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In Taungyi District, Shan State wood-fuel remains the main energy source for the majority of the people. Though more than half of the total land area of the country is covered by forests, the forest cover is generally very sparse in the densely populated areas where rapid rates of forest degradation and depletion have occurred due to the heavy demand on forest products, including wood-fuel, and other causes associated with population pressure. The result is an acute fuelwood scarcity problem. This study reviews fuelwood consumption according to the increasing population pressure in the Taungyi District. The necessary data was collected by Rapid Rural Appraisal (RRA) and Focus Group Discussion with households of the villages and quarters in the study area. The data was analyzed using statistical tools. This study reports the dependency on forests for fuelwood is 60% and consumption of agricultural waste is 4%. The urban household consumption of charcoal is (1.3) tons in the Taungyi District and average rural household consumption of fuelwood is (2.67) tons per year.

Keywords: Increased population, fuelwood scarcity, forest product, household, Rapid Rural Appraisal

INTRODUCTION

Biomass energy is an important source of energy in most Asian countries (FAO,2009).. Substantial amounts of fuelwood, charcoal and other biomass energy such as agricultural residues, dung and leaves are used by households and industries. The main household use is cooking and heating whereas industrial use ranges from mineral processing (bricks, lime, tiles, ceramics), food and agro processing, metal processing, textiles (dyeing, etc.) to miscellaneous applications like road tarring, tyre retreading, and ceremonies (FAO,2009). Besides these 'heating' applications, biomass fuels are also used for power generation. A lot of biomass fuels are available as by-product from other activities, such as saw milling and agricultural crop production. In many developing countries, forests are the main source of fuel wood, timber for house construction and fodder for livestock. Consequently, any depletion of this resource base can erode living standards as well as ecosystem stability (FAO, 2009). In Southern Shan state, wood-fuel remains the main energy source for the majority of people (FD, 2010). Though more than half of the total land area of the country is covered by forests, the forest cover is generally very sparse in the densely populated areas where rapid rates of forest degradation and depletion have occurred

* Corresponding author. E-**mail**: chaw.chaw4@gmail.com

due to the heavy demand on forest products, including wood-fuel, and other causes associated with population pressure (FD,2010) The result is an acute fuelwood scarcity problem. Therefore, it is necessary to review the fuelwood consumption according to the increasing population pressure and to find alternative ways for the fuelwood consumption in in the Taungyi District.

The study was conducted to achieve the following objectives:
(a) To estimate per household consumption and cottage industry consumption of fuelwood in the study areas.
(b) To find out the alternative ways for the fuel-wood consumption
(c) To investigate the extent of deforestation and degradation due to fuel-wood consumption.

The Importance of Fuelwood for Livelihoods, Logics of Fuelwood Consumption and their Reported Impacts to Forest Resources and Livelihoods of People in the World Environmental Implications of Fuel wood Consumption

It was estimated that in the late 1990s, about 3 billion people in the world (more than half of the global population at that time) relied on fuel wood for cooking and heating (Population Action International 1999). In addition, more than half of all wood harvested is used, not for products such as paper, building products, or veneer, but for fuel (Food and Agriculture Organization, 2000). Developing countries account for most fuel wood consumption and more than 75% of wood harvested in these countries is for fuel (Food and Agriculture Organization, 2000; Bearer et al., 2008). Deforestation and increasing demand for fuel wood have resulted in a looming fuel wood shortage crisis in many areas (Heltberg et al., 2000; Macht et al. 2007). Fuelwood harvesting has been linked to deforestation (Amacher *et* al., 1993), but critics argue that most wood collected for fuel is dead wood and, therefore, does not exacerbate rates of deforestation (Nagothu, 2001; Arnold and Persson, 2003). Recent research indicates that fuel wood consumption is rarely a primary driver of large scale deforestation (Arnold and Persson, 2003). Fuel wood extraction has also been implicated in biodiversity loss. This occurs in at least three ways. First, fuel wood extraction destroys habitat for cavity-using birds and mammals (Du Plessis, 1995) and reduces habitat for other forest-dwelling species such as giant pandas (Bearer et al., 2008; Liu et al., 2001). Second, habitat for saproxylic species (those which rely on dead wood for survival, such as wood-decomposing fungi and certain types of beetles) is reduced by fuel wood harvesting (Jonsell, 2007). Third, the extraction of deadwood disrupts the nutrient recycling process in forests (Shankar et al., 1998). Given these environmental implications, it is important to understand the factors influencing fuel wood consumption.

Consumption of Biofuel in Urban and Rural Areas

The main source of fuel in both urban and rural areas within developing countries is biomass (FAO, 2012). Biomass is commonly available in two forms: charcoal and fuelwood. Charcoal is energy that is made from wood, while fuelwood is collected and used directly from the field (FAO, 2012). Fuelwood gathered from forested areas is the most important source of domestic energy for the developing world (Heltberg *et* al., 2000). There are two types of fuel used within the village: fuelwood and charcoal. Fuelwood is cut and collected mainly by women of the household. Charcoal is purchased either from neighbors or along the roadside.

Firewood gathered from forested commons is an important source of domestic energy in rural areas of many poor countries (Cecelski *et* al., 1979; Heltberg et al., 2000). It has been estimated that more than 2.4 billion people rely directly on traditional biomass fuels for their cooking and heating, and in poor countries biomass use represents over half of residential energy consumption (International Energy Agency, 2005). Demands for fuelwood by subsistence agricultural households may be the leading cause of world deforestation (Amacher *et* al., 1993; Amacher *et* al., 1996). Factors such as family size, cost of wood, season, type of cooking device, alternative energy sources and the type of wood determine the level of wood consumption (Hamed, 1990). According to FAO (1995), 2 out of 5 people worldwide depend on wood or charcoal as a source of domestic energy.

Degradation and Deforestation of the Forest due to Fuelwood Consumption

The collection of fuelwood from forests that exists sustainable yield causes degradation. Forest degradation in turn leads to fuelwood scarcity and a variety of adverse consequences including loss of biodiversity, deterioration of watershed functions, release of carbon dioxide into the atmosphere and soil erosion. Degradation of the natural environment has become the subject of increasingly intense research over recent decades. This is just as true in the social sciences as in the natural, biological and physical sciences. The social sciences have been particularly concerned with the consequences of social organization and social actions on levels of environmental degradation. Human consumption of natural resources is generally identified as the key link between human behavior and degradation of the natural environment (Stern et al. 1997). Though social research has primarily focused on the total volume of human consumption, classical sociology points toward the importance of transitions in the nature of consumption as a fundamental change in the way people relate to their environment (Foster 1999).

Firewood gathered from forested commons is an important source of domestic energy in rural areas of many poor countries (Cecelski *et* al., Heltberg, *et* al., 2000). It has been estimated that more than 2.4 billion people rely directly on traditional biomass fuels for their cooking and heating, and in poor countries biomass use represents over half of residential energy consumption (International Energy Agency 2005). Demands for fuelwood by subsistence agricultural households may be

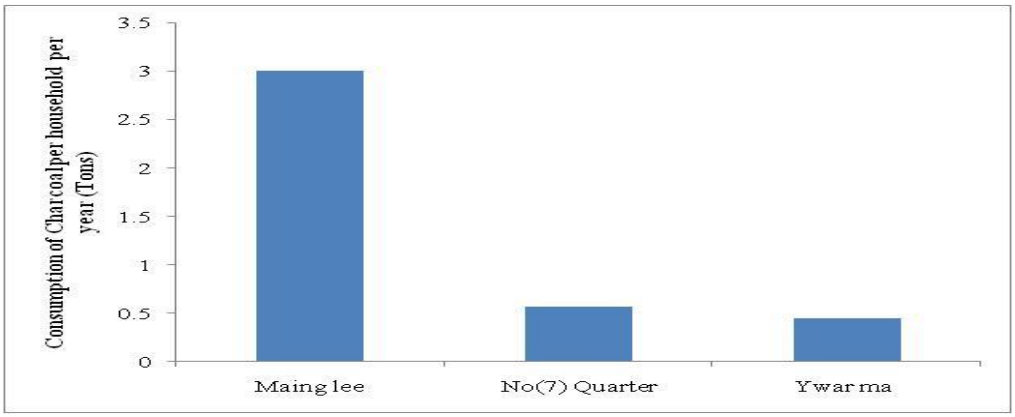

Figure 1: Consumption of charcoal in the study areas.

the leading cause of world deforestation (Amacher, Hyde and Joshee 1993; Amacher, Hyde and Kanel 1996).

In addition to the scarcity of fuelwood as a crisis per se, deforestation has numerous other harmful consequences such as loss of biodiversity and soil erosion (Heltberg *et* al. 2000; Palloni, 1994). Also, because women are the main gatherers of fuelwood, the depletion of forests forces women to spend more time looking for wood to gather and search farther from their homes, lengthening their working day (Agarwal, 1994). Finally, deforestation exacerbates conditions that could produce global warming, such as the release of carbon dioxide into the atmosphere (Heltberg *et* al., 2000; Palloni, 1994). Therefore the transition from fuelwood to alternative sources of energy is a key transition in how humans affect the environment. Substitution of fuelwood with alternative fuels can reduce pressure on natural forests. This is because alternative sources of rural domestic energy (such as crop residues, animal dung, wood from trees on the farm, biogas, kerosene, sun and wind power) do not cause forest degradation (Heltberg *et* al., 2000).

MATERIALS AND METHODS

Study Area Description

The study was conducted in Taungyi District, Southern Shan State The State extends from approximately 20° 15' to 20°45'N Latitude and 96° 49 ' to 96° 48' E Longitude. Basic rocks of the Shan plateau are composed of limestone. Granite and Shale can be found in some areas (source?). Soil found in the Taungyi District is mountainous brown and yellow brown , classified as Cambisol and Ferrasols The minimum temperature occurs in December around 13° to 24° C while maximum temperature occurs during April within a range of 21°-32° C. The area experiences severe cold nights during the Cold Season. The humidity ranges from less than 40% in March to 90% in August. In summer the prevailing winds are south-westerly warm tropical winds, originating from the Bay of Bengal. In the Cold Season (December to February) the winds are north-easterly cold winds, originating from Central Asia. The Rainy Season occurs during the period from April to November, with maximum rainfall occurring from August to September (FD, 2009).

Data Collection and Analysis

The study was conducted from 15 November 2012 to 5th January of 2013 within the Maing lee Quarter, Khaung Taing and Kan Taung villages from Nyaung Shwe Township, No. (7) Quarter, Myin Ka village and Kyauk Talone village from Kalaw Township and Ywar Ma Quarter, Peinnekon and Yechanpyin villages from Ywar Ngan township. Qualitative and quantitative data was gathered to gain a better understanding of fuelwood consumption within the area. Rapid Rural Appraisal (RRA) was applied to assess the use of wood-fuel and other energy sources. Semi-structured interview was were conducted for each household and cottage industries with sampling rate of 10% (in order to ….). Focus group discussion was also carried out with different -aged of people to focus dependency of fuel wood on forest and the practical way to substitute wood-fuel utilization. Before the interviews were administered, pre-test interviews were conducted to ensure that the questions were comprehensible and appropriate. Interviews took place face to face with the head of the household. Information gathered on demographics, gathering and collection of fuelwood, home and domestic attributes, charcoal use, and social factors were recorded. The data was analysed using statistical tools such as Spearman Correlation.

RESULTS AND DISCUSSION

Fuelwood and Charcoal consumption in the study area

Findings from the interviews showed that 85% of the households in the rural (villages) used the fuelwood for

Table 1: Consumption of fuelwood and charcoal per household in the study areas

No	Township	Quarter/ Village	No of household	Fuelwood (tons)/yr	Charcoal/ (tons)/yr	Agricultural Residues (cardloads)/yr	Electricity (unit)/month
1	Nyaung Shwe	Maing lee Quarter	38		3		387
2		Khaung Taing Village.	21	12		43	162
3		Kan Taung Village	25	2.11		28	125
4	Kalaw	No(7) Quarter	28		0.57		209
5		Myin Ka Village	17	2.55			62
6		Kyauk TaloneVillage	12	2.15			
7	Ywar Ngan	Ywar Ma Quarter.	33		0.45		202
8		Peinne Kon Village	22	2.5			
9		Yechanpyin Village	16	3.53			

cooking. In Nywe Shwe township, fuelwood consumption of Khaung Taing and Kan Taung Villaes were (12) tons and (2.11) tons per year per household respectively. In Myin Ka and Kyauk Talone Villages in Kalaw Township, fuelwood consumption were 2.55 tons and 2.15 tons per year per households. In Ywar Ngan Township, the estimated fuelwood consumption of two villages; Peinnekon and Yechanpyin were (2.5) tons and (3.53) tons per year per households as shown in Figure 1 One significant difference was found in Khaung Taing Village where all households were doing small cottage industries and the fuelwood consumption was higher than other villages. Utilization of agricultural residues (maize – pits) was also observed in Khaung Taing and Kyauk Taw Villages. It was observed that the consumption of wood waste for tomatoes boxes increased day by day, it was one of the benefits from waste in Nyaung Shwe Township. In Kyauk Talone Village, the consumption of fuelwood decreased to one third lesser than in the two previous years due to the utilization of improved cooking stoves. Moreover, the forest condition was better than other areas due to the replacement of home gardens instead of shifting cultivation in the study area. Less dependence on natural forests occurred in areas where self-owned forests inherited from relatives. According to Table 1 they could easily collect fuelwood from those forest and as a result less dependence of natural forest occurred in these areas. On the other side, most of the households in the urban quarters used charcoal and electricity for cooking. Higher consumption of charcoal was found in the Maing Lee Quarter due to the favour of charcoal for cooking. Table 1 shows the consumption of fuelwood, charcoal, agricultural residues and electricity in the study areas.

Spearman correlation analysis for consumption of fuelwood /charcoal and socio-economic characteristic of households in the study area showed that in Khaung Taing Village, all socio-economic characteristic are negatively correlated with the consumption of fuelwood by households. A significant difference was noticed about the consumption of fuelwood for households in Kaung Taing village contributing towards age of households, total land areas, income per month, education (years of study) and use of electricity.

Except age of household and education, all socioeconomic characteristics are negatively correlated with the consumption of fuelwood by households in Kan Taung Village. A significant difference was observed about the consumption of fuelwood by households contributing towards income per month in Kaung Taing village.

A significant difference was found with the consumption of fuelwood by households contributing towards total lands area and the rests socioeconomic characteristics are negatively correlated with the consumption of fuelwood by households in Myin Ka Village,

In Kyauk Talone village, a significant difference was found on the consumption of fuelwood by households contributing towards the distance for fuelwood collections and others are positively correlated with the consumption of fuelwood by households.

There were significant differences at $p<0.05$ between the consumption of fuelwood by households contributing and the number of income earnings in Peinne Kon Village .Only significance was observed about the consumption of fuelwood by households contributing towards income per months in Yechan Pyin Village.

In Nyaung Shwe Township, Maing lee quarter, four socioeconomic characteristic; number of household members, income per month, education (years of study), were positively correlated and the rests are negatively correlated with the consumption of charcoal by households. A significant difference was noticed about the consumption of charcoal contributing towards number of household members.

A significant difference was noticed at $p<0.05$ about the consumption of charcoal for households in No (7) quarter in Kalaw Township, contributing towards education (years of studyIt was observed that all socioeconomic characteristics are negatively correlated with the consumption of charcoal by households in Ywar Ma quarter except one characteristic, income per month. One significance was occurred that the consumption of charcoal for households contributing towards education (years of study). It means that even though the households are educated and have

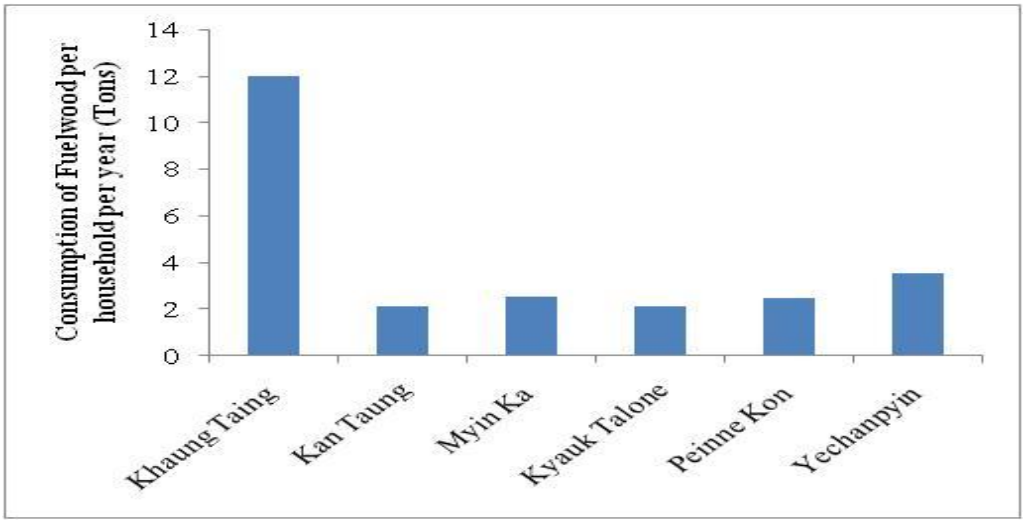

Figure 2: Consumption of fuelwood in the study area

Table 2: Spearman correlations for consumption of fuelwood /charcoal and socio-economic characteristic of households in the study area.

1. Nyaung Shwe Township													
Khaung Taing Village					**KanTaungVillage**				**Maing Lee Quarter**				
No	n	Mean	SD	r	n	Mean	SD	r	No	n	Mean	SD	r
1	21	51.333	7.351	-0.61*	25	49.8	6.58	0.02	1	38	47.2	6.89	-0.22
2	21	4.857	1.424	-0.58*	25	4.3	0.85	-0.29	2	38	4.2	0.96	-0.26*
3	21	3.810	1.030	-0.39	25	2.8	0.65	-0.14	3	38	0.6	0.76	0.07
4	21	1.905	0.944	-0.35	25	1.6	0.51	-0.18	4	38	2.1	0.73	-0.15
5	21	109545.5	28531.90	-0.96*	25	111000.0	32627.95	-0.17*	5	38	184473.7	53710.81	0.06
6	21	9.905	1.411	-0.35	25	4.8	0.75	-0.10	6	38	10.8	2.74	0.05
7	21	7.762	3.520	-0.60*	25	6.5	2.76	0.17	7	38	387.4	440.75	0.06
8	21	162.857	54.14	-0.45*	25	125.2	52.21	-0.33					

2. Kalaw Township													
Myin Ka Village					**Kyauk Talone Village**				**No (7) Quarter**				
No	n	Mean	SD	r	n	Mean	SD	r	No	n	Mean	SD	r
1	17	48.7	7.09	-0.27	12	48.9	10.69	0.12	1	28	49.5	10.02	-0.18
2	17	4.3	0.99	-0.07	12	4.1	1.08	0.33	2	28	4.2	1.10	-0.19
3	17	2.9	0.83	-0.28*	12	2.7	0.89	0.23	3	28	0.8	0.75	0.08
4	17	1.6	0.49	0.12	12	1.4	0.51	0.14	4	28	1.6	0.57	-0.22
5	17	106666.7	25075.64	0.33	12	77666.67	33518.88	0.23	5	28	148214.3	50921.40	-0.20
6	17	3.6	0.55	-0.18	12	3.9	0.65	-0.04*	6	28	9.9	2.65	-0.22*
7	17	8.5	3.32	0.04	12	6.3	3.25	-0.18	7	28	209.6	45.26	-0.16
8	17	62.4	21.07	-0.32									

Table 2 cont'd

3. Ywar Ngan Peinne Kon Village					Yechan Pyin Village				Ywar Ma Quarter				
No	n	Mean	SD	r	n	Mean	SD	r	No	n	Mean	SD	r
1	22	51.18	8.24	0.29	16	48.63	8.39	-0.15	1	38	54.2	8.60	-0.01
2	22	4.41	0.85	0.26	16	3.81	1.17	0.01	2	38	4.4	0.93	-0.16
3	22	2.59	0.80	0.32	16	2.19	0.66	-0.25	3	38	0.8	0.76	-0.07
4	22	1.27	0.46	0.50*	16	1.50	0.63	-0.24	4	38	1.5	0.51	-0.23
5	2	94318.18	33284.33	-0.22	16	83250.00	32868.42	-0.42*	5	38	169697.0	62524.24	0.20
6	22	2.59	0.43	-0.48*	16	3.18	0.25	0.22	6	38	10.9	0.42	-0.32*
7	22	6.00	2.12	0.24	16	5.75	2.02	0.13	7	38	202.4	2.28	-0.15

For Villages

1 = Age of households
2 = No. of household members
3 = Total land areas(acres)
4 =No of income earnings household members
5 = Income per month
6 = Education (years of study)
7 = Use of ,electricity (unit)

For Quarters

1 1 = Age of households
1
2 = No of household members
3 = Total land areas(acres)
4 =No of income earnings household members
5 = Income per month
6 = Distance for fuelwood collection
7 = Education (years of study)
8 = Use of electricity (unit)

*P<0.05, n= Number of sample households in the village

Table 2b: Consumption of fuelwood and charcoal by cottage industries in the study area

No	Township	Quarter	Kind of cottage industry			Fuelwood (tons)/yr	Charcoal (tons)/yr	Agricultural residues (card loads)/yr		Electricity (unit)/month	Natural gas (viss)/month
			Small	Medium	Large			Rice husk	Saw dust		
1	Nyaung Shwe	Maing lee	No	No	Bakery	142.65	No	No	No	No	No
	Nyaung Shwe	Maing lee	No	No	Hupin Restaurant	106.92	25.45	480	80	22850	48
	Nyaung Shwe	Maing lee	No	No	Smith	36.36	No	No	No	No	No
	Nyaung Shwe	Maing lee	No	No	Sugar Industry	No	No	4000	4000	No	No
	Nyaung Shwe	Maing lee	No	No	Tomatoes boxes	150	No	No	No	No	No
2.	Kalaw	No.(7)	No	No	Hotel	11.09	17.62	No	No	43016	174
3	Ywar Ngan	Ywar Ma	Coffee Industry	No	No	2.38	No	No	No	No	No
		Ywar Ma	No	No	Soe Winn Coffee	59.4	No	No	No	No	No
		Ywar Ma	No	No	Restaurant	No	No	350	480	12000	No

Table 3: Quarters/ Villages and different sources of fuelwood (descriptive characteristics)

Quarters/Villages	No of households	Community forest(%)	Home Garden(%)	Agricultural residues(%)	Natural Forest(%)	Self-owned Forest(%)
Maing lee quar.	38				16	
Khaung Taing vil.	21	9	22	14	13	42
Kyauk taw vil.	25	9	30	1	18	42
No.(7) quar.	28		70	8	19	
Myin ka vil.	17	32	24	4	16	46
Kyauk talone vil.	12	14	37	2	14	43
Ywar ma quar.	33		60		31	
Peinne kon vil.	22	10	41	5	23	46
Yechan pyin vil.	16	16	38	2	29	48

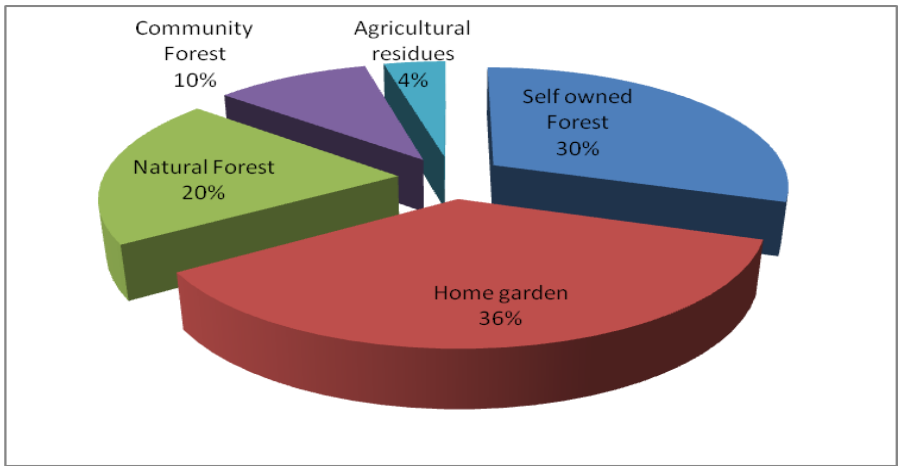

Figure 3: Sources of fuelwood in the study area

enough knowledge to conserve forest, they are still collecting fuelwood for their household use.

Consumption of Fuelwood and Charcoal by Cottage Industries in the Study Area

It was observed that the consumption of wood waste for tomatoes boxes were increased day by day at the present time. It was one of the benefits from waste in Nyaung Shwe Township. The annual use of wood waste for the tomato boxes was (150) tones per cottage industry, annual consumption of fuel wood for smith was (36.36) tones and per restaurant consumption of saw dusts and rice husk was (350) cardloads and (480) cardloads respectively. One significant in Nyaung Shwe Township was that consumption of rice husk and saw dust was (4000) cardloads per year by Hupin Sugar Industry. Table number 2shows the consumption of fuelwood and charcoal by cottage industries in the study area.

Sources of Fuelwood

Table 3 showed that homegarden (36%) was the main source of fuelwood, followed by self owned forest (30%), natural forest (20%), community forest (10%) and agricultural residues (4%) in the study area. Table 3 shows the main sources of fuelwood in the study areas.

Main Causes of Forest Degradation and Deforestation in the Study Area

The forest is the main sources of the fuelwood in the Taungyi District. The use of fuel wood is the only form of energy for cooking. Men, women and children from nearby forested areas collect firewood. At higher elevations people collected firewood during winter months only and store it in heaps for the whole year, whereas, at lower elevations collection is made throughout the year. Due to collection of huge amount of

Table 4: Quarters/ Villages and different causes of forest degradation and deforestation in the study area(descriptive characteristics)

Quarter/Village	Agricultural Expansion (%)	Wild Fire (%)	Mining (%)	Increased Population (%)	Illegal logging (%)	Shifting Cultivation (%)	Fuelwood Collection (%)
Maing Lee	10	3	6	9	8	4	60
Khaung Taing	8	4	4	10	6	6	62
Kyauk Taw							
	9	6	4	14	7	5	55
No.(7)	6	2	7	13	9	7	56
Myin Ka	8	5	3	8	10	8	58
Kyauk Talone	2	7	5	6	12	9	59
Ywar ma	3	5	4	7	7	9	65
Peinne kon	5	2	6	8	9	6	64
Yechan pyin	7	4	2	12	3	10	62

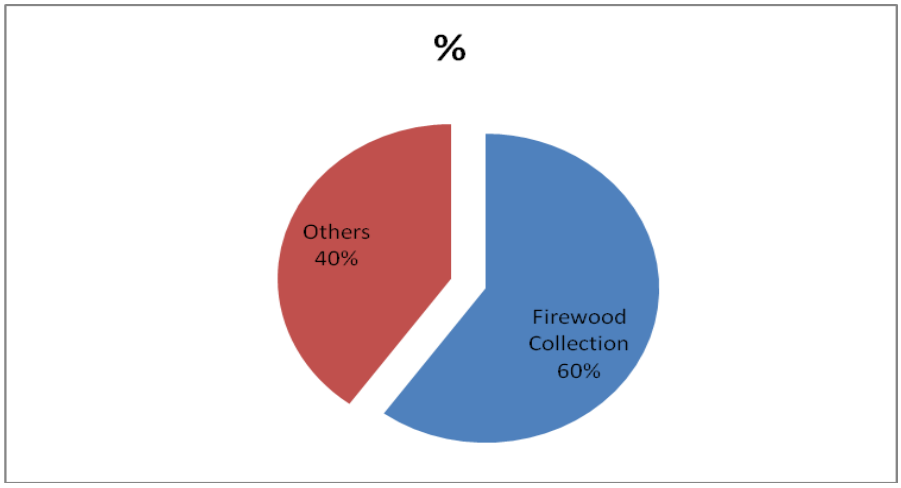

Figure 4: Main causes of forest degradation and deforestation in the study area

fuelwood, forests near to the villages are subjected to rapid degradation and over exploitation. A very small fraction of fuelwood comes from the agriculture residues. According to the focus group discussion, it was observed that the main causes of forest degradation and deforestation is fuel wood collection (60%) and others including agricultural expansion, wild fire, mining, increased population, illegal logging, shifting cultivation was (40%) as shown in Figure 4.

DISCUSSIONS

In addition, the dependency of fuelwood on forests is 60% and an agricultural residue is 4%. The result show that the annual per household consumption of fuelwood in the village is estimated to be 2.6 tons charcoal is estimated to be about 1.34 tons in the study area. According to the studies of Soe Tint (1996), the fuelwood consumption per household is 7.25 tons per year in the Ayeyarwaddy Region and 8.6 tons per year per household in the Mandalay Region. According to the review of World Bank, the fuelwood consumption of fuelwood in the Ayeyarwaddy, Mandalay, Sagaing and Bago Regions and Shan State were 5.35 tons, 4.41 ton, 4.37 tons, 4.87 tons and 4.37 ton respectively. In Shan State, it was observed that the fuelwood consumption was decreased if we compare with the World Bank study and the previous study. It may mainly depend on many reasons. First may be due to the development of the living standard of the study area and the households are now trying to abandon the use of traditional cooking stoves by using fuelwood. The second may be improvement of the mildest of the rural people and increase awareness raising of the value and important of forest on climate change and are now utilizing agricultural residues such as rice husk, coconut husk, maize-stalk and other agricultural residues for cooking. The third may be in some villages, most households are using improved cooking stoves to save fuelwood and they may also get fuelwood from the self owned forests.

Forestry Sector supplies fuel wood which is part of the renewable energy in Myanmar to fulfill the need of people. Fuel wood and charcoal consumption is 76.41%

of total energy consumption in Myanmar. Deforestation in the past two decades (from 1990 to 2010) has reached 0.55% of total land mass annually and the main reasons are fuel wood and charcoal production. However, using fuel wood and charcoal in rural areas could not be avoided till they have access to alternative energy sources such as oil, natural gas and electricity. Therefore, the following activities are implemented by the forestry sector, as part of the National Energy Policy and to support the need of country's energy.

(a) Establishment of Village Supply Plantation
(b) Establishment of Community Forest
(c) Distribution of Seedlings for Green Programmes and Tree Planting Festivals
(d) Distribution of Improved Cooking Stoves
(e) Distribution of Fuel briquettes
(f) Utilization of Agricultural residues

CONCLUSIONS AND RECOMMENDATIONS

In conclusions, efficient use of natural resources is one of the areas of Green Growth. It will augment our capacity to manage natural resources on sustainable basis with less negative environmental impacts, increase resources efficiency and reduce waste effectively. The Republic of the Union of Myanmar has been frustrating its best to manage forest resources on a sustainable basis for enhanced humanity and social equity at the same time dropping environmental vulnerabilities and related risks. Myanmar confidently believes the sustainable landscape for green growth to eliminate poverty as well as maintaining the health functioning of the Earth. Energy needs for living of all livelihoods to generate a minimum level of income. And also income-generation should be the primary goal of rural energy development in Myanmar's social, economic and environmental affair.

In order to support the fuelwood in rural areas and to conserve natural forest sustainably, the following should be done.

(a) Village-owned fuel-wood plantations and community forest plantation should be established.
(b) Natural forests should be conserved annually and regionally.
(c) Distribution of improving cooking stoves should be promoted.
(d) Multipurpose use of tree plantation should be established around the farm lands.
(e) There should be appropriate land use policy to transfer the inherited land to future generations.
(f) We should assess the opportunity for rural electrification for less dependency of natural forests.

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