

Status of Fuelwood consumption and Charcoal production in the Yangoupokpi Lokchao Wildlife Sanctuary, Manipur, India

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ABSTRACT

Fuelwood is essential for the rural livelihood sustenance in India as 75% of rural households use firewood as their primary source of fuel for cooking. This study examined the recent status of fuelwood consumption by the local communities residing inside the sanctuary. Household data were collected from the seven-forest village using structured questionnaire focusing on fuelwood consumption and charcoal production. The results indicate that on an average a household consumed 315 Kg of fuelwood per month. On an average a household of the study village produces 280 Kg of charcoal per annum. The pressure on fuelwood still persists in the sanctuary as people totally depend on fuelwood for cooking and charcoal for space heating as there is no other alternative as the sanctuary is being located at the remote hilly periphery of India and Myanmar. There is an urgent need to defuse this pressure on fuelwood by providing other feasible alternatives.

1. Introduction

In many developing countries due to scarcity of other energy resources, people use wood as their primary source of fuel because rural communities cannot afford other alternatives. A study on the Indian subcontinent showed that the situation is especially critical in the Himalayan foothills. In fact, the fuelwood crisis directly affects the poorer sections of the rural population in the 3rd world and possibly due to this reason, it has not attracted so much attention [1]. The people of Manipur, the hill tribal in particular, suffer from scarcity of energy resources and thus largely depend on wood for fuel. Furthermore, the hill community of the state extracts forest products other than fuelwood and timber. Like other hill dwellers, the people of Yangoupokpi Lokchao Wildlife Sanctuary fully depend on fuelwood for cooking and space heating purposes. Firewood as fuel is the only option available in this remote region of the state where there is less possibility of reaching LPG (Liquefied Petroleum Gas) as an alternative fuel is far beyond the reach of the people due to less accessibility coupled with poor economic conditions (average family income ₹ 3000 to ₹ 4000 per month) of the people residing in this part of the state. Charcoal is not as convenient as petroleum fuels, so as incomes rise, people tend to shift from charcoal to coal, gas, or oil. Thus, charcoal consumption has tended to peak, then diminish, as development proceeds. Other large users of charcoal include light industrial users, such as blacksmiths and ceramic and brick makers, and Brazil alone produces approximately 6 million tons of charcoal annually for steel production [2]. According to recent FAO Forestry paper [3], estimates that the global charcoal consumption is increasing and will continue to grow as the population expands. Developing countries accounted for nearly all this consumption, and African countries alone consumed more than half the total world production.

2. Study Area

YLWS is a PA situated in Manipur (Fig. 1) having a unique and vibrant wildlife ecosystem. It represents the Indo-Malayan biodiversity due to its location at the confluence of two major geographical zones, i.e. India and Myanmar. The sanctuary was formally declared as a Protected Area by the government of India on 21st March 1989. The sanctuary is located in Tengnoupal sub-division under Chandel District of Manipur between 24° 13'51" N to 24° 26' N latitude and 94° 13' 51" E to 94° 23' 51" E longitude with a varying altitude of about 276m-888m above mean sea level. The total geographical area of the sanctuary is about 177 sq. kilometers and includes seven (7) forest villages. Forest villages are allowed to remain within reserved forests by the State Forest Department in lieu of providing free labour to the latter in cutting and transporting trees, protecting the forest from fires, etc. [4]. Located within the sanctuary limits are various tribes including Kuki (an indigenous tribe in the hills of Manipur and other areas of Northeast India, north western Myanmar and the foothills of Chittagong Hill Tract of Bangladesh), Naga (an ethnic group of some 60 odd tribes native to Northeast India and North west Myanmar) and Meitei population (an indigenous group of people whose origin can be traced back to the Shang Dynasty (c.1600-1046 BCE) that migrated from the Yangtze river area of China) and other populations (Tamil, Bihari, Nepali, Marwari, etc. form parts of mainland India and Nepal) inside the trading border town of Moreh. The temperature of the sanctuary ranges from 4°Celsius in January to 40°Celsius in June with humidity ranging from 35% (during winter) to 80% (during the monsoon season). The sanctuary is an abode of various flora and fauna which consist of seasonal migratory elephants from Myanmar and Hoolock-Gibbon, the only ape species found in India.

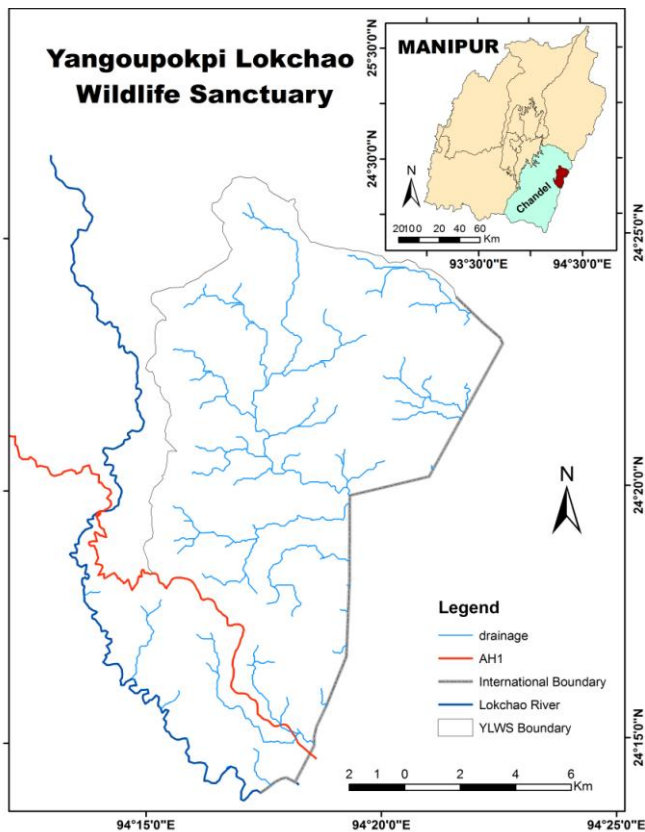


Fig. 1. Map of study area

3. Fuelwood consumption

People harvest fuelwood by cutting or coppicing shrubs, by lopping branches off mature trees, or by felling whole trees. In many rural areas, local people prefer fuelwood from shrub species that will regenerate after coppicing [5]. Cooking and space heating are the major end users of fuelwood for the local community. With the passage of time people tend to shift from wood fuels to other sources for home heating and cooking in accordance with the developing economic status, but the local people of the sanctuary has no other option rather than to stick on to firewood as their main source of fuel for cooking. Tracking an account on the production and consumption of fuelwood is rather quite difficult since it is consumed at domestic level and often takes place outside the market and rarely inside market in some exceptional case.

Table 1. Forest village consumption of fuelwood per annum

Sl. No.	Forest Village		
	Name of Village	Total household	Firewood in tones
1	Satang	38	171
2	Kwatha	77	346
3	H.Mongjang	66	297
4	B.Bongjang	48	216
5	Govajang	35	157.5
6	Chikim	53	315
7	Saikul	110	238.5

Source: Fieldwork 2014-17

Cutting, lopping or collection of fuelwood for domestic use is usually carried out during dry season (November to April). For the people of Yangoupokpi Lokchao Wildlife Sanctuary the

collection of fuelwood is not a year-round activity, they collect fuelwood in one season and stored in stack for the whole year. The collection of firewood is carried out around 500 meters radius at the periphery of the village. It is kind of selective cutting where specific trees good for burning is cut down. And there is certain section of people who used to collect dried/death trees or their twigs for fuelwood occasionally. Fuelwood is mainly used for cooking and also for space heating to some extend during cold season. From the study it is found out that every household of forest village use firewood as their prime source of fuel for cooking and space heating purposes. Firewood as fuel is the only option available in this remote region of the state where there is less possibility of reaching LPG (Liquified Petroleum Gas) as alternative fuel is far beyond the reach of the people due to less accessibility coupled with poor economic condition (average family income ₹ 3000 to ₹ 4000 per month) of the people residing in this part of the state. In Africa, there is a general trend to replace fuelwood with charcoal [5]. For example, in Bamako, Mali, the proportion of households that use charcoal has risen from nothing in 1975 to 50% in 1996, while the proportion using fuelwood has declined at the same rate [6]. The use of firewood varies from family to family depending on the size of the family, small family require lesser amount of fuel while bigger family require more fuelwood. As per the studies an average volume or amount of fuelwood consumption of a family for every village were calculated and found out that an average family consumption of fuelwood (4.5 tonnes per annum and 315 Kg per month) for the forest village.

In India approximately 75% of the rural households use firewood as their primary source of fuel for cooking [7]. According to Forest Research Institute (FRI) 2017 Chandel district having a geographical area of 3,313 sq. km has a total forest cover area of 2,829 sq. km which is about 85% of forest out of the total geographical area of the state. Out of the total forest cover 73.7% under open forest and 26.3% under moderately dense forest. The report further states that fuelwood makes 96.74% of the total energy requirement of Chandel district of Manipur. Out of the total fuelwood consumption 86.23% is extracted from the forest. The dependency of fuelwood on forest is one of the highest in Chandel district as compared to other districts of Manipur. The results of recent study regarding the consumption of fuelwood and dependency of people on forest for fuelwood with FRI 2017 report were found complimentary to each other, where almost every household of the YLWS and its neighbouring village totally depend on forest for fuelwood. The average household monthly fuelwood consumption of the study villages (315 kg per month) which were much higher than the district average 290.4 kg [8] and more than double the national average 121.19 kg [9]. The Himalayan state of India, Uttarakhand having a similar type of climate with the study area consumed 221 kg of firewood per month [10] which is much lower than the consumption YLWS people. Thus, it can conclude that the local people carry out illegal sale of firewood from the sanctuary and its neighbouring forest. Similar instances of fuelwood sales openly in market were found in Nameri Tiger Reserve of Assam [11]. Similar case of studies was also found out by [8] where Chandel district sold 16.37% out of the total fuelwood extraction annually. The selling of fuelwood for cash is high in Churchandpur (18%) and Chandel (16.7%) districts while Senapati (1.16%) and

Tamenglong (1.47%) districts were lowest [8] The preferred species for fuelwood of study area are *Magnifera indica*, *Pinnus kesiya*, *Dendrocalamus hamiltonii* and *Artocarpus heterophyllus* [8].

4. Charcoal Production

Charcoal consists of the remnants of wood that has been subjected to partially anaerobic pyrolysis (decomposition under heat). Conversion of wood to charcoal creates a product with double the energy per unit mass that is less bulky and more convenient for transport, marketing, and sale than fuelwood. The process of conventional charcoal making is an age-old tradition and follows the traditional kiln methods at village level production. The process is found quite similar with other parts of the world where small scale charcoal is produced like Mozambique, Malawi, Tanzania and Zambia. The method consists of the following steps;

3	H.Mongjang	66	24
4	B.Bongjang	48	9.78
5	Govajang	35	16.5
6	Saikul	53	16.56
7	Nungkam	110	24

Source: Field study 2014-17

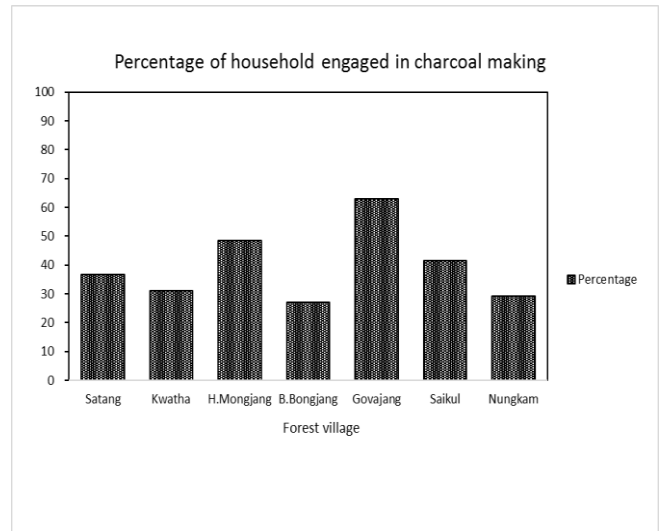


Fig.2. Percentage household engaged in Charcoal making (Forest village)

On an average a household of the study village produce 280 Kg of charcoal per annum. The production of charcoal in the YLWS were done mainly for commercial purpose and less quantity is consumed by people themselves for domestic heating purpose during winter. The end products were send to nearby market for sale mainly Moreh town (Fig. 3) from where the product is further dispersed to different nearby urban centers and reached till Imphal, the capital city of the state. But contrasting scenario of consumption pattern is found in Malawi where people preferred charcoal next to electricity for cooking purpose, about 44% household of Malawi use charcoal for cooking [14].

5. Conclusion

People of Yangoupokpi Lokchao Wildlife Sanctuary depends on forest resource for their livelihood sustenance. They extract firewood from the sanctuary for cooking and charcoal for sale and space heating to some extend as there is no other alternatives for fuel due to hilly topography coupled with irregular power supply in the area. The felling of woody trees for firewood and charcoal by the local residence ultimately affects the forest cover of the sanctuary. Illicit cutting and uncontrolled felling of trees for domestic used and for sale by some section of local people from the sanctuary had been observed practicing in the recent past. This illicit activity will give adverse effect to the vegetation cover of the sanctuary if it is not curtailed/checked rationally at the earliest. There is an urgent need of Government intervention to curtail/check this illicit felling of trees by providing alternatives such as solar energy and regular power supply if we are to conserve the ecology of sanctuary from depletion.

(i) locating suitable trees (ii) Choosing the right place to build the kiln (flat and sandy soil closer to the trees) (iii) Cutting and transporting of trees to the kiln sites (iv) Gathering necessary materials for kiln construction (grass, clay/sand and stone when available) (v) Construction kiln (vi) Operating the kiln (vii) Unloading the kiln and (viii) Putting the charcoal into bags. The process of making is laborious and mainly carried out by men [12;13]. The major domestic end uses of charcoal are cooking and heating, often in the urban areas of developing countries where people are able to purchase, rather than gather, their home energy supplies.

Table 2. Average annual charcoal production.

Sl. No.	Forest Village		
	Name of village	Total household	Charcoal in tones
1	Satang	38	10.54
2	Kwatha	77	18

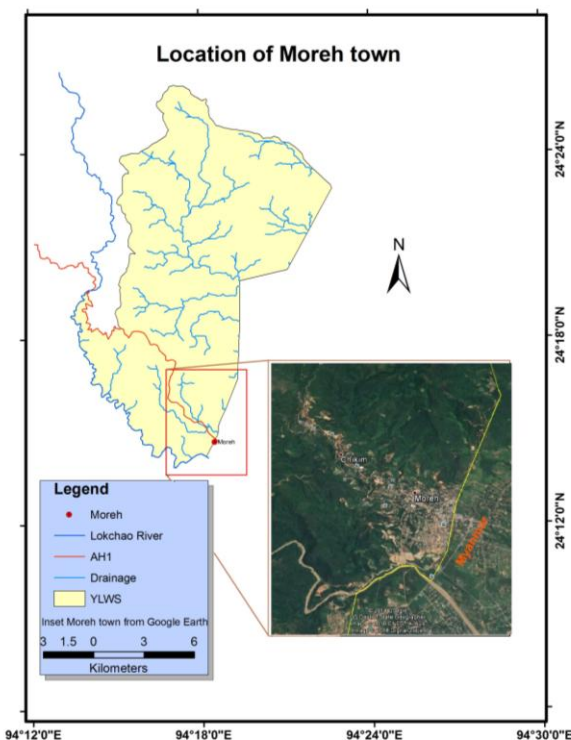


Fig.3. Location of Moreh town

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