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Challenges to collaborative forest management and their impact on strengthening forest-dependent communities in Bara District, Nepal

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ABSTRACT

Collaborative forest management (CFM) is a widely endorsed approach for achieving sustainable forest management, emphasizing inclusive participation and equitable benefit-sharing among stakeholders. In Nepal, however, the effectiveness of CFM is often constrained by institutional, socio-economic, and policy-related challenges that adversely affect forest-dependent communities. This study aims to identify and evaluate the key barriers to effective CFM and examine their implications for enhancing the resilience of these communities in Badhnihar Collaborative Forest in Parsa district, Nepal. Data were collected using a forest user survey (n=144), field observation, and focus group discussions, integrating both qualitative and quantitative tools, including perception analysis using a Likert scale and socio-economic indicators. The findings show major constraints, with limited institutional capacity (65.25% of respondents), inadequate funding (47.95%), and political interference (61.75%) emerging as the most significant barriers to successful collaboration. These challenges intensify socio-economic vulnerabilities by limiting access to forest resources and pushing communities to seek alternative livelihoods. In addition, factors such as gender roles and educational level influence both decision-making processes and access to resources, underscoring the need for inclusive and context-specific strategies. Notably, CFM initiatives have generated substantial employment, with 8,475 jobs through nursery establishments and 6,500 jobs through forest monitoring efforts. Thus, the study concludes that addressing these institutional and socio-political barriers is essential for enhancing community resilience and advancing sustainable forest management. Major recommendations include strengthening institutional frameworks, promoting equitable resource access, and integrating participatory approaches such as the local adaptation plan.

Contribution/ Originality: This study documents original insights into institutional, socio-political, and policy barriers undermining Collaborative Forest Management (CFM) in Nepal's Terai region. By integrating quantitative surveys with qualitative perceptions, it highlights governance gaps, livelihood impacts, and resilience challenges, offering evidence-based recommendations to strengthen inclusiveness, equity, and sustainable forest-dependent community development.

1. INTRODUCTION

Forests remain one of the most important renewable natural resources that underpin ecological stability, cultural identity, and socio-economic well-being for millions of people across the world [1, 2]. In developing countries, especially those located in the tropics and subtropics, forests provide food, fodder, fuelwood, timber, and a range of ecosystem services essential for sustaining rural livelihoods [1]. Globally, the transition from state-led forest management to participatory models emerged in response to widespread forest degradation, limited state capacity,

and the recognition of local communities' central role in sustainable resource governance [1, 2]. Collaborative forest management (CFM) has thus gained increasing attention as a governance model that emphasizes joint responsibility, shared decision-making, and equitable benefit-sharing between state institutions and local users [2, 3]. This model aligns with the broader discourse on sustainable development and environmental justice by positioning communities as co-managers rather than mere beneficiaries of forest resources [3, 4].

In Nepal, forests account for nearly 40% of the country's total land area and play a pivotal role in supporting rural livelihoods, national biodiversity conservation, and climate mitigation goals [5]. The country has been internationally recognized for its pioneering community-based forest management (CBFM) initiatives, especially community forestry (CF), which has successfully engaged millions of people in participatory governance since the late 1970s. While community forestry has become a flagship program, its reach in the lowland Terai region has historically been limited due to complex socio-political, economic, and ecological factors [1]. The forests of the Terai are not only biologically rich, hosting diverse flora and fauna, but also economically valuable as a source of timber and non-timber forest products (NTFPs) [3]. These characteristics have rendered them vulnerable to overexploitation, elite capture, and illegal timber trade. Consequently, to address these issues and ensure both conservation and local livelihood improvement, the Government of Nepal institutionalized Collaborative Forest Management (CFM) in the late 1990s and formally legitimized it under the Forest Act of 1993 [3, 6].

Unlike traditional community forestry, CFM emphasizes a tripartite collaboration: the provincial government, local municipalities, and forest-dependent communities [2, 3]. The rationale is that forests in the Terai and inner Terai regions are too large and commercially valuable to be managed solely by user groups, yet too socially sensitive and locally embedded to be managed exclusively by government agencies [2]. CFM therefore seeks to bridge governance gaps by promoting inclusive participation, equitable distribution of benefits, and sustainable forest utilization [2, 3]. However, the transition from policy design to practical implementation has been fraught with numerous challenges.

The case of Parsa district in Madhesh Province exemplifies this complexity. The district lies adjacent to the Chure-Terai ecological zone and shares boundaries with Parsa National Park [6, 7]. It is inhabited by a heterogeneous population comprising indigenous groups such as Tharu and Tamang, alongside Madhesi communities, Brahmin-Chhetri migrants, and Dalits. This socio-cultural diversity creates both opportunities for participatory governance and tensions arising from inequities in resource access, gender norms, and political power [6]. In theory, CFM was expected to enhance forest conditions, curb illegal logging, and uplift socio-economic conditions by generating employment and revenues for local households [2, 3]. In practice, however, multiple institutional and policy barriers have constrained its effectiveness [8, 9]. These include: ambiguous tenure rights and weak benefit-sharing mechanisms; limited institutional capacity; political interference and elite capture; weak enforcement of laws; Marginalization of women, Dalits, and disadvantaged groups, etc. These structural issues are not unique to Nepal. Studies from Ghana [10], India [11], and other countries adopting participatory forest management reveal similar challenges of power asymmetry, institutional weakness, and contested resource rights [2, 6]. What distinguishes Nepal's case, however, is the co-existence of different forest governance regimes (community forestry, collaborative forestry, leasehold forestry, buffer zone forestry), each with varying degrees of autonomy and state oversight [1, 2]. This mosaic often causes confusion among users, overlapping claims, and fragmented policy attention.

Despite these obstacles, CFM has demonstrated tangible contributions. For instance, employment opportunities have been generated through nursery establishments, forest watchers, and fire line construction [2, 3]. Additionally, when effectively implemented, CFM has the potential to improve forest conditions and biodiversity conservation, aligning with Nepal's commitments under REDD+ and international climate frameworks [2, 6]. Yet, the gap between potential and realized outcomes remains wide. The forest-dependent households of Bara and Parsa districts rely on forest resources not only for subsistence but also as a safety net against shocks such as agricultural crop

failures, climate-induced stresses, and economic marginalization [6, 7]. Weak implementation of CFM directly compromises their livelihood security and undermines adaptive capacity. Furthermore, gendered roles and educational disparities shape how benefits are distributed and how decisions are made within forest user groups. Exclusion of women and marginalized groups from leadership positions reduces the inclusiveness of decision-making, perpetuating structural inequities [6].

In this context, critically examining the barriers to CFM implementation and their socio-economic impacts is essential for policy reform. This study, focusing on Badhnihar Collaborative Forest in Parsa district, contributes to filling this knowledge gap. It identifies institutional, socio-political, and policy challenges and analyzes their implications for community empowerment, equity, and resilience [7]. By integrating qualitative insights from focus groups with quantitative data from household surveys, the research provides a holistic picture of local realities. The findings not only inform Nepal's forestry sector reforms but also contribute to global debates on participatory resource governance, resilience-building, and sustainable forest management.

2. METHODOLOGY

2.1. Description of Study Area

The study was conducted in Badhnihar Collaborative Forest, which lies in Parsaghadi Municipality of Parsa District, Nepal, and is dominantly inhabited by ethnic groups such as Chaudhary, Yadav, and Tamang, along with other groups including Brahmin, Chhetri, Dalit, and various castes [7]. The area spans an altitudinal range of 100–235 meters above sea level, with geographic coordinates at 27°1'6.16"N latitude and 84°52'24.12"E longitude. Covering an area of 2,195 hectares, it shares its boundary with Parsa National Park, which harbors endangered species such as the Bengal tiger, wild elephant, along with other species like the common leopard, bison, blue bull, etc. While *Shorea robusta*, *Terminalia alata*, *Dalbergia sissoo*, *Adina cardifolia* are major forest species [7].

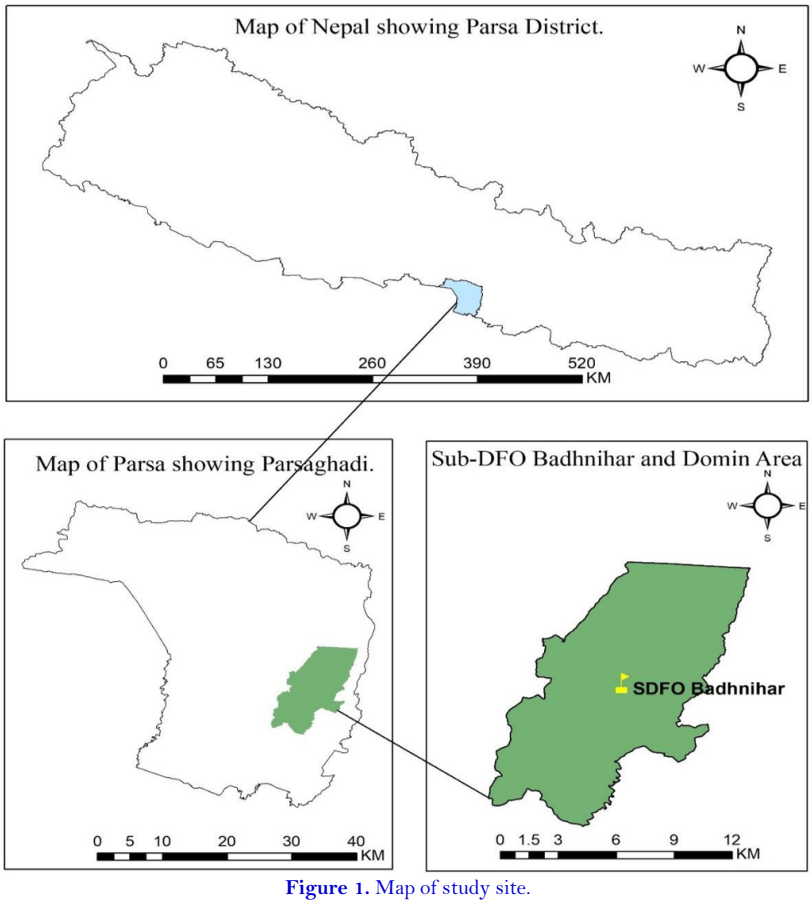

Figure 1. Map of study site.

2.2. Sampling Technique and Data Collection

Both quantitative and qualitative approaches were applied to collect the data. Data were collected through a forest user survey and focused group discussions. The forest user survey was conducted in 144 households following simple random sampling, along with 8 focus group discussions. Village elders, farmers, social workers, and other social leaders were included in the focus group discussions.

2.3. Data Analysis

Data were analyzed using the Statistical Package for Social Science (SPSS) software. Standard methods were employed to examine both qualitative and quantitative data, utilizing appropriate statistical tools. Qualitative data was analyzed through descriptive text, while quantitative data underwent rigorous analysis, with results presented through bar charts, tables, figures, etc.

To analyze the institutional and policy barriers, the categorical data were subsequently analyzed using the following percentage response formula:

$$\text{Percentage } (\%) = \left(\frac{\text{Number of Responses in Category}}{\text{Total Responses}}\right) \times 100\%$$

Furthermore, forest user's perceptions towards CFM were determined through three scale (i.e. agree, neutral to disagree (1-3) Likert scale approach [12]. Then, weighted mean was calculated by the following formula.

$$Weightedmean = \sum(Wi * Xi)/\sum Wi$$

Where, Wi = Respondents' response in % and Xi = Value assigned to agree or disagree.

3. RESULTS AND DISCUSSION

3.1. Institutional and Policy Challenges

The findings revealed that political interference (28%) emerged as the most significant institutional barrier, followed by inadequate coordination (20%), funding constraints (19%), lack of local participation (18%), and limited staff (15%) (Figure 1). While the Chi-square ($\chi 2$) analysis suggested no statistically significant difference ($p<0.02$) at 5% level of significance among institutional barriers, the prominence of political interference deserves particular attention. In Nepal's federal system, political actors often view CFM committees as sites for patronage and favoritism. The tendency of local politicians to influence committee member selection and resource allocation undermines democratic representation and weakens community trust. This aligns with Gurung [13], who argued that governance failures and political capture hinder participatory forestry. Figure 2 illustrates the institutional challenges faced by CFM.

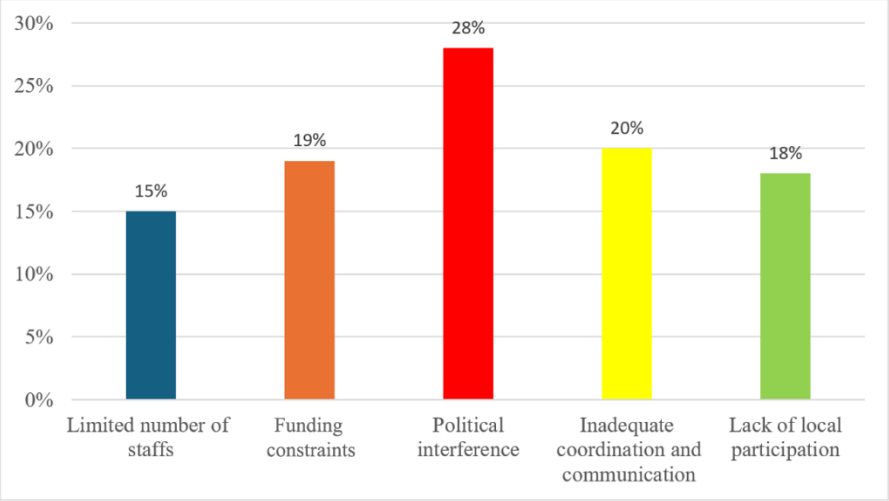

Figure 2. Institutional challenges on CFM.

In terms of policy barriers, the absence of clear guidelines and lack of transparent selection procedures for committee members (30% each) were the most significant. Respondents also highlighted poor resource allocation (25%) and insufficient stakeholder engagement (15%). Interestingly, the Chi-square (χ^2) test revealed statistical significance ($p<0.03$) at 5% level of significance for the lack of clear guidelines and weak stakeholder engagement, underscoring that these are systemic issues rather than random perceptions. Such policy-level ambiguities contribute to fragmented implementation. For example, forest product revenues are often distributed inconsistently, leading to disputes and dissatisfaction among user groups. Comparatively, Berkes and Ross [14] emphasize that institutional resilience requires clarity of roles, transparent governance, and adaptive capacity. The lack of these elements in Badhnihar reflects a fragile institutional framework, which not only hampers forest management but also erodes social capital within user groups. Improvements are needed in the institutional framework and governance, socio-economic benefits, and forest management aspects [15]. Similarly, declining budgets and staff reductions over the years have further constrained effective collaboration in community-based forest management [16]. Figure 3 illustrates the policy challenges on CFM.

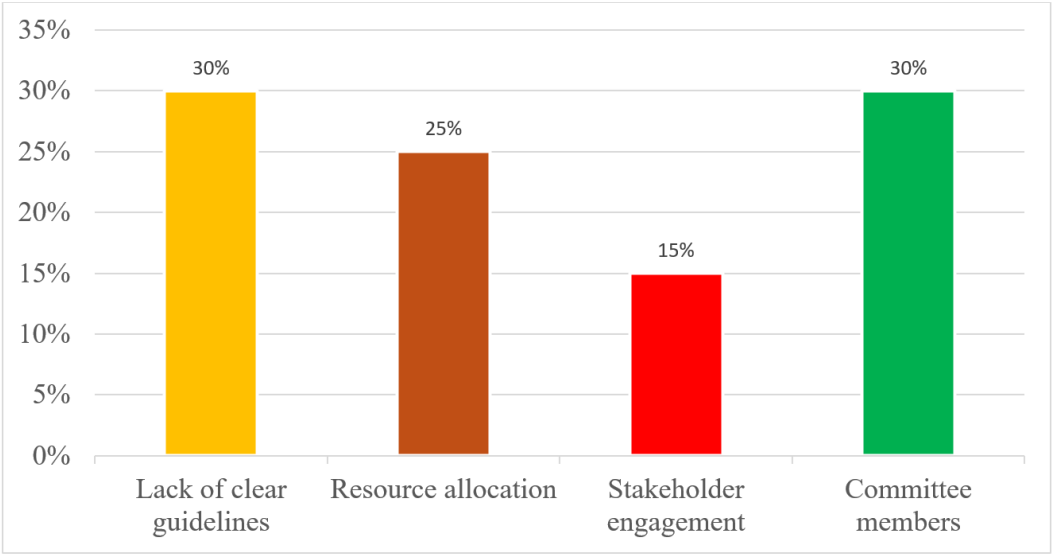

Figure 3. Policy challenges on CFM.

3.2. People's Perceptions on CFM

Perception analysis indicated widespread dissatisfaction with decentralization, institutional capacity, and equity. A weighted mean score of 1.63 for insufficient institutional capacity and 1.80 for inequitable benefit-sharing highlights critical governance gaps.

Notably, 77% of respondents perceived weak enforcement of law as a major barrier (with a weighted mean of 1.39), linking high political interference with poor rule enforcement. The strong negative correlation ($r= -0.85$) between political interference and law enforcement further confirms this relationship. These findings align with Sapkota et al. [17], who found that community forestry often fails to deliver on its potential due to weak governance and inequitable participation.

In practice, communities feel disempowered when decision-making is centralized in the hands of elites or politically connected individuals. Respondents also expressed concern about limited access to forest resources, as 49.32% disagreed with adequate access, which directly undermines the livelihood support functions of forests [18]. Interestingly, insufficient awareness and training (with a weighted mean of 2.03) suggest a knowledge gap that could be addressed relatively easily through targeted capacity-building. Without training in forest management, financial administration, and legal rights, communities remain passive participants rather than empowered co-managers. Table 1 presents stakeholders' perception toward CFM.

Table 1. Stakeholder's perception toward CFM.

Statement	Agree (1)	Neutral (2)	Disagree (3)	Weighed mean (WM)
Limited decentralization	46.5	39.5	14	1.67
Insufficient institutional capacity	65.25	9.07	26.58	1.63
Political interference	61.75	18.75	19.5	1.58
Weak enforcement of law	77	7	16	1.39
Inadequate community involvement in decision-making.	47.95	26.5	25.55	1.78
Lack of financial resources for management activities	44.63	33.9	18.47	1.67
Limited access to forest resources for local communities.	29.68	21	49.32	2.20
Inequitable benefit sharing	52.52	14.46	33.02	1.80
Insufficient awareness and training on collaborative forest management.	42.39	12.36	45.25	2.03

3.3. Socio-Economic Impacts

The study revealed irregular household earnings from forest products following stricter conservation-oriented management (Figure 4). This paradox reflects the tension between ecological sustainability and livelihood needs. While conservation objectives limit extraction, they also reduce immediate economic benefits for forest-dependent households. Illegal felling of *Shorea robusta* (Sal) increased sharply in recent years, with 2023/24 recording the highest incidence (Figure 5). The strong correlation (r = 0.98) between illegal felling and *Shorea robusta* species suggests that commercial incentives drive illicit activities, particularly when legal access is restricted.

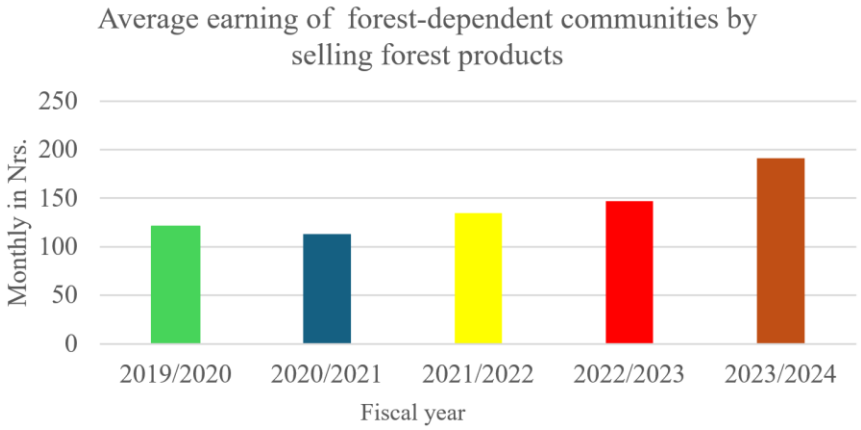

Figure 4. Average earnings of forest users from selling forest products.

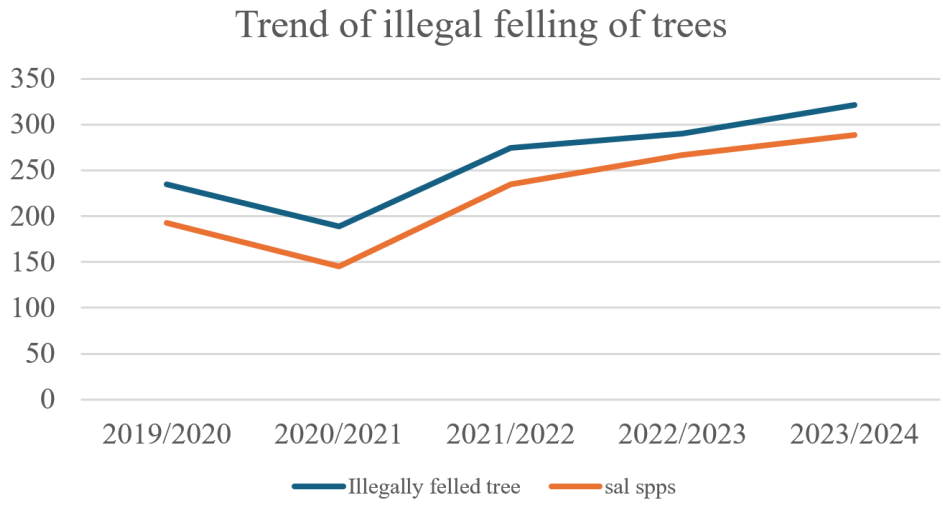

Figure 5. Trends of illegal felling.

This pattern echoes Varughese [19] and Chaudhary et al. [20], who highlighted how rigid bureaucratic restrictions can unintentionally encourage illegal practices. By excluding communities from legitimate access, governance failures may fuel black markets in timber. Such outcomes undermine both conservation goals and social trust in institutions. For disadvantaged groups (DAGs), the situation is especially precarious. Their involvement in CFM remained stagnant, showing limited progress toward inclusivity. This mirrors findings from Paswan et al. [9] who noted that forest product distribution often benefits elites at the expense of marginalized groups. The socio-economic impacts are therefore twofold: reduced legal incomes and increased vulnerability of poor households to livelihood shocks [21, 22]. Figure 6 illustration depicts the average earnings of forest users from selling forest products.

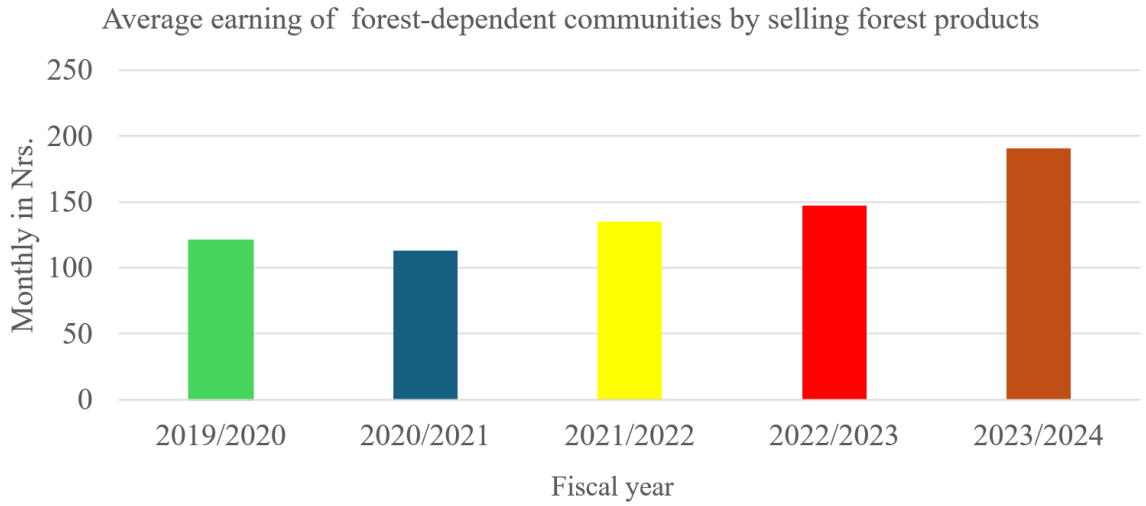

Figure 6. Average earnings of forest users from selling forest products.

Figure 7 illustrates the trends in timber smuggling.

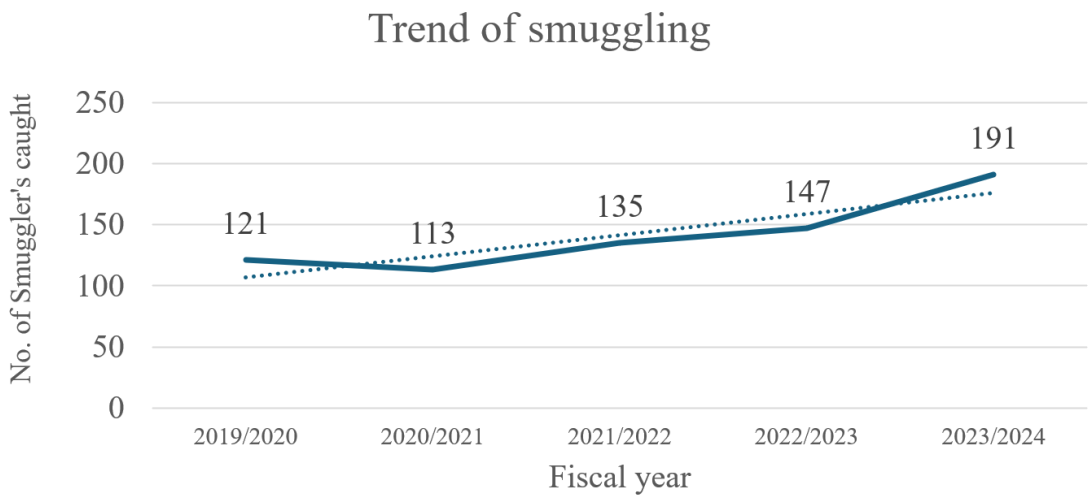

Figure 7. Trends in the smuggling of timbers.

3.4. Employment Generation through CFM Activities

Despite the challenges, CFM has generated considerable employment: 8,475 jobs in nurseries, 6,500 through forest watchers, and over 4,800 via fire line and fencing activities (Table 2). These contributions are significant for rural economies where alternative employment is scarce. However, questions remain about the sustainability and quality of these jobs. Many are seasonal, low-paid, and lack social security provisions. Still, such employment demonstrates that CFM can function as a vehicle for local development if institutional barriers are addressed.

Comparatively, Poudel [22] found similar positive outcomes in Rangapur CFM, where forest-based activities diversified rural livelihoods. Hence, the challenge is not the absence of benefits but their uneven distribution and limited scale.

Table 2. Employment generation through CFM activities.

S.N.	Income generation activities	Total employment generation (In last 6 years)
1	Fire line establishment and construction	2520
2	Fencing activities	2340
3	Study tour	162
4	7 Forest watcher for 6 years	6500
5	Compartment boundary, stem mapping, marking, felling, preparatory felling in 6 years	53
6	Nursery establishment and establishment of seedling	8475
7	Depot establishment	1785

3.5. SWOT Analysis

The SWOT assessment underscores the dual nature of CFM (Table 3). On the one hand, Nepal has a well-established legal framework, active local user groups, and clear opportunities for biodiversity conservation and alternative livelihoods. On the other hand, weaknesses such as limited inclusion of marginalized groups, poor coordination, and weak capacity persist. Threats, especially political interference and illegal logging, jeopardize long-term sustainability. This mirrors findings by KC et al. [23] who also highlighted political pressure and weak law enforcement as major threats. Furthermore, Maskey [24] also reported poor law enforcement, illegal resource extraction, and insufficient funding as major issues in community-based forest management in Nepal. The analysis suggests that addressing these weaknesses requires not only technical interventions but also structural reforms in governance. Strengthening accountability, enhancing transparency, and integrating adaptive governance mechanisms can transform threats into opportunities.

Table 3. SWOT analysis of the CFM approach.

Strengths	Weaknesses
1. Established a collaborative forest management (CFM) framework in Nepal. 2. Active participation of local forest user groups (CFUGs). 3. Contribution to livelihood improvement and biodiversity conservation. 4. Institutional frameworks such as local adaptation plans of action (LAPAs).	1. Limited inclusion of marginalized groups (e.g., women, disadvantaged communities). 2. Inadequate benefit-sharing mechanisms and resource access disparities. 3. Weak institutional capacity and limited staff support. 4. Lack of strong coordination among stakeholders.
Opportunities	**Threats**
1. Potential for sustainable forest management and biodiversity conservation. 2. Employment generation through forest-based activities. 3. Capacity-building programs and policy reforms for inclusive governance. 4. Promotion of alternative livelihoods for forest-dependent communities.	1. Political interference and unstable policies. 2. Low stakeholder support and weak enforcement of laws. 3. Risk of illegal logging and resource exploitation. 4. Insufficient funding for long-term sustainability efforts.

4. CONCLUSION

This study highlights that while Collaborative Forest Management (CFM) in Nepal was envisioned as a transformative mechanism to harmonize conservation objectives with community welfare, its practical

implementation continues to face multifaceted challenges. Findings from Badhnihar Collaborative Forest in Parsa district reveal that institutional weaknesses, political interference, inadequate financial resources, and ambiguous policy guidelines are the most pressing barriers undermining its effectiveness. These systemic shortcomings have directly constrained community participation, perpetuated inequitable benefit-sharing, and weakened law enforcement, leading to unintended socio-economic consequences such as declining household earnings from forest resources and the rise of illegal timber felling, particularly of *Shorea robusta*.

Despite these barriers, CFM has demonstrated tangible benefits through employment generation in nursery management, forest monitoring, and protection activities, showing its potential as a socio-economic safety net for rural households. However, the sustainability and inclusiveness of these benefits remain limited due to elite capture, gender disparities, and weak institutional capacity. The SWOT analysis further highlights that while Nepal has an established legal framework and strong community engagement potential, political instability, insufficient funding, and poor governance remain persistent threats.

For CFM to realize its transformative potential, a paradigm shift is necessary. Strengthening institutional frameworks, clarifying tenure rights, and promoting equitable benefit distribution are critical. Moreover, addressing political interference, building technical and managerial capacity, and ensuring meaningful inclusion of marginalized groups women, Dalits, and disadvantaged households will be key to enhancing legitimacy and community ownership. Linking CFM with broader climate adaptation frameworks such as Local Adaptation Plans of Action (LAPAs) and REDD+ initiatives can further integrate local priorities with global sustainability goals.

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Institutional Review Board Statement: The Ethical Committee of the Agriculture and Forestry University, Faculty of Forestry, Nepal has granted approval for this study on 14 April 2023 (Ref. No. 76).
Transparency: The authors state that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.
Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: All authors contributed equally to the conception and design of the study. All authors have read and agreed to the published version of the manuscript.

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