Original Research Article

Social analysis of NTFP (Non-Timber Forest Products) dependent livelihoods of South India

ABSTRACT

Aim

This study explores the socioeconomic factors influencing the collection of Non-Timber Forest Products (NTFPs) among tribal communities in Wayanad, Kerala, South India. It also examines their perceptions of the decline in NTFP availability and their awareness about the conservation measures necessary to address the issue.

Methodology

The data was collected from 105 households to assess NTFP dependency, and their perceptions. Multilinear regression was used to analyse the factors affecting NTFP collection and Likert scale was utilized to understand their perception and awareness.

Results

Results revealed significant gender disparities, with men primarily involving in physically demanding NTFP collection activities. The findings indicated a relatively low interest among the youth towards NTFP collection, with younger generation increasingly disengaging in favour of alternative employment opportunities linked to higher education. variables such as tribal group, land ownership, total marketing expenditure, income from wages, agricultural income, and overall annual income significantly influenced total NTFP income levels. Majority of tribals had a medium level of awareness, recognizing the primary causes of decline but lacked a comprehensive understanding.

Conclusion

The study emphasizes the urgent need for integrating traditional ecological knowledge with modern conservation practices, promoting sustainable harvesting methods, enhancing market infrastructure, and the need for targeted interventions that empower women in NTFP-related livelihoods, offering them training and access to higher-value NTFP collections. Addressing these challenges is crucial for the socialupliftment of tribal communities and sustainable management of NTFPs.

Keywords: Non-Timber Forest Products (NTFPs); **Tribal households**; **Sustainable harvesting**; **Market challenges**; **Conservation practices**

INTRODUCTION

Non-Timber Forest Products (NTFPs) are an essential component of income of tribal communities across the world. These products, include a wide variety of resources such as fruits, nuts, resins, medicinal plants, and fibres, are harvested from forests without the need to fell trees. NTFPs provide critical subsistence resources, supplement household incomes, and serve as a safety net during times of economic or agricultural crisis. Globally, an estimated 1.6 billion people depend on forests for their livelihoods, and for many, NTFPs represent a significant portion of their daily sustenance and income (FAO, 2014). In India, NTFPs are particularly crucial for the socioeconomically marginalized tribal populations living in forest regions.

Livelihood dependence on NTFPs extends far beyond subsistence needs. In India, NTFPs account for 20-60% of the total annual income of forest-dependent households, playing a crucial role in reducing poverty and inequality(Dash et al., 2016). Globally, NTFPs are a vital source of income in

regions such as Southeast Asia, Africa, and Latin America, where they are integral to local economies. In some areas, the collection and sale of NTFPs are among the few viable livelihood options for rural populations, particularly for women, who are often primary gatherers of these resources (Arnold and Pérez, 2001). Additionally, NTFPs contribute significantly to food needs, medicinal needs, and cultural practices, further emphasizing their importance in the daily lives of many forest-dependent people.

Despite their significance, NTFP production and marketing face numerous challenges that threaten both the sustainability of these resources and the livelihoods they support. Deforestation, habitat degradation, and the overexploitation of key species have led to a steady decline in the availability of NTFPs(Saxena, 2003; Ticktin, 2004). Climate change and unpredictable weather patterns exacerbate these environmental challenges, reducing the natural regeneration of forest resources (IPCC, 2022). In India and worldwide, these environmental pressures are further complicated by institutional barriers, such as unclear land tenure rights and inadequate policies for forest governance, which hinder the sustainable management of NTFPs(Saxena, 2004).

Many rural and tribal communities have limited access to formal markets, infrastructure, and value addition opportunities, forcing them to rely on intermediaries who often exploit their lack of market knowledge. This resulted in unfair pricing and reduced economic returns for the collectors(Lacuna-Richman, 2002). Furthermore, the lack of processing facilities prevented communities from adding value to raw NTFPs, which could have significantly increased their marketability and income potential. This challenge is not unique to India; similar issues exist globally, where NTFP gatherers face barriers to market entry and equitable trade(Arnold and Pérez, 2001).

The decline in NTFP availability has prompted discussions about the need for sustainable management and their conservation. Local communities often perceive conservation through the lens of traditional practices, such as rotational harvesting, which are embedded in their cultural and ecological knowledge(Bain, 2017). However, there is a need to integrate modern scientific methods, such as sustainable yield management, to ensure the long-term viability of NTFP resources(Pandey et al., 2016). Unfortunately, conservation efforts are frequently undermined by weak institutional support and governance challenges, leading to the continued degradation of forest ecosystems and the depletion of NTFPs.

NTFPs are of critical importance to the livelihoods of millions worldwide, offering economic, subsistence, and cultural value. However, the challenges in production, marketing, and conservation must be addressed to ensure the sustainability of these resources. Understanding the socioeconomic dynamics and the perceptions of local communities toward conservation will be crucial in formulating strategies that enhance NTFP-based livelihoods while preserving forest ecosystems for future generations. This paper aims to study about the socioeconomic profile of the tribes dependent on NTFPs, challenges faced during collection and marketing of NTFPs and their perceptions regarding the reasons for the reduction of NTFPs and various conservations measures to be undertaken for protecting them.

METHODOLOGY

Location of study

The present study was carried out in the tribal settlements of Wayanad district, Kerala, South India. Wayanad was chosen as the study area due to its extensive forest cover, which constitutes 74.19% of the district's total geographical area(Forest Survey of India, 2019). The district is home to 31% of Kerala's total tribal population(KIRTADS, 2023). Wayanad's forests are rich in biodiversity, providing a wide range of NTFPs such as wild honey, medicinal plants, tubers, wild fruits, mushrooms, resins, and non-edible products like bamboo, which are vital to the livelihoods of the local forest-dependent communities.

Three panchayaths namely, Meppadi in Vythiri, Thirunelli in Mananthavady, and Noolpuzha in Sulthan Batherywere selected, based on population data obtained from the Integrated Tribal Development Project (ITDP) office in Kalpetta. Tribal settlements within these panchayaths were randomly selected with input from the respective tribal extension officers.

Population and sampling

Primary data was collected from 105 randomly selected households, 35 each from the selected panchayaths, through the use of a pre-tested, structured interview schedule.

Data collection and analysis

These data were analyzed using basic statistical techniques such as mean, median, mode, standard deviation, and presented using tabular and percentage analyses. Multilinear regression was used to analyze the household factors influencing income from NTFPs.

A five-point Likert scale was utilized to evaluate the knowledge and perceptions of tribal communities regarding the conservation of Non-Timber Forest Products (NTFPs) and the factors that contribute to their decline. The responses were rated a scale ranging from five to one, representing different levels of knowledge and awareness related to conservation practices.

5 - Strongly agree

4 - Agree

3 - Neutral

2 - Disagree

1 - Strongly disagree

The perception score for each respondent was converted into a percentage. Based on the mean and standard deviation values, respondents were categorized into three levels of perception: high, medium, and low.

Figure 1. Study area

3. RESULTS

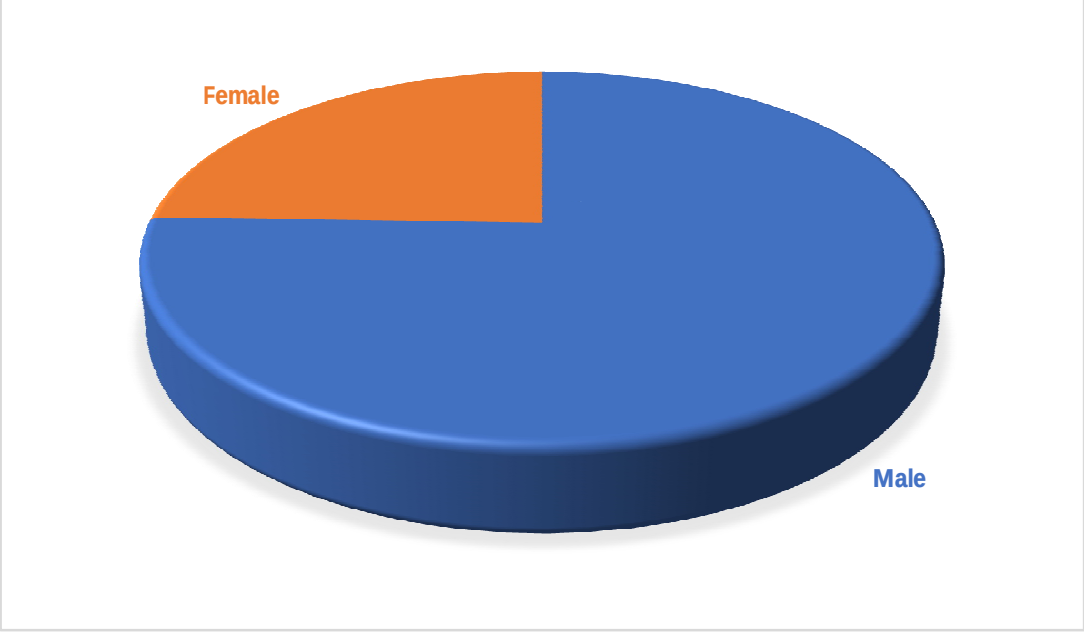
3.1 Social characteristics of tribal groups

The survey included five major tribal communities: Kattunaikka (60.37%), Vettakuruma (19.81%), Paniya (10.37%), Mullukuruma (4.71%), and Ooralikuruma (4.71%). The Kattunaikka tribe was the largest group, and hence they had a significant contribution in NTFP collection and dependence on forest resources. The Vettakuruma and Paniya tribeswere smaller in numberwith a relatively moderate engagement in NTFP activities. The Mullukuruma and Ooralikuruma communities, though smaller in representation, also contributed valuable insights into the diverse ways in which these communities rely on NTFPs.

3.1.1Gender and Age distribution among the tribal communities

The survey on NTFP collection showed a notable gender disparity, with 75.45% of the respondents being male and 24.55% female (Figure 2).

Figure 2. Graphical representation of gender distribution

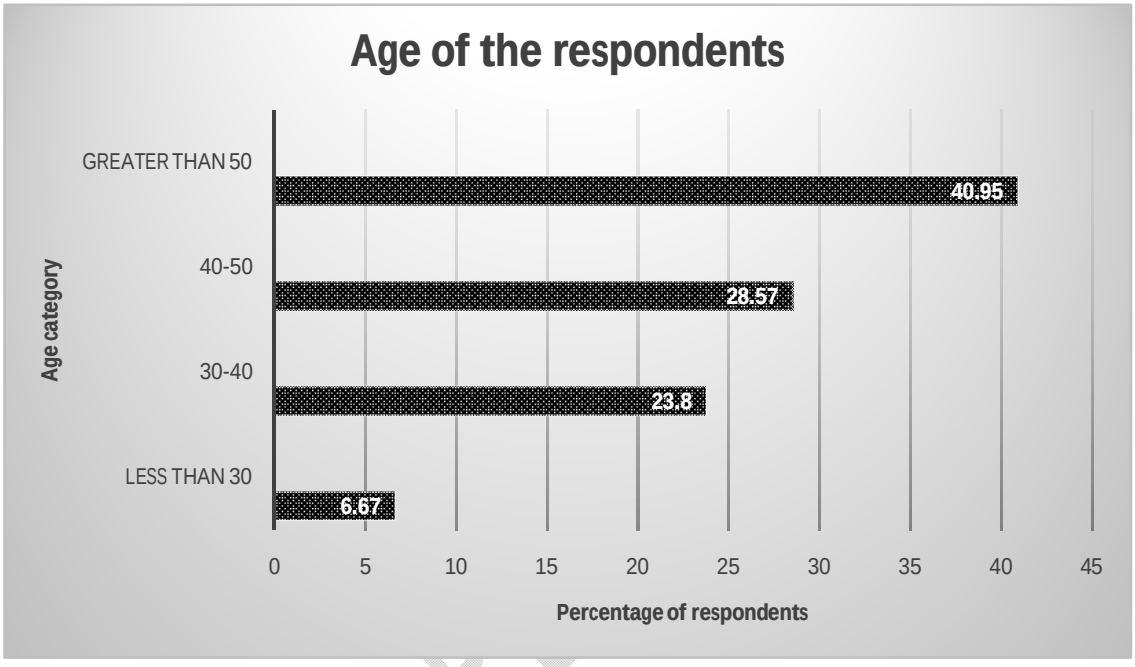


Majority of respondents in the study were in the age group of over 50 years (41%), followed by category between 40 to 50years (28.6%) which is evident from the Table 1 and figure 3.

Table 1. Distribution of NTFP collectors based on age

Sl. No.	Particulars	No. of respondents	Percentage (%)
1	Less than 30	7	6.67
2	30-40	25	23.80
3	40-50	30	28.57
4	Greater than 50	43	40.95

Figure 3. Age distribution of NTFP collectors



3.1.2Family size

Average family size of the surveyed households was 4.63 with on an average 1.73 males, 1.45 females and 1.45 children.

Table 2. Particulars of family size

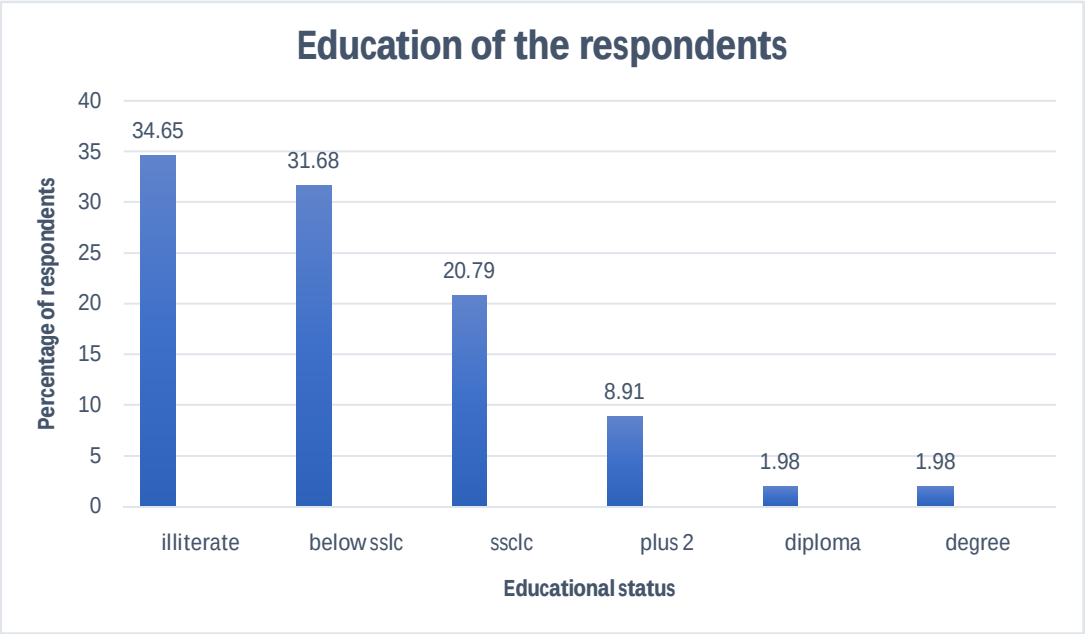
Sl. No.	Particulars	Average
1	Size of the family (average)	4.63
2	Males	1.73
3	Females	1.45
4	Children	1.45

The tribal communities surveyed were slowly moving towards a nuclear family culture. These results are in consonance with the studies undertaken by Prakash (2008), and Gubbi and Mcmillan(2008).

3.1.3. Educational qualification

The educational status of the respondents was grouped into six categories, with 35% being illiterate (no formal education), followed by 32% having education below SSLC, and 21% having completed up to SSLC. This indicatedthat a majority of the respondents who were in low education category were increasingly depended on NTFPs and vice-versa.

Figure 4. Distribution of tribes as per educational status



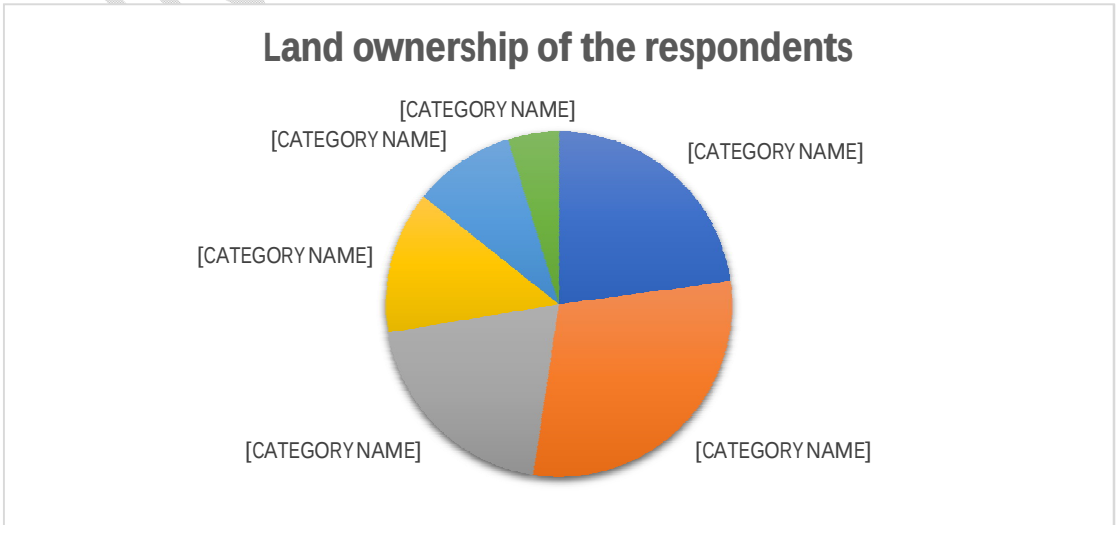
3.1.4 Land ownership

The sample respondents were grouped based on landholding patterns, with 29% of respondents owning between 0.10 to 0.20 ha, followed by 23% with less than 0.10 ha. Approximately 20% held between 0.20 to 0.40 ha, while 13% had between 0.40 to 0.80 ha. Fourteen percent of the respondents owned more than 0.80 hectare. The data reflects a predominance of small landholdings, with a majority of respondents having less than 0.40 hectares of land.

Table 3. Distribution of tribes as per land holding size

Size of the holdings	No. of respondents	Percentage
<0.10 ha	24	22.85
0.10- 0.20 ha	31	29.52
0.20- 0.40 ha	21	20.00
0.40- 0.80 ha	14	13.33
0.80- 1.62 ha	10	9.52
>1.62 ha	5	4.76

Figure 5. Distribution of tribes based of land ownership



Sl. No.	Variable	Coefficient	Std. Error	P value
1	Intercept	600.5	32690	0.985
2	Gender	-2303	12370	0.853
3	Tribal group	-19870	6645	0.003**
4	No. of earning members in family	-5941	5618	0.293

3.1.6Employment status

Majority of the respondents depend on the wage labour as a source of income (63%), followed by salary employment (11.42%) and self-employment (1.9%). Around 24 per cent of the respondents were unemployed and NTFPs were the only source of income. The wage labour includes estate workers, timber works etc. Salary employment include forest guards, tribal extension workers etc.

Table 4. Details of employment status of tribes involved in NTFP collection

Particulars	Frequency	Percentage
Wage employment	66	62.85
Unemployed	25	23.80
Salary employment	12	11.42
Self employed	2	1.90

3.2 Multilinear regression

The Multilinear regression analysis was conducted to assess factors affecting factors affecting income from Non-Timber Forest Products (NTFPs). Key factors included gender, tribal affiliation, number of family earners, land ownership, distance for collection, and expenditures related to marketing, among others. The coefficients indicate that variables such as tribal group, land ownership, total marketing expenditure, income from wages, agricultural income, and overall annual income significantly influenced total NTFP income levels.

The model's R^2 value of 0.673 suggests that around 67.3% of the variability in NTFP income is explained by these household variables. An adjusted R^2 of 0.640 further indicates the robustness of the model.

Table 5. Results of multiple linear regression

5	Land ownership	-13580	4835	0.006**
6	Distance travelled for collection	725.90	413.50	0.082_
7	Total expenditure for marketing	4.71	0.579	1.95E-12***
8	Total income from wage	0.209	0.102	0.043*
9	Total income from Agriculture	-0.146	0.046	0.002**
10	Total annual income from all sources	-0.149	0.051	0.004**
	Multiple R-square	**0.673**		
	Adjusted R-square	**0.640**		

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1

3.3 Perception level of NTFP collectors

The perception of Non-Timber Forest Products (NTFP) collectors regarding the causes of NTFP reduction and the measures needed for their conservation were analysed in the present study.

3.3.1 Causes for NTFP Reduction

The reduction of NTFPs in the study area has been attributed to a variety of factors, including climate change, over-exploitation, deforestation, habitat destruction, and human interventions such as quarrying and agricultural expansion.Shackleton et al. (2007) highlighted that land use changes and over-exploitation have significantly reduced the availability of NTFPs, affecting the natural regeneration of key species. Similarly, Mishra et al. (2013) reported that agricultural expansion and forest land conversion in the Himalayan regions have led to a significant reduction in medicinal plant species, emphasizing the critical impacts on forest resources. Mandal et al. (2023) also highlighted that habitat loss due to deforestation and climate change threatens high-value NTFP's distribution in India and nearby regions. The Forest Survey of India (FSI) report (2021) also noted that environmental stressors like changing rainfall patterns and climate change have contributed to the decline of certain NTFP species in Kerala, leading to an ecological reduction in availability rather than a decline in collection.

Table 6. Perception level statements regarding causes for NTFP reduction

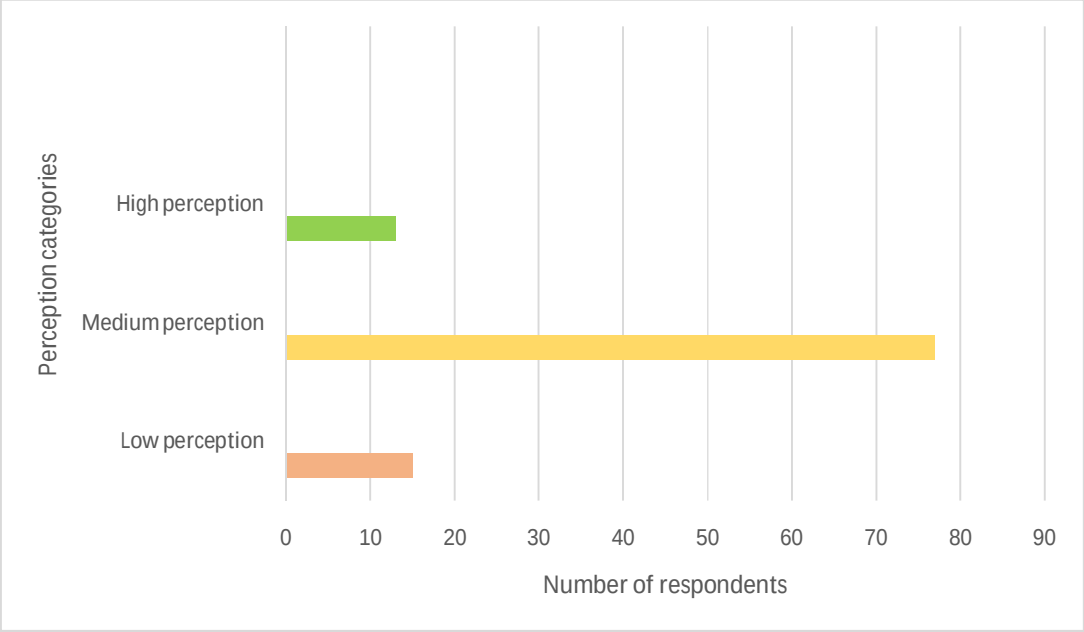
Sl. No.	Particulars
1	Climate change impacts
2	Over exploitation for commercial and scientific purposes
3	Deforestation
4	Destruction of natural habitats
5	Converting forest areas to agriculture
6	Removal of natural forest for commercial purposes
7	Forest fires
8	Unscientific afforestation
9	Human interventions like quarrying
10	High grazing incidence
11	Unsustainable practices of harvesting
12	Diseases and pest attack

Respondents' perceptions of these factors were categorized into three levels: low, medium, and high perception indices. Sixteen respondents had a low perception index, indicating limited awareness of the key factors affecting NTFP availability. Majority of tribals (77) had a medium level of awareness, recognizing the primary causes but lacking a comprehensive understanding. Fourteen respondents demonstrated a high level of perception, reflecting a deeper awareness of the complex interactions affecting NTFP resources.

Table 7. Perception level of tribes regarding the causes of NTFP reduction

Perception categories	Mean perception index	No. of respondents
Low perception index	Mean- SD	15
Medium perception index	Mean+-SD	77
High perception index	Mean+ SD	13

Figure 6. Perception level of tribes regarding the causes of NTFP reduction



3.3.2 Conservation Measures

Ten specific measures were proposed to assess the community's understanding of effective conservation strategies. These included scientific afforestation, preventing over-harvesting, integrating local and scientific knowledge, promoting sustainable and rotational harvesting, increasing awareness about NTFPs, preventing forest conversion, and curbing human interference such as quarrying and resort development. Additionally, measures to train local communities and forest officials and prevent forest fires were also considered essential. Several studies, including those byPullanikkatil et al. (2019), Angelsen et al. (2014), and USAID (2017), have shown similar results, highlighting the importance of sustainable harvesting, integrating local knowledge with scientific methods, and raising awareness about conservation strategies.

Table 8. Perception level statements regarding conservation measures for NTFPs

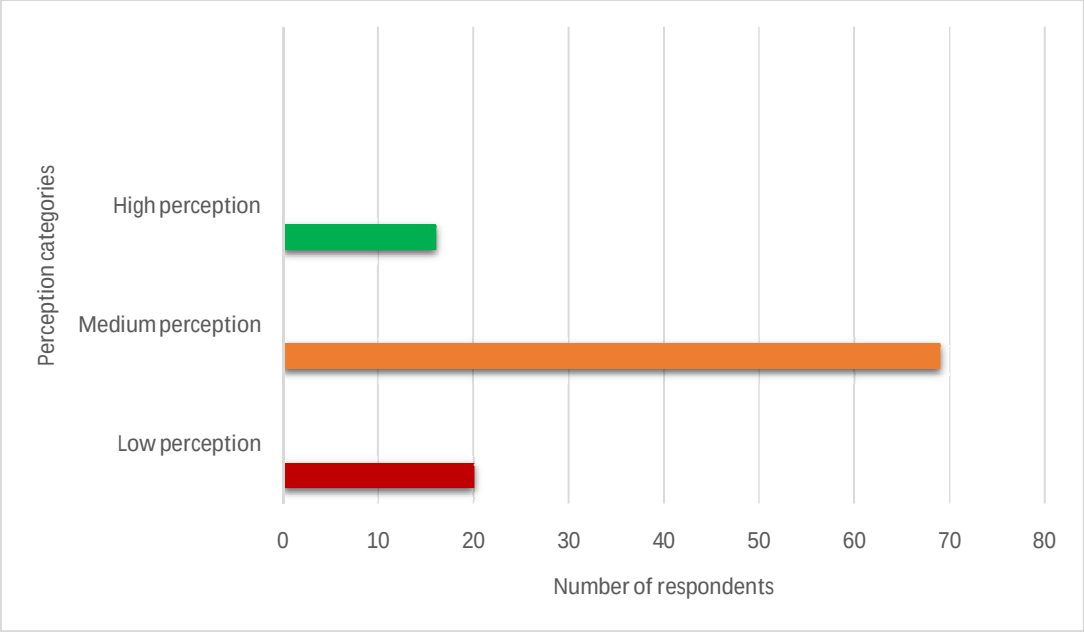
Sl. No.	Particulars
1	Scientific afforestation
2	Preventing over harvesting of NTFPs
3	Integrating local and scientific knowledge
4	Sustainable harvesting of NTFPs
5	Rotational harvesting
6	More awareness of NTFPs
7	Prevent conversion of natural forest
8	Prevent quarrying and resorts inside forest
9	Training locals and forest officials
10	Adequate measures to prevent forest fires

The respondents were grouped based on their perception index, which revealed varied levels of understanding. A group of 20 respondents had a low perception index, indicating limited awareness of conservation practices and the importance of integrating local and scientific knowledge. Sixty-nine respondents had a medium perception index, showing a moderate awareness of conservation measures but a need for more in-depth knowledge and implementation. The remaining 16 respondents had a high perception index, demonstrating a comprehensive understanding of the necessary conservation measures, including sustainable harvesting and fire prevention.

Table 9. Perception level of tribes regarding the conservation measures for NTFPs

Perception categories	Mean perception index	No. of respondents
Low perception index	Mean- SD	20
Medium perception index	Mean+-SD	69
High perception index	Mean+ SD	16

Figure 7. Perception level of tribes regarding the conservation measures for NTFPs



4. DISCUSSION

The research findings revealed a clear gender disparity in NTFP collection, where men predominantly participated due to the physical demands and cultural expectations associated with high-value products such as honey and Kalpasam. Women, in contrast, were mainly involved in gathering smaller subsistence-level products like wild fruits, herbs, and fuelwood. This pattern aligns with studies by Tee et al. (2015) and Rijal et al. (2011), who reported similar gender roles in NTFP collection, particularly in regions like the Himalayas, where men engaged in more labour-intensive and economically rewarding activities while women focused on household sustenance. These findings underscore the need for targeted interventions that empower women in NTFP-related livelihoods, offering them training and access to higher-value NTFP collections. By promoting gender-inclusive policies, we can challenge the traditional roles that limit women's participation and enhance their economic contributions.

Age also played a significant role in NTFP collection, with older individuals more actively involved, likely due to their extensive knowledge and experience. In contrast, younger people showed a reluctance to engage, often opting for alternative employment opportunities, such as wage labour, which is seen as more stable and financially rewarding. Sahoo et al. (2016) and Garibay-Orijel et al. (2007) observed similar trends, where younger generations, influenced by education and social

pressures, perceived NTFP collection as a low-status, low-income activity compared to other available jobs. These findings highlight the need to increase awareness of the economic potential of NTFPs, especially among younger people, to preserve traditional knowledge and ensure the continuity of NTFP-based livelihoods.

Education was another critical factor influencing NTFP dependency, with the study showing that individuals with higher educational levels were less dependent on forest resources. This is consistent with findings by Shackleton et al. (2008) and Mahapatra and Tewari (2019), who observed that higher education levels often lead to formal employment, reducing reliance on NTFPs. As educational opportunities increase, livelihood diversification becomes possible, leading to more stable incomes outside of forest-based activities. These results suggest that improving access to education could play a pivotal role in reducing dependency on NTFPs while offering more sustainable livelihood options for tribal communities.

The study also found that most respondents had small landholdings, often less than 0.40 hectares. This aligns with the findings of Suleiman et al. (2017), who observed that households with limited farmland often cannot produce sufficient food to sustain themselves. Consequently, they rely significantly on nearby forest resources as a safety net to offset food shortages. Similarly, Swaminathan et al. (2021) found that smaller landholders often supplemented their income through NTFP collection, particularly when subsistence farming was not viable. These findings reinforce the importance of forest resources for small landholders and highlight the need for strategies to diversify income sources in communities with limited agricultural land.

The regression analysis highlights key household variables impacting income from non-timber forest products (NTFPs), particularly tribal group affiliation, land ownership, and marketing expenditures. Tribal affiliation and limited land ownership are associated with reduced NTFP income, aligning with studies showing that tribal and indigenous groups often face restricted access to forest resources and markets (Arnold & Pérez, 2001; Shackleton et al., 2011). Marketing expenditures have a positive influence, as investment in processing and transport strengthens market access, increasing profitability. Income from other sources also plays a role: wage income positively influences NTFP earnings, suggesting that households with diverse income streams can reinvest in NTFP collection, while agricultural income's negative association indicates that households invested in farming may rely less on NTFPs. This finding echo research on NTFPs as supplementary income sources that buffer against economic shocks, especially for low-income households (Sakai et al., 2016). Overall, these results suggest that improving market access, reducing transaction costs, and supporting resource rights could enhance NTFP income for vulnerable groups, reinforcing the economic resilience of households dependent on these forest products.

Regarding the perceptions of the decline in NTFP availability, findings are in line with studies by Kunwar et al. (2009), and Ghimire et al. (2005), which indicated that while communities are generally aware of deforestation and over-exploitation, fewer respondents understood the broader ecological and economic factors affecting NTFP availability, such as climate change and market dynamics. This underscores the need for improved education and capacity-building efforts to enhance community understanding of these broader issues, ensuring more effective conservation and sustainable use of NTFP resources.

The perception analysis regarding conservation also revealed that most respondents had a moderate understanding of sustainable practices, mirroring studies by Angelson and Wunder (2003),Shackeleton and Pandey (2014) and Angweyni et al. (2021). This suggests a need for greater education and capacity-building initiatives to strengthen community involvement in conservation efforts. By integrating traditional knowledge with scientific approaches, communities can adopt more sustainable harvesting practices and contribute to the long-term protection of NTFP resources.

To succinctly summarize, this study reveals how gender, age, education, and landholding patterns influence NTFP collection among tribal communities, with men and older individuals playing a dominant role while younger, educated individuals shift away from forest-based livelihoods. Small landholdings and market constraints increase dependence on NTFPs, yet safety concerns and restrictive policies hinder optimal utilization. Targeted interventions, including gender-inclusive

policies, educational initiatives, and improved market access, are crucial for empowering communities, reducing reliance on NTFPs, and ensuring sustainable conservation of forest resources for future generations.

5. CONCLUSION

This study revealed the multifaceted challenges faced by tribal communities in Wayanad who depend on NTFPs for their livelihoods. While NTFPs contribute significantly to household income, their collection is hampered by various physical and policy-related barriers. Wild animal attacks, accidents *viz.,* falling off from trees and restrictive forest policies stand out as the key challenges. Moreover, the disengagement of younger generations from NTFP-related activities, driven by education and better employment opportunities, is a major concern for sustainability of traditional livelihoods.

To safeguard the future of NTFP-based livelihoods, it is imperative to integrate both traditional knowledge and modern conservation practices. Sustainable harvesting, rotational collection, and community-led conservation efforts, supported by scientific methods, are crucial initiatives to be undertaken. These strategies would ensure that NTFP resources remain viable the use of future generations while addressing the socioeconomic needs of the present.

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