Eco. Env. & Cons. 28 (October Suppl. Issue) : 2022; pp. (S39-S44)
Copyright@ EM International
ISSN 0971–765X

DOI No.: http://doi.org/10.53550/EEC.2022.v28i06s.006

Utilization pattern of forest resources: Evidence from the fringe villages of Manas National Park, Northeast India

Simi Talukdar

NH-52, Knowledge City, Arunachal University of Studies, Namsai 792 103, Arunachal Pradesh, India

(Received 30 January, 2022; Accepted 27 February, 2022)

ABSTRACT

The present study based in the Manas National Park (MNP), explored the different resource utilization pattern by the ethnic communities, namely, Bodo of Kochubil (KB), Assamese of Borpothar (BP), Nepali of Kahitama (KT), Adivashi of Barangabari (BB), and Bengali of Bishnupur (BN) village. Mixed method of data collection includes structured and semi-structured questionnaires, addressing to the respondents with face-to-face interview was conducted. Among the resources, fuelwood is found to be the most important resource in all the study villages. Out of 110 species (belonging to 60 families), herb comprises the most used life-form, while leaves are widely used plant parts. Bodo (27%) people were widely using the forest resources compared to Assamese (25%), Nepali (17%), Adivashi (18%) and Bengali (13%). Among ethnobotanical indices, highest FL value reported for *Azadirachta indica* (85.9%), while *Dillenia indica (73.02%)showed highest PR value.*

Key words: *Ethnic community, Forest resource, Manas National Park, Ethnobotanical indices*

Introduction

The northeast India harbors about 50% of the floristic composition of India, 40% of which are endemic. The biogeographical climatic condition supports growth of numerous wild edible, medicinal, aromatic, ornamental and other valuable plants. Among the seven sisters, Assam is an imperative region falls within Indo-Burma Hotspot and harboring a variety of vegetation. For the betterment of the wildlife and conservation of many endemic and endangered species, the state has declared six national parks along with 18 wildlife sanctuary (Sarma *et al.,* 2008). Of these, Manas national park (MNP) is an UNESCO world heritage site and located in the foothills of the Eastern Himalaya. Tribal communities of the fringe villages derive their food, fodder, medicine and a range of other forest product from nature. Also, they have rich indigenous knowledge on those resources, which play a vital role in meeting socioeconomic functions including the upgradation of rural life (Sarma and Sarma, 2008).

Although different floral and faunal diversity of MNP studied by previous workers, but, documentation of indigenous knowledge on resources and their utilization pattern has never been recorded yet. Therefore, an attempt was made to collect primary data collection on i) socioeconomic condition of the local villagers; ii) types of forest resources used; iii) pattern of utilization of different resources by different tribes/communities.

Materials and Methods

Study area

Manas National park is the only protected area in India, accorded with five different conservation statuses. It is located in between Baksa and Chirang districts (26°35'-26°50'N, 90°45'-91°15, E) with a total area of 2837 sq. km and 500 sq. km forming a core area. The climate of the MNP is moistly tropical with annual average rainfall between 3000 mm to 4000 mm. The average annual temperature ranges between 16-37% with the highest in the month of July-August (Borthakur, 1986). *Terai* and *Bhabar* grassland are characteristics of MNP, occupying more than half of the area. Apart from grasslands vegetation, other parts are covered with Sub-Himalayan high alluvial Semi-evergreen, Eastern Himalayan Moist Mixed Deciduous and Assam valley Semi-evergreen forest (Champion and Seth, 1986). More than 500 species have been identified in MNP, of which many plants are endemic to Northeast India (Jain and Hajra, 1975).

More than sixty villages (~62) are located in the vicinity of ~2 km of the MNP, which are situated in the south direction of MNP. AsMNP is spread over the Baksa and Chirang districts, consequently, there is a significant difference in the ethnic composition as one moves from one corner to another corner of the NP. Majority of the population belongs to *Bodos* comprising 45-65% of the total population followed by *Assamese*, *Bengali*, *Adivashi* and *Nepalese* (Rabha, 2007).

Socioeconomic and forest data collection

Three month pilot survey was conducted through informal and semi-structured discussions with villagers and questions were modified wherever necessary. Out of total sixty two villages, only those villages were selected initially, which were inhabited by a single community. Finally, five villages were selected for this study depending on the accessibility, viz. Kochubil (KB) inhabited by the Bodo tribe, Borpothar (BP) by the Assamese, Kahitama (KT) by the Nepali, Barangabari (BB) by the Adivashi tribe, and Bishnupur (BN) inhabited by the Bengali community. Secondary data, such as official demographic data, forest-related data, geographic and meteorological as well as other relevant documents, maps, etc. were collected from the Block Development Office of Barpeta district, Office of the Field Director, Manas Tiger Reserve, Assam, India.

Field trips were conducted from February to November, 2018. Participants were selected from stratified random sampling and purposive sampling methods. From each of the selected villages, half of the family head members were selected randomly and a face-to-face interview was conducted (Alphonse and Gu, 2009). Both qualitative and quantitative data collection was made including structured and semi-structured interviews (Ogra, 2009). A variety of data were gathered on forest resources, viz, plant used purpose, local names, part/s used, life forms of those plants, use pattern etc. Information collection was followed by sample collections, which were labeled properly for herbariums preparation (Phukan *et al.,* 2003) and later deposited to the Department of Botany, Arunachal University of Studies, Namsai, A.P.

Ethnobotanical indices for quantitative data analysis

Fidelity level (FL) gives us an idea about potentiality and informers' most preferred local plants against a particular disease.

$FL = Ip/Iu \times 100$

Here, Ip = number of informers who individually claimed the use of a plant for a particular purpose; Iu = total number of informers who mentioned about the plant used for different purpose (Giday *et al.,* 2010).

Use value shows a relative importance of every single plant based on their relative uses among informers (Albuquerque *et al.,* 2006).

$UV = (\Sigma Ui)/N,$

Here, Ui = number of uses quoted by each informer for a given plant; N =total number of informers.

In preference Ranking (PR) respondents were requested to present the values (5=best, 4 = very good, 3 = good, 2 = less used, 1 = least used, 0=do not know) to each plant species (Cotton, 1996). The average value is calculated by adding up all scores for a plant and divided by the total number of respondents and transformed into a percentage.

Results and Discussion

Socioeconomic Profile

Socioeconomic data of the respondents from KB, BP, KT, BB and BN were recorded (Table 1). Thirty-

seven, seventeen, twenty-four, thirty-three and fifteen respondents, who were the heads of the randomly selected households, were interviewed from KB, BP, KT, BB and BN villages, respectively. The socio-economic conditions of all the communities did not differ significantly except that the Bodos of KB. Though the land holding of respondents was less in KB and BP, the application of biofertilizer and cowdung gives them higher returns as compared to the other villages. Taking into account all the aforesaid variables, it could be said that the KB Bodos were somewhat more affluent than the other communities. Previous research shows that agricultural productivity is inversely proportional to forest products extraction (de Boer and Baquete, 1998). However, the situation is not so straight forward in the present study. Capitalizing on the relative proximity of their village to the forested tracts, which is only second to that of BP, a large proportion of KB residents were found to make weekly trips to the forest for collecting fuelwood as well as edibles and other materials. Thus on the one hand, they had adopted improved technologies to augment their agricultural production both in terms of quantity and diversity; while on the other hand, they are able to supplement their income by saving on expenditure on fuelwood and even edibles. Thus the Bodos represent a community that has made the best of 'both the worlds', although their contribution and pioneering involvement in establishing Manas NP as a protected area need to be appreciated.

Primary income is the highest in KB followed by BP, KT, BB and BN; secondary income is also highest in KB followed by BP and KT, with BB and BN respondents having no secondary income. Primary income sources of all the villages include agriculture, daily wage, private sector jobs, teaching and forest guard jobs. Agriculture and daily wage are the two main livelihood options for the majority of the respondents. 'Primary income' denotes the main livelihood option on which the respondent and his/her family depend, while 'secondary income' is the amount received besides the main income or sometimes when there is no income from the primary source. For example, farmers after harvesting crops in one season have to wait for two-three months for the next plowing. During this time they try to earn from secondary income sources such as daily wage and/or petty private sector jobs. BN has the highest proportion of respondents having BPL (Below Poverty Line) ration card, while KB has the lowest; KB also has the highest proportion of respondents having APL (Above Poverty Line) ration card; and BP has the highest proportion of respondents not having any ration card. The literacy status of the interviewees is found to be highest in BB, where 58.34% respondents can read and write and 42.60% can sign their names, while none is illiterate. However, the highest number of literate members in the family is reported from KT (3.14 ± 1.51). Land hold-

Table 1. Socioeconomic profile of respondents in the study villages

Variable	Kochubil (KB)	Borpothar (BP)	Kahitama (KT)	Barangabari (BB)	Bishnupur (BN)
Age (year)	45.2 ± 13 (24-70)	46.1 ± 17.6 (24-85)	56.9 ± 14.5 (28-73)	42.2±12.3 (30-75)	41.17±13.69 (20-70)
Family size	4.54 ± 1.55 (2-8)	4.91 ± 1.6 (2-7)	5.2 ± 1.7 (2-8)	4.5±1.42 (2-8)	5.06±1.1 (3-7)
Primary income/month (INR)*	9128.23 ± 12079.7 (3000-46934.3)	6453.14 ± 6985.43 (2400-26667.7)	3453.07 ± 1186.6 (1902-5677)	4925.03± 1805.85 (3000-9000)	4339.39± 1782.48 (2000-10000)
Secondary income/month (INR)*	1854.95 ± 2207.3 (2133-8000)	1647.06 ± 1902.01 (2500-5500)	1300 ± 1672.9 (1902-5677)	No other income source	No other income source
Ration card availability					
a) BPL	21.62%	29.41%	40%	25%	48.48%
b) APL	29.73%	11.76%	26.7%	29.17%	27.27%
c) No card	48.65%	58.82%	33.33%	45.83%	24.24%
Land (ha)	1.91 ± 2.49 (1.03-10.81)	1.62 ± 2.59 (1.03-8.14)	1.92 ±1.9 (1.02-6.10)	2.97±2.16 (1.36-8.79)	2.82±1.05 (1.35-4.16)

* 1 USD ~74.81 INR

ing size is highest among BB respondents (2.97±2.16 ha), followed by those from BN (2.82±1.05 ha), KT (1.92 ±1.9 ha), KB (1.91 ± 2.49 ha) and BP (1.62 ± 2.59 ha).

Forest resource utilization by communities

All the respondents from the five study villages regard the Manas NP as a rich source of fuel, fodder, edibles, medicine and water. Among the different resources, about 70-89 per cent respondents from all five study villages give first preference to fuelwood, followed by water (41-79 %), and edibles. However, 5-12 per cent KB and BP respondents have given edibles as the first priority, while 13.33% of respondents in KT, and 4.17% in BB also put fodder as their first preference. A few families in BP and BN did not harvest fish, since they were found to be vegetarian because of their '*Vaishnava*' faith. Medicinal plants are not included in the first preference by any, with 2.7% in KB and 3.03% in BN showing second preference for medicinal plants (Fig. 1). Extraction of medicinal plants from forest was found to be higher in BP village, as many elderly persons there have good knowledge of medicinal plants which they commonly utilized for treating their diseases.

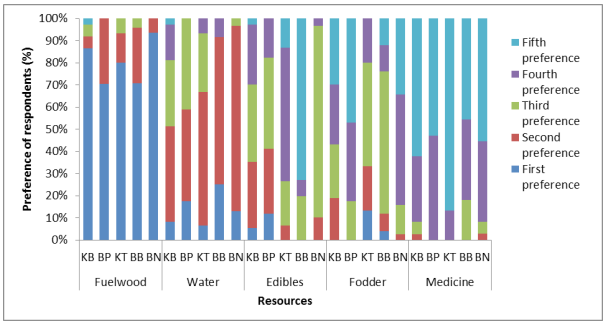

Fig. 1. Forest products preference given by the communities

A total of one hundred ten plant species belonging to sixty-one families are found to be used for different purposes (edible, medicinal, ritual, ceremonial, etc.) by these five communities. Some plants are used by two or more communities, while the uses of some were community-specific. For example, *Euphorbia ligularia* is a plant of immense cultural-religious and medicinal importance for the Assamese; *Cyperus rotundus* for the Nepali; *Solanum viarum* and *Aristolochia indica* for the Bodo; and *Hydrocotyle sibthorpioides* for the Adivashi. The Nepali community uses four medicinal plants for curing skin burning, jaundice and kidney problem, which are not used by Assamese and Bodo communities. Bengali of BN use seven different plant species not used by the other four communities. Likewise, Adivashi of BB used six plant species that are not used by the other communities. Previous studies reported that ethnic communities of Northeast India have learned to use the forest according to their needs such as for subsistence, medicine, and cultural use etc. (Buragohain, 2011; Chakraborty *et al.*, 2012). Species like *Homalomena aromatica* and *Piper griffithii* are widely used as spices, while species like *Ananas comosus* (leaf), *Plumbago zeylanica* (stem and leaves), and *Scoparia dulcis* (whole plant) are commonly used in traditional beer brewing. This kind of beer spices are used in different parts of the world (Deka and Sarma, 2010; Das *et al.*, 2012) and are integral parts of the cultural traditions of the communities. A study showed that though people are aware of about the harmful effects of resource extraction in the long run, but when the choice is between conservation and starvation, they are bound to opt for resource extraction (Byer, 1996). Total, twenty-six

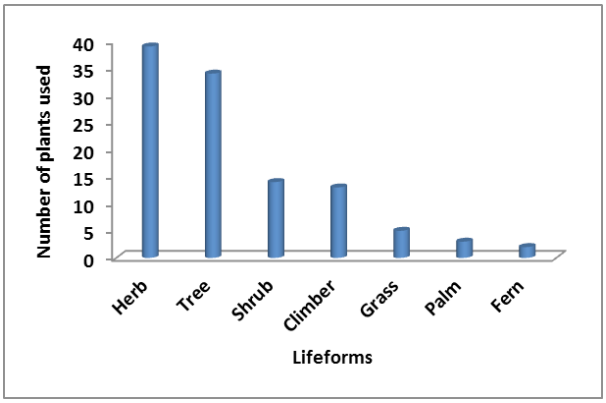

Fig. 2. Lifeforms used by Bodo, Assamese, Nepali, Adivashi and Bengali communities

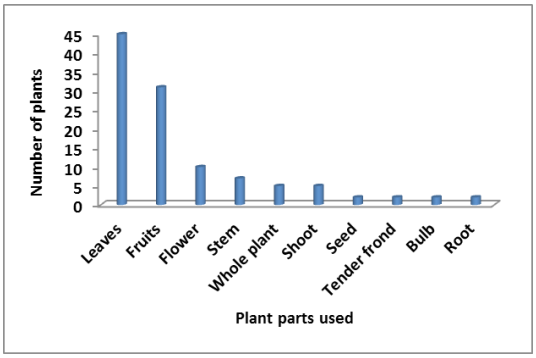

Fig. 3. Plant parts used by Bodo, Assamese, Nepali, Adivashi and Bengali communities

plants are used by all five communities for the same or different purposes. Herb comprises the most used life-form, followed by tree, shrub, climber, grass, palm and fern (Fig. 2) and among the plant parts; the leaf is most widely used (Fig. 3).

Bodo (27%) people were widely using the forest resources compared to Assamese (25%), Nepali (17%), Adivashi (18%) and Bengali (13%) (Fig. 4). Study revealed that all the five communities were using these forest resources mostly for edible (57%) purpose followed by medicinal (23%) use and cultural used (20%) (Fig. 5).

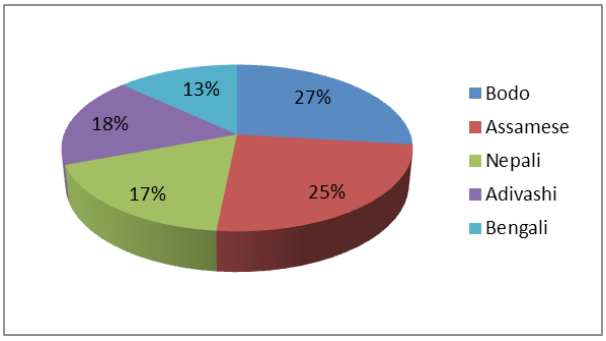

Fig. 4. Percentage of plant used by selected communities.

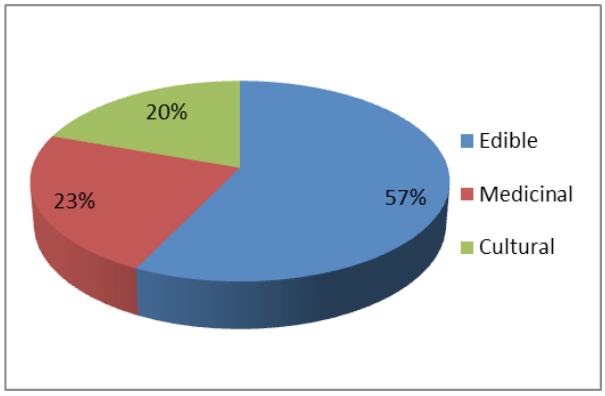

Fig. 5. Plants used by communities for different purpose

Another important fact that has come out of the present study is that the majority of the respondents irrespective of different age groups believed that the number of trees as well as wild animals was declining in the study area. Plants like pali (*Stereospermum personatum*), gamari (*Gmelina arborea*), sal (*Shorea robusta*), titasopa (*Michelia champaca*), okshi (*Dillenia pentagyna*), makarisal (*Schima wallichii*),sissu (*Dalbergia sissoo*), and bonsum (*Phoebe goalparensis*) are good timber plants and consequently fetch good market price.

Ethnobotanical indices

The highest fidelity value was reported for *Azadirachta indica* (Neem) (85%) from the study site. Therapeutical and many medicinal properties of *A. indica* have been reported in Unani and Ayurvedic system of medicine. Different plant parts including ripe fruit coating, root bark, stem bark, seed extract and leaves contains many phytochemical compounds used for the treatment of common ailments including bacterial and fungal sources (Quraishi *et al.*, 2018). *Dillenia indica* (73.02%) (highest PR value) locally, known as *Outenga* has received highest the preference ranking. Besides, a very common and popular local cuisine item, it has promising effects against diabetes and other diabetic-associated difficulties (Kamboj *et al.*, 2019). It has been extensively used in Ayurveda as antimicrobial (Nazma *et al.*, 2009), antioxidant (Deepa and Jena, 2011), analgesic and anti-inflammatory (Badrul *et al.*, 2012). Highest UV value is reported for *Murraya koenigii* (UV=0.81). Leaves of this plant are widely used in curry as spice and also have medicinal value (Jain *et al.*, 2012). Many secondary metabolites such as flavonoids, terpinoids, tannins, and alkaloids play an active roles and having incredible therapeutic properties. And hence widely used both in medicine and in daily use.

Conclusion

The present study reveals that the socio-economic conditions of all the communities did not differ significantly except that the Bodos of KB had a higher primary income than that of the others. Majority of respondents from all the villages were marginal farmers. Availability of forest products is the topmost priority in the minds of the majority of BN, BP, BB and KB respondents. This study of forest resource documentation showed 110 plants that are used by the five ethnic communities of Manas NP. In many cases, it has been observed that one particular plant is used in different ways by different communities. It seems that those communities have learned well to utilize the forest resources in the same or another way to sustain their lives.

Acknowledgments

I profoundly extend my gratitude to the Forest Department, Assam, and local people of all the five vil-

lages for their support during the field work. I am also grateful to the Department of Botany, Arunachal University of Studies, Namsai, A.P. for their support and guidance during herbarium identification.

Conflict of interest

None

References

Albuquerque, U.P., Lucena, R.F.P., Monteiro, J.M., Florentino, A.T.N. and Almeida, C.F.C.B.R. 2006. Evaluating two quantitative ethnobotanical techniques. *Ethnobotany Res. Appl*. 4 : 51–60.

Alphonse, N. and Gu, Y. 2009. Local livelihood and protected area conservation in Rwanda: a case study of Akagera National Park. *J. American Sci*. 5(4) : 171-178.

Badrul, A.M., Saifur, R.M., Hasan, M., Khan, M., Nahar, K. and Sheema, S. 2012. Antinociceptive and antioxidant activities of the *Dillenia indica* bark. *Inter. J Pharmacol*. 8 : 243-251.

Borthakur, M. 1986. Weather and Climate of North East India. *North east Geogr*. 18 (1-2) : 20-24.

Buragohain, J. 2011. Ethnomedicinal Plants Used by the ethnic Communities of Tinsukia District of Assam, India. *Rec. Res. Sci. Tech.* 3(9): 31-42.

Byers, B.A. 1996. Understanding and influencing behaviours in conservation and natural resource management. *Afri. Biodiv. Conser*. 4: 118-125.

Chakraborty, R., De, B., Devanna, N. and Sen, S. 2012. North-East India an Ethnic Storehouse of Unexplored Medicinal Plants. *J. Nat. Prod. Plant Res.* 2(1) : 143-152.

Champion, H. G. and Seth, S.K. 1968. *A Revised Survey of the Forest Types of India*. Govt of India Press, Delhi.

Cotton, C.M. 1996. *Ethnobotany: Principles and Applications*. John Wiley & Sons.

Das, A.J., Deka, S.C. and Miyaji, T. 2012. Methodology of rice beer preparation and various plant materials used in starter culture preparation by some tribal communities of North-East India: A survey. *Inter. Food Res. J.* 19(1) : 101-107.

de Boer, W.F. and Baquete, D.S. 1998. Natural resource use, crop damage and attitudes of rural people in the vicinity of the Maputo Elephant Reserve, Mozambique. *Env. Conser.* 25 : 208–218.

Deka, D. and Sarma, G.C. 2010. Traditionally used herbs in the preparation of rice-beer by the *Rabha tribe* of Goalpara district, Assam. *Ind. J. Trad. Know*. 9(3) : 459-462.

Deepa, N. and Jena, B.S. 2011. Antioxidant fraction from bark of *Dillenia indica*. *Int. J. Food Prop*. 14 : 1152-1159.

Giday, M., Asfaw, Z. and Woldu, Z. 2010. Ethnomedicinal study of plants used by Sheko ethnic group of Ethiopia. *J. Ethnopharmacol*. 132 : 75–85.

Jain, S.K. and Hajra, P.K. 1975. On the botany of Manas Wildlife Sanctuary in Assam. *Bull. Bot. Sur. India.* 17 (1-4) : 75-86

Jain, V., Momin, M. and Laddha, K. 2012. Murraya Koenigii: An updated review. *Int. J. Ayur. Herbal Med*. 2(4) : 607-627.

Kamboj, P., Talukdar, N.C. and Banerjee, S.K. 2019. Therapeutic Benefit of Dillenia indica in Diabetes and Its Associated Complications. *J. Diabetes Res. Vol*. Article ID 4632491, 7 pages. https://doi.org/10.1155/2019/4632491.

Nazma, P., Mohammad, S.R., Mohammad, S.I. and Mohammad, A.R. 2009. Chemical and biological investigations of *Dillenia indica*. *Bangladesh J. Pharmacol*. 4 : 122-125, 2009.

Ogra, M. 2009. Attitudes toward resolution of human–wildlife conflict among forest-dependent agriculturalists near Rajaji National Park, India. *Human Ecol*. 37 : 161-177.

Phukan, U., Bezbarua, P., Sarma, G.C. and Baruah, C.K. 2003. Important medicinal plants of Manas Biosphere reserve, Assam. In: *Biodiversity of Eastern Himalayan Protected Areas* (Ed Boruah, P.P.) Handique Girls' College, Guwahati.

Quraishi, H.A., Islam, N., Iqbal, A., Bhat, S.A., Ahmed, J., Ashraf, S.S. and Khan, Q.A. 2018. Therapeutical and medicinal properties of Neem (*Azadirachta indica*) in context of Unani system of medicine: a review study. *J. Drug Deliv. Therap*. 8(6-s) : 394-399.

Rabha, A. 2007. *Management plan of Manas National Park*. Office of Field Director, MNP, Barpeta Road, Assam.

Sarma, H. and Sarma, C.M. 2008. Alien traditionally used plant species of Manas Biosphere Reserve, Indo-Burma hotspot. *Zeitschrift Fur arznei Gewurpflanzen.* 13 : 117-120.

Sarma, K., Hilaluddin and Tiwari, S. 2008. Land use/ land cover in Bodoland Territorial Council. In *Bringing Back Manas*, pp. 44-56.Conservation Reference Series 7. Wildlife Trust of India. New Delhi.