Assessment of Challenges and Opportunities in Private Forest Management in Sarlahi District, Madhesh Province, Nepal [1]

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Abstract

Private forests in Nepal are gaining recognition as a vital component of forest resource management, contributing significantly to timber production, environmental services, household income, and environmental services. This study analyzed the challenges and opportunities of Private forests (PFs) management in the Sarlahi district of Madesh Province, Nepal. The study was conducted covering all 91 registered Private forest owners, using questionnaire surveys, group discussions, and field observations. Results found that Private Forest ownership was primarily held by male (76.92%), with most owners aged between 41 and 50 years. Agriculture was the primary source of income for more than half of the participants (52.74%). The composition of species in Private forests was primarily made up of fast growing and economically important species, including *Eucalyptus camaldulensis* (34%), *Tectona grandis* (21%), and *Dalbergia sissoo* (16%). The developmental trend indicated steady growth in registered private forests from 1990 to 2010, followed by a decline after 2010 due to complicated regulatory procedures. Furthermore, study found that complicated harvesting permits, transportation restrictions, and lack of financial incentives were the major challenges perceived by forest owners. Conversely, income generation, livelihood diversification, and the local security of forest products were recognized as essential opportunities. Despite its strong economic potential, Private forestry in the Terai region faces significant institutional barriers that limit its expansion. Policy reforms, streamlined regulations, improved market access, and technical support can strengthen Private forestry's role in sustainable forest management and rural livelihoods in Nepal.

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Introduction

Forest is the foundation of the ecological, economic and livelihood system in Nepal, where forest is a vital ecosystem for biodiversity conservation, climate regulation and rural subsistence (Ghimire and Lamichhane, 2020; Paudel et al., 2022). As per the Forest Act 2019, the forest is categorized into national and private forest based on ownership and management systems (GoN, 2019). National forest includes community forest, collaborative forest, leasehold forest, religious forest, forest protection area and government-managed forest, which are generally managed under participatory or government-led management systems (GoN, 2019; Ghimire and Lamichhane, 2020; Paudel et al., 2022). Private forest is managed, administered and utilized by individuals or institutions on legally registered private land and offers timber production, agroforestry and household income (Amatya and Lamsal, 2017). This framework of classification guides forest management, resource utilization and conservation across the country.

The private forest is defined as a "forest established, managed, or conserved on registered private land owned by an individual" (GoN, 2019; GoN, 2022), which can be registered in the local level with the recommendation of respective Division or Sub-division Forest Office to get technical assistance and have full rights to manage, use, or sell forest products. Forests account for about 46.08 of the total land area of Nepal, and the country has become known worldwide for its participatory forest management systems, especially community forestry (MoFE, 2025; GoN, 2025). Although community forestry has received significant attention in research and policy discussions, private forestry has been a relatively understudied part of Nepal's forestry sector despite its increasing contribution to timber production and livelihood support (Amatya& Lamsal, 2017; Aryal et al., 2020; Joshi et al., 2023). A study found that Nepal officially has 5,552 registered private forest owners who manage 5 49,426 ha of forest area (MoFE, 2025). Despite covering merely 0.05% of the country's forest area, private forests supply nearly 80% of marketed timber, significantly higher than government-managed forests (7.7%) or community forests (5.5%). and contribute over 20% of forestry sector income (Basnyat et al., 2020). This highlights a large untapped potential for PF expansion, commercial forestry, biodiversity enhancement, and climate resilience (Oli et al., 2016; Aryal et al., 2020; Joshi et al., 2023) Private forests can therefore play an important role

in reducing pressure on natural forests while simultaneously enhancing rural household income.

In recent decades, private forestry has gained increasing importance due to rising demand for timber and forest products, as well as restrictions on harvesting from natural forests (Thapa & Weber, 1994; Oli et al., 2016; Aryal et al., 2020). The Government of Nepal has recognized the importance of private forestry and introduced policies to promote tree planting on private land. The Forest Act (2019) of Nepal and earlier policy instruments encourage farmers to plant trees on private land by granting ownership rights over planted trees and allowing them to harvest and sell forest products independently (Aryal et al., 2020; Basnyat et al., 2020). However, despite these supportive provisions, private forestry development has remained relatively slow in many parts of the country. Studies suggest that complex regulatory procedures, limited market access, and lack of technical and financial support continue to discourage farmers from investing in private forestry (Aryal et al., 2020). In the **Terai region of Nepal**, where fertile agricultural lands dominate the landscape, private forestry has considerable potential to contribute to sustainable timber production (Pokharel, 1999). Farmers in the Terai commonly plant fast-growing and commercially valuable species such as *Eucalyptus camaldulensis*, *Tectona grandis*, *Dalbergia sissoo* and *Albizia* species due to their rapid growth and strong market demand These species are widely used for construction timber, furniture, and fuelwood, making them economically attractive to landowners (Pokharel, 1999; Amatya & Lamsal, 2017; Joshi et al., 2023). As a result, private forestry has become an important source of timber supply in across lowland districts.

Although private forestry development has economic potential, institutional and technical challenges have been identified, including delays and administrative challenges in harvesting and transporting timber (even on legally owned land by the landowner), lack of funding and technical support for private forest management, limited access to improved planting materials, forestry knowledge, and reliable market data, unstable wood prices and ineffective market structures, and land-use pressure and encroachment (especially in the densely populated Terai area of Nepal) (Maraseni, 2008; Amatya & Lamsal, 2017; Aryal et al., 2020). Private forests provide a consistent source of timber and fuelwood, which alleviates pressure on community forest and government-managed forest, diversifies livelihoods, generates income for households and employment opportunities (Amatya & Lamsal, 2017; Aryal et al., 2020; Bolakhe et al., 2024).

Moreover, private forests are increasingly being recognized to contribute to climate change mitigation through carbon capture and carbon financing (Pandit et al., 2013; Joshi et al., 2023). However, the status, challenges and opportunities of private forestry in Nepal are less studied, particularly in the Terai region, where there is a pressing need to increase timber supply and the need for sustainable forest management (Amatya & Lamsal, 2017; Aryal et al., 2020). Therefore, this study investigates the species composition, current challenges and opportunities of private forests in the Terai region.

Materials and Methods

Study area

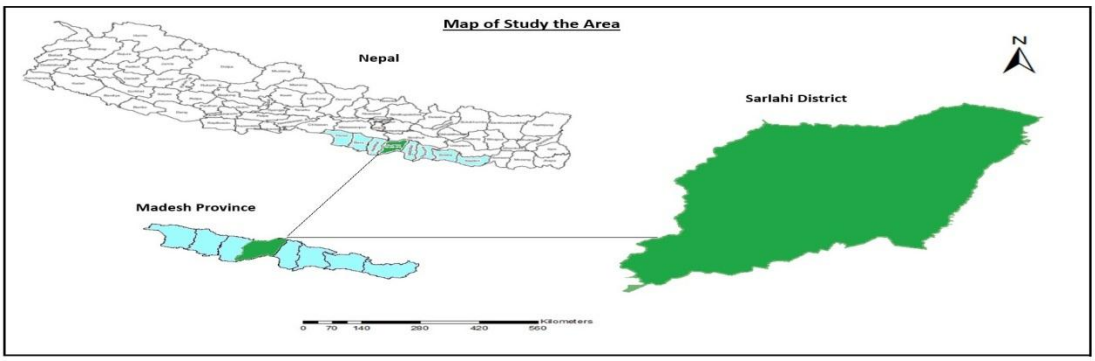
The study was conducted in Sarlahi district located in southern lowland area of Madesh Province, Nepal, at 26°51′20″ N latitude and 85°33′44″ E longitude with Terai agro-ecological setting and having a tropical climate with a total area of 1,259 km². The district is advancing with more private forestry approaches, with 91 registered private forests (PFs) covering 45.55 hectares, which are becoming increasingly significant in supplementing timber availability, increasing household income, and helping regional ecosystem services in a dominant agricultural landscape.

Sampling method

This study employed a mixed method that combined quantitative and qualitative approaches to examine private forest management and policy relevance. Because the study population was reasonable in size (91 owners in the research area), a total enumeration method was used, which included all owners, forest dimensions, and management techniques, reducing sampling bias and making the results more reliable and applicable in the district context.

Figure 1

Map Showing Study Area



Data collection

Data for this study were collected through questionnaire survey, focus group discussion (FGDs) and observation made through direct field visit. Semi-structured questionnaires were conducted to all 91 registered PF owners to gather data on the history of forest establishment, species composition, management practices, and levels of relevance with current forest policies and regulations. Two FGDs were held with groups of private forest owners and representatives from forestry institutions to discuss collective experiences, challenges and opportunities in private forestry, and to triangulate findings from the questionnaire survey. Direct field visits were made to verify the status of private forests, including species identification, and visible management interventions, and strengthen the validity of self-reported information and facilitate a more accurate evaluation of forest management practices.

Data analysis

Quantitative data were analyzed using Statistical Package for Social Science (SPSS) version 2024, generating descriptive statistics and visual representations (tables, and bar diagrams). Qualitative information was analyzed thematically to interpret challenges, opportunities, and compliance patterns. Matrix ranking was used as a participatory tool to evaluate the relative importance of identified challenges and opportunities (Likert, 1932). During the household questionnaire survey, respondents ranked each factor on a three-point ordinal scale (1 = least important, 2= important and 3 = most important). Respondents independently scored each factor based on their own experience in managing private forests. The total score for each factor was calculated as:

$$\text{Total Score} = \sum_{i=1}^{n} S_i \qquad \sum_{i=1}^{n} S_i$$

Where, S_i represents the score given by the i^{th} respondents.

The **mean score** for each factor was then computed by dividing the total score by the number of respondents (Likert, 1932). Factors were ranked in descending order of mean score, with higher mean values indicating higher perceived importance. Furthermore, Chi-square test ($\chi 2$) was performed to test the association between education level and perceived challenges and opportunities.

Results

Socio-economic characteristics of private forest owners

Results showed that Private forest ownership in Sarlahi district was dominantly held by men (78.92%), while women accounted for only 23.08% of the surveyed owners. The majority of owners were in the 41–50 age group, indicating that middle-aged individuals are more actively involved in private forest management. the most common occupation was agriculture showing strong linkage between forest ownership and agricultural subsistence in the study area.

Table 1

Socio-economic Characteristics of Respondents

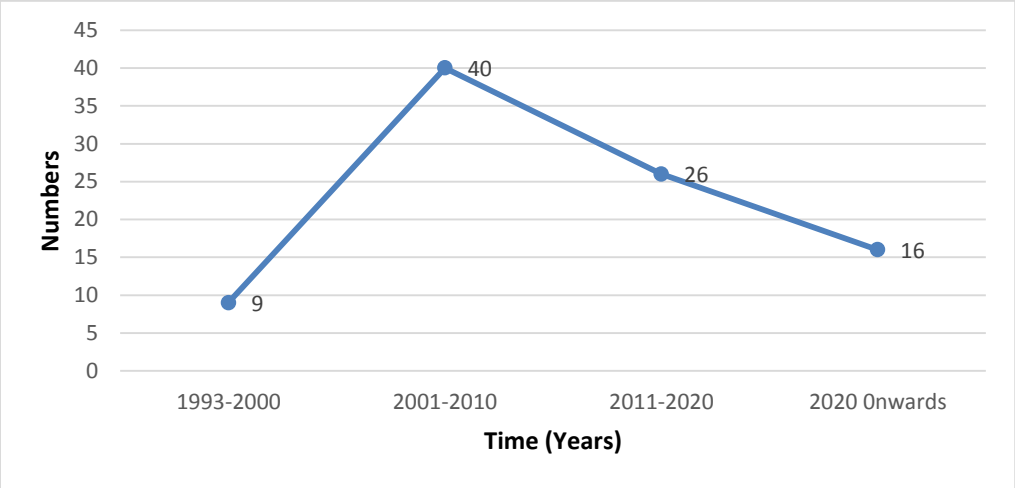
Variables	Categories	Percentage (%)
Gender of household head	Male	76.92
	Female	23.08
Age class of household head	30-40	20.88
	41-50	41.64
	51-60	27.47
Education level	Illiterate	19.78
	Primary (1-5)	31.86
	Secondary (6-10)	34.06
	Higher education	14.28
Average landholding	<0.5ha	42.85
	0.5-1ha	37.36
	>1ha	19.78
Occupation	Agriculture	52.74
	Government job	16.48
	Private Job/ Business	19.78
	Wage labor	9.89

Status and development of registered private forests

In Sarlahi district, there was a clear increase in the number of registered private forests from 1990 to 2010, which increased from 9 to 40, suggesting high awareness among the forest owners and financial incentives, but from 2010 to 2025, the number declined drastically from 40 to 16, while formal renewal patterns remained very low or almost non-existent. After 2010, the number of private forests registered went down, which can be attributed to the long and complicated registration and renewal processes that made forest owners not want to keep or renew their private forests even after the amendment made in the forest regulation.

Figure 2

Status and Trend of Private Forests over the Time

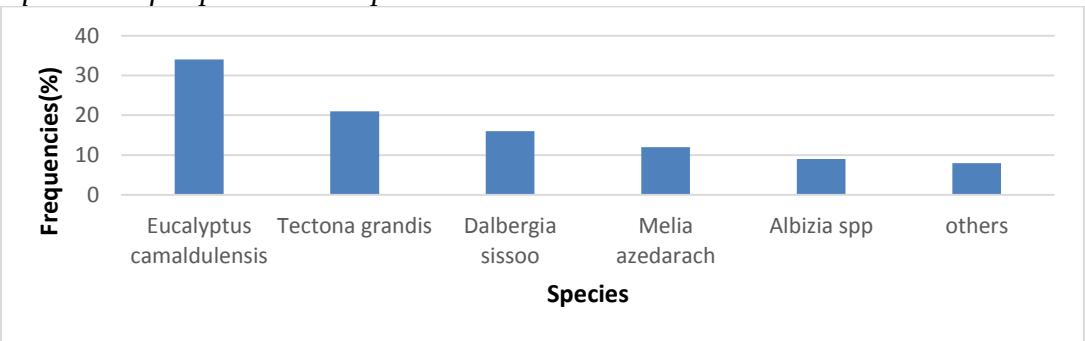


Species composition of private forests

In private forests, fast-growing and economically valuable tree species were predominant: *Eucalyptus camaldulensis* (34%), *Tectona grandis* (21%), and *Dalbergia sissoo* (16%), which are preferred by landowners due to their high market demand, rapid growth, and economic value, indicating that private forest management in the region prioritizes income generation and timber production over biodiversity conservation or ecological restoration. *Eucalyptus camaldulensis* is widely used for poles and fuelwood; *Tectona grandis* for high-value timber and furniture; and *Dalbergia sissoo* for construction wood and furniture production.

Figure 3

Frequencies of Top Five Tree Species recorded in Private Forests



Challenges of private forestry in Sarlahi district

From the study it was reported that regulatory constraints, particularly harvesting permits and transportation rules were ranked as the most severe challenges**,** indicating that institutional barriers outweigh technical limitations. Land-use pressure and lack of financial incentives were perceived as moderate but persistent constraints. The Chi-square test indicates that there is no statistically significant association between education level and perceived challenges in private forest management ($\chi 2=2.65$, $p=0.10$) at 5% level of significance. This suggests that respondents across different education levels experience similar constraints in managing private forests.

Table 2

Matrix Ranking of Major Challenges in Private Forest Management

Challenges	Score 1	Score 2	Score 3	Total Score	Mean score
Complicated harvesting permit	5	28	58	235	2.58
Transport restriction/ forest product	4	31	56	234	2.57
Lack of financial incentives	6	35	50	226	2.48
Land-use pressure	7	38	47	224	2.44
Lack of technical support	6	39	46	222	2.43
Limited market access	8	38	45	219	2.41

Opportunities of Private forestry in Sarlahi district

The study found that livelihood diversification, income generation and forest products security (timber, fuelwood and fodder) emerged as the top opportunities**,** reflecting the strong livelihood relevance of private forests. While emerging opportunities such as carbon financing were ranked lower due to limited awareness and access mechanisms. The Chi-square test showed a significant association between education level and perception of private forestry opportunities ($\chi 2=4.32$, $p=0.03$) at 5% level of significance. Respondents with higher education levels were more likely to recognize the income-generating potential of private forests. According to MoFE Madesh Province (2025) in the fiscal year 2023/24, approximately 158,202 Cubic feet of timber and 681 Chatta of fuelwood were produced in Sarlahi district, generating revenue of NPR 5,678,304. In the subsequent fiscal year 2024/25, production increased to 235,279 Cubic feet of timber and 724 Chatta of fuelwood, resulting in total revenue of NPR 6,332,168. These figures indicate a notable increase in both forest product output and revenue generation over the two fiscal years.

Table 3
Matrix Ranking of Major Opportunities in Private Forest Management

Challenges	Score 1	Score 2	Score 3	Total Score	Mean score
Livelihood diversification	3	23	65	244	2.68
Household income generation	2	28	61	241	2.65
Timber, fuelwood and fodder security	6	33	52	228	2.51
Environmental services	4	40	47	225	2.47
Timber supply for local market	10	37	42	210	2.30
Potential for carbon financing	2	35	44	204	2.24

Discussion

This study investigated the status, opportunities, and challenges associated with registered Private forests in Sarlahi district. The study revealed that Private forest ownership is mostly male dominated (76.92%), reflecting the traditional land ownership pattern in rural Nepal, where land ownership is primarily held by men. Restricted land ownership and decision-making power among women may hinder their participation in Private forest management, indicating the need for gender-inclusive policies, which aligns with national-level observations where land and resource ownership remains unequal due to structural and socio-cultural norms (Acharya et al., 2008). The majority of Private forest owners belonged to the **41–50 age group**, indicating that middle-aged farmers are more actively involved in Private forest development such as tree planting. Findings on the composition of species revealed the dominance of economically valuable species such as *Eucalyptus camaldulensis, Tectona grandis,* and *Dalbergia sissoo*, implying that economic factors rather than goals of ecological restoration or biodiversity conservation dominate the management of PFs. Comparable findings have been reported in the Terai, where farmers tend to prefer fast-growing species that have the maximum economic return within a short rotation period (Acharya et al., 2016; Amatya and Lamsal, 2017). Although these species enhance timber production, excessive dependence on monoculture plantations may reduce biodiversity and increase vulnerability to disease and pest outbreaks.

Private forests increased from 1990 to 2010, and then declined considerably after 2010, which may be related to complex administrative processes associated with registration and renewal of forests. The main challenges identified by forest owners were regulatory hurdles such as permits to harvest and restrictions on transportation. Similar institutional challenges are well documented in Nepal where bureaucratic procedures

often discourage farmers from engaging in Private forestry (Acharya et al., 2008; Amatya & Lamsal, 2017; Aryal et al., 2020). Lack of market access and limited financial incentives were also identified as significant barriers, since farmers are less likely to invest in long-term forestry plantations without guaranteed market channels and stable prices. Market strengthening and financial incentives such as subsidies or credit options would improve the private forestry program (Amatya & Lamsal, 2017; Aryal et al., 2020). However, this study identified several opportunities related to private forestry, including livelihood diversification and income generation, which were ranked as the most important opportunities, indicating the economic value of private forests for rural livelihoods (Acharya et al., 2008; Amatya & Lamsal, 2017; Aryal et al., 2020). In addition, private forests can provide valuable environmental services, including carbon sequestration, soil protection, and micro-climate regulation (Pandit et al., 2013; Joshi et al., 2023). However, the relatively low ranking of carbon financing opportunities suggests that private forest owners have limited knowledge of, and access to, carbon financing strategies.

Conclusion

Private forestry is a major underutilized component of Nepal's forestry sector and this study found that owners of private forests are primarily middle-aged males, and that economically important species such as *Eucalyptus camaldulensis*, *Tectona grandis*, and *Dalbergia sissoo* dominate private forests. The main challenges reported relate to complicated harvesting permits, transport restrictions, and insufficient financial incentives which has resulted in a recent decline in the development due to institutional and regulatory barriers. Yet, private forestry holds great potential to secure forest products, income generation, and provide diversification of local livelihoods. Policy reform to streamline the regulatory processes, improve market access, and provide financial and technical support to Private Forest owners, better extension services, and expanded awareness of new opportunities will be essential for the sustainable development of private forestry.

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Conflicts of Interest

The author states that there are no conflicts of interest associated with this paper.

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