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Forest-Based Livelihoods, Gender Dynamics and Biophysical Conditions in Rural Communities of Kashmir Himalaya, India

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Abstract

Understanding the forest-based livelihoods and biophysical conditions of rural communities is essential to design regional strategies for forest management and livelihood security in Kashmir Himalaya. This study examined the extraction, consumption, marketing, gender dynamics and biophysical conditions of rural communities in the Lidder Forest division of Anantnag district, Jammu and Kashmir. Data were collected employing structured interviews and personal observations from 115 households, which were selected through multi-stage random sampling. Findings revealed that 94% of households relied on forest-based resources, with NTFPs contributing 20-60% of the household income. A clear gender division of labour was observed—men primarily engaged in timber and resin harvesting (6-8 hours/day; ₹240-₹810/day), while women dominated the collection of fodder, medicinal herbs, and mushrooms (5-6 hours/day; ₹270-₹931/day). Despite their substantial contribution, women's labour remained undervalued and largely excluded from decision-making processes. While local markets absorbed 70% of low-value forest products such as firewood and fodder, high-value commodities like Gucchi mushrooms, honey, and walnuts reached regional markets. Profits were diminished by intermediary control (20-30%) and inadequate storage and processing facilities. Unsustainable extraction, with annual firewood consumption (1,970 kg/household) exceeding ecological thresholds, alongside seasonal overharvesting of medicinal plants and fodder, is leading to vegetation degradation. The household biophysical factors directly influence forest resource collection and forest-based livelihoods; hence, these factors must be given due consideration in planning. The study emphasizes the urgent need to recognize forests' roles as an essential source for balancing livelihood security with ecological sustainability.

Keywords: Forest resource, NTFPs, Livelihoods, Rural economy, Biophysical Conditions, Kashmir

1. Introduction

Forests play a vital role in sustaining the livelihoods of communities living in their vicinity, particularly in regions where alternative economic opportunities are limited (Bhat *et al.*, 2017; Banday *et al.*, 2022) ^[6, 4]. Forest resources play an important role in food security, fodder/ livestock security, agricultural support, bio-energy security, housing security, cottage industry, health security, sociocultural security, income security, and employment security for local people in developing countries (Islam and Quli, 2017; Islam and Sheikh Shah, 2017) ^[11, 12]. Gangoo *et al.* (2017) ^[10] investigated the status of NTFP collectors in Jammu and Kashmir U.T., identifying key non-timber forest products (NTFPs) such as *Saussurea costus*, *Commiphora wightii*, and various medicinal and aromatic plants (MAPs), while also discussing their role in supporting livelihoods and the economic advantages and challenges faced by these collectors, including transport permissions and market problems. Bagala *et al.* (2022) ^[3] focused on the traditional use of NTFPs in the Shivalik range of the Jammu region, which plays a vital role in the livelihoods of the peasants in the study area; NTFPs contribute 29% of the average annual income of farmers. Islam *et al.* (2020) found that the manufacture of 43514 wicker handicrafts/year generated an income of ₹ 5953470/year. Atta *et al.* (2023) ^[2] reported that NTFPs serve as a pivotal reservoir of herbal remedies for forest fringe inhabitants in Gurez valley of Kashmir and medicinal NTFPs play a significant role in

reducing income inequality, generating an annual income of ₹ 756400.00 and creating employment of 655.20 man-days per year. The Lidder Forest Division, located in Anantnag district of Jammu and Kashmir, India, exemplifies this intricate relationship between forest ecosystems and human well-being. Spanning a diverse landscape of temperate forests, this region is home to numerous rural and tribal communities who rely heavily on forest resources for their subsistence and economic security. The extraction of timber, non-timber forest products (NTFPs), fuelwood, fodder, and medicinal plants from the Lidder Forest Division not only supports the daily needs of these communities but also contributes to their cultural and economic fabric. This is highly relevant as NTFPs are likely a crucial component of livelihood security in the Lidder Forest Division significantly to the annual income of rural households. However, increasing developmental pressures, unsustainable harvesting practices, and environmental changes pose significant challenges to the long-term viability of these forest-dependent livelihoods. This research examines the dynamics of forest resource extraction for livelihood security in the Lidder Forest Division, focusing on the types of resources utilized, the biophysical factors driving dependence, and the sustainability of current practices. By exploring the interplay between human needs and ecological limits, this study aims to shed light on how forest resources shape the lives of local communities while identifying potential pathways for balancing livelihood security with conservation goals. Situated in a region known for its rich biodiversity and fragile ecosystems, the Lidder Forest Division offers a critical case study for understanding the broader implications of forest resource use in mountainous areas of South Asia. Through this investigation, the research

seeks to contribute to the growing body of knowledge on sustainable forest management and inform policies that support both people and nature in Anantnag district.

2. Materials and Methods

2.1 Study Area

The Lidder Forest Division (Figure 1) is situated within the Anantnag district of Jammu and Kashmir, India, forming a significant part of the Lidder Valley. Geographically, it lies in the southern part of the Kashmir Valley, nestled between the Pir Panjal mountain range to the south and the Zaskar range to the north, with coordinates approximately ranging from 33.73°N to 34.15°N latitude and 75.10°E to 75.35°E longitude (Anonymous, 2011) [11]. The study site is administered under the Lidder Forest Division, headquartered at Bijbehara, and is characterized by its temperate climate, with cold winters, moderate summers, and substantial rainfall, averaging around 1000-1200 mm annually. The altitude varies from 1,600 to 3,000 meters above sea level, contributing to a diverse topography of steep slopes, rolling hills, and river valleys. The Lidder River, a tributary of the Jhelum River, flows through the division, shaping its landscape and supporting both ecological and human systems. The forest cover predominantly consists of coniferous species such as *Pinus wallichiana* (blue pine), *Cedrus deodara* (deodar cedar), and *Abies pindrow* (silver fir), interspersed with patches of broadleaf trees and alpine meadows at higher elevations. This biodiversity supports a variety of flora and fauna, including medicinal plants, wild fruits, and wildlife like the Himalayan black bear and musk deer, making it a critical ecological zone.

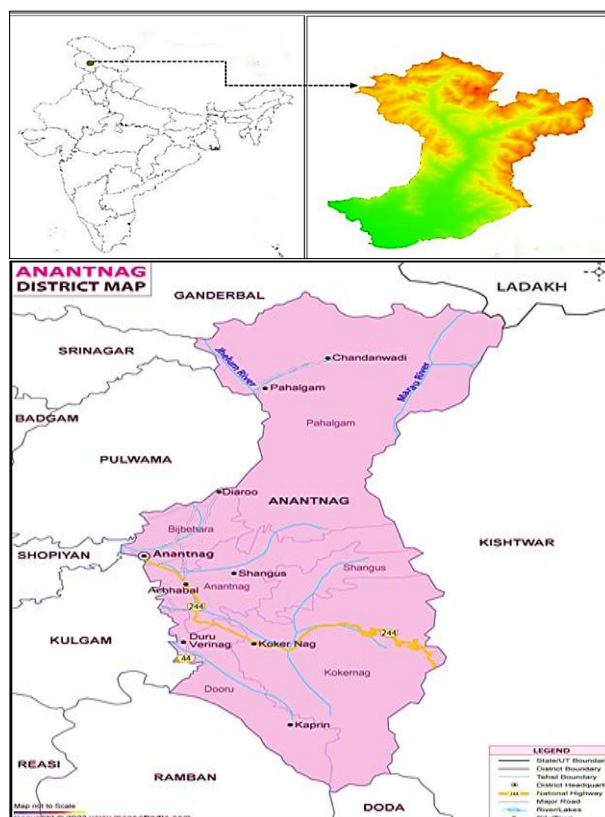


Fig 1: Location of the study area

Demographically, the Lidder Forest Division is surrounded by rural settlements and villages, with a population largely comprising agro-pastoral communities, including Gujjar and

Bakarwal tribal groups (Census of India, 2011) [7]. These communities depend on the forest for timber, fuelwood, fodder, and NTFPs to sustain their livelihoods. The area's

proximity to tourist destinations like Pahalgam, approximately 45 km from Anantnag town, also influences local economic activities, though forest-based livelihoods remain predominant due to limited infrastructure and market access. The forest division spans several administrative blocks within Anantnag district, covering an estimated area of 200-300 square kilometers.

2.2 Sampling technique and Sample

The present study was conducted in purposively selected Anantnag district of Jammu and Kashmir UT. Multi-stage

random sampling technique (Ray and Mondol, 2011)^[19] was employed in the selection of villages and respondents for the household survey. One hundred and fifteen (115) households, were selected from the sample villages. The sample villages selected were Seer and Saller from Mattan block; Lidroo and Ganishbal from Pahalgam block; Pastuna and Gulshanpora from Tral block. In the second stage, selection of respondents was done having sample size of 25% of the total number of the households in the sample villages. Household heads or eldest members were treated as the respondents. The summary of sample selection process is given in the Table 1.

Table 1: The sampling frame and sample size

S. No.	Blocks	Villages	Sampling frame	Sampling intensity	Sample size
1.	Mattan	Seer	110	0.25	28
2.	-do-	Sallar	58	0.25	15
3.	Pahalgam	Lidroo	83	0.25	21
4.	-do-	Ganishbal	80	0.25	20
5.	Tral	Pastuna	54	0.25	14
6.	-do-	Gulshanpora	68	0.25	17
Total	3	6	453	0.25	115

2.3 Data collection

In order to achieve the research objectives, the present study includes both qualitative and quantitative methods. Data have been collected by using both secondary sources and primary field survey. Secondary sources included, research reports, forest department records, village records, internet, previous researches, annual reports and other related documents and different governmental and non-governmental agencies. Primary sources included structured interviews with selected respondents, direct observations, key informants interview and focus group discussion (Mangal and Mangal, 2020)^[16]. The primary data have been collected at individual/ household and village level whereas

the secondary data have been collected for block, village and household/ individual level.

3. Results

3.1 Forest resource collection

The annual collection of forest resources was recorded as timber (41.80 m³), medicinal plants (0.75 tonnes), gucchi (0.05 tonnes), resin (1.15 tonnes), firewood (226.55 tonnes), honey (1.82 tonnes), fodder grass (1056.93 tonnes) and wild berries (1.25 tonnes) (Table 2). Methods adopted for harvesting the forest resources were: manual cutting, handpicking, tapping, gathering, traditional smoking, and cutting with a sickle.

Table 2: Forest resource collection in sample households (N=115)

Forest resource	Quantity collected (tonnes/year)	Seasonality	Method of harvesting	Value addition
Timber (Deodar, pine, Fir etc.)	41.80 [§]	Year round	Manual cutting	Carvings, processing lumber into finished building materials
Medicinal Plants (Kuth, Handh etc.)	0.75 (dry weight)	Summer/ autumn	Handpicking	Packaging and labelling
Gucchi	0.05 (dry weight)	Spring/ summer	Handpicking	Garland sewing, sun drying
Resin	1.15	Summer	Tapping	Using rosin in industrial application
Fire wood	226.55	Year round	Manual cutting, gathering	Drying for more burning efficiency
Honey	1.82	Summer	Traditional smoking/ extraction	Packaging in attractive containers
Fodder grass	1056.93 (green/ dry weight)	Summer/ autumn	Cutting with sickle	---
Wild berries	1.25	Autumn	Handpicking	Processing into juices, extracting oils for cosmetics

Note: §=m³

3.2 Forest resource consumption

The annual consumption of forest resources was recorded as timber (29.00 m³), medicinal plants (0.375 tonnes), gucchi (0.035 tonnes), resin (0.70 tonnes), firewood (150.00 tonnes), honey (1.26 tonnes), fodder grass (837.14 tonnes) and wild berries (0.875 tonnes) (Table 3). Modes of

consumption for the forest resources were construction, toolmaking, infusion, decoctions, traditional remedies, cooking in meals, incense, medicinal ointments, burning for heating, cooking, eating raw, feeding to cattle, juices, jams, and eating fresh.

Table 3: Forest resource consumption in sample households (N=115)

Forest resource	Consumption (Tonnes/year)	Consumption category	Mode of consumption	Seasonality
Timber	29.00 [§]	Household use	Construction, tool making	As needed
Medicinal herbs	0.375	Medicinal	Infusion, decoctions, traditional remedies	As needed peak during illness seasons
<i>Gucchi</i>	0.035	Food	Cooked in meals	Spring/summer
Resin	0.70	Traditional use	Incense, medicinal ointments	As needed
Firewood	150.00	Essential	Burning for heating, cooking	Year round (high in winter)
Honey (wild)	1.26	Food, medicinal	Eaten raw	Summer
Fodder grass	837.14	Livestock feed	Feed to cattle	Summer/autumn (stored for winter)
Wild berries	0.875	Food, medicinal	Juices, jams, eaten fresh	Autumn

Note: §=m³

3.3 Forest resource marketing

The annual marketing of forest resources was recorded as timber (12.80 m³), medicinal plants (0.375 tonnes), *gucchi* (0.015 tonnes), resin (0.45 tonnes), firewood (76.55 tonnes), honey (0.56 tonnes), fodder grass (219.79 tonnes) and wild berries (0.375 tonnes) (Table 4). Marketing of forest

resources fetched a handsome cash income, including timber (₹9,600.00/year), medicinal plants (₹1,12,500.00/year), *gucchi* (₹4,12,500.00/year), resin (₹90,000/year), firewood (₹4,59,300/year), honey (₹5,04,000/year), fodder grass (₹10,98,950/year) and wild berries (₹1,31,250/year).

Table 4: Forest resource marketing in sample households (N=115)

Forest Resource	Quantity sold (Tonnes/year)	Sale rate (₹/kg)	Marketing channel	Total income (₹/year)	Average (₹/household/year)
Timber	12.80 [§]	500-800 (₹/m ³)	Level 4 (Industrial/ construction markets)	9600.00	83.47
Medicinal plants	0.375	200-400	Level 2 (Small scale markets)	112500.00	978.26
<i>Gucchi</i>	0.015	25000-30000	Level 3 (Premium/ export channels)	412500.00	3586.95
Resin	0.45	150-300	Level 1 (Local sales)	90000	782.61
Firewood	76.55	3-7	Level 1 (Local sales)	459300	3993.91
Honey (Wild)	0.56	800-1000	Level 3 (Premium/ export channels)	504000	4382.61
Fodder Grass	219.79	2-5	Level 0 (Local/ community use)	1098950	9556.08
Wild berries	0.375	200-500	Level 2 (Small scale markets)	131250	1141.30

Note: §=m³

3.4 Livelihood sources and income composition

The average household income from all the sources was ₹115500/year, including forest resources (₹28000/year), agriculture (₹13500/year), livestock rearing (₹13000/year), wage earning (₹10500/year), business (₹30000/year), employment (₹16500/year), and other activities

(₹4000/year) (Table 5). The relative contribution of various livelihood sources into the household income was found to be forest resources (24.24%), agriculture (11.69%), livestock rearing (11.26%), wage earning (9.09%), business (25.97%), employment (14.29%), and other activities (3.46%).

Table 5: Family income composition in sample households (N=115)

Livelihood source	Income range (₹/year)	Average (₹/household/year)	Share (%)
Forest resource	11000-45000	28000	24.24
Agriculture	6000-21000	13500	11.69
Livestock rearing	4000-22000	13000	11.26
Wage earning	6000-15000	10500	9.09
Business	10000-50000	30000	25.97
Employment (temporary)	8000-25000	16500	14.29
Other activities	3000-5000	4000	3.46
Total	30000-108000	115500	100.00

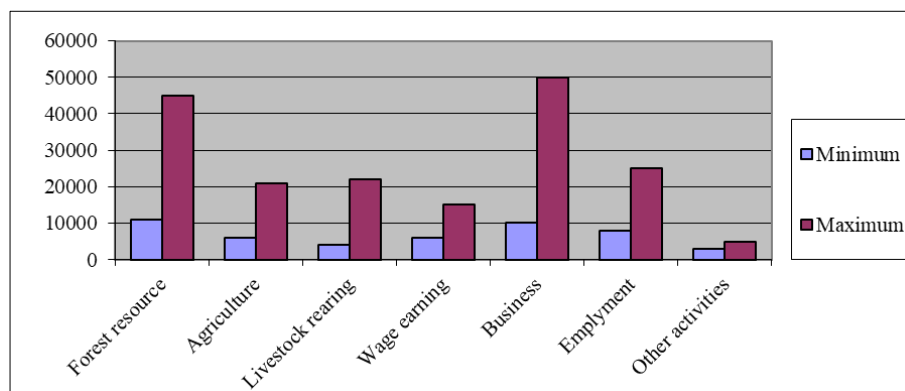


Fig 2: Household occupational pattern in the study villages (N=115)

3.5 Gender dimensions in forest resource utilization

Forest resource collection, processing, domestic use and trade - all the regular activities - were mostly performed by men with the joint participation of women (Table 6). Although decisions on all regular activities were taken independently by men, a definite division of labour among

men and women in forest resource utilization exists and women share their responsibilities with men to a varying degree. Hence, women's contribution to forest resource utilization is undoubtedly extremely significant.

Table 6: Gender dynamics in forest resource utilization in sample households (N=115)

Item	Male	Female	Total
No. of active days involved in collection in a year	8-11 days	10 -15 days	18-26 days
No. of active wage-earning days in a year	8-11 days	10-15 days	18-26 days
No. of active hours of works in a day	6-8 hours	5-6 hours	11-14 hours
Quantity collected/person/day	16-42 kg	17-48 kg	33-90 kg
Quantity processed/person/day	9-30 kg	10-35 kg	19-65 kg
Quantity marketed/person/day	8-27 kg	9-31 kg	17-58 kg
Income earned/person/day	₹ 240-810	₹ 270-931	₹ 510-1741

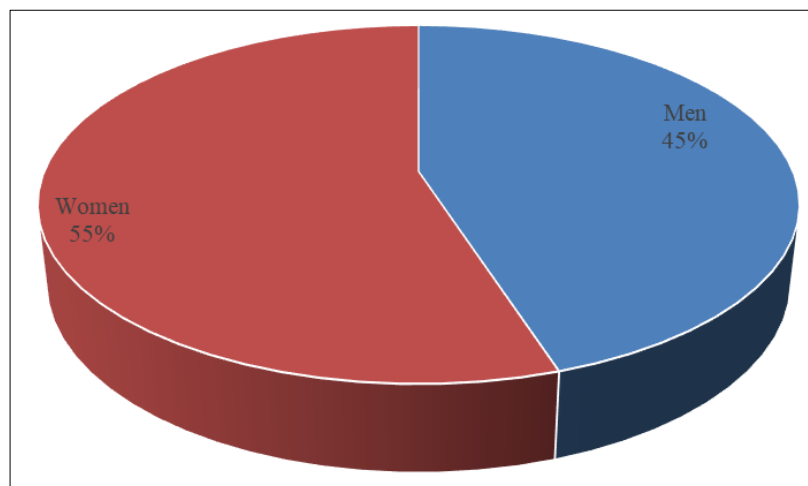


Fig 3: Involvement of family members in forest resource collection (N=115)

3.6 Biophysical conditions of forest fringe communities

The results (Table 7) revealed that a maximum (60.86%) of households have less than 5 km proximity to forests, followed by 5-10 km (26.08%), 10-15 km (8.69%), and more than 15 km (4%). The average proximity to the forests among sample households was observed to be 9.30 km. Further, a maximum (47.82%) of the households visited the forests very frequently, followed by frequently (26.08%),

occasionally (17.39%) and never (8.69%). The extent of agroforestry/homestead forestry plantation was 0.11-0.20 ha among the maximum (39.13%) of the households, followed by 0.21-0.30 ha (30.43%), < 0.10 ha (17.39%), and >0.30 ha (13.04%). Average extent of agroforestry/ homestead forestry plantation among the sample households was recorded to be 0.22 ha.

Table 7: Proximity to forests, frequency of forest visits and extent of homestead forestry in the sample households (N=115)

Proximity to forests		Frequency of forest visits		Extent of homestead forestry	
Category	Household (%)	Category	Household (%)	Category	Household (%)
< 5 Km	70 (60.86)	Very frequently	55 (47.82)	< 0.10 ha	20 (17.39)
5-10 Km	30 (26.08)	Frequently	30 (26.08)	0.11-0.20 ha	45 (39.13)
10-15 Km	10 (8.69)	Occasionally	20 (17.39)	0.21-0.30 ha	35 (30.43)
> 15 Km	5 (4.34)	Never	10 (8.69)	> 0.30 ha	15 (13.04)

As regards access to the forest plantation, most of the households (47.82%) had access to the forest plantations most often, followed by often (26.08%), seldom (17.39%), and never (8.69%) (Table 8). Regarding urban closeness, a maximum number of households (56.52%) have urban

closeness of 5-10 km, followed by < 5 km (17.39%), 10-15 km (13.04%) and >15km (13.04%). The average urban closeness of the sample households was found to be 9.8 km in the locality.

Table 8: Access to the forest plantation and urban closeness of the sample households (N=115)

Access to the forest plantation		Urban closeness	
Category	Household (%)	Category	Household (%)
Most often	55(47.82)	< 5 Km	20(17.39)
Often	30(26.08)	5-10 Km	65(56.52)
Seldom	20(17.39)	10-15 Km	15(13.04)
Never	10(8.69)	> 15 Km	15(13.04)

4. Discussion

4.1 Forest-based livelihoods

The data reveals that almost all the households depend on forest resources for livelihood security, with firewood and fodder being the most extracted products. Other major forest resources collected for livelihood support were timber, medicinal plants, gucchi, resin, honey, and wild berries. Methods adopted for harvesting the forest resources were: manual cutting, handpicking, tapping, gathering, traditional smoking, and cutting with a sickle. A large part of the forest resources collected were consumed by the households for subsistence and safety nets, while a small fraction was traded for cash income. High-value products (mushrooms, honey, walnuts) were sold in regional markets, cooperatives or specialist traders, yielding better returns, but intermediaries captured 20-30% of profits. Poles and NTFPs like mushrooms (gucchi) and honey generated the highest income. However, timber extraction was restricted to permit holders, creating income disparities. Medicinal plants (e.g., Kuth) and wild berries, though lower in volume, had high market value, indicating potential for value-added enterprises. Forest resource collection involved both men and women, with distinct roles. Women have a significant role in the collection, processing, consumption and marketing of forest resources. Children were minimally involved due to seasonal schooling but assisted in low-risk tasks like berry picking. Several studies (Islam and Quli, 2017; Dinda *et al.*, 2020; Lepcha *et al.*, 2020; Rahman *et al.*, 2021; Banday *et al.*, 2022)^[11, 4, 15, 18] revealed that the forest income is the most important source of household income, contributing to a considerable amount of the total household income.

4.2 Biophysical conditions of rural communities

The majority of the households live in close vicinity (less than 5 km distance) to forests, where the members visit very frequently for collection of forest resources to support their livelihoods. Every household has an adequate land under agroforestry/ homestead forestry plantation to procure food, feed and NTFPs. People are provided with man-made tree plantations close to their villages, allowing them to regularly collect forest products to support their daily living. The urban markets are situated close to the villages where people purchase and sell forest usufructs for their subsistence and earnings. Biophysical conditions comprising proximity to forests, frequency of forest visits, extent of homestead forestry, access to the forest plantation and urban closeness are fundamental to the survival and economic viability of rural communities. The favourable biophysical conditions enable the collection, consumption and marketing of forest resources overwhelmingly among the local communities. There is a strong association between biophysical conditions and the amount of forest resource extraction and consumption among households; the more conducive the biophysical conditions, the higher the extraction and consumption, and vice versa. Biophysical conditions significantly affect psychological and behavioural traits such as awareness, attitude, aspirations, willingness to adopt innovations, and risk-bearing capabilities (Chandramolloy and Islam, 2015)^[8]. The findings align with earlier studies (Banday *et al.*, 2019; Peerzada *et al.*, 2022; Islam *et al.*, 2025; Tasveer *et al.*, 2025)^[5, 17, 20] that claimed that positive biophysical conditions drive forest resource extraction directly among rural communities.

5. Conclusion

The study underscores the Lidder Forest Division's critical role in sustaining rural livelihoods. Almost all the households relied on forests, with NTFPs contributing a considerable income for marginalised families. Households with marginal landholdings and low annual incomes showed the highest reliance, as forest resources contributed considerably to the total income. Women's labour in NTFP collection was significant but undervalued in income and decision-making. High-value products (mushrooms, honey) had profit potential but were constrained by intermediaries and poor infrastructure. The household biophysical conditions have substantial impacts on the forest resource collection and usage. Overextraction of firewood and medicinal plants risked long-term resource collapse. The Lidder Forest Division exemplifies the delicate balance between livelihood security and ecological preservation. While forests are a lifeline for Anantnag's rural poor, unsustainable practices threaten both biodiversity and long-term income streams. Integrated policies prioritizing community-led conservation, equitable markets, and climate resilience are urgent.

6. Recommendations

Based on our findings following recommendations were suggested:

1. Promote Sustainable Harvesting

- Train communities in rotational harvesting and NTFP cultivation (e.g., medicinal plant nurseries).
- Enforce stricter penalties for illegal logging.

2. Strengthen Value Chains

- Establish cooperatives for direct marketing of mushrooms and honey.
- Invest in solar drying units and storage facilities to reduce post-harvest losses.

3. Gender-Inclusive Policies

- Provide women with access to microloans for NTFP-based enterprises.

4. Climate Adaptation

- Introduce climate-resistant fodder species and diversify income sources (e.g., eco-tourism).

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