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Exploration and Documentation of Bamboo Diversity, Ethnobotanical Study and Its Contribution in Rural Livelihood in the Dibrugarh District of Assam, India

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Abstract

The present paper concerns with the ethnobotanical study of bamboo and its role in rural livelihood in Dibrugarh District, Assam. The study was undertaken to document the bamboo species growing in different localities of rural areas of the district, document traditional knowledge and ethnobotanical uses of bamboo, and assess its contribution to livelihood generation and sustainable rural development. In this study, 17 species of bamboo were recorded, all belonging to the Poaceae family. These species were used for the construction of houses, making handicrafts, agricultural tools, food and medicinal purposes. Approximately 10 diseases were treated using the documented bamboo species. The most frequently reported medicinal uses included respiratory relief, peptic ulcer, urinary disorders, immuno-stimulation, anti-diabetic treatment, gastrointestinal disorders, skin diseases, indigestion, and anti-inflammatory applications. Leaves were the most used plant part and decoction was the most common mode of preparation. Results indicated that bamboo was embedded in local cultures and indigenous knowledge systems and served as a key resource for everyday life and cultural activities. The study also showed the significant contribution of bamboo-based activities in income and employment generation through handicraft production, bamboo trading and value-added product preparation.

Keywords: *Bamboo, Diversity, Ethnobotany, Sustainable resource, Livelihood, Assam.*

Introduction

Ethnobotany is the scientific study of the relationships between people and plants, focusing on how different communities utilize plant resources for food, medicine, shelter, rituals, handicrafts, and livelihood. It provides valuable insights into traditional ecological knowledge, cultural practices, and the sustainable management of biological resources that have been passed down through generations. Ethnobotanical studies are essential in the documentation of indigenous knowledge and to promote biodiversity conservation in a country like India with rich floral diversity along with diverse ethnic communities. India is considered one of the megadiverse countries of the world, having around 12 percent of the world's bamboo resources with more than 136 species distributed in different agroclimatic regions. Among these, bamboo has emerged as one of the most significant ethnobotanical resources because of its wide range of traditional and economic uses [1], [2], [3].

The ethnobotanical significance of bamboo becomes even more prominent in the North eastern Region of India, which is considered the country's bamboo heartland. This region accounts for about 66% of the bamboo growing area of India and is inhabited by several indigenous communities, whose cultural identity and traditional lifestyle are intricately associated with bamboo. Bamboo has been a part of rural life for centuries, used in the construction of houses, fencing, agricultural implements, fishing gears, baskets, mats, musical instruments, religious ceremonies and traditional handicrafts. Apart from the structural use, tender bamboo shoots are popular as nutritious traditional food and medicinally important in several indigenous health care systems. Bamboo is thus not only a forest resource but also a living symbol of cultural heritage and traditional knowledge of Northeast India [4], [5], [6].

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Assam is a unique state in north-eastern region in terms of its tremendous diversity of bamboos and history of bamboo utilization. The state has more than 50 species of bamboos under several genera, of which many are naturally distributed in forests, homesteads and village landscapes. Ethnobotanical relationship between the people of Assam and bamboo has developed over centuries. Different ethnic groups such as Ahom, Mishing, Moran, Motok, Sonowal Kachari, Tea Tribes etc. and other communities have their unique knowledge on the cultivation, harvesting, processing and utilization of bamboo. Bamboo plays an important role in daily life as a material for housing, household utensils, agricultural tools, handicrafts, weaving accessories, fishing equipment, food products and traditional ceremonies. Such indigenous knowledge is indicative of the sustainable use of bamboo resources while ensuring rural livelihoods and cultural continuity. [4], [1], [3].

Dibrugarh, among the districts of Upper Assam, is an important ethnobotanical landscape where bamboo has been an integral part of the socio-economic and cultural life of rural communities. The district is characterized by fertile floodplains, tea gardens, wetlands, and village ecosystems providing suitable conditions for the growth of several bamboo species like *Bambusa tulda*, *Bambusa balcooa*, *Bambusa pallida*, *Dendrocalamus hamiltonii*, *Melocanna baccifera* etc. [5]. Rural households still use these species for house construction, fencing, bamboo bridges, storage structures, agricultural implements, fishing traps, baskets, mats, furniture, and miscellaneous household articles. Local artisans and bamboo- based enterprises are still supported by traditional knowledge on species selection, harvesting season, processing techniques, and product preparation, which is passed down through generations. Despite rapid socio-economic changes, bamboo remains an essential ethnobotanical resource that contributes significantly to the livelihood security, cultural identity, and sustainable rural development of Dibrugarh district. Thus, documenting the ethnobotanical knowledge related to bamboo is important not only for the conservation of indigenous wisdom but also for the promotion of sustainable resource management and the strengthening of bamboo-based rural livelihoods in the region. [3].

Although several studies have documented the diversity, ecology, and economic importance of bamboo in Assam and Northeast India, limited information is available on the traditional ethnobotanical knowledge associated with bamboo in the Dibrugarh district. In particular, the medicinal properties of bamboo, indigenous practices of bamboo processing for household health care and their scientific documentation are poorly explored. Besides, the contribution of bamboo-based activities to rural livelihoods and socio-economic well-being in Dibrugarh has been given little attention, thereby emphasizing the need for detailed ethnobotanical and livelihood-oriented studies in the area.

Materials and Methodology

Study area:

The present study was undertaken in Dibrugarh district of eastern part of Assam, India. The district lies between latitudes 27°05′ and 27°42′ North and longitudes 94°33′ and 95°29′ East and covers an area of about 3,381 square kilometres. Dibrugarh is bounded by Dhemaji district to the north, Tinsukia district to the east, Charaideo district and Sivasagar district to the southwest, while the mighty Brahmaputra River flows along its northern boundary. The district has an average elevation of about 111 m above mean sea level. Dibrugarh experiences a humid subtropical climate with mild winters, a distinct monsoon season and warm summers. The district has an average annual rainfall of 2,500-3,000 mm and most of the precipitation is between May and September. Average temperature is between 10 and 35 degrees Celsius. The climatic conditions along with the rich alluvial soils create a conducive environment for the growth of various bamboo species. The district is inhabited by the ethnic groups such as Ahom, Bodo, Moran, Motok, Mishing, Sonowal Kachari, Tea Tribes, Deori and other indigenous groups which have rich traditional knowledge on the use and management of bamboo resources.

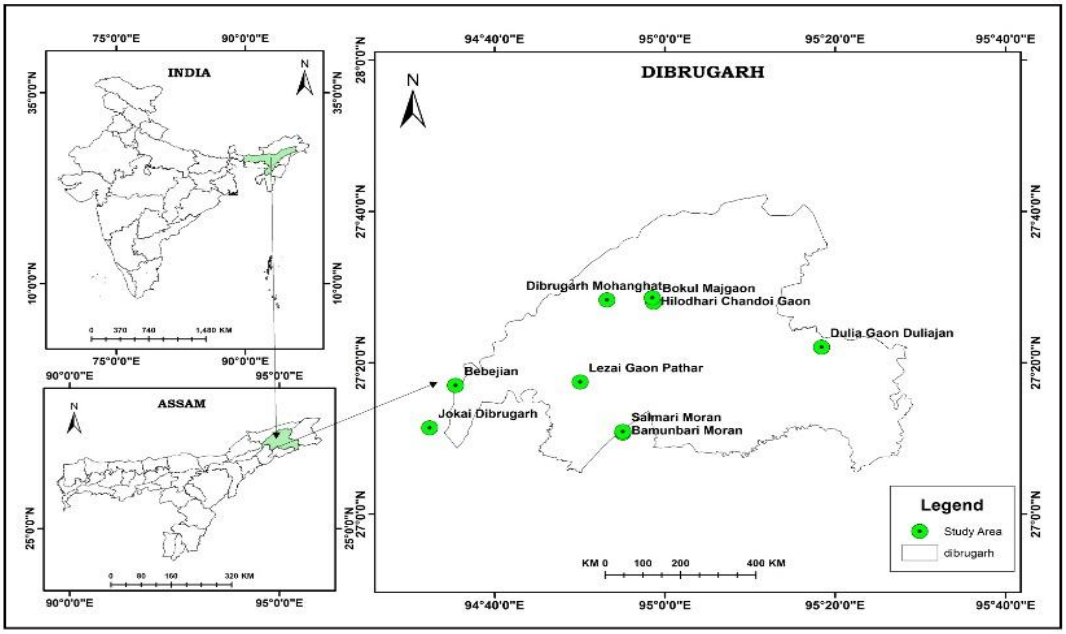

Fig 1: Map of Study area (Dibrugarh)

Extensive field surveys were conducted on the month of March – May 2026 to record bamboo species occurring in the selected villages. Bamboo specimens were collected, photographed, and identified using standard taxonomic literature. Information regarding traditional uses of bamboo was collected through interviews, household surveys, group discussions. The respondents included were village elders, traditional healers, bamboo artisans, bamboo traders and entrepreneurs. Information was recorded on local names of bamboo species, parts used for making traditional medicines, medicinal applications, food uses, construction purposes, handicrafts and household products, culture and religious significance. Information recorded included sources of bamboo income, bamboo products manufactured, employment generation, marketing channels, seasonal variation in income, participation of women and youth, constraints faced by bamboo artisans. The recorded bamboo species were tabulated and categorized according to their Culm height, Culm diameter, internode length and leaf size. Also, the uses and distribution are given in paragraph format. Socio-economic data were analysed using percentages, averages, charts, and tables to determine the contribution of bamboo to household income and rural development. Traditional knowledge was documented only after obtaining informed consent from participants.

Results

The present study documented 17 bamboo species from different rural areas of Dibrugarh District, Assam (Fig 1). The most frequently encountered species included *Bambusa tulda, Bambusa balcooa, Bambusa pallida, Bambusa nutan, Bambusa teres, Bambusa assamica, Dendrocalamus hamiltonii , Dendrocalamus strictus, Dendrocalamus giganteus, Melocanna baccifera,* and *Bambusa bambos.* Species such as *Bambusa ventricosa, Schizostachyum griffithii, Schizostachyum pergracile, Phyllostachys nigra, Phyllostachys aurea, Schizostachyum pergracile* are comparatively less abundant and were observed only in selected localities (Table 1). Among the documented species, *Bambusa tulda* exhibited the highest frequency of occurrence due to its wide adaptability and multiple domestic and commercial uses. *Bambusa balcooa* and *Dendrocalamus hamiltonii* were predominantly cultivated for construction materials and handicraft production because of their thick culms and high mechanical strength. The survey found that local communities have rich traditional knowledge on bamboo cultivation, harvesting, processing, and utilization. The different parts of the bamboo plant were used in a whole host of ways. These included the culms, the shoots, the leaves, the bamboo manna (tabasheer), the branches, and the sheaths. The culms were extensively used for house construction, fencing, agricultural implements, bridges, fishing traps, baskets, furniture, handicrafts, and storage structures. Young bamboo shoots of selected species were used as traditional medicine, seasonal vegetables and preserved

through fermentation and drying for later use. Informants reported that bamboo harvesting was generally carried out during the dry season when the culms attained maturity. The study also documented the use of bamboo in religious ceremonies, community festivals, marriage functions etc.

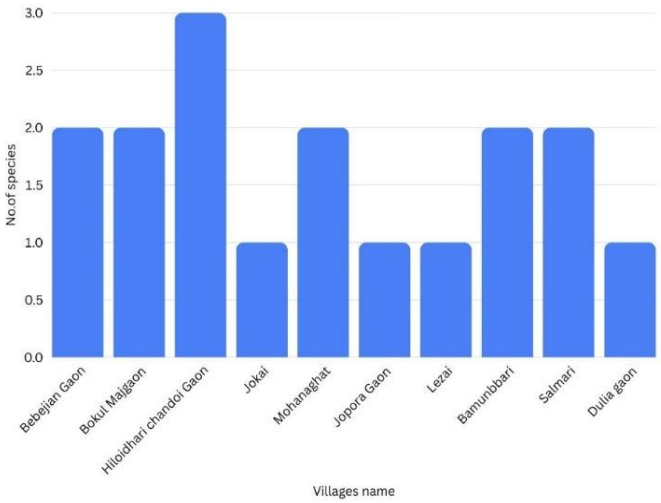

Fig 1: Distribution of bamboo species in different villages of district

The survey is done at selected location such as Bokul , Jokai, Dulia gaon, Moran, Mohanaghat, Hiloidhari Chandoi Gaon, Lejai (Fig 1). These villages were selected because of their rich bamboo diversity, traditional knowledge systems, and dependence on bamboo-based livelihoods.

Table 1: List of bamboo species used during ethnobotanical study.

Sl. no	Botanical name	Common name	Culm height	Culm diameter	Internode length	Plant part used	Medicinal properties
1	*Bambusa tulda* Roxb.	Jati bah	12-23m	5-12cm	30-60cm	Leaves	Respiratory relief, anti-inflammatory
2	*Bambusa balcooa* Roxb.	Bholuka bah	12-25m	6-15cm	20-40cm	Shoot, leaves	Peptic ulcer, anti-diabetic, immuno-stimulant
3	*Bambusa pallida* Munro.	Bijuli bah	13-20m	2.5-8cm	45-75cm	Young shoot, leaves, tabasheer	Digestive aid, respiratory relief
4	*Bambusa nutan* Wall.ex Munro	Mokal bah	6-15m	5-10cm	25-50cm	-	-
5	*Bambusa teres* Buch.-Ham.Ex Munro	Bhaluki bah	15-24m	15-28cm	50cm	Tender shoot, leaves,roots,stem exudate	Cough, joint pain, stomach issue,wounds
6	*Bambusa assamica* Barooah &Borthakur	Barjali bah	15-25m	10-18cm	30-45cm	-	-
7	*Bambusa ventricosa* Mc Clure	Buddha bah	6-10m	3-8cm	15-35cm	-	-
8	*Dendrocalamus hamiltonii* Nees &Arn.ex Munro	Kako bah	20-40m	15-28cm	30-50cm	-	-

9	*Dendrocalamus strictus* (Roxb.) Nees	Saal bah	6-18m	2.5-8cm	30-45cm	Tabasheer, tender shoot	Urinary disorders, Digestive ailments, Respiratory relief
10	*Dendrocalamus giganteus* Munro	Worra bah	20-30m	10-30cm	20-55cm	-	-
11	*Melocanna baccifera* (Rozb.)Kurz	Muli bah	10-20m	3-9cm	30-60cm	Young shoot, Leaves, fruit	Respiratory ailments, diabetes, gastrointestinal issues
12	*Phyllostachys aurea* (Carriereex A.Riviere & C.Riviere	Halodhiya bah	2-8m	2-5cm	15-30cm	-	-
13	*Phyllostachys nigra* (Lodd.Ex Lindl.)	Kola bah	4-12m	2-5cm	20-30cm	-	-
14	*Schizostachyum dullooa* (Gamble)R.B Majumdar	Dolu bah	6-12m	2.5-8cm	40-75cm	-	-
15	*Schizostachyum griffithi* (Munro)R.B Majumdar	Behti bah	7.5-15m	1-3cm	45-65cm	-	-
16	*Schizostachyum pergracile* (Munro)R.B Majumdar	Medang bah	8-15m	3-7.5cm	30-45cm	-	-
17	*Schizostachyum polymorphum* (Munro) R.B Majumdar	Bajal bah	5-20m	1.2-5cm	20-23cm	-	-

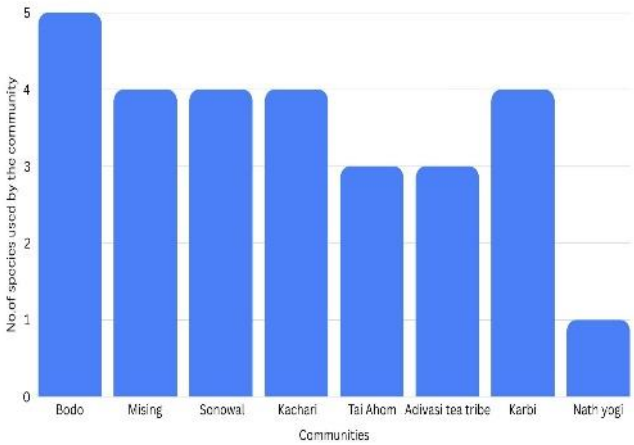

Fig 2

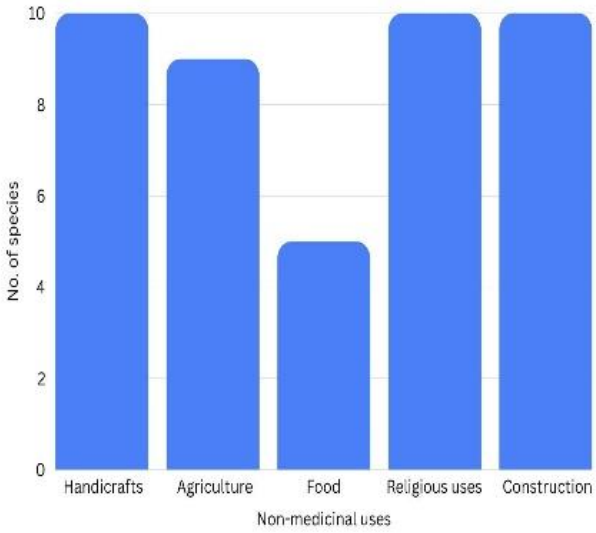

Fig 3.

Fig 2 and 3: Illustrative comparison of different bamboo species used by communities for medicinal and non-medicinal uses. The majority of the artisan households reported that bamboo was an additional source of income. Women were mainly involved in weaving, handicraft making, processing of bamboo shoots, and local marketing, while men were mainly engaged in harvesting, processing of culms, and construction activities. Respondents identified several constraints impacting bamboo based livelihoods, including variable market prices, poor transportation facilities, limited access to organized markets, lack of skill development programs, inadequate storage facilities for raw bamboo, and declining availability of quality planting material (Fig.3). However, the majority of respondents considered bamboo as a renewable natural resource with vast potential for sustainable livelihood generation and rural development.

Information collected from traditional healers and elderly villagers revealed that various parts of bamboo, including young shoots, leaves, and bamboo manna, are utilized either singly or in combination with other medicinal plants for treating common ailments (Fig.4). The preparation methods observed during the survey included boiling, crushing, grinding into paste, extraction of fresh juice are taken (Fig 5,6). These herbal preparations are traditionally used for the management of different diseases mentioned in the table 1.

Fig 4.

Fig 5

Fig 6

Fig 4-6. Preparation of traditional medicine from different bamboo species. The findings of the present study also revealed that bamboo-based activities constitute an important source of supplementary income for rural

households in Dibrugarh district, Assam. Income generation varies according to the bamboo species available, their market demand, and the type of products manufactured by local artisans. The rural households derive income from the cultivation, harvesting, processing, and marketing of different bamboo species. Among the recorded species, *Bambusa balcooa, Bambusa tulda, Melocanna baccifera,* and *Dendrocalamus hamiltonii* contribute the highest share of household income because of their extensive use in house construction, handicrafts, basket making, furniture production, fencing, and agricultural implements. Other species such as *Dendrocalamus giganteus, Bambusa vulgaris, Bambusa nutans,* and *Bambusa pallida* provide supplementary income through the sale of culms and value-added products (Fig 7). Bamboo-based activities offer seasonal employment and an important supplementary source of livelihood for rural families, especially artisans and small-scale producers.

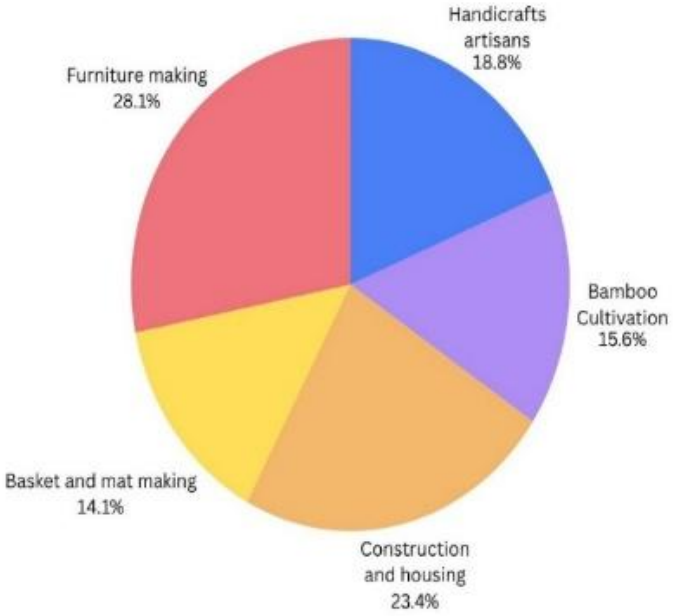

Fig 7: Average Monthly &Annually Income of bamboo in Dibrugarh District

Table 2: The market analysis of bamboo products in Dibrugarh district.

Sl no	Product	Use	Market demand
1	Bamboo basket	Agriculture & Storage	High
2	Bamboo mats	House construction	High
3	Bamboo fencing	House construction	High
4	Bamboo furniture	Household	Moderate
5	Bamboo handicrafts	Decoration & Gift	Moderate
6	Bamboo poles	Construction	High
7	Bamboo tray & winnowing fans	Household	High

The data presented in the Table 2 indicate that bamboo products have diverse applications and varying levels of market demand in the study area. Among the seven major bamboo products identified, bamboo baskets, bamboo mats, bamboo fencing, bamboo poles, and bamboo trays/winnowing fans exhibit high market demand due to their extensive use in agriculture, storage, house construction, household activities, and construction purposes. However, the market demand
for bamboo furniture and handicrafts is moderate, as they are mainly used for households, decoration, and gifts.

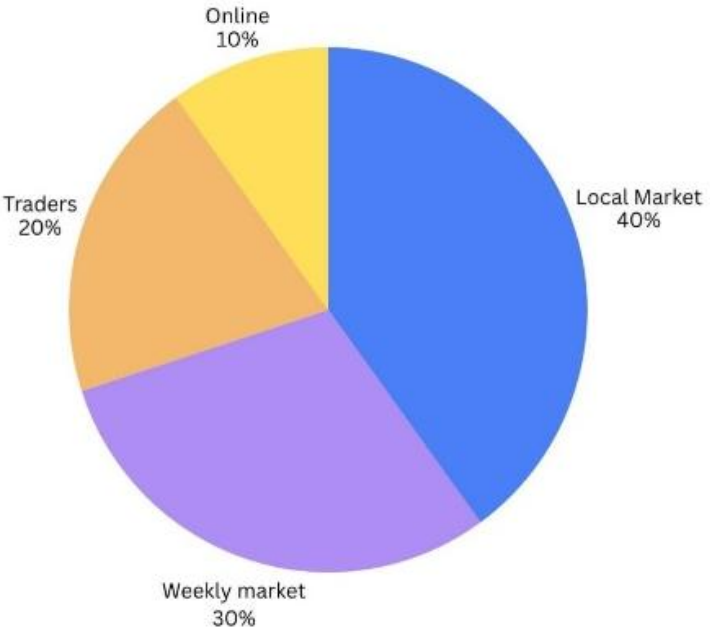

Fig 8: Distribution of Bamboo product marketing channel

The distribution of marketing channels of bamboo products in the Dibrugarh district reveals that the local market is the main outlet for bamboo products, contributing to 40% of total sales. Next are wholesale markets (30%), important for bulk distribution (Fig. 8). Traders constitute 20% of the marketing channel and serve as the link between artisans and consumers. However, only 10% of bamboo artisans use online marketing, showing a low level of adoption of this strategy. The study reveals that the marketing of bamboo products in the Dibrugarh district is still largely dependent on the conventional market channels, and the digital platforms are underutilized. The income and market reach of bamboo artisans can be improved through expansion of online marketing and strong market linkages.

The survey also showed that several constraints face the bamboo artisans in Dibrugarh district that impact the growth and profitability of bamboo-based livelihood activities. Low market price was the major constraint among the identified challenges, as reported by 42% of the respondents. This indicates that even after investing a lot of labor, skill, and time to produce bamboo products, artisans are not paid adequately due to poor pricing, competition from cheaper alternatives, and lack of organized marketing systems. The second major constraint was transportation, which was mentioned by 24% of the respondents. Poor transport facilities and the high cost of moving raw materials and finished products to markets reduce the profitability of bamboo enterprises, particularly for artisans residing in remote rural areas. Lack of training was reported by 18% of the respondents, suggesting that many artisans have limited access to skill development programs, modern production techniques, innovative product designs, and marketing knowledge. This limits their ability to diversify products and compete in evolving markets. Another important constraint identified by 16% of the respondents was raw material storage. Inadequate storage facilities make bamboo culms susceptible to attack by insects and fungi and to deterioration, thereby affecting the quality and durability of both raw materials and finished products.

Discussion

The present study reveals that even today, bamboo is playing an important ecological, cultural, and socio-economic role in the rural areas of the Dibrugarh district of Assam. We recorded a good diversity of bamboo species like *Bambusa balcooa*, *Bambusa tulda*, *Bambusa bambos*, *Dendrocalamus hamiltonii*, *Melocanna baccifera*, and *Dendrocalamus giganteus* that were widely used for household purposes, handicrafts, construction, agriculture, food, and traditional medicines. These results are in line with previous studies from Northeast India, which reported the high diversity of bamboo and its significant ethnobotanical importance among the indigenous and rural communities [7], [8].

The documentation of traditional knowledge revealed that the local communities had extensive indigenous knowledge on the use of bamboo in the making of traditional medicines, edible bamboo shoots, household implements, fishing gear, baskets, furniture, fencing material, and religious articles. This knowledge has been passed from generation to generation but is becoming increasingly threatened by modernization, changing lifestyles, and less dependence on traditional practices. Studies from Assam and other parts of Northeast India have made similar observations, thus highlighting the urgent need for documentation and conservation of indigenous knowledge [9], [10].

The livelihood analysis shows the important role of bamboo-based activities in generating income and employment, especially for rural artisans and poor households. The study found several constraints that hinder the bamboo sector despite its provision of regular income from the sale of handicrafts and raw culms, including inadequate market access, limited financial support, fluctuating raw material availability, lack of modern production technologies, and insufficient government assistance. These results support previous studies that identified marketing inefficiencies, poor infrastructure, and limited value addition as the major barriers to sustainable development of the bamboo sector in Northeast India [11], [12].

The marketing analysis also showed that most of the artisans still rely on local markets and intermediaries to distribute their products, which results in low profit margins. Increased consumer demand for eco-friendly bamboo products exists but direct marketing and organized market linkages are still missing. Strengthening producer cooperatives, improving transportation facilities, skill development programs and promotion of digital marketing platforms could significantly enhance the income and market competitiveness of artisans.
The overall findings underscore the importance of bamboo as a sustainable natural resource that can contribute to biodiversity conservation, preservation of cultural heritage, and development of rural economy. Promotion of scientific bamboo cultivation, value addition, entrepreneurship, and policy support for strengthening bamboo-based livelihoods in the Dibrugarh district will add to the sustainable rural development and goals of a green economy.

Conclusion

The study reveals the great ethnobotanical, socio-economic, and cultural importance of bamboo in the rural areas of the Dibrugarh district, Assam. Many different species of bamboo were recorded, and their traditional uses in medicine, housing, handicraft, agriculture, and household activities. The results show that bamboo-based livelihoods provide considerable income and employment opportunities to rural artisans and contribute to the promotion of sustainable rural development. Despite its enormous potential, challenges such as limited market access, inadequate processing facilities, declining traditional knowledge, and inadequate institutional support continue to afflict the bamboo sector. Therefore, strengthening conservation efforts, promoting value addition, improving marketing systems, and encouraging skill development are vital to enhance the economic benefits of bamboo while preserving the traditional knowledge associated with its use. Overall, bamboo remains a vital resource for biodiversity conservation, cultural heritage, and sustainable livelihood enhancement in Dibrugarh district.

Conflict of Interest

The authors declare that there is no conflict of interest.

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