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Identification of Non-Timber Forest Products and Economic Value- A Study in Eastern Himalayan States of India

Limasunep Ozukum, Sanjoy Das, Amod Sharma, R. Nakhro, N.K. Patra[1], Manoj Dutta[2] and M. Jangyukala[3]

Department of Agricultural Economics, [1]Department of Agricultural Extension,
[2]Department of Soil and Water Conservation,
[3]Department of Horticulture, School of Agricultural Sciences,
Nagaland University, Medziphema Campus, Nagaland-797 106, India
E-mail: sdas1973.sd@gmail.com

Abstract: The study was conducted in the Eastern Himalayan states of Meghalaya and Nagaland, selecting two districts from each state. From twenty villages, 250 respondents were proportionately selected based on household availability. Non-Timber Forest Products (NTFPs) were valuated using the direct use value method and categorized by consumptive uses. In Meghalaya, 17 plant-based and 5 animal-based NTFPs were identified, primarily for nourishment, followed by therapeutic uses, alimentary supplements, fuel wood, housing material, and ornate products. Nagaland identified 16 plant-based and 9 animal-based NTFPs, with similar categories. The average time spent per trip collecting plant-based NTFPs was 2.21 hours in Meghalaya and 2.93 hours in Nagaland and for animal-based NTFPs was 3.62 and 4.44 hours, respectively. Weekly, respondents collected 14.17 kg and 10.04 kg of plant-based NTFPs in Meghalaya and Nagaland, respectively, and 2.66 kg and 12.30 kg of animal-based NTFPs. Bamboo shoots gave the highest annual return in Meghalaya, while wild black pepper was most valuable in Nagaland.

Keywords: NTFPs, North-east India, Meghalaya, Nagaland, Valuation

NTFPs play a significant role in providing income for the poor in many countries, with approximately 50 million people in India relying on NTFPs for subsistence and cash income (Talukdar *et al.*, 2021). NTFPs are rich in biodiversity and serve as a source of food, fodder, fiber, fertilizers, herbal products, construction materials, cosmetics, and cultural products such as perfumes, medicines, and paints (Saikia et al., 2017)).Valuing the environment is crucial for sustainability, assessing management, and incorporating non-measurable environmental impacts in cost-benefit analysis (Kiran and Kaur, 2011). Methods of economic valuation consist of three procedures *viz*., (i) Revealed preference approach (ii) Stated preference approach (iii) Benefits transfer. Revealed preference uses actual market prices, while stated preference creates hypothetical markets. (Brander et al., 2024). The revealed preference approach uses market price analysis to examine changes in commodity prices in economic markets (Kiran et al., 2016).The Eastern Himalayas, also known as Purvanchal Himalayas, encompass the southern border of Arunachal Pradesh and extend in a north-south direction through Nagaland, Manipur, Mizoram, and Tripura. The region is joined by the Meghalaya Plateau in the west. Nagaland and Meghalaya are two Eastern Himalayan states of North East India that were chosen for the study because of the abundance of NTFPs and their various uses by indigenous communities. The North East region of India covers an area of 255,088 km^2, accounting for 7.7% of India's total geographical area. This region boasts diverse flora and fauna, as well as over 200 distinct ethnic groups. Many communities in this area rely on forest products, particularly NTFPs, which play a vital role in their subsistence and food security. Nagaland and Meghalaya have dense forests covering approximately 78% of their total geographical area. These forests are crucial for the livelihoods of around 5.4 million people in the region, who directly or indirectly depend on NTFPs (Kaushik and Banik 2020). The study aimed to estimate the economic value of Non-Timber Forest Products (NTFPs) available in the Eastern Himalayan states.

MATERIAL AND METHODS

The proposed study was conducted in the Eastern Himalayan states of Meghalaya and Nagaland.An exploratory research design was used and the type of data collected were panel data with a purposive sampling technique. Meghalaya and Nagaland were selected purposefully for the proposed studybecause of their rich biodiversity. Altogether, total number of 20 villages were selected. From the 20 selected villages, a total of 250 respondents were selected proportionately based on the availability of the number of households in the villages (Table 1, 2).

Table 1. Geographic and demographic features of the study sites in Meghalaya

Particulars	East Khasi Hills					Rhi-boi				
Name of village	Thangtim	Mawmang	Kongthong	War War	Kshaid	Umran	Umsning	Mawknor	Umshorshor	Umiarong
Geographic position	25.32°N ,91.81°E	25.30°N 91.83°E	25.31°N 91.83°E	25.33°N 91.79°E	25.36°N 91.77°E	25.77°N 91.87°E	25.75°N 91.89°E	25.73°N 91.87°E	25.72°N 91.85°E	25.70°N 91.87°E
Mean altitude (m)	1304	861	874	1444	631	690	774	806	770	826
Population of the village	108	183	567	213	287	1370	1176	148	269	477
Number of households	22	46	109	45	59	268	218	27	55	93
Sample size (*n*)	3	6	14	6	8	36	29	4	7	12

Table 2. Geographic and demographic features of the study sites in Nagaland

Particulars	Peren					Mokokchung				
Name of village	Kendung	Kipeujang	Mpai old	Ndunglwa	Peletkie	Mangkolemba	Japu	Satsukba	Khar	Chungliyimsen
Geographic position	25.35°N 93.69°E	25.54°N 93.77°E	25.38°N 93.70°E	25.33°N 91.79°E	25.53°N 93.75°E	26.50°N 94.44°E	26.50°N 94.41°E	26.45°N 94.35°E	26.47°N 94.47°E	26.45°N 94.42°E
Mean altitude (m)	542	816	1038	776	1382	589	619	504	763	1098
Population of the village	101	674	693	424	300	3713	487	242	3614	337
Number of households	21	125	174	106	64	879	134	65	848	103
Sample size (*n*)	3	16	22	14	8	27	4	2	26	3

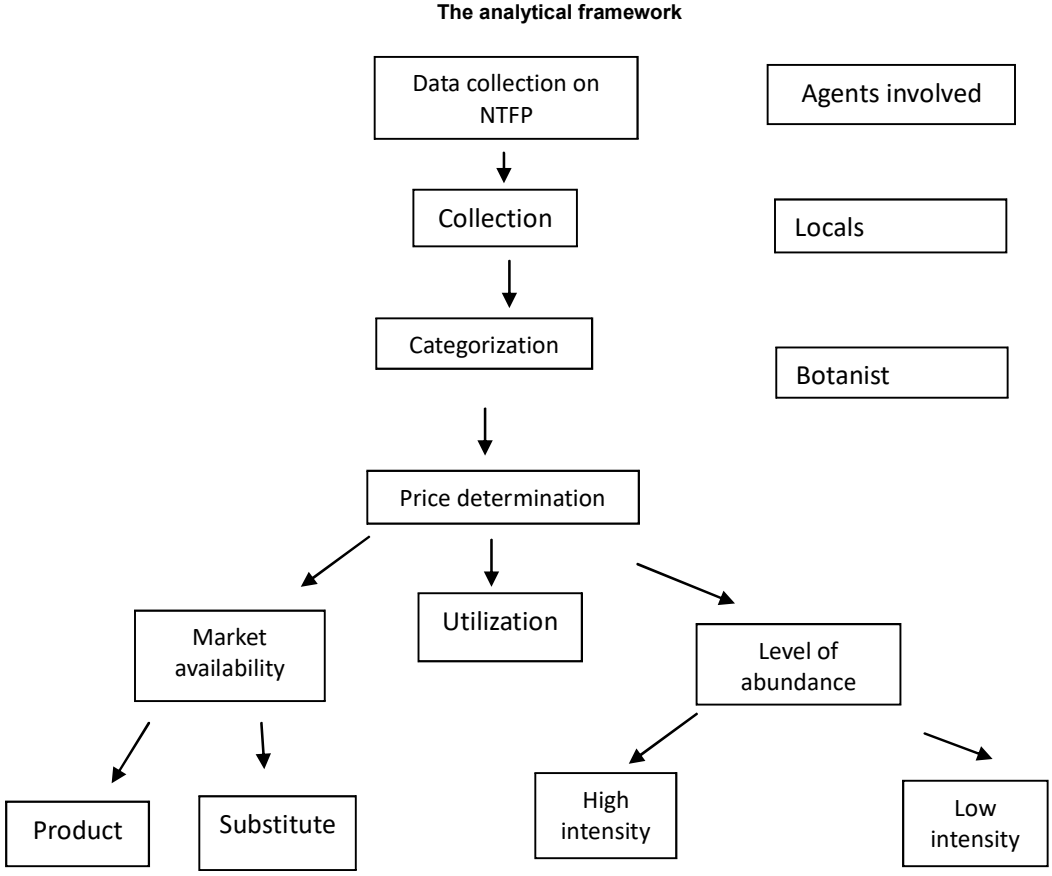

Fig. 1. Methods for valuing non-timber forest products

Figure 1 demonstrates the analytical framework for evaluating the NTFP collected in the study areas beginning with the inception of collection of the NTFP through verbal and observational data from the respondents followed by its scientific identification based on the nature and usage of the NTFP. Price validation is assigned to the NTFPs either by the prevailing market price or the price of its substitute product in the market.

Valuation: The value of NTFPs collected was estimated by using the direct use value (revealed market price) method acknowledging the cost-benefit analysis and the NTFP collected were categorized as a part of forest resources having consumptive uses. The following variables were used to supplement the valuation procedure as well as to forecast a pattern in their structure of NTFP collection.

a) NTFP (animal-based or plant-based)
b) Parts used
c) Season of collection (summer, winter or year-round)
d) Collection trip per week
e) Average time spent (hrs) per trip
f) Quantity collected per trip(kg)
g) Distance travelled to collect (km)
h) Existing Market price (₹kg^{-1})
i) Monetary value (₹$year^{-1}$)

RESULTS AND DISCUSSION

Identification and classification of NTFPs: In total 47 NTFPs were identified and categorized based on their uses such as food, medicinal supplements, decorative items, construction materials, and fuel wood. The identification and categorization of the different non-timber flora and fauna found in Meghalaya presented in Table 3. The majority of 17 (77.27%) were plant-based products, whereas 5 (27.73%) were derived from animals. Among the NTFPs gathered, the predominant uses were for nourishment (59.09%), therapeutic purposes (22.73%), housing materials (13.64%), and fuel wood (4.55%).

Tribal of Nagaland use traditional indigenous knowledge of NTFPs for nutrition and medicine, passed down orally through generations (Walling et al., 2021). Altogether 16 plant-based and 9 animal-based products were identified. These NTFPs were gathered from the region, reflecting the diverse range of uses attributed to them. The majority of the collected NTFPs in Nagaland were primarily utilized for nourishment purposes, accounting for 60.00% followed by therapeutic properties (24.00%), as housing materials (12.00%), as fuel wood (4%). Further classification based on the nature of the NTFPs revealed that the majority were plant-based, 64.00% of the total. This classification highlights the significant reliance on plant-derived resources among the indigenous tribes of Nagaland for various purposes, including nutrition, medicine, construction, and fuel.

The people of Meghalaya rely on a variety of non-timber forest products (NTFPs) for their food, medicine, and utility needs (Table 5, 6). Plant-based NTFPs include edible fruits like Burmese grape (*Baccuarea sapida*), Indian plum (*Flacourtia jangomas*), and bayberry (*Myrica esculenta*), as well as medicinal plants such as Indian gooseberry (*Phyllanthus emblica*). Other plant parts like banana buds, bamboo shoots, and tender fern leaves are utilized as food sources, while materials like thatch leaves and bamboo stems serve as roofing and construction materials. The animal-based NTFPs collected include honey from the Asian honeybee (*Apis dorsata*), shrimp, and meat from animals like flying lizards and common carp, with some also used for medicinal purposes.

The people of Nagaland similarly gather a wide range of NTFPs for food, medicine, and functional uses. Plant-based products include leaves of colocasia (*Colocasia sp*.) and ketibu (*Uroticadiocia*), fruits such as myrobalan (*Terminalia chebula*) and Chinese sumac (*Rhus chinenses*), and construction materials like bamboo stems. Medicinal plants like Indian gooseberry (*Phyllanthus emblica*) and Indian nightshade (*Solanum violaceum*) are also utilized for their health benefits. On the animal side, honey from the Asian honeybee (*Apis dorsata*), meat from wild pigs (*Sus scrofa cristatus*), and decorative items like porcupine quills are collected.

Economic importance: NTFPs products like Kanthior (*Sterculia roxburghii*), Ferns (*Dryopten* ssp.), Bamboo (*Bambusa* sp.), and Pine wood (*Pinus* spp.) were available year-round while important NTFPs like Banana buds (*Bambusa* sp.), Bayberry (*Myrica esculenta*), Mushroom (*Pleurotus*sp.) and Burmese grape (*Baccuarea sapida*) were available during summer and NTFPs such as Indian plum (*Flacourtia jangomas*), Indian gooseberry (*Phyllanthus Emblica* L.), Wild apple (*Docynia indica*) and bay leaves (*Cinnamomum tamala*) were available during the winter season (Table 5). Households went on varying numbers of trips for the collection of Non-Timber Forest Products (NTFPs), depending on the type of NTFP and its use. In most of the cases respondents went out 2-3 times per week for NTFPs collection, except for banana buds and thatch leaves, which required 4 trips per week. In the case of brown shrimp, common carp fish, and flying lizard, only one trip was made.The average time spent per trip for plant-based NTFPs was 2.21 hours. The maximum time was dedicated for collecting bamboo shoots (4.16 hours), banana buds (3.56 hours), and bag flower (3.15 hours). Regarding animal-

Table 3. Identification and categorization of Non-Timber Forest Products found in Meghalaya

NTFPs categorization		No products/species
Nourishments	Plant-based	10
	Animal-based	3
	Subtotal	13 (59.09)
Therapeutic	Plant-based	3
	Animal-based	2
	Subtotal	5 (22.73)
Housing material	Plant-based	3
	Animal-based	0
	Subtotal	3 (13.64)
Fuelwood	Plant-based	1
	Animal-based	0
	Subtotal	1 (4.55)
Plant-based NTFPs		17 (77.27)
Animal-based NTFPs		5 (27.73)

Figures in parentheses represent percentage to total

Table 4. Identification and categorization of non-timber Forest Products found in Nagaland

NTFPs categorization		No products/species
Nourishments	Plant-based	7
	Animal-based	8
	Sub total	15 (60.00)
Therapeutic	Plant-based	5
	Animal-based	1
	Sub total	6 (24.00)
Housing material	Plant-based	3
	Animal-based	0
	Sub total	3 (12.00)
Fuel-wood	Plant-based	1
	Animal-based	0
	Sub total	1 (4.00)
Plant-based NTFPs		16 (64.00)
Animal-based NTFPs		9 (36.00)

Figures in parentheses represent percentage to total

Table 5. Non-timber forest products collected by the people of Meghalaya state

Plant-based				Animal-based			
Common name	Scientific name	Part collected	Use	Common name	Scientific name	Part collected	Use
Burmese grape	*Baccuarea sapida*	Fruit	Food	Asian honeybee	*Apisdorsata*	Honey	Food/medicine
Bag flower	*Clerodendrum colebrookianum*	Tender leaves	Food/medicine	Brown shrimp	*Crangon crangon*	Meat	Food
Giant Indian fig	*Ficus roxburghii*	Tender leaves/fruit	Food	Common carp	*Cyprinus carpio*	Meat	Food
Indian plum	*Flacourtia jangomas*	Fruits	Food	Flying lizard	*Draco norvilli*	Meat	Medicine
Banana buds	*Musa spp.*	Buds	Food	Mushroom	*Pleurotus* sp.	Whole part	Food/medicine
Bayberry	*Myrica esculenta*	Fruits	Food/medicine				
Indian gooseberry	*Phyllanthus Emblica L.*	Fruit	Medicine				
Kanthior	*Sterculia roxburghii*	Fruits	Food				
Broom grass	*Thysanolaena maxima*	Anthesis, stem	Utility				
Bamboo shoot	*Bambusa*sp.	Tender shoots	Food				
Ferns	*Dryoptens*sp.	Tender leaves	Food				
Thatch leaf	*Calamus arboresence*	Leaves	Roofing material				
Bamboo	*Bambusa* sp.	Stem	Roofing material/ construction				
Pinewood	*Pinus* sp.	Whole plant/resins	Fuelwood/ornate				
Wild apple	*Docynia indica*	Fruit	Food/medicine				
Betel leaf vine	*Piper bettle*	Leaves	Tobacco				
Bay leaves	*Cinnamomum Tamala*	Leaves	Food/medicine				

based NTFPs, the average time spent per trip for collection was 4.02 hours, with the highest time spent on collecting common carp fish (4.38 hours), followed by flying lizard (4.02 hours).The distance travelled by households for NTFP collection was categorized into three groups: less than 2 km, between 2-5 km, and more than 5 km. For plant-based NTFPs like bag flower, banana buds, and broom grass, households travelled more than 5 km. For NTFPs such as Indian plum, bayberry, and thatch leaves, the distance travelled was between 2-5 km. For Burmese grape, kanthior, and wild apple, the distance travelled was less than 2 km. Regarding animal-based NTFPs like Asian honey bee, common carp fish, brown shrimp, and mushroom, villagers travelled more than 5 km.

Important NTFPs products which were available year-round were colocasia (*Colocasia*sp.), Pinewood (*Pinus* sp.), Bamboo (*Bambusa* sp.), bamboo shoot (*Bambusa* sp.), Asian honeybee (Apisdorsata), chocolate Mahseer (*Neolissochilushexagonolepis*), wild pig (*Sus scrofa cristatus*), jungle fowl (*Gallus gallus*), mushroom (*Pleurotuspetaloides*) and snail(*Pila spp.*), while NTFPs like myrobalan (*Terminalia chebula* Retz.), Indian nightshade (*Solanum violaceum*), chinese sumac (*Rhus chinenses*), and tree bean (*Parkia roxburghii*) were available during the summer season and NTFPs like Indian gooseberry (*Phyllanthus Emblica* L.), ferns (*Dryoptens*sp.), wild black pepper (*Piper* sp.) and broom grass (*Thysanolaena maxima*) were available during the winter season. The average trip per week for collecting NTFPs recorded highest (5 nos.) in bamboo shoot followed by bamboo (4 nos.), 3 times in a week in case of wild black pepper, tree bean and broom grass, etc., twice in a week in case of Colocasia, Chinese sumac and Asian honey bee, etc., while NTFPs like Indian gooseberry, Indian nightshade, and jungle fowl etc. were collected only once in a week. The average time spent per trip for plant-based NTFPs recorded as 3.33 hours where the maximum time was spent in the collection of bamboo (5.18 hrs), broom grass (4.37 hrs), and bamboo shoot (4.34 hrs). For animal-based NTFPs, the average time spent per trip was 4.44 hours. Maximum time was spent in the collection of NTFPs

Table 6. Non-timber forest products collected by the people of Nagaland state

Plant-based				Animal-based			
Common name	Scientific name	Part collected	Use	Common name	Scientific name	Part collected	Use
Colocasia	*Colocasia* sp.	Leaves	Food	Asian honeybee	*Apisdorsata*	Honey	Food/medicine
Myrobalan	*Terminalia chebula* Retz.	Fruits	Food /medicine	Chocolate Mahseer	*Neolissochilus hexagonolepis*	Meat	Food
Indian gooseberry	*Phyllanthus Emblica* L.	Fruit	Medicine	Tsuma Ngai (fish)	-		
Ferns	*Dryoptens* sp.	Tender leaves	Food	Wild pig	*Sus scrofa cristatus*	Meat	Food/ornaments
Wild black pepper	*Piper* sp.	Fruit	Food/medicine	Jungle fowl	*Gallus*	Meat/feathers	Food/ornaments
Pinewood	*Pinus* sp.	Whole plant/resins	Fuelwood/ornate	Frog	Varied	Meat	Food
Ketibu	*Uroticadiocia*	Leaves	Food/medicine	Porcupine	*Hystrix indica*	Meat/quills	Food/ornaments
Indian nightshade	*Solanum violaceum*	Roots/fruits	Food/medicine	Mushroom	*Pleurotuspetaloides*	Whole part	Food/medicine
Chinese sumac	*Rhus chinenses*	Fruit	Food/medicine	Snail	*Pila* sp.	Fleshy innards	Food/medicine
Common walnut	*Juglans regia*	Seed	Food				
Bamboo	*Bambusa*sp.	Stem	Roofing material /construction/ornate				
Wild apple	*Docynia indica*	Fruit	Food/medicine				
Toko patta	*Livistona jenkensiana*	Berry/branch	Food/roofing material				
Tree bean	*Parkia roxburghii*	Pod	Food				
Broom grass	*Thysanolaena maxima*	Anthesis, stem	Utility				
Betel leaf vine	*Piper bettle*	Leaves	Tobacco				

like porcupine (6.07 hrs), jungle fowl (5.38 hrs) and wild pig (5.27 hrs). NTFPs such as chocolate mahseer, wild pig, and porcupine, etc. respondents travelled more than 5 km for their collection, while jungle fowl, frog and mushroom were collected after travelling a distance between 2-5 km.

The average quantity of plant-based NTFPs collected in a week from Meghalaya recorded as 14.17 kg, where maximum quantity of NTFPs collected were bay leaves (70.38 kg) followed by bamboo shoot (12.00 kg) and banana buds (11.00 kg). The average quantity of animal-based NTFPs collected in a week from Meghalaya was 2.66 kg, where among the animal-based NTFPs, mushroom (6.00 kg) and Asian honey bee (2.00 kg) were collected in maximum quantities. Among the NTFPs collected in the State, NTFPs *viz*. bamboo shoot gave the highest value of return (₹50406 household^{-1}), followed by bay leaves (₹40533year^{-1}) and pine wood (₹33682 year^{-1}) and these were some of the highly sought NTFPs with high value compared to the other NTFPs (Table 9).

The average weekly collection of plant-based NTFPs was 10.04 kg, with bamboo shoot being the most abundant at 32.40 kg, followed by wild apple at 23.56 kg, and Indian gooseberry at 10.22 kg. As for animal-based NTFPs, the average weekly collection amounted to 12.30 kg. Among the

Asian honeybee larva *(Apisdorsata)* | Mushroom (*Agaricus bisporus)*

Snail *(Pila* sp.*)* | Jungle fowl (*Gallus gallus)*

Tsuma Ngai (fish) scientific name (NA) | Wild pig (*Sus scrofa cristatus)*

Fig. 3a. Animal-based NTFPs

Table 7. Season of collection, collection trip per week, average time spent (hrs) per trip and distance (km) travelled for NTFPs collection in Meghalaya State

NTFPs	Parts used	Season of collection	Collection trip per week	Average time spent (hrs) per trip	Distance travelled to collect (km)
Burmese grape	Fruit	Summer	2	2.18	<2
Bag flower	Tender leaves	Winter	3	3.15	>5
Giant Indian fig	Tender leaves/fruit	Winter	2	1.50	<2
Indian plum	Fruits	Winter	3	2.00	2~5
Banana buds	Buds	Summer	4	3.56	>5
Bayberry	Fruits	Summer	2	1.34	2~5
Indian gooseberry	Fruit	Winter	3	1.29	>5
Kanthior	Fruits	Year-round	3	1.07	<2
Broom grass	Anthesis, stem	Winter	2	3.05	>5
Bamboo shoot	Tender shoots	Summer	3	4.16	>5
Ferns	Tender leaves	Year-round	2	1.49	2~5
Thatch leaf	Leaves	Summer	4	2.45	2~5
Bamboo	Stem	Year-round	3	2	2~5
Pinewood	Whole plant/resins	Year-round	3	2.18	2~5
Wild apple	Fruit	Winter	2	1.46	<2
Bay leaves	Leaves	Winter	3	2.45	>5
Asian honeybee	Honey	Year-round	2	3.29	>5
Brown shrimp	Meat	Year-round	1	3.16	>5
Common carp	Meat	Year-round	1	4.38	>5
Flying lizard	Meat	Year-round	1	4.02	<2
Mushroom	Whole part	Summer	3	3.27	>5

animal-based NTFPs collected, the highest quantities were attributed to wild pig at 43.34 kg and mushroom at 15.32 kg.Based on their existing market prices, the NTFPs with high value were identified. Wild black pepper ranked first with a monetary value of ₹134,306.10 year^{-1}, followed by chocolate masheer at ₹87,460 year^{-1}, and Asian honeybee at ₹70,180year^{-1}. Furthermore, the average weekly collection of animal-based NTFPs reached 10.64 kg (Table 10).

The total value of the NTFPs collected annum^{-1}from Meghalaya was ₹433455, whereas plant-based NTFPs was ₹330689 and the animal-based NTFPs was ₹102766 (Table 11). The total value of the NTFPs collected annum^{-1}from Nagaland was ₹980991, whereas the value of the plant-based NTFPs was ₹523242 and the animal-based NTFPs was ₹457749.

From the NTFPs collected in Meghalaya, the monetary value of NTFPs seemed highest which were available year-round (₹153053 annum^{-1}) followed by winter season (₹141106.12 annum^{-1}) and summer (₹139295.56annum^{-1}) (Table 11). The monetary value of NTFPs which were available year-round (₹585584.79annum^{-1}) was the highest followed by NTFPs which available during the winter season (₹263831annum^{-1}) and summer (₹131575 annum^{-1}).The monetary value ofplant-based NTFPs collected from Meghalaya was highest in case of NTFPs available during winter (₹141106.12 annum^{-1}) followed by summer (₹108026 annum^{-1}) and year-round (₹81556 annum^{-1}). The monetary value of animal-based NTFPs collected from Meghalaya was highest which were available during year-round (₹71497) followed by animal-based NTFPs available during summer (₹31268 annum^{-1}). The plant-based NTFPs collected from Nagaland was highest which were available during winter

Table 8. Season of collection, collection trip per week, average time spent (hrs) per trip and distance (km) travelled for NTFPs collection in Nagaland State

NTFPs	Parts used	Season of collection	Collection trip per week	Average time spent (hrs) per trip	Distance travelled to collect (km)
Colocasia	Leaves/corms	Year-round	2	2.31	>5
Myrobalan	Fruits	Summer	2	2.24	<2
Indian gooseberry	Fruit	Winter	1	1.23	>5
Ferns	Tender leaves	Winter	2	3.45	>5
Wild black pepper	Fruit	Winter	3	3.38	>5
Pinewood	Whole plant/resins	Year-round	2	2.23	2-5
Ketibu	Leaves	Winter	1	2.3	2-5
Indian nightshade	Roots/fruits	Summer	1	1.22	2-5
Chinese sumac	Fruit	Summer	2	1.43	<2
Common walnut	Seed	Summer	2	3.27	2-5
Bamboo	Stem	Year-round	4	5.18	2-5
Bamboo shoot	Tender shoots	Year-round	5	4.34	>5
Wild apple	Fruit	Winter	2	2.65	>5
Toko patta	Berry/branch	Winter	3	4.05	>5
Tree bean	Pod	Summer	3	3.23	2-5
Broom grass	Anthesis, stem	Winter	3	4.37	2-5
Asian honeybee	Larvae/honey	Year-round	2	4.29	2-5
Chocolate Mahseer	Meat	Year-round	2	3.33	>5
Tsumangai (fish)	Meat	Year-round	2	4.01	>5
Wild pig	Meat/ tusks, teeth	Year-round	1	5.27	>5
Jungle fowl	Meat/feathers	Year-round	1	5.38	2-5
Frog	Meat	Year-round	2	3.45	2-5
Porcupine	Meat/quills	Year-round	1	6.07	>5
Mushroom	Whole part	Year-round	2	4.16	2-5
Snail	Fleshy innards	Year-round	2	4.01	>5

Table 9. Quantity collected per trip (kg), market price and monetary value (₹year^{-1}) of NTFPs collected in Meghalaya

NTFPs	Parts used	Quantity week^{-1} (kg)	Existing market price (₹kg^{-1})	Monetary value (₹year^{-1})
Burmese grape	Fruit	5.00	21.86	5683
Bag flower	Tender leaves	6.00	36.45	11372
Giant Indian fig	Tender leaves/fruit	3.00	27.32	4261
Indian plum	Fruits	6.00	91.10	28423
Banana buds	Buds	11.00	45.56	26060
Bayberry	Fruits	1.60	95.56	7950
Indian gooseberry	Fruit	9.00	60.95	28524
Kanthior	Fruits	6.00	27.32	8523
Broom grass	Anthesis, stem	8.00	45.56	18952
Bamboo shoot	Tender shoots	12.00	80.78	50406
Ferns	Tender leaves	2.34	58.57	7126
Thatch leaf	Leaves	17.00	20.22	17925
Bamboo	Stem	60.00	24.00	32223
Pine wood	Whole plant/resins	5.40	120.00	33682
Wild apple	Fruit	4.00	43.45	9037
Bay leaves	Leaves	70.38	33.34	40533
Asian honeybee	Honey	2.00	273.34	28427
Brown shrimp	Meat	1.50	91.11	7106
Common carp	Meat	2.00	265.32	27593
Flying lizard	Meat	1.78	90.43	8370.20
Mushroom	Whole part	6.00	100.22	31268

Table 10. Quantity collected per trip (kg), market price and monetary value (₹year^{-1}) of NTFPs collected in Nagaland state

NTFPs	Parts used	Quantity per week (kg)	Existing market price (₹ kg^{-1})	Monetary value (₹year^{-1})
Colocasia	Leaves/corms	6.23	61.80	26423
Myrobalan	Fruits	8.20	90.60	48280
Indian gooseberry	Fruit	10.22	56.45	34026
Ferns	Tender leaves	5.78	136.66	21377
Wild black pepper	Fruit	3.00	386.36	134306
Pinewood	Whole plant/resins	10.00	95.78	34478
Ketibu	Leaves	7.20	47.89	25470
Indian nightshade	Roots/fruits	5.10	24.87	10374
Chinese sumac	Fruit	4.00	50.00	21378
Common walnut	Seed	8.20	92.57	13515
Bamboo	Stem	2.80	22.34	18052
Bamboo shoot	Tender shoots	32.40	114.28	56156
Wild apple	Fruit	23.56	45.76	10021
Toko patta	Berry/branch	4.20	10.85	2010
Tree bean	Pod	5.33	122.96	35605
Broom grass	Anthesis, stem	8.33	28.45	31764
Asian honeybee	Larvae/honey	22.33	405.67	70180
Chocolate Mahseer	Meat	3.46	296.98	87460
*Tsumanga*i (fish)	Meat	5.89	126.97	40757
Wild pig	Meat/ tusks, teeth	43.34	689.34	56961
Jungle fowl	Meat/feathers	6.42	476.21	54630
Frog	Meat	4.78	87.90	24392
Porcupine	Meat/quills	5.55	543.65	19988
Mushroom	Whole part	15.32	212.76	37977
Snail	Fleshy innards	3.57	176.52	65400

Table 11. Monetary value of NTFPs collected based on their nature and season of collection

Particulars		Monetary value ₹ year^{-1}	
		Meghalaya	Nagaland
Nature			
Plant-based		330689	523242
Animal-based		102766	457749
Total		433455	980991
Season of collection			
Summer		139295	131575
Winter		141106	263831
Year-round		153053	585584
Total		433455	980991
Season of collection and types of NTFPs collected			
Summer	Plant-based	108026	129153
	Animal-based	31268	0.00
Winter	Plant-based	141106	258976
	Animal-based	0.00	0.
Year-round	Plant-based	81556	135111
	Animal-based	71497	457749
Total		433455	980991

Bamboo shoot (*Bambusa* sp.)

Giant Indian fig(*Ficus roxburghii)*

Colocasia(*Colocasia* sp.*)*

Common walnut*(Juglans regia)*

Banana buds*(Musa* sp.*)*

Tree bean *(Parkia roxburghii)*

Ferns (*Dryoptens* sp.*)*

Fig. 3b. Plant-based NTFPs (nourishment)

Wild gooseberry (*Phyllanthus Emblica* L.*)*

Bag flower (*Clerodendrum colebrookianum)*

Chinese sumac*(Rhus chinenses)*

Indian nightshade (*Solanum violaceum)*

Wild apple(*Docynia indica)*

Wild black pepper (*Piper* sp.)

Bayberry (*Myrica esculenta*)

Fig. 3c. Plant-based NTFPs (therapeutic)

(₹258976 annum^{-1}) followed by year-round (₹135111annum^{-1}) and summer (₹129153 annum^{-1}). The animal-based NTFPs collected from Nagaland were available all year-round with a monetary value of ₹457749 annum^{-1}. A similar study by Yadav et al. (2020) conducted on the monetary value of plant-based and animal-based NTFPs in Valsad North and South Forest Divisions (VNFD and VSFD) were similarly evaluated. VNFD and VSFD collectively housed 23 vegetable NTFPs and 1 animal NTFP, with a total quantity of 10643610.6 kg annum^{-1} and 7581813 bundles annum^{1} of *Diospyros melanoxylon* leaves. The monetary value of these NTFPs was assessed at ₹230.40 lakhs annum^{1}, contributing significantly to the local economy. The study underscores how NTFP diversity and economic benefits impact the livelihoods and subsistence of forest dwellers in these regions.

CONCLUSION

Non-Timber Forest Products (NTFPs) play a vital role in the Eastern Himalayan region of India, supporting biodiversity conservation, rural livelihoods, local economies, cultural heritage, and traditional healthcare systems. They are collected for subsistence and cultural purposes, extending beyond market value. NTFPs provide employment and entrepreneurship opportunities, especially for marginalized communities in remote areas, reducing reliance on traditional agriculture. Many NTFPs possess medicinal properties, contributing to herbal remedies. Sustainable management, including ecological assessments and harvesting guidelines, is essential to ensure future availability. Valuing NTFPs involves considering their market prices, ecological services, subsistence importance, and cultural significance, showcasing their immense contribution to the region's economy and society.

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