



Resource Distribution and Benefit Sharing in Baghmara Buffer Zone Community Forest: Implications for Sustainable Livelihoods in Nepal

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Abstract

Article Info

Purpose: The study examines the distribution pattern and benefit sharing of forest resources at the Baghmara Buffer Zone Community Forest (BBZCF) in Chitwan, Nepal, with focus on how community forestry (CF) supports local livelihoods.

Received:

13 February 2026

Methods: Structured questionnaires were used to collect data from 71 households in the study area. Descriptive statistics including Lorenz curve and Gini coefficient were employed to analyze the collected data and the results are presented in tables and figures.

Revised:

12 May 2026

Results: Low-value products are mainly accessed by marginalized groups, whereas high-value timber is largely captured by elite groups. The comparative analysis of the Lorenz curve shows that although there is an equitable distribution of subsistence resources among caste/ethnicities (Gini=0.051) and wealth rank (Gini=0.119), high-value timber exhibits substantial inequality, which is more concentrated among dominant wealth rank (Gini=0.549) than caste/ethnicity groups ((Gini=0.268).

Accepted:

16 May 2026

Conclusion: The study of BBZCF shows that CF supports sustainable livelihoods of local people but there are found persistent inequalities in high-value resources like timbers. Enhancing inclusiveness in forest resource distribution can improve outcomes of local livelihoods and reduce socio-economic inequalities.

Keywords: Baghmara buffer zone community forestry, Benefit sharing, Equity, Livelihoods, Resource distribution

JEL Classification: Q23, Q56, D63

I. Introduction

Community forestry (CF) has been identified as a leading paradigm in forest management worldwide, with a focus on promoting a balance between forest restoration, poverty reduction/ and social inclusion (Agrawal & Angelsen, 2009; Baynes et al., 2015). This decentralization of authority is predicated on the theory that local forest rights lead to superior sustainability and equity outcomes (Charnley & Poe, 2007; Ribot et al., 2006). CF focuses on the link between forest resources and livelihoods and contributes to forest conservation and reforestation.

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Nepal, with a very high proportion of the rural population involved, is widely recognised as one of the most successful examples of community forestry in Asia (Gentle & Thwaites, 2016). Its extensive CF program, formally expanded in the late 1970s, has transferred management authority over national forests to more than 22,000 Community Forest User Groups (CFUGs) (Ojha et al., 2016; DoFSC, 2023). While these groups are legally empowered to manage resources and generate income from timber and non-timber forest products (NTFPs), they have evolved into complex socio-political entities responsible for reinvesting revenue into rural infrastructure and social services (Poffenberger, 2000; Rasolofoson et al., 2015).

Despite institutional successes in reversing forest degradation, the equity gap in benefit sharing remains a critical scholarly concern. Benefits have also been observed to be distributed in ways that favor elite capture (Adhikari et al., 2004; Nightingale, 2011). Marginalized groups and ethnic minorities are often excluded from participation incentives (Kanel, 2004). This raises critical questions regarding the effectiveness of CF as a pro-poor development strategy (Bosma, 1995). The aforementioned dynamics in Buffer Zone Community Forests add further complexity due to the interrelationship of conservation objectives and high-value revenue from eco-tourism activities (Budhathoki, 2004).

The Baghmara Buffer Zone Community Forest (BBZCF), located adjacent to Chitwan National Park, represents an established example of a financially viable CF model (Dhital, 2003; Sharma & Chalise, 2015). Revenue from tourism, conservation activities, and forest products has the potential to significantly enhance community funds, increasing the important of equitable resource distribution. While CF is considered equitable, disparities in benefit distribution persist across caste/ethnicity and, wealth. As BBZCF has long invested in community development, it provides a strong case to assess household-level benefit sharing. This study examines its distribution patterns to inform global debates on equity, inclusiveness, and livelihood outcomes in CF.

The paper consists of five sections and begins with the introduction. Section two discusses the relevant literature. Section three presents the materials and methods. Section four discusses the results. Section five concludes with policy implications.

II. Reviews

The Paradigm of Community Forestry in Nepal

Community forestry has been introduced as a paradigm shift in forest management and is departing from state-centric approaches toward decentralization and community participation in forest management (Agrawal & Angelsen, 2009). Nepal has been recognized as a pioneer in decentralized forest management through the institutionalization of CFUGs in the late 1970s (Ojha et al., 2016; Bhandari et al., 2019). The recent estimates suggest that more than a quarter of national forests are under the management of CFUGs, covering millions of people across the nation (Budhathoki, 2005). Legally, CFUGs function as autonomous entities that are empowered to manage, utilize, and sell forest products through approved operational plans (DoFSC, 2023). The ecological success of this model in terms of increased forest biomass and biodiversity restoration is widely acknowledged (Gilmour, 2016; Pokhrel & Gautam, 2024). Recent literature has highlighted its role as a socio-economic development tool, where income generated from forest products is invested back in development activities.

Benefit Sharing and Rural Livelihoods

The benefit sharing is a mechanism through which forest-based wealth, such as timber sales, non-timber forest products, and tourism earnings, is converted into community wealth (Gilmour & Fisher, 1991). Studies in Nepal show that CFUGs are using a significant portion of their earnings to support community development projects. The CFUGs in Nepal operate as 'mini-governments', reinvesting in schools, irrigation schemes, local roads, health services, income-generating activities, and poverty reduction through micro-credit schemes (Pokhrel, 2008; Chapagain & Banjade, 2009; Dahal, 2003). The effectiveness of CF as a poverty

reduction strategy depends on the equitable sharing of resources among different user groups (Chapagain & Banjade, 2009; Pokhrel, 2008). CF literature has increasingly focused on the aspects of equity, inclusiveness, and distribution. The effectiveness of benefit sharing depends not only on the volume of benefits generated but also on how these benefits are distributed among households.

Equity Gap due to Elite Capture

A large body of literature showed that there is a disparity in the distribution of benefits in CFUGs, termed 'elite capture' (Nightingale, 2011). In most cases, the executive committees are comprised of richer individuals and higher castes, and the benefits are distributed in their favor, as they are the ones with private landholdings and livestock and are able to use more timber and fodder (Adhikari et al., 2014; Sharma, 2010). Marginalized social groups, such as those defined by gender, caste and wealth, face discrimination and women, the poor people, and dalits, continue to be excluded from accessing benefits, even in pro-poor policy environments (Agarwal, 2010; Nightingale, 2017). However, there are recent findings that emphasize the significance of 'equitable benefits sharing' in CFs. If benefits do not accrue in an equitable manner, the social acceptability of the community forestry concept is compromised, and the community is unlikely to adhere to the rules and regulations (Pokhrel & Gautam, 2024; Luintel et al., 2017).

Governance in Buffer Zone Community Forests

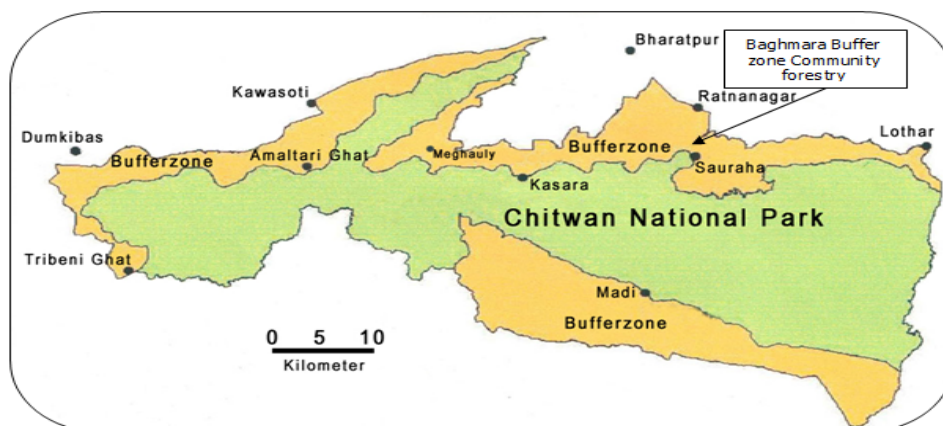
Buffer zones, established at the fringes of protected areas, strike an intricate balance between protecting biodiversity and ensuring the livelihood of the local population (Bhagwati, 1997). Nonetheless, Buffer zones complicate the regulatory relationship between the park management authority and the right of community forests (Budhathoki, 2004). For instance, in cases such as Chitwan national park, where there is a significant amount of economic gain resulting from eco-tourism, there exist many challenges including human-wildlife conflict and heavy regulations on the extractions of natural resources (Dhital, 2003; Budhathoki, 2005; Straede & Treue, 2006). Conflicts over wildlife, regulations on natural resource use and the uneven distribution of tourism income may also contribute to inequality in the area.

More so, there is an existing inequality caused by the spatial variables that enable those living closer to these "power centers" capture far more benefits than those residing far from the decision-making bodies (Mulepati, 2009). Regardless of all the interrelations between the conservation regulation, ecology and tourism income, the knowledge about benefit-sharing within the households is minimal regarding how these benefits actually trickle down to the household level. In high-revenue models like Baghmara, the specific impacts on different ethnic and wealth groups remain largely overlooked. This study fills that void by mapping the actual distribution of forest products and development funds within the Baghmara Buffer Zone, shifting the conversation toward genuine equity in high-value forest products, and tracking how these forest resources for local benefits are distributed to see if "high-value" resources truly translate into local equity.

III. Methodology

Study Area and Site Description

The Baghmara Buffer Zone Community Forest, established in 1995, is situated in the Ratnanagar Municipality, Chitwan District, Nepal (27° 34' 78"- 27° 35' 53"N; 84°28'43"-84°29'40" E). This CF experiences a tropical climate with temperatures ranging from 7° to 42.5° and annual precipitation averaging 2,500 mm. Of its 215 ha total area, 163 ha covers high-density riverine forest dominated by *Bombax ceiba*, *Albizia spp.*, and *Dalbergia sissoo* etc.

Map 1*Map of the National Park and Its Buffer Zone with BBZCF*

Map source: *dnpwc website, 2026*

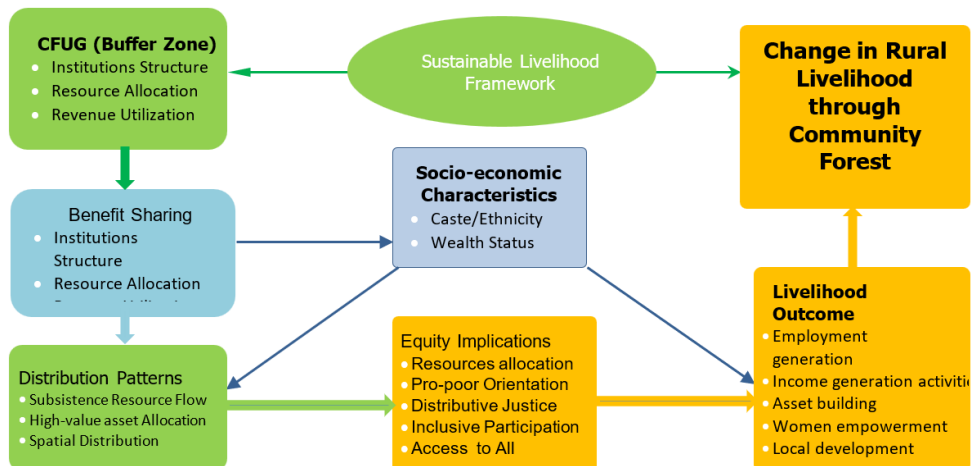
The site serves as a vital biological corridor for flora and fauna like the one-horned Rhino (*Rhinoceros unicornis*) Bengal tiger (*Panthera Tigris*). Economically, BBZCF is one of Nepal's most successful community enterprises, generating over USD 100,000 annually through eco-tourism (Budhathoki, 2005; BBZCF, 2014). The forest supports a heterogeneous population of 1,299 households (approx. 6,000 population) across nine villages, including Sauraha and Padariya. The diverse ethnic composition comprises of Tharu (53.5%), Brahmin/Chhetri (18.3%), Janajati (18.3%), and Dalit/other marginalized groups (10%) with local livelihoods primarily relying on agriculture, trade, and tourism (CBS, 2011; DDC, 2014).

Theoretical Foundation and Conceptual Framework

This study designs conceptual framework following a tripartite view which integrates institutional theory, equity theory and sustainable livelihood framework (SLF). Drawing on the New Institutionalism of North (1990) and DiMaggio and Powell (1983), the research outlooks CFUGs as the fundamental 'rules of the game', which govern resource allocation and organizational legitimacy. The study incorporates equity theory by Adams (1963) using the distributive justice approach, to evaluate the fairness of the resource allocations and compare individual inputs against outcomes compared with other community members. Finally, the SLF conceptualized by Chambers and Conway (1992) and operationalized by DFID (2000) serves as the primary analytical tool for distributive equity. This study examines that how institutional rules and distributive outcomes influence the vulnerability context, and the accumulation of five core livelihood capitals like human, social, natural, physical, and financial.

Figure 1

Sustainable Livelihood Framework Linking Distribution, Benefit Sharing, and Livelihood Through CF



Note. Author's Origination, 2026

As illustrated in Figure 1, the Buffer Zone CFUG acts as the central institutional driver, shaping benefit-sharing mechanisms through specific governance and access rules. These directions dictate the distribution patterns of forest resources and their benefits, mediating the the socio-economic characteristics of individual household. By applying equity theory for the distribution pattern, the study measures distributive justice. Thus, applying the Sustainable Livelihood Framework' the study eventually determines how these outcomes transform livelihood capitals to drive overall changes in individual well-being and people's livelihoods.

Sampling Frame And Sample Size Calculation

Out of 1299 population from the communities of Brahmin, Chhetri Tharu, Magar, Gurung, Tamang, Mushahar, and Dalit groups, a stratified random sampling¹ technique was employed to ensure representation across caste/ethnic groups and socio-economic strata. The stratification of the data was done based on the population size of each caste/ethnicity and socio-economic status of population by categorizing the wealth-ranking criteria based on the asset holding, livestock pattern, landholding size and income sources. The total sample size was determined using a formula developed by Cochran (1977):

$$n = \frac{N \cdot z^2 \cdot p \cdot q}{e^2 (N-1) + z^2 \cdot p \cdot q}$$

Where N = 1299, z = 1.96 (95% confidence level), e = 0.10 (margin of error), and p = 0.70 (estimated proportion of forest-dependent households). Although the initial calculated sample was n=76, the final realized sample was n=71 due to respondent attrition. The final sample size for each stratum was determined through proportional allocation, ensuring that the ethnic and socio-economic composition of the population households accurately reflects the weight

¹Stratified random sampling is methods of sampling where researchers divide a diverse population into smaller, non-overlapping groups (called strata) based on shared characteristics as population proportion, and then randomly select participants from each group.

of each group within the total population HHs.

Data Collection Instruments

This study employed a mixed method approach to obtain quantitative and qualitative data:

Household Surveys: Structured questionnaires were used to interview senior members of 71 households. The method used for sampling is stratified random sampling.

Key Informant Interviews (KII): Ten semi-structured interviews were conducted with CFUG executive committee members, local elders, and Buffer Zone officials to understand institutional benefit-sharing rules.

Focus Group Discussions (FGDs): FGDs were conducted among the marginalized section of society, i.e., Dalits and Tharu to explore unequal distribution of high-value FPs.

Secondary Sources: Institutional audit reports, CFUG operational plans, and national census data used as the baseline for analysis.

Variable Measurement and Data Analysis

Quantitative data were processed using MS Excel. Descriptive statistics, including frequencies and percentages, were used to categorize household livelihoods. To examine 'Benefit Sharing' and 'Resource Distribution', a descriptive statistical analysis and Lorenz curve approach were carried out on closed-ended questions related to the perception of equity. To assess resource distribution equity, Lorenz curves were constructed by plotting the cumulative percentage of the sampled population against the cumulative share of forest products, with the degree of inequality quantified using Gini² coefficients calculated via the trapezoidal rule. Wealth ranking and caste/ethnic groups were used to examine the distribution of low-value resources, in contrast with high-value resources to identify elite capture. Qualitative insights from CFUGs were explored through descriptive analysis to provide context to the statistical results.

IV. Results and Discussion

Demographic Profile

The demographic profile of the 71 sampled households (a total of 391 individuals) provides critical insights into the social structure in the Baghmara Buffer Zone Community Forest (Table 1).

Table 1

Demographic Profile of Sampled Households (n = 71)³

Variables	Category	Frequency (n)	Percent (%)	Variables	Category	Frequency (n)	Percent (%)
Population	Male	193	49.4	Religion	Hindu	59	83.1
	Female	198	50.6		Buddhist	5	7
Age Group	0–15 years	56	14.3	Christian	2	2.8	
	15–60 years	301	77	Muslim	3	4.2	
	≥61 years	34	8.7	Others	2	2.8	

²The Gini coefficient (G) was derived using the formula $G = 1 - \sum (X_i - X_{i-1})(Y_i + Y_{i-1})$, following standard approaches for assessing equality measurement for resource distribution in community-managed forests.

³Caste/Ethnicity frequencies (n) refer to households and Gender and Age frequencies refer to total population of sampled HHs.

Variables	Caste/Ethnic composition		Family Size		Sex Ratio [(M/F)*100]- >(Avg=97.47)		
	Frequency (n)	Percent (%)	HHs (Popn)	Family size	Male	Female	Sex ratio*
Brahmin/Chhetri	13	18.31	13 (63)	4.85	32	31	103.23
Tharu	38	53.52	38(214)	5.63	105	109	96.33
Janajati	13	18.31	13 (69)	5.31	34	35	97.14
Dalit	3	4.23	3 (22)	7.33	10	12	83.33
Others	4	5.63	4 (23)	5.75	12	11	109.09

Note. Field Survey, 2026

The results reveal a near-balanced sex ratio of 97.47 males per 100 females. The age distribution shows that the population structure is heavily skewed in favor of the economically active age group (15-60 years), which accounts for 77% of the total population. In terms of caste composition, the population is characterized by significant diversity, with the Tharu community representing the majority at 53.5%. This is followed by Brahmin/Chhetri, Janajati, and Dalit ethnicities. The average family size is 5.77 people, but there is a notable variation in family size across different groups. The religious composition is predominantly Hindu (83.1%). These demographic indicators are fundamental for assessing household resource dependency and the distributive equity of benefit-sharing approaches.

Socio-Economic Status

The socio-economic profile of the 71 sampled households (N=391) shows that a rural economy that is primarily driven by agriculture, which is constrained by unequal landholding sizes. The pattern of asset ownership suggests that economic status is moderately low and unevenly distributed.

Table 2

Socio-economic Status of Sampled Households (n=71 with 391 Members)

Category	HHs	Percent	Category	HHs	Percent	Category	HHs	Percent
Physical Assets Availability								
Electricity	71	100	Computers/Laptop	20	28.17	Mobile/Landline	63	88.73
Radio/Television	46	64.79	Bicycle	46	64.79	Motorcycle	29	40.85
Structure of House			Sanitation Facility			Solid-waste disposal patterns		
RCC	32	45.07	Open/Indiscriminate	0	0	Bury in Yard	2	2.82
Bricks/Cement	12	16.90	Simple Latrine	34	47.89	Open Dump	27	38.03
Bricks/Soil Wall	23	32.39	Pour flush latrine	29	40.85	Public Container	35	49.29
Others	4	5.63	Septic tank	8	11.27	Burning at Yard	7	9.85
Drinking Water Supply			Rented Land for Agriculture			Agriculture Productivity		
Ground water	24	33.80	Rent	20	28.17	Increased	35	49.30

Tap	47	66.20	No rent	51	71.83	Decreased	36	50.70
Educational Status			Food Sufficiency (in Months) ⁴			Live-stock Rearing Pattern ⁵		
Illiterate	58	14.83	Below 6 months	9	12.68	Brahman/kshetri	140	16.75
Primary education	155	39.64	6 to 9 months	11	15.49	Tharu	449	53.71
Secondary	102	26.09	9 to 12 months	17	23.94	Janajati	177	21.17
Above Secondary	76	19.44	Saving & selling	27	38.03	Dalit/others	70	8.37
Occupation Structure			Land Holding Size (in Katta)			Production Patterns (in Tons)		
Category	Popn	Percent	Category	HHs	Percent	Category	Tons	Percent
Agriculture	207	52.94	No land	7	9.86	Paddy	1338	57.65
Business	33	8.44	0.5-10 Kattha ⁶	18	25.35	Wheat	33	1.42
Service/Wage	53	13.56	10-20 Kattha	26	36.62	Maize	578	24.90
Student	71	18.16	20-30 Kattha	17	23.94	Mustard	279	12.02
Inactive/Infant	27	6.91	> 30 kattha	10	14.08	Cash crops	93	4.01

Note. Field Survey, 2026

Regarding educational attainment, 39.64% of respondents have only attained primary education, while 14.83% are illiterate. This limited literacy level likely hinders livelihood diversification. Agriculture is the primary occupation, engaging 52.94% of the population, followed by service/wage earners (13.56%) and business owners (8.44%), while students and inactive/infant members account for 18.16% and 6.91%, respectively. In terms of land scarcity, 25.35% of households possess smallholdings of less than 10 Kattha, while 9.86% are entirely landless. Consequently, 28.17% of households resort to renting land for cultivation. Food security remains a significant challenge, as only 38.03% of households report year-round food sufficiency. These findings underscore the role of the BBZCF as a critical resource for this predominantly small-scale farming- and tourism-based economy with no industrialization, where proximity to the national park attracts international tourists, providing essential non-farm income opportunities.

Forest Products' Utilization and its Demand

Forest Products Utilization by Types

Forest product sourcing reveals a sophisticated multi-source strategy necessitated by land scarcity and regulatory frameworks; users primarily integrate community forests (CF), private lands, and external sources to satisfy subsistence demands (Table 3). The results indicate a high degree of source diversification. As firewood and fodder exhibit the highest level of diversification, with 60.56% and 63.38% of households, respectively, utilizing a combination of CF, private lands, and other external sources. In contrast, low-value products such as dry grass and Khadai (thatch grass) are sourced exclusively from the CF by 53.52% of households, whereas leaf litter shows a balanced dependence between CF and private holdings (50.7%). Timber procurement recorded the lowest frequency of extraction, with only 39.44% of households utilizing the CF as a source, while the remainder relied on other sources or did not extract timber.

⁴ Total sample sizes are taken 71 HHs for calculation though 7 household have no land holdings.

⁵ The count of total no of animal rearing by respondents by caste

⁶ 1 Kattha=20 Dhur ≈ 338.63 m² ≈ 3645 sq.ft. 1 Bigha=20 Kattha ≈ 6,772.63 m².

Table 3*Sources of Forest Products (No of HHs within parentheses)*

Forest Products (Bharies)	CF	Private	Others	CF +Private	CF+ Others	CF+ Private + Others
	Percent (HHs)					
Firewood	4.23 (3)	-	-	14.08 (10)	21.13 (15)	60.56 (43)
Grass/ Fodder	2.82 (2)	7.04 (5)	-	11.27 (8)	-	63.38 (45)
Leaf-litter	11.27 (8)	21.13(15)	-	50.7 (36)	-	-
Drygrass, khadai	53.52 (38)	-	-	-	-	-
Timber(cft/ year)	39.44 (28)	-	11.27 (8)	-	14.08(10)	-

Note. Field Survey, 2026

Overall, the findings suggest that the community forest plays a complementary rather than exclusive role in meeting the demand for forest products. This is particularly true for subsistence-level products, whereas high-value products like timber follow more selective and restricted distribution channels.

Collection Patterns of Forest Products by Sex-Wise

Forest product collection is primarily subsistence-oriented and exhibits a distinct gender division of labor (Table 4). Results indicate that women are the primary collectors of low-value products, such as grass/fodder (52.11%) and firewood (47.89%), through independent collection. Conversely, timber extraction is characterized by a reliance on hired labor (32.39%) and joint collection (21.13%), likely due to the high physical energy and technical requirements involved.

Table 4*Forest Products Collection⁷ (Sex-Wise)*

Collection	Firewood		Grass/Fodder		Timber		Dry-grass, Leaf- litter, Khadai	
	HHs	Percent	HHs	Percent	HHs	Percent	HHs	Percent
Women	34	47.89	37	52.11	0	0.00	11	15.49
Women + Men	27	38.03	14	19.72	15	21.13	14	19.71
Women + Children	8	11.27	9	12.68	0	0.00	5	7.04

⁷The collection of resources is not by individual but pattern of collection by respondent HHs.

Hired Labor	2	2.82	2	2.82	23	32.39	3	4.23
Not Collection	0	0.00	9	12.68	33	46.48	38	53.52
Total	71	100	71	100	71	100	71	100

Note. Field Survey, 2026

Child participation remains low and is restricted to low-value products like fodder (12.68%) and firewood (11.27%), with no involvement in timber extraction. Furthermore, hired labor is significantly more prevalent in timber collection compared to other products. The substantial percentage of households reporting no collection of timber (46.48%) or dry grass (53.52%) reflects the regulated and selective access to these specific resources (Westoby, 1987).

The fact that 32.39% of households utilize hired labor for timber is a significant economic finding; it suggests that while the forest is 'community-managed', the actual labor of extraction is being commodified. Consequently, wealthier households who can afford hired labor and heavy equipment may benefit more from high-value resources than poorer households who lack the necessary capital for extraction.

Demand and Supply Situation of Forest Products

The annual resource requirements of the sampled households reflect a diversified procurement strategy necessitated by varying landholding sizes and differential access to institutional resources (Table 5).

Table 5

Total Demand and Supply Situation of Forest Products

Forest products (In Bharies ⁸)	Demand of FPs			Supply of FPs per year				
	Total demand/year	Avg demand of FPs/ HHs	CF	Percent	Private	Percent	Others	Percent
Firewood	7596	106.99	888	11.69	3796	49.97	2912	38.34
Grass/Fodder	49712	700.17	14040	28.24	21216	42.68	14456	29.08
Leaf-litter	5044	71.04	1560	30.93	3484	69.07	-	-
Drygrass/Khadai	260	3.66	260	100	-	-	-	-
Timer(cft/year)	320	4.51	213	66.56	-	-	107	33.44

Note. Field Survey, 2026

Households exhibit substantial annual demand for biomass-intensive products, particularly grass/fodder (700.17 bharies/HH) and firewood (106.99 bharies/HH). These needs are met through an integrated reliance on Community Forests (CF), private lands, and external markets. The results indicate that private landholdings serve as the primary source for daily requirements of firewood (49.97%) and fodder (42.68%). Conversely, the CF plays a pivotal role as the major source for specialized products, providing 100% of dry grass and 66.56%

⁸Bhari is a back-load. The estimated mean weight for firewood/Khadai = 34.5 kg, for grass/fodder, leaf-litters, dry grass and khadai= about 20 kg.

of timber requirements. In conclusion, the CF fulfills approximately one-third of the aggregate resource demand for the sampled households. This diversified dependency pattern, leveraging CF, private landholdings, and markets, acts as a critical socio-ecological buffer that mitigates unsustainable resource extraction from the core areas of the national forest.

Distribution Pattern of Forest Product

Equitable resource distribution remains a central challenge for community forestry in socially heterogeneous landscapes. This study examines equity through the lens of caste/ethnicity and wealth status, distinguishing between subsistence biomass and high-value timber (Table 6).

The distribution of subsistence forest products also shows variation by caste/ethnicity and income groups by wealth rank. Across caste groups, Tharu households, around half of total population, use subsistence products like firewood (37.3%), grass/fodder (42.6%), leaf litter (50%), dry grass (67.7%), and timber (40.8%), while other caste/ethnicity groups use proportional shares. Across wealth groups, lower and lowest-income households rely most heavily on subsistence forest products. The least income group alone consumes 48.1% of community forest firewood, 37.8% of grass/fodder, 33.3% of leaf litter, and 46.9% of dry grass, despite representing only one-quarter of total households. Conversely, the higher and highest income groups show limited dependence on community forests for subsistence products due to larger landholding sizes. A higher proportion of subsistence forest products from private and other sources is distributed in higher caste and wealthier income groups due to their larger landholding size and higher purchasing power. Results show that while subsistence forest resources are accessed relatively equally, high-value products follow a different trajectory due to unequal distribution.

Table 6

Distribution of FPS by Caste/Ethnicity and Wealth Rank (No. of HHS and Percent in Parentheses)

Classification		Caste/Ethnicity Group					Wealth-Rank Group			
Distribution Unit		Distribution of FPs in Ratio (%)					Distribution of FPs in Ratio (%)			
Forest Product	Source	Braman/ kshetri (13, 18.31%))	Tharu (38, 53.52%))	Janajati (13, 18.31%))	Dalit (3, 4.23%))	Others caste (4, 5.63%))	Highest Income (10, 14.08%))	Higher income (17, 23.94%))	Lower Income (26, 36.62%))	Lowest Income (18, 25.35%))
Firewood (Bharies/ yr)	Community forest	12.7	37.3	12.7	2.9	34.3	9.8	16.7	25.4	48.1
	Private & others	16.3	51.9	21.7	4.7	5.4	22.5	31.8	30.2	15.5
Grass/ fodder (bharies/ yr)	Community forest	11.5	42.6	23.3	9.6	13	8.5	25.2	28.5	37.8
	Private & others	24.2	51.6	16.5	3.2	4.5	26.8	27.6	30.9	14.7
Leaf-litter (Bharies/ yr)	Community forest	13.3	50	16.7	10	10	6.7	23.3	36.7	33.3
	Private & others	32.8	50.7	11.9	1.5	3	25.5	28.6	34.5	11.94
Drygrass & Khadai (Bharies/ yr)	Community forest	3.1	67.7	19.2	3.1	6.9	0	13.1	40	46.9
	Private & others	0	0	0	0	0	0	0	0	0

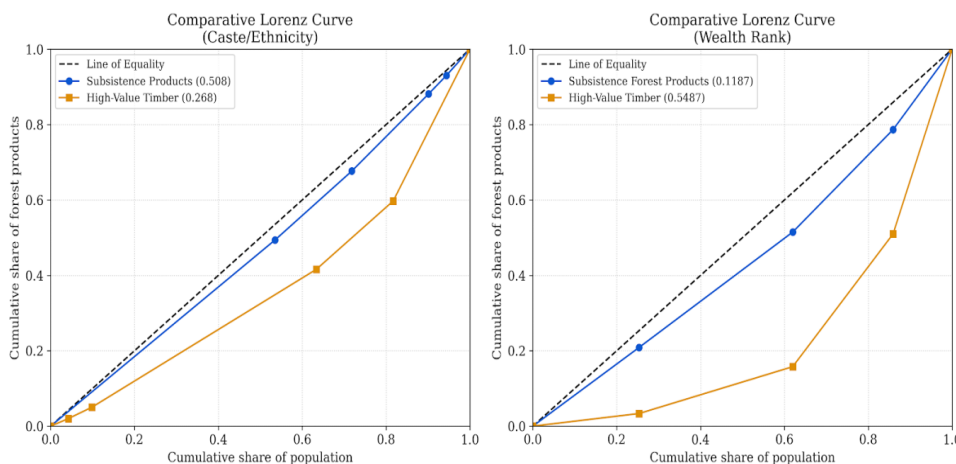
Timber	Community forest	30.9	40.8	20.4	3.2	4.7	40.84	34.55	19.37	5.24
(cft/yr)	Private & others	57	29	14	0	0	63.6	36.4	0	0

Note. Field Survey, 2026

The high value forest products i.e. timber distribution also exhibits variation. Within caste/ethnicity groups, timber are mainly distributed to Tharu (40.8%), followed by Brahmin/Chhetri (30.9%) and Janajati (20.4%) households, and Dalit and other castes get less than 8%. By wealth rank, high value timber is relatively evenly distributed, though the highest income group receives the largest share (40.8%), followed by the lower (34.6%), higher (19.4%), and least-income groups (5.2%). In contrast, timber from private and other sources is highly skewed, with Brahmin/Chhetri households accounting for 57%, Tharu by 29% and Janjati by 14%, while no private-source timber use is reported for Dalit and other groups. These variations are due to unequal landholdings size. Wealth-wise, 63.6% of private timber is consumed by the highest income group, with the remainder used by the highest income group, and there is no reported use among lower and the lowest income households due to smaller land holding sizes and lower purchasing power.

Figure 2

Lorenz Curve of Forest Product Distribution by Caste/Ethnicity and Wealth Rank



Note. Author's Construction, 2026

The Lorenz curve (Figure 2) illustrates this “equity dualism”: the curve for subsistence products runs near the diagonal line of equality (0.051 for caste; 0.1187 for wealth rank), while the timber curve deviates sharply (Gini = 0.268 for caste; 0.5487 for wealth), indicating a high concentration of wealth among the elite. The distribution pattern of forest products reveals a distinct equity dualism. Community forests provide essential pro-poor access to subsistence goods for Tharu, Janajati, and Dalit households who lack private landholdings. This supports assertion of Adhikari (2005) that while CFs are vital biomass sources for the poor, their relative benefit is higher for subsistence than for capital accumulation. Conversely, wealthier households rely more on private land for high-value products due to greater purchasing power (Adhikari et al., 2004). Consequently, while the BBZCF successfully ensures equitable access to survival resources, vertical inequality remains entrenched regarding high-value timber. In conclusion, the BBZCF functions effectively as a safety net for the marginalized, but it has not yet dismantled the structural hierarchies that prevent the poor from accessing

high-value timber resources.

Benefit Sharing and Perceived Livelihood Outcomes

Forest Products Need from CF

As illustrated in figure 3, firewood distribution shows relatively higher perceived fulfillment, with 45.07% of households reporting a substantial contribution, while 54.93% specified a limited contribution. Regarding grass and fodder, 25.35% of households reported high fulfillment, compared to 45.07% reporting limited fulfillment and 15.49% reporting inadequate supply. Perceived fulfillment was lower for leaf litter and timber.

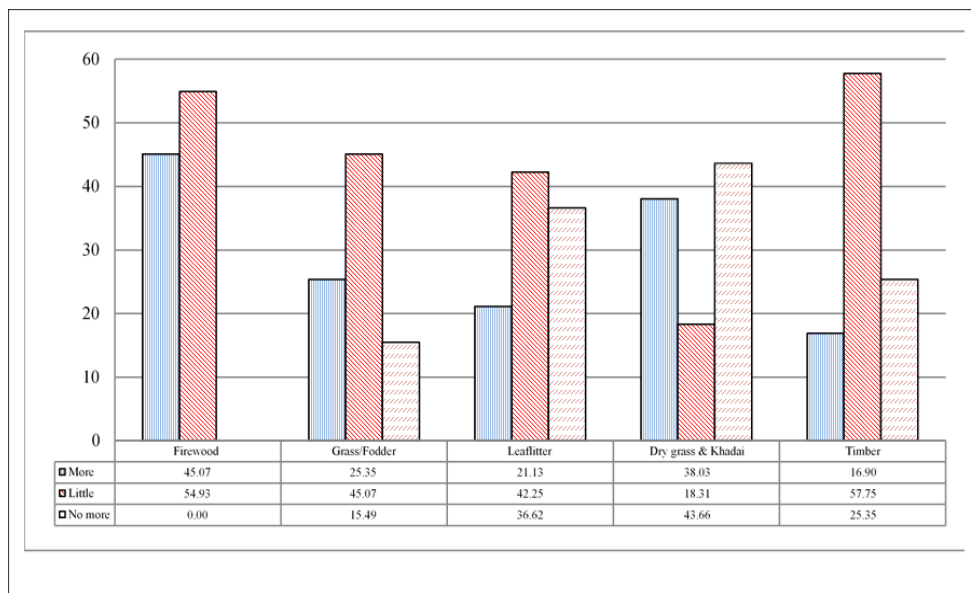
Only 21.13% of households reported substantial fulfillment for leaf litter, whereas 42.25% reported a limited contribution and 36.62% reported no benefit. In the case of dry grass and khadai, 38.03% of households reported high fulfillment, while 43.66% reported no benefit. Timber distribution exhibited the lowest perceived adequacy, with only 16.90% of households reporting substantial fulfillment, compared to 57.75% reporting limited contribution and 25.35% reporting no utilization. In summary, community forests are perceived to be more effective in meeting household demand for low-value subsistence forest products than for high-value timber, likely due to complicated legal provisions.

Equity on Distribution of FP

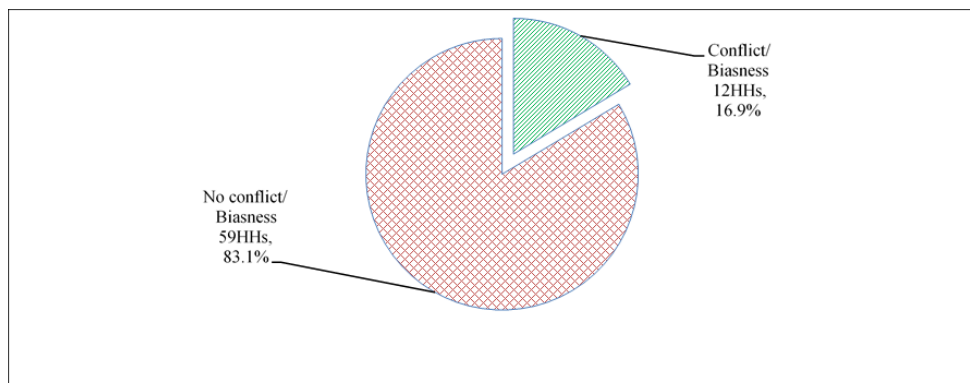
Figure 4 shows that the majority of sampled households (83.1%, n = 59) reported no conflict or perceived bias in the distribution process regarding kinship with committee members or political favoritism. In contrast, 16.9% of the households (n = 12) reported the occurrence of conflicts and bias related to distribution. These reported issues were primarily linked to unequal benefit sharing and favoritism. In conclusion, the distribution of forest products is found to be equitable, based on the opinions of the majority of households.

Figure 3

Forest Products Need from CF



Note. Field Survey, 2026

Figure 4*View of Forest Products Distribution**Note.* Field Survey, 2026

However, a small percentage of households reported problems with bias, unfair sharing, and discrimination. This disparity indicates that while the current system of forest product distribution is largely successful, addressing these underlying issues will help promote long-term social cohesion within the community.

Social Program Provision Through CDP

Baghmara Buffer Zone Community Forestry (BBZCF) has operationalized community development programs (CDP) through diverse sectoral interventions, including education, health, targeted women-empowerment programs, and poverty reduction initiatives through income-generating activities (IGAs).

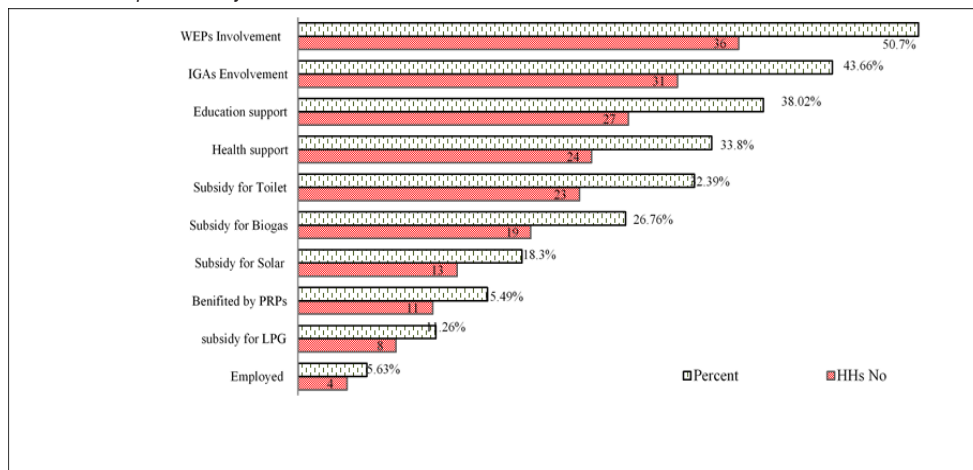
Figure 5 shows the distribution of these benefits among sampled households. Women-empowerment programs reached the largest share of sampled households (50.7%), followed by IGAs (43.7%), education (38.02%), and health (33.8%). Subsidies included support for toilet construction (32.39%), biogas (26.76%), solar panels (18.3%), PRPs (15.5%), LPG gas (11.3%), and employment (5.63%). In conclusion, the findings indicate that community forestry supports inclusive local progress by enhancing livelihood opportunities, improving basic services, and strengthening women's participation, with particular benefits for poor and marginalized households. By merging social welfare with conservation, the BBZ effectively transforms natural resource management into a direct driver of community resilience.

More Benefited Caste/Ethnicity

Regarding caste and ethnicity-based benefits from CFs, among the 71 sampled households, 8.5% (n = 6) perceived that Brahmin/Kshetri were the most benefited group, while 11.3% (n = 8) identified Janajati as the primary beneficiaries.

Figure 5

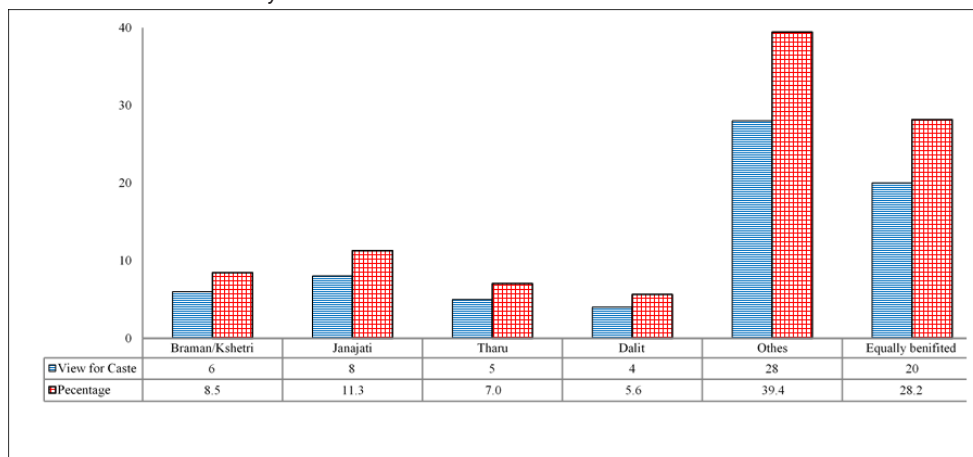
Benefited Sampled HHs by CDP



Note. Field Survey, 2026

Figure 6

More Benefited Caste/Ethnicity



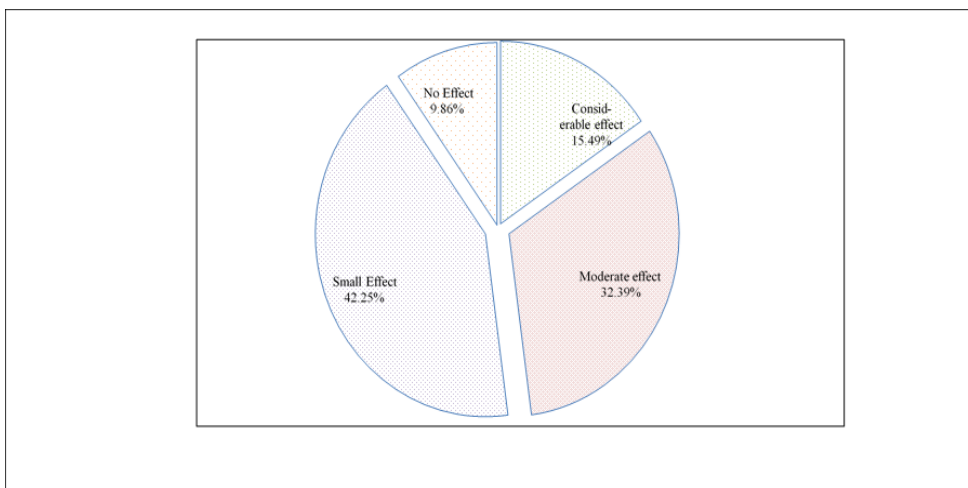
Note. Field Survey, 2026

Tharu ethnic group was perceived as the most benefited by 7% (n = 5) of respondents, whereas Dalits were identified by 5.6% (n = 4) and other castes by 39.8% (n = 28). However, 28.2% (n = 20) of households reported that all caste and ethnic groups benefit equally from community forests. Overall, the findings show mixed perceptions of benefit distribution across caste and ethnic groups, with an extensive portion of households identifying that marginalized groups receive benefits alongside those with equal access.

Effect on Asset Building Due to CF

Figure 7

Effect on Wealth Accrual Due To CF



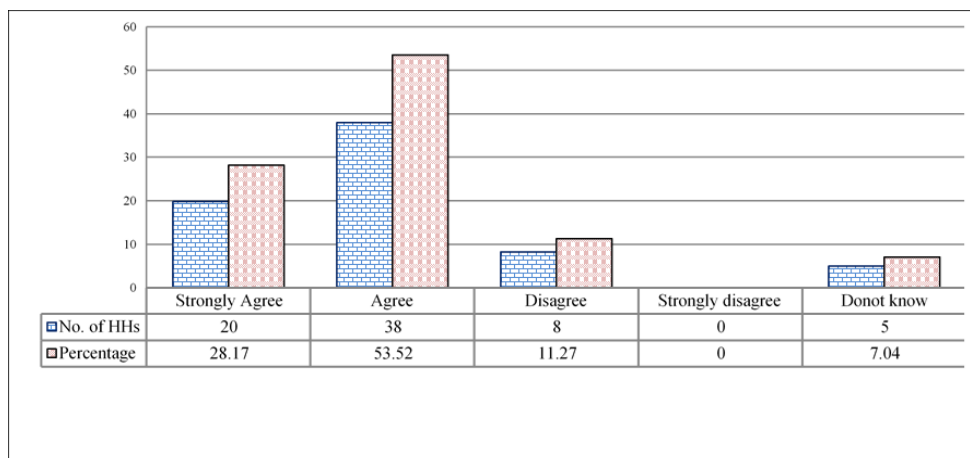
Note. Field Survey, 2026

To examine whether the community forestry program plays a vital role in the growth of household income, participants were surveyed regarding the perceived effect of the program on their overall asset building.

Out of 71 households, only 9.86% reported no effect on wealth. However, the majority reported positive outcomes, with 42.25% noting a small effect, 32.39% reporting a moderate effect, and 15.49% experiencing a considerable effect. Based on these results, it is evident that the level of economic gain varies across households. More than 90% of the respondents reported improved financial conditions, which clearly demonstrates the importance of CF as a driver of wealth creation.

Livelihood Improvement Due to CF

The introduction of community forestry has promoted tourism development in the buffer zone area and contributes to increase household income through improved utilization of forest resources and tourism-related activities such as elephant riding and the study of forest biodiversity.

Figure 8*View of Livelihood Change Due to CF**Note. Field Survey*

Income generated by the community forest is reinvested in local development. Results indicate that 28.17% of the households strongly agree and 53.52% agree that the community forestry initiative has improved the family socio-economic status. While 11.27% disagree and 7.04% reported no knowledge regarding its role in poverty reduction. Overall, it is found that a positive impact was observed due to the CF on the socio-economic change of its members.

Discussion

Community-based forest management represents a vital paradigm for resource conservation and livelihood improvement in Nepal (Pradhan, 1995). However, evidence from the BBZCF reveals a pronounced gap between procedural equality and distributive equity; despite equal quotas, benefits vary significantly according to wealth and caste strata. Thus, equal treatment in socially heterogeneous settings is unlikely to ensure equitable outcomes (Sen, 1992; McDermott et al., 2013). Without differentiation, equal allocation may unintentionally reinforce structural inequalities rather than alleviating disparities (Malla et al., 2003; Severin & Kasim, 2014).

The results obtained in BBZCF point to a disconnection between procedural equality and distributive equity. The disparity between the near-perfect equity in subsistence distribution (Gini=0.0508 for Caste Group and Gini=0.118 for Wealth Rank) and the high concentration of timber benefits (Gini = 0.549 for Wealth Rank, Gini=0.268 for Cast Group) suggests that while policies safeguard basic needs, they remain susceptible to 'elite capture' of commercial dividends. Through the lens of 'Theory of Access', property rights provide access through quotas; however, 'ability to benefit' is affected through social and economic factors (Ribot & Peluso, 2003). Wealthier households leverage 'structural and relational mechanisms', such as capital and private land ownership, to access high-value timber, confirming that rules are ineffective if 'ability to mobilise resources' is ignored (McDermott et al., 2013).

A clear dualism in resource utilization exists: marginalized households exhibit a pro-poor distribution for low-value subsistence products due to a unequal private land holding sizes (Adhikari et al., 2004; Thoms, 2008), while high-value timber are disproportionately captured by the wealthy. This 'elite capture' is driven by superior purchasing power and private assets rather than formal institutional design (Agarwal, 2001; Pokharel, 2004), demonstrating that socio-economic factors often override formal rules (Ribot & Peluso, 2003).

Moreover, the low participation rate of women, despite significantly contributing to FPs collection, indicates a failure in 'congruence' between appropriation and provision rules, which may decision making processes in executive bodies (Ostrom, 1990). Furthermore, Community Development Programs (CDPs) should shift from infrastructure toward income-shifting activities to better address the equity gap.

Thus, the policy framework should be shifted towards need-based and poverty-sensitive allocation mechanisms that incorporate marginalized groups in decision-making processes (Ostrom, 1990; Larson & Ribot, 2007). There should be focus on progressive pricing and means-tested quotas, and subsidized rates for marginalized groups and linked women's collection labor with institutional decision-making, which are the most feasible pilot reforms in the context of BBZCF. In conclusion, even though the BBZCF has been able to maintain the resource access at the basic level, the current system is not able to deliver distributive justice.

V. Conclusion and Implications

This study examined the relationship between forest resource distribution, benefit sharing and rural livelihoods in the Baghmara Buffer Zone Community Forest (BBZCF), addressing a significant gap in the literature regarding distributive equity in Nepal's community forestry programs. The findings confirm that while CFUGs effectively serve as a subsistence safety net for the poor, distributive justice remains elusive for high-value timber. An 'equity paradox' is evident: while the user group provides an effective pro-poor safety net for low-value resources, such as firewood, fodder, and leaf litter, prosperous households receive disproportionate benefits from timber allocations. These high-value resources are currently distributed via formally uniform quotas that inadvertently favor users with larger landholdings, greater labor capacity, and superior financial status.

The results underscore that procedural equality does not inherently guarantee distributive justice. Lorenz curve analysis demonstrates that wealth and caste/ethnicity remain primary drivers of inequality for commercial resources (timber benefits (Gini = 0.549 for Wealth Rank, Gini=0.268 for Cast Group) even as subsistence resources (Gini=0.0508 for Caste Group and Gini=0.118 for Wealth Rank) stay relatively accessible. Furthermore, structural inequalities continue to dictate resource access despite formal institutional equality. This is particularly visible in the under-representation of women in executive roles; despite being the primary actors in resource collection and forest protection, their ability to shape decision-making remains limited. Such dynamics suggest that inclusive institutional principles remain vulnerable to elite capture without substantive reform.

Policy must shift from a 'one-size-fits-all' model toward need-based approaches that institutionalize tiered pricing, mandatory governance quotas, and targeted resource distribution. In the context of the BBZCF, means-tested timber quotas and subsidized rates for marginalized groups represent the most feasible pilot reforms. To improve distributive justice, the CFUG should move beyond flat-rate pricing toward a progressive system where wealthier households pay higher rates to fund subsidized access for the poor.

This research contributes empirical evidence to the broader equity debate regarding the conservation-linked model of community forestry in buffer zone area in Nepal, reinforcing the distinction between procedural and distributive equity. The research is limited by its focus on a single CFUG and the absence of psychometric instruments, such as Likert scaling; consequently, the analysis is restricted to identifying thematic trends rather than performing inferential modeling. Future research should apply comparative approaches to assess the impact of need-based reforms across different socio-economic contexts and utilize structured Likert scales to quantify institutional legitimacy and gendered decision-making dynamics over time.

Acknowledgements

The author would like to express sincere gratitude to Prof. Dr. Komal Dhital, Prof. Dr. Ram Prasad Gyanwaly, and Prof. Dr. Neelam Kumar Sharma for their invaluable guidance and academic mentorship throughout this research. Special thanks are also extended to the anonymous reviewers for their constructive feedback and to the editorial team for their publication and professional support during the publication process.

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ANNEX I
Detail Table of Distributional Pattern

Table 1

Total, average, and proportional distribution of forest products by caste/ethnicity and sources (No. of HHs and its percentage are in parenthesis)'

Forest Product	Source	Caste/Ethnicity-wise distribution of forest products (Bharas/year except timber (cft/vr)) in total average and use in percent (%)										Over-all Total	Over-all Avg					
		Braman/ kshetri		Tharu		Janajati		Dalit		Others								
		Total	Avg	%	Total	Avg	%	Total	Avg	%	Total			Avg	%			
Fire-wood	CF	113	8.69	12.73	331	8.71	37.27	113	8.69	12.73	26	8.67	2.93	305	76.25	34.3	888	1251
	Private & other	1092	84.00	16.28	3484	91.68	51.94	1456	112.00	21.71	312	104.00	4.651	364	91.00	5.4	6708	94.48
Grass / fodder	CF	1612	124.00	11.48	5980	157.37	42.59	3276	252.00	23.33	1352	450.67	9.630	1820	455.00	13.0	14040	197.75
	Private & other	8632	664.00	24.20	18408	484.42	51.60	5876	452.00	16.47	1144	381.33	3.207	1612	403.00	4.5	35672	502.42
Leaf	CF	208	16.00	13.33	780	20.53	50.00	260	20.00	16.67	156	52.00	10.000	156	39.00	10.0	1560	21.97
	Private & other	1144	88.00	32.84	1768	46.53	50.75	416	32.00	11.94	52	17.33	1.493	104	26.00	3.0	3484	49.07
Drygrass Khadaei	CF	8	0.62	3.08	176	4.63	67.69	50	3.85	19.23	8	2.67	3.077	18	4.50	6.9	260	3.66
	Private & other	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.000	0	0.00	0.0	0	0.00
Timber (cft/vr)	CF	59	4.54	30.89	78	2.05	40.84	39	3.00	20.42	6	2.00	3.141	9	2.25	4.7	191	2.69
	Private & other	61	4.69	57.01	31	0.82	28.97	15	1.15	14.02	0	0.00	0.000	0	0.00	0.0	107	1.51

Table 2
Total, average, and proportional distribution of forest products by wealth rank and sources
(The No. of HHs and its percentage are in parenthesis)

Forest products	Sources	Wealth-Rank wise distribution of forest products (Bharis/year except timber (ctf/year)) in total average and percent use (%)													
		Highest Income Group (10, 14.08%)			Higher income Group (17, 23.94%)			Lower Income Group (26, 36.62%)			Least Income Group (18, 25.35%)			Total (71)	Total Avg
		Total	Avg	Percent	Total	Percent	Propn	Total	Avg	Percent	Total	Avg	Percent		
Firewood	CF	87	8.7	9.8	148	8.7	16.7	226	8.7	25.5	427	23.7	48.1	888	12.5
	Private & other	1508	150.8	22.5	2132	125.4	31.8	2028	78.0	30.2	1040	57.8	15.5	6708	94.5
Grass/	CF	1196	119.6	8.5	3536	208.0	25.2	4004	154.0	28.5	5304	294.7	37.8	14040	197.7
	Private & other	9568	956.8	26.8	9828	578.1	27.6	11024	424.0	30.9	5252	291.8	14.7	35672	502.4
Fodder	CF	104	10.4	6.7	364	21.4	23.3	572	22.0	36.7	520	28.9	33.3	1560	22.0
	Private & other	884	88.4	25.4	988	58.1	28.4	1196	46.0	34.3	416	23.11	11.94	3484	49.1
Dry-grass Khadai	CF	0	0.0	0.0	34	2.0	13.1	104	4.0	40.0	122	6.8	46.9	260	3.7
	Private & others	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0
Timber	CF	78	7.8	40.8	66	3.9	34.6	37	1.4	19.4	10	0.6	5.2	191	2.7
	Private & other	68	6.8	63.6	39	2.3	36.4	0	0.0	0.0	0	0.0	0.0	107	1.5

Source: Field survey, 2026