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Livelihood Strategies, Social Structures, and Household Dependence on NTFPs in Dadeldhura

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Abstract

This paper clarifies its unique contribution by examining how household socio-economic and demographic factors interact with ecological conditions to shape livelihood strategies, highlighting the overlooked role of non-timber forest products (NTFPs) in Dadeldhura district, Nepal. While NTFPs are often undervalued and insufficiently documented at the local level, this study demonstrates their significance as complements to subsistence agriculture and as coping mechanisms under ecological and demographic pressures.

A cross-sectional quantitative research design was applied, surveying 222 households with structured questionnaires in multi-stage sampling to capture ecological and social diversity. Descriptive statistics and cross-tabulations were used to assess associations between NTFP use and household characteristics such as caste status and occupation, supplemented by secondary census and government data.

Results indicate that eco-diversity, measured through climatic and soil variation, directly affects agricultural reliability, driving greater dependence on NTFPs in less productive areas. Demographic pressures (notably population growth and land fragmentation) further reinforce this reliance. Social hierarchy was also crucial: socially excluded groups (particularly Dalits) had stronger dependence on NTFPs, with women playing an active role in collection and processing. Overall, the study uniquely contributes by integrating ecological, demographic, and social dimensions to explain household livelihood strategies, offering insights into how marginalized groups sustain rural economies through NTFPs.

***Keywords*: Non-timber forest products, Livelihood strategies, Social structures, Demographic factors, Dadeldhura**

Introduction

Forests are an important source of ecosystem service benefits, and non-timber forest products (NTFPs) are one of the most important resources for the maintenance of rural livelihoods (Lila, Miller, Venn, & Bryan, 2021). NTFPs are biological products other than wood extracted from forests, farmlands, and grasslands (Belcher, Ruíz-Pérez, & Achdiawan, 2005), and comprise foods, medicines, fodder, fibres, and building materials that are essential to millions of households globally (Shackleton, 2019; Singh et al., 2020). Their importance is particularly pronounced in Nepal, where an estimated 80–90% of the rural population primarily rely on traditional plant-derived (phyto) medicine as their main form of healthcare (Chhetri

et al., 2021; Shrestha et al., 2020). More than 700 species of medicinal and aromatic plants are used domestically for nutrition, subsistence, and income generation (Kunwar et al., 2020). Because they renew relatively quickly compared to, for example, timber extraction, NTFPs are increasingly considered central to both biodiversity conservation and sustainable livelihoods (Njwaxu & Shackleton, 2019).

To situate this literature, the livelihood environment policy nexus provides a guiding framework:

- Livelihood dimension: At the household level, NTFPs provide crucial supplements to food security and income, particularly for marginalized groups with limited land or formal employment opportunities.
- Environmental dimension: Local ecological conditions, including climate and soil, strongly influence household choices, reinforcing the interdependence between natural resource availability and livelihood strategies.
- Policy dimension: Governance, commercialization pressures, and sustainability challenges shape how NTFPs are accessed, managed, and valued across different social groups.

Despite their importance, the role of NTFPs remains underestimated in policy and under-reported at household level. Growing commercialization, unsustainable collection, and poor governance place their availability at serious risk, especially in regions such as Dadeldhura where 64% of the population depends on subsistence agriculture, facing inherent challenges from steep terrain, land fragmentation, and irregular rainfall (CBS, 2012; Government of Nepal, Ministry of Finance, 2024). In such contexts, NTFPs represent a vital coping mechanism. Yet little is known systematically about how socio-economic and demographic characteristics such as caste, gender, and family composition interact with ecological conditions to shape household reliance on NTFPs (Ghimire, McKey, & Thomas, 2004).

At the national level, Nepal has formulated multiple strategies including the Herbs and NTFPs Development Policy (2004) and the National Biodiversity Strategy and Action Plan (2014), alongside community forestry initiatives to promote sustainable management and equitable benefit-sharing (Dhakal & Masuda, 2008; Bijaya et al., 2016). However, most of these studies remain focused at the national scale, paying limited attention to local contexts where socio-economic diversity and ecological variability strongly condition forest use (Paneru, 2024). Anchored in this livelihood environment–policy framework, the present article investigates how socio-demographics drive the diversity of livelihood strategies in Dadeldhura, with a particular focus on household reliance on NTFPs. By situating household strategies within broader social and ecological structures, the paper aims to address key knowledge gaps and provide evidence to strengthen both livelihoods and forest governance in the hills of Nepal.

Methodology

This study used a quantitative research approach to investigate the contribution that non-timber forest products (NTFPs) make to rural livelihoods in Dadeldhura district of Nepal. A structured household survey was the main instrument used to collect data, covering socio-economic and demographic traits, sources of income, patterns of NTFP collection, and marketing

participation. A sample of 222 households was selected through multistage sampling taking into account Dadeldhura's ecological and socio-demographic heterogeneity. Sampling was stratified across caste, ethnicity and administration units to capture key social and environmental contexts. The relatively small sample size enabled a more in-depth examination of intra-household dynamics however, results are representative rather than truly generalisable.

The survey findings were corroborated and contextualized using secondary data such as census reports, government databases and peer-reviewed literature. The data were analysed with the help of descriptives and cross-tabulations to find out the relationship that exists between the socio-economic traits and livelihood strategies, mainly on NTFPs dependence. This approach enabled a holistic yet selective examination of 'what factors push and pull for mobile labor'.4 The selected variables used in this analysis allowed us to achieve a comprehensive but focused view of the influence of population pressure, social organization, and household composition on livelihood diversity in Dadeldhura. Constrained as we were by our relatively small sample size, this study contributes to an understanding of the way socio-economic and demographic contexts shape the livelihood strategies of households, and the patterns of dependence on NTFPs, in Dadeldhura.

Results

1. Climate, Rainfall, Temperature and Soil

The climate in the Dadeldhura district can be divided with a lot of distinction because the altitude (height above sea level) in different parts of the district is not the same. This then implies that special and rigorous attention must be paid to the weather and temperature because different portions of the district are on different levels of the plain and hills. According to geography and altitude, the climate of the district is of four types.

Table 1 shows the four climatic zones of Dadeldhura-tropical, sub-tropical, temperate, and alpine-induced by elevation and consequent changes in temperature and precipitation. The average annual rainfall in the district is 1,434.6 mm, with the highest in July (339.6 mm) and the lowest in May (43.6 mm). Summer and winter temperatures are 32.7 °C and 3.6 °C, respectively. Such climatic variations, together with the differences in elevation between lowlands and upper hills, have an important impact on agriculture and livelihood. A variety of soils are also present; the principal types include fertile alluvial sandy loam and clay silt loam in valleys, loam, clay loam, and silty clay loam on mid- and high-hill areas, and black sandy soil along riverbanks. This ethnic and ecological diversity has direct implications for household livelihood strategies: those living in fertile valleys depend more on agriculture, while groups in highland or less productive areas must rely on NTFPs as crucial supplements to ensure food security and generate additional income. Linking these ecological zones to policy relevance highlights the need for tailored interventions that recognize the differing agricultural potentials, resource dependencies, and vulnerabilities across zones, ensuring that development and livelihood strategies are context-specific and equitable.

Table 1: Types of Climates in Dadeldhura District

S .N	Climate Type	Altitude (meters)	Temperature (˚C)		Locations
			Summer	Winter	
1	Tropical Climate	452–800	20°C - 37°C		Bhageshwar, Rupal, Shirsha, Jogbuda, Alital, Sakharam, etc.
2	Sub-Tropical Climate	800–1800	20°C - 25°C	2.6°C	Gankhet, Koteli, Manilek, Bhatkapur, and lower hilly areas of Alital & Nawadurga Rural Municipality
3	Temperate Climate	1800–2500	15°C - 20°C	0°C or below	Amargadhi Municipality, Samjhauli, Bagarkot, Dewal, Dipayal, upper parts of Ganeshpur
4	Alpine Climate	Above 2500			Ghantyadgad, Anar Khola area

(Source: Statistics Office Dadeldhura, 2018/2019 A.D.)

2. Population and Gender

From Table 2, it can be observed that the population of Dadeldhura District steadily increased between 2066 and 2072 B.S. (2009–2015 A.D.). During this period, the total population grew from 152,332 to 162,094, while the number of households rose from 24,507 to 27,545. In 2072, the male population slightly exceeded the female population, with 82,089 males compared to 80,005 females.

Population density also increased, rising from 99 to 105.6 persons per km², reflecting growing pressure on limited land resources. Interestingly, the average household size showed only a slight change from 5.57 members in 2066 to 5.89 in 2072 indicating a slow trend toward more compact family structures rather than significant fragmentation.

Taken together, these demographic patterns point to sustained population growth, a narrowing gender gap, and intensifying pressure on land resources. This, in turn, raises important questions about the human development implications of increasing density particularly regarding equitable access to resources, housing, and livelihoods in the district.

Table 2: Population of Dadeldhura District

S.N.	Year (B.S.)	No. of Households	Total Population	Male	Female	Family Size	Population Density (per sq. km)
1	2066	24,507	1,52,332	77,935	74,397	5.57	99.0
2	2067	24,678	1,53,137	78,647	74,490	6.22	99.73
3	2068	25,050	1,54,519	79,199	75,320	6.17	100.7
4	2069	25,500	1,55,467	79,684	75,783	6.10	101.3
5	2070	25,844	1,56,384	80,196	76,188	6.05	101.9
6	2071	26,124	1,57,068	80,578	76,490	6.01	102.4
7	2072	27,545	1,62,094	82,089	80,005	5.89	105.6

(Source: Central Statistics Department, 2005–2015)

3. Caste/Ethnicity

Table 3 shows that the Cast and ethnic composition of Dadeldhura District is comprises traditional hill communities, and the dominant group is Chhetri, which constitutes 40.65% of the population, followed by Brahmins (16.77%). Dalit communities also make up a significant portion with Kami accounting for (9.67%), Damai (6.04%) and Sarki (5.66%). This community is followed by Magar (2.45%) and Thakuri (2.03%). Marginalized groups including Yadav, Gurung, Newar, Rai, Limbu, Gharti, Kumal and Rajbanshi, make up less than 1% of the total population. The predominance of the Chhetri and Brahmin castes, as well as the presence of various low caste, and ethnic groups, mirrors the district's hierarchical social makeup, and the preeminence of the Doteli language marks the cultural commonalities between the various groups.

Table 3: Caste/Ethnicity Distribution in Dadeldhura District

S.N.	Caste/Ethnic Group	Population	Percentage (%)
1	Chhetri	61,450	40.65%
2	Brahmin	25,575	16.77%
3	Kami	15,595	9.67%
4	Sarki	10,007	5.66%
5	Damai	9,514	6.04%
6	Magar	3,855	2.45%
7	Thakuri	3,205	2.03%
8	Yadav	1,524	0.99%
9	Gurung	500	0.33%
10	Newar	145	0.09%
11	Rai	47	0.03%
12	Limbu	51	0.04%
13	Gharti	51	0.04%
14	Kumal	16	0.01%
15	Rajbanshi	25	0.02%
16	Others	620	0.49%
	Total	**1,51,089**	**100%**

(Source: Branch Statistics Office Dadeldhura, 2008/09 A.D.)

4. Occupation and Employment

Table 4 reveals that 43.45% share of the population works in agriculture and livestock. Besides this major sector, a few people are also engaged in some other occupations to some extent such as: service (1.27%), foreign employment (0.91%) trade/business (0.45%). Construction, fruit, handicrafts, industry, health, transport and religious services all contribute with less than 1% for each minor sector. This pattern reveals the district's continued dependence on subsistence agriculture, its low investment in non-farm employment and also very low presence of skilled or industrial employment.

Table 4: Occupational Distribution of Dadeldhura Population

S.N.	Type of Occupation	Population	Percentage (%)
1	Agriculture & Livestock	1,14,553	43.45%
2	Government Jobs	3,245	1.27%
3	Non-Government Jobs	258	0.10%
4	Foreign Employment	2,391	0.91%
5	Trade & Business	1,176	0.45%
6	Construction Work (Masonry)	961	0.36%
7	Fruit Farming	424	0.33%
8	Gold & Silver Work	38	0.03%
9	Handicrafts & Weaving	26	0.02%
10	Industry	391	0.15%
11	Leather Work	115	0.04%
12	Driving	94	0.03%
13	Others	912	0.35%
14	Health Sector	125	0.05%
15	Clergy (Religious Work)	26	0.02%
16	Other	256	0.22%
	Total	**1,25,090**	**100%**

(Source: Branch Statistics Office Dadeldhura and DDC Dadeldhura, 2008/09 A.D.)

Discussion

The ecological variety in Dadeldhura strongly impacts on household livelihood strategies and NTFP dependence. Unequal agro-potential is determined by variation in climatic range of the lowland tropical (fertile) and highland alpine (marginal) environments of the districts. Valleys enable relatively productive agriculture, but high altitude households are limited and crops unreliable, and villagers are compelled to rely on forest resources to supplement subsistence. On these landscapes, NTFPs in the form of fuelwood, fodder, fruits, and medicinal plants act as important complements to agriculture, both in terms of food security and income. This trend is also consistent with evidence from rural Nepal in general, elsewhere households from ecologically marginal landscapes are heavily reliant on NTFPs as saving net while struggling against food shortages and income variability (Shackleton, 2019; Kunwar et al., 2020; Shrestha et al., 2020; Gurung et al.2021). It has been documented that these resources alone contribute 20–40% of household incomes, while some families derive as much as 60% from MAPs, resins, and wild edibles (Gonfa, 2019; Binega Derebe et al., 2023).

Beyond food security, the environmental diversity of Dadeldhura allows for household strategies to change with altitude and season. Lowland families rely more on fruits and fodder; highland households use more medicinal plants and fuelwood, leading to diversified harvesting periods, which allow for a distribution of agricultural risks and increase resilience. This flexible use of NTFPs relates to what Shackleton (2022) refers to as the coping strategies in case of shocks, such as thin farming seasons or economic crisis. Further, the cultural and medical importance of numerous NTFPs also enhance their importance beyond economic terms, intertwining them with local identity, rituals and traditional medicine (Shrestha et al., 2020; Rai et al., 2022). Combined, these processes indicate that environmental diversity is not just a natural determinant, but a core of social and cultural continuity, where households absorb the forest resources into their daily strategies6:7 of life directly.

The population has been continuously increasing in Dadeldhura from 152,332 in 2066 B.S. to 162,094 in 2072 B.S. and the Settlement density (both) has also increased from 99 to 105.6 persons per square kilometers (Table 2). Even as the average size of a household has gradually decreased during this period, landholdings have become more fragmented, leading to lower agricultural productivity and driving many households to other sources of livelihood. When subsistence agriculture alone is no longer able to support families, the importance of forest resources grows. NTFPs including fodder, fuelwood, medicinal plants, and edible wild fruits commonly utilized to cope with seasonal food shortages and for cash generated for household wellbeing in the age of high population are indicative of their significance in household livelihood sustenance. This is in line with evidence from other rural districts in Nepal and the Global South, where population growth and a reduction in landholding foster increased reliance on forests (Gurung et al., 2021; Binega Derebe et al., 2023). Forests, on the other hand, serve as an essential lifeline, safeguarding food security and resilience in the case of economic or agricultural downturns as populations continue to swell. Research in Ethiopia and India also demonstrates how demographic pressure can further compel use of NTFPs, especially among

land-poor or marginalized families (Shackleton, 2022; Singh et al., 2020). In Dadeldhura, this pattern illustrates that while demographic change is a key driver of forest pressure, it is also central to shaping household livelihood strategies increasing mechanisms to focus on forest products to fulfill daily needs.

Caste and ethnicity in Dadeldhura is a significant factor determining access to resources, diversification of livelihood, and reliance on NTFPs. The politically and economically dominant groups such as Chhetri (40.65%) and Brahmin (16.77%) (Table 3) usually have better access to land, education, and formal employment, permitting them to diversify their livelihood sources from subsistence agriculture. By contrast, Dalit communities such as Kami, Damai, and Sarki altogether 21.5 per cent of the district population face entrenched power asymmetries that manifest in unequal land ownership, limited opportunities for economic advancement, and persistent social marginalization. These systemic inequalities restrict the livelihood options of Dalit households, forcing a greater reliance on NTFP extraction and marketing as a key strategy for survival. This trend aligns with Shrestha et al. (2020), who show that excluded populations across Nepal frequently depend more heavily on forest resources because of barriers to farmland access and alternative incomes. Similarly, Maharjan and Dangal (2021) note that for such communities, NTFPs are not merely economic safety nets but essential resources that reduce the risk of poverty and food insecurity.

The uneven dependence on NTFPs is indicative of larger structural hierarchies that perpetuate the livelihood insecurities of the subalterns. Especially for the Dalits, the forest resources become some of the only available options for households for livelihood, and mirrors international trends where marginalised, poor people depend heavily on common-pool resources to survive (Shackleton, 2019; Poudel et al., 2021). Simultaneously, cultural identity is related with economic dependence, since most NTFPs are used for ritual and medicinal purposes that are strongly related to local customs (Rai et al., 2022). Nevertheless, differences in market access often result in relatively lower returns for Dalit collectors than for middlemen, indicating that social stratification and economic marginalization interact (Ghimire et al., 2021). These are replete and our analyses show how caste and ethnicity in Dadeldhura not just influences the extent of dependence on NTFPs but also exacerbates societal contradictions; thereby forest reliance turns into a livelihood strategy as well as a measure of social gradient.

Diversification of livelihood activities is still very low in Dadeldhura because the agriculture and livestock still uses more than half of the household (43.45%) whereas formal and/alternative activities such as government job (1.27%); foreign job (0.91%); and trade (0.45%) are available to a very few percent (Table 4). This limited diversification reflects the importance of non-timber forest products (NTFP) as both subsistence goods and income for many households. NTFPs including fuelwood, fodder, fruits, and medicinal plants augment food crop-based livelihoods especially under food stress or economic constraints. Similar results from Nepal and other developing countries suggest that when opportunities for wage labor, migration, or trade are constrained, households use forest more as a coping strategy to manage household economies and build resilience (Shrestha et al., 2020; Gurung et al., 2021). Consequently, the continued

existence of NTFPs within local economies should be seen to be an institutional factor and not a symptom of a lack of modernisation.

In these livelihood dynamics, gender is key to understanding the collection, use, and value of NTFPs. Women are disproportionately involved in NTFP collection, processing, and home use, contributing significantly to food security, health care, and casual income (Maharjan & Dangal, 2021; Bista & Webb, 2021). They also support traditions, as a rich body of ritual and medicinal knowledge is associated with numerous forest products (Rai et al., 2022). Yet gendered contributions are frequently exploited, specifically in market systems where men intermediaries have often captured the lion's share of the economic benefit (Poudel et al., 2021). In Dadeldhura, Community Forestry programs have increased women's formal participation in decision making, but overall womens access to benefits from Community Forestry has been constrained by structural barriers such as unequal access to markets, the limited bargaining power of women, and social hierarchies. These trends expose the multiple and opposing roles that NTFPs play as both sites of women's economic and cultural empowerment and dynamic places where gender inequalities are re-created.

Conclusion

This study illustrates the significance of household socio-economic and demographic characteristics in determining livelihood strategies diversity in Dadeldhura, where NTFPs are a critical substitute to subsistence agricultural activities. The results suggest that demographic growth, ecological diversity, and social hierarchies determine the degree and type of reliance on forest resources by households. For example, the ecological diversity characterized by diverse climatic zones and soil types limiting agricultural production in many places coerces households to procure NTFPs as a buffer against food shortages and seasonal income reductions. Population growth combined with active land fragmentation exacerbates the existing pressure on the limited resources.

The analysis also demonstrates that social stratification continues to serve as a key factor in determining access to and utilization of resources. Groups of society that are more marginalized, such as Dalits, display higher reliance on NTFPs because of lower access to land and regulated employment, highlighting growing inequalities in resource utilization and opportunities for survival. Gender was another determining factor; women were significantly more involved in the collection and processing of NTFPs, which impacts household incomes and traditions. Thus, the integration of ecological diversity, household demographics, and social stratification proves the existence and significance of NTFP income in determining livelihood choices in a socially stratified rural context.

The outcomes reaffirm the argument that NTFPs are not just economic resources; they are critical components of social identity and community resilience. To build on these findings, pathways forward should focus on empowering marginalized groups through equitable resource access, promoting sustainable NTFP management practices, and creating supportive policies that enhance women's role in value chains ensuring that NTFPs contribute not only to subsistence but also to long-term social and economic resilience.

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