International Journal of Ecology and Environmental Sciences 50: 459-466, 2024
ISSN: 2320-5199 (Online); https://doi.org/10.55863/ijees.2024.0057

Assessment of Fuelwood Consumption Pattern in Indigenous Communities in North-East India: A Case Study in Ukhrul District, Manipur, India

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ABSTRACT

One of the major sources of energy especially in rural sector is the fuelwood and it remains as the first choice of energy source. The North-east states of India have high indigenous population and depend upon the natural resources for their livelihood. A study was carried out in Ukhrul District, Manipur to understand the present fuelwood consumption pattern, the common species collected, and its impact on the forest land and conservation measure based on traditional knowledge. The primary data was collected using a detailed field survey, personal observations and questionnaire-based interviews and discussions with knowledgeable villagers were carried out. Annual fuelwood consumption was approximately 3000 kg per household. The most commonly collected fuelwood species were *Quercus serratus, Lithocarpus fenestratus, L. dealbatus* and *Q. cerris*. The traditional village institutions have withstood numerous challenges and have proved crucial to the preservation of the forests. The community requires assistance and incentives from the government in order to create a mutually beneficial situation for conservation as well as the improvement of the local community living standard.

Key words: Fuelwood, Livelihood, Tribal, Conservation, Tangkhul, Ukhrul

INTRODUCTION

Over 1.6 billion people are dependent on forest products such as food, medicines, fruits, and fuelwood to meet their primary needs (Brack 2018). But all over the world, forests are under tremendous pressure due to various anthropogenic activities such as rapid land use changes, logging, urbanization, infrastructure development, and mining. More than 2 million tonnes of biomass are combusted on a daily basis globally for cooking and heating (Anonymous 2006). The collection of fuelwoods contributed to about 6% of deforestation around the world (Kumar and Sharma 2009, Velumail 2011). Around 77 % of the rural population in India relies greatly on traditional biomass-based fuels for meeting their everyday needs (Anonymous 2007-08). In rural India, fuelwood remains the first choice of energy source (Sedai et al. 2016). The biomass consumption is dependent on the access to the resources, availability, local food and the cooking practices and therefore is likely to vary widely across small geographical units (Khuman et al. 2011, 2014). There are four basic components of the hill agricultural system; forests and pasture, arable land, human population, and cattle, which are all associated in a series of dynamic relationships involving the production, consumption, and transfer (Tiwari 2000). The North-east region of India is one of the most treasured regions in India and well distinguished for its rich biodiversity and it is one of the most ethnic and linguistically diverse regions in India. The region has high engrossment of indigenous population and each community has their own distinct cultures and traditions. The traditional knowledge of the people is very important and used for utilizing and managing the natural resources in the community. Most of the traditional communities of North-east states in India rely upon agricultural and forest-based resources for their livelihood. The forest is closely associated with agriculture and animal husbandry, which provides fodder, firewood, food, and medicine for humans and timber for house construction (Upreti and Sundriyal 2001). Quantifying the existing fuelwood use pattern, the species collected and its impact on the forest

needs to be done to understand the present status and seek for policies with proper management strategies to secure sustainable use of available resources.

METHODOLOGY

Study site

Manipur is one of the 28 states of India which is an innate part of North-east India. The Tangkhul community is one of the major tribes in the state of Manipur. Although they are spread in the districts of Ukhrul, Kamjong, Kangpokpi and Tengnoupal, however, about 90% of the total population of Tangkhul are found in the first two districts which together cover a geographical area of 4544 km^2 of which 3,623.75 km^2 or 79.75% of the area is under forest (Anonymous 2021a). Ukhrul District (Fig. 1) is situated at 25º07'0''N and 94º22'00''E. The terrain of the district is hilly with varying heights of 913 to 3114 m amsl. The climate of this district is characterized by sub–tropical monsoon type. Maximum temperature is about 27.98ºC in summer and the minimum temperature is 1.7ºC in winter in 2020 (Anonymous 2021b). This study was carried out in four selected Tangkhul traditional villages; Talui village with a population of 4296 in 820 households, Peh with a population of 2617 in 499 households, Hoomi with a population of 1267 in 277 households and Halang with a population of 2878 in 688 households. The villages were selected as they represent the traditional way of living and dependency on forest products in the study region.

Data collection and sampling

Both primary and secondary information were used for the present study. The primary information was collected using a detailed field survey, personal observations, questionnaire-based interviews and discussions with knowledgeable villagers. The respondents comprised of all sections of people, such as gender, age group, education level and economic

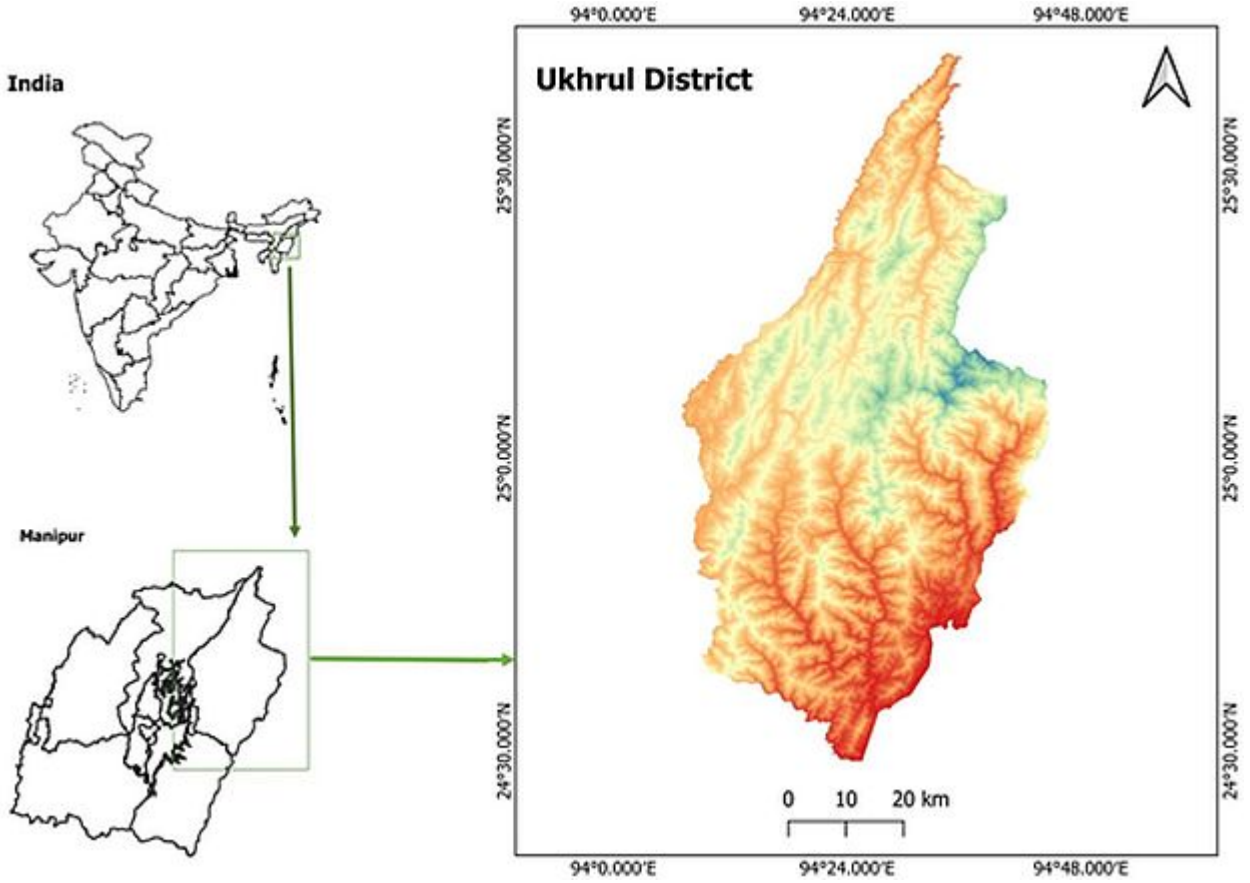

Figure 1. Map of study area

status, in the village. The questionnaire used for the study consisted of various variables such as information on household assets, family members, educational qualification, land holding type, and economic condition. The information on fuelwood consists of mode of collection, quantity per year, season of collection, names of tree species, place of collection, impact on the forest land due to collection; and conservation measures at an individual level and village level. The local name of the species was noted down and their scientific names were identified by consulting taxonomists who have worked in North-east India. Secondary information was obtained from village records, district handbook and published literature.

RESULTS AND DISCUSSION

Twenty tree species were recorded as source of fuelwood (Table 1). The fuelwood is burnt in their fireplace primarily for two purposes; cooking and heating purposes. The fireplace serves both as a kitchen and a living place. Villagers collect fuelwood from the forest by felling the whole tree or tree coppices using a traditional axe, a locally prepared implement. The felled tree trunk/branch is cut into several pieces, each measuring about 3.5 ft in length. The cut pieces are piled up in a single unit known as 'kela'; one kela is a pile of collected fuelwood weighing approximately 1500 kgs and measuring 12 X 6 ft in dimensions (Fig. 2). The average number of members in a household in the study area was found to be six; one household uses up to 2 kela of fuelwood annually which corresponds to an average of 3000 kg per household. Kangsembou (2018) reported an average of 3780 kg fuelwood per household from Yangoupokpi, Manipur. However, Rai and Chakrabarti (1996), reported lower per capita fuelwood consumption per household (423 - 1320 kg) from forested areas of Arunachal Pradesh, Manipur, Madhya Pradesh, Mizoram, Meghalaya, Nagaland, Sikkim, and Tripura. The fuelwood consumption pattern by tribal Gujjar community in Uttarakhand is 3560 to 8111.11 kg per household per year (Shekhar et al. 2016) and is far greater than that reported in the present study.

At present, the studied villages are also covered under the Pradhan Mantri Ujjwala Yojana, a flagship scheme to provide liquified petroleum gas (LPG) to the deprived and rural households to reduce the

Figure 2. Pile of stacked up fuelwood of 1 kela (approx. 1500 kg)

Table 1. Most commonly collected fuelwood species

Scientific name	Common name	Vernacular name	Family	Time of collection
Alnus nepalensis	Alder	Ngavaithing	Betulaceae	January-February
Betula pendula	Silver birch	Shairenthing	Betulaceae	January-February
Choerospondias axillaris	Nepali hog plum	Sangklakthei	Anacardiaceae	January-February
Cinnamomum tamala	Tejpatta	Tejpatta	Lauraceae	January-February
Dipterocarpus turbinatus	Garjan	Khangra	Dipterocarpaceae	January-February
Lithocarpus dealbatus	Stone oak	Kaphab	Fagaceae	January-February
Lithocarpus fenestratus	Stone oak	Ngalaithing	Fagaceae	January-February
Lithocarpus sp.	Stone oak	Pharung	Fagaceae	January-February
Michelia champaca	Champak	Leihao	Magnoliaceae	January-February
Myrica esculenta	Box myrtle	Maheithei	Myricaceae	January-February
Olea europaea	Wild olive	Kushongthei	Oleaceae	January-February
Phoebe hainesiana	Tree king	Uningthou	Lauraceae	January-February
Phyllanthus emblica	Indian gooseberry	Heikru	Phyllanthaceae	January-February
Pinus kesiya	Khasi pine	Uchan	Pinaceae	January-February
Prunus nepalensis	Bird cherry	Chamthei	Rosaceae	January-February
Prunus cerasoides	Wild cherry	Shunghaithei	Rosaceae	January-February
Quercus serratus	Manipur oak	Shilimthing	Fagaceae	January-February
Quercus sp.	Oak	Thingchangthing	Fagaceae	January-February
Quercus cerris	Turkey oak	Hungkungthing	Fagaceae	January-February
Toona ciliata	Red cedar	Thingphang	Meliaceae	January-February

extraction pressure on the local forests and encourage the use of clean cooking fuel. Under this scheme in the state of Manipur, 156,195 out of 385,520 rural households (Anonymous 2011), have been provided with LPG connections (Sinha 2023). Even if every household has one LPG cylinder, the family still use fuelwood as they consider fuelwood to be cheaper and use of wood in the kitchen as the source of heating the living space.

Traditional knowledge in the collection of fuelwood

Though the villages are located in different areas, all follow similar practices throughout the year. Table 2 shows the traditional agricultural calendar that the communities follow from the month of January to December. Throughout the year people are involved with agriculture activities and their lives revolves around it. In North-east India, around three fourth of the population depends on agriculture and allied activities (Seitinthang 2014). The collection of fuelwood is carried out mostly in the month of January and February, as these two months are considered the driest months and the water content in wood is low and the maintenance of tree life is manageable during these months. Khangsembou (2018) in his paper also mentioned that collection of fuelwood for domestic use is mostly carried out during dry season of November to April. The communities while collecting fuelwood do not cut or uproot the whole tree, only the major branches are felled. Pruning and coppicing is carried out for unhealthy trees for proper regeneration. This process helps to protect the trees by preventing it from decay-producing fungi and infection of other areas of the tree (Gilman and Grabosky 2006). Some tree species are not preferred by the locals as fuelwood as they serve other requirements or possibly cause health hazard (Table 3).

Traditional land governance system for collection of fuelwood

Traditionally village lands in the study area are broadly divided into three categories; private land, clan land, and community land (Table 4). The people collect from these different types of land. Kipgen

Table 2. Agricultural calendar of the traditional farmer in the study area which integrates the fuelwood collection as an integral activity

Activities	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Preparing the agricultural land for planting potato and maize	yyy	yyy										
Collection for firewood	yyy	yyy										
Preparation of home gardens	yyy	yyy										
Ploughing of paddy fields	yyy	yyy										
Garlic harvesting is started during this month	yyy	yyy										
Sowing of rice seeds for transplanting			yyy									
Sowing of potato and maize			yyy									
Collection of firewood			yyy									
Ploughing of the wet paddy fields				yyy								
Transplanting of rice seedlings to the wet paddy fields					yyy	yyy						
Sowing of ginger, yam, king chilli, beans					yyy							
Fishing carried out						yyy						
Cleaning the transplanted wet paddy field							yyy	yyy				
Planting of garlic is started								yyy				
Maize is harvested.								yyy				
Cleaning of the bunds is carried out								yyy	yyy			
Harvesting of rice is carried out										yyy	yyy	
Month of weddings and festive season												yyy

Table 3. Tree species not preferred as fuelwood for various traditional reason

Species	Reasons for not using as fuelwood
Pine, Tree King, Red cedar	Construction of homes
Pine, Tree King	Used for making furniture
Pine	Wood when burned produces excessive smoke
Needle wood tree, *Rhus* tree	Causes skin rashes, itchiness and allergies
Chinese Sumac	When burned it gives popping effect
Gooseberry, wild olive, wild apple, elephant ear fig, Himalayan pear, wild walnut	Wild non cultivated edible fruits

Table 4. Socio-economic attributes of the study villages. COL - community land, PL - private land and CL - clan land

Attributes	Halang	Hoomi	Peh	Talui
Number of households	688	277	499	820
Population	2878	1267	2617	4296
Male	1431	652	1310	2232
Female	1447	615	1307	2064
Type of land ownership	COL & PL	COL & PL	COL, PL & CL	COL, PL & CL
Ratio of COL : PL : CL (~ %)	40 : 60 : 00	70 : 30 : 00	60 : 37 : 3	59 : 40 : 1

(2018) in his work also mentions three main types of land divisions in Manipur which includes: community land and clan's land, forest and village settlement. Lands owned by individual families such as residential areas, wet paddy fields, home gardens, and some forest areas are under private lands category. The land adjacent to the settlements, usually up to 1 km, are mostly private land. The individual family has the absolute right to use such lands according to his needs and wishes and such lands can be traded and also inherited. Every village has several clans; each clan is believed to have the same origin with a common ancestor in the family tree. Most of the clans own their common are of land/ forest in the village which belongs to clan land category. Such lands have been inherited from their forefathers as per the indigenous customs. Here, the members of a particular clan have the right to collect fuelwood or practice any form of food production.

Land under community land category constitutes the major chunk of the village area. The community lands are those areas that belong to all villagers as a whole and are governed and managed by village authority. The village people are allowed to collect fuelwood from community land with permission from the village authority and a tax of IRS 500 per kela is collected. Fuelwood collection from this area is allowed exclusively for domestic uses only. The administration of the hilly region in Manipur is still based on the traditional customs and laws (Kipgen 2018).

Conservation measures at individual and village/ community level

The villagers strongly believe that unless strong and effective regulatory measures concerning the conservation of forests are introduced, rich natural resources will be depleted sooner rather than expected. For this, strict regulation is in force for the conversion of forest land as compared to other land use types. Along with such regulation, other forest conservation measures are taken such as; setting aside of certain part of the village land as a reserved forest, only seasonal pruning of trees is practiced (January to February), and complete felling of a tree is not allowed unless the tree is unhealthy. Collection areas are given time to regrow by practicing rotation of use of areas and local youth clubs are involved in the planting of native forest trees. In the study area the village authorities have

banned the burning of forest, irrespective of community forest or private forest. In case of violation of this rule, fine is imposed on the concerned offender. Ethnic groups play a significant role in biodiversity management and conservation. They understand that biological diversity plays a crucial role in producing the natural resources and ecological services that they rely on (Singh et al. 2023).

CONCLUSION

The traditional village institutions have been resilient to various pressure and this institution have been playing a major role in the conservation of forests. In the absence of any visible conservation initiatives from government-controlled forests, it is only the traditional institutions that have been able to safeguard the natural forests in the region. They could do so due to time-tested traditional knowledge and the historic emotional attachment of indigenous communities to their surrounding natural environment. The introduction of Pradhan Mantri Ujjwala Yojana benefitted a large number of inhabitants but the benefits of this scheme still need to reach a large number (59.48%) of the total rural households in the state of Manipur. The dependence on fuelwood could decrease with such initiatives. The indigenous communities in North-east India have a great sense of community feeling, participation, and belongingness to their villages. Such virtue has played a conducive environment for traditional village authorities to carry out activities and implement any conservation-related policies. Indigenous communities need support and incentives from the government to bring a win-win situation for the conservation and upliftment of livelihood of local communities.

ACKNOWLEDGEMENT

The corresponding author (TS) thanks the Director, Research and Development Cell of GGSIPU for financial grant under the Faculty Research Grant Scheme (FRGS) (F.No. GGSIPU/DRC/FRGS/2019/1553/52).

Author's contribution: All authors contributed equally.

Conflict of interest: Authors declare no conflict of interest.

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Received:30th November 2023
Accepted: 7th February 2024