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Understanding management practices and user's perspective on sustainable forest management in Nepal

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ABSTRACT

Sustainable forest management (SFM) plays a critical role in maintaining ecological balance, supporting livelihoods, and mitigating climate change. This study was conducted to explore the management practices and user perspectives regarding sustainable forest management in Nepal, focusing on community forestry and government-led initiatives. Using a mixed-methods approach, data were collected through surveys, interviews, focus group discussions and field observations. A total of 180 user's opinion were collected in 9 selected forest user groups from four district of Nepal (i.e. Ilam, Jhapa, Sarlahi, and Makawanpur). The study revealed that major forest management practices applied by community users' are thinning, pruning, and improvement felling. Majority of the users (70.56%) were unsure about the forest management practices prescribed in the Operational plans (OPs). Accordingly, most users (92.78%) were agreed with the opinions that they need to be trained about forest management practices and its implementation. Majority of the users (92.00%) also agreed that participatory forest management modalities like Community Forest (CF), Collaborative Forest Management (CFM) and Leasehold Forest (LHF) area protecting biodiversity and reducing environmental risks. However, people believe that arbitrary policy changes was the main challenges for proper implementation of sustainable forest management practices. Therefore, strengthening capacity-building programs, enhancing government support, developing a consistent guideline, and promoting adaptive management practices are essential for improving sustainable forest resource management in Nepal.

Contribution/Originality: While previous studies have assessed the outcomes of community forestry in Nepal, few have examined the complex interplay between management practices and user perceptions. The originality of this study lies in its holistic approach (i.e. qualitative and quantitative), to find practical solutions tailored to the sustainable management Nepal's forest resource.

1. INTRODUCTION

Forest is a very valuable resource for maintaining a clean and balanced environment particularly in a mountainous country like Nepal. "Green Forests are the wealth of Nepal" has been a widely recognized slogan in Nepal and to some extent reality as well [1].

Nepal covers 6.60 million hectares of forest land, which makes up 44.74% of the country's total land mass [2] and 0.17% of the world's total forest area [3]. About 35% of the country's population depends on forest resources for their livelihood [3] which means appropriate management and rational utilization of forest resource are major forest management issues in Nepal [4-6].

In the last five decades, forest area in quality, quantity and density have decreased considerably especially in the Terai and Siwalik regions due to uncontrolled and unsustainable use of forests and to meet the demand for forest products and biomass for growing population and huge demand from growing urban centers as well [7-9]. Forest management involves the use of forests to meet the objectives of land owners and society. Sustainable forest management is an important approach for enhancing forest productivity, increasing forest products and ecosystem services, supporting local livelihood, and local economy [9-12].

Based on land ownership, Nepal has two categories of forest i.e. national forest and private forest [6, 13]. Government forests are managed under different management regimes, i.e. Community forest (CF), Collaborative Forest management (CFM), Leasehold Forest (LHF), Religious Forest (RF) fall under this category [13]. While forest planted, conserved and managed in any private land owned by an individual belongs to Private forest [13]. In the history of Nepalese forest sector, various practices and approaches have been observed at various times. During five decades of its implementation, the program has undergone a considerable shift from state-centric top-down approach to participatory community-based management approach to sustainable forest management approach economy [6, 14].

Some of these practices are more concerned on central resource exploitation to generate revenue, while others are more focused on resource protection to supply local communities with essential forest products such as Fuelwood, timber and fodder [14, 15]. Nepal's 15th periodic plan 2020-2024, also recognizes the forestry sector as an economically productive sector with sustainable forest management as a primary pillar. Meanwhile, sustainable forest management has also been recognized as vital in achieving the Ministry of Forests and Environment's vision of 'Forestry for Prosperity' economy [13]. Therefore, successful implementation of sustainable forest management therefore calls for uniformity in understanding among stakeholders and forest technicians.

Most of Nepalese forests are being managed based on sustainable forest management principles. In order to manage forests based on scientific principal, Operational plans normally lasting for five to ten years, are prepared [13].

Operational plans are prepared, approved and implemented by respective forest management regimes. However, there is very little information available on the outcome of the plan implementation mainly in terms overall forest management intervention and silvicultural practices [16]. It is not known; how well silvicultural practices have been applied; how effective these forest management practices are; and how much local people are aware about these forest management prescriptions. Hence, this study intended to explore these aspects of forest management in Nepal.

2. METHODOLOY

2.1. Study Area

This study was conducted in four districts of Nepal, namely: Makawanpur, Sarlahi, Jhapa and Illam. A total of 9 Operational Plans of 9 forest user groups (FUGs) were analyzed i.e. 5 Community Forest User Groups (CFUGs), 1 Collaborative Forest Management User Groups (CFMUGs) and 3 Leasehold Forest Groups (LFGs) from four studied districts (Figure 1).

Detail of the studied FUGs are presented in Table 1.

Figure 1. Map showing the studied districts.

Table 1. Detail of the studied FUGs.

S.N.	Name of FUGs	Address	Area(ha)	Date of hand over	Number of users interviewed
1	Pashupati CF	Manahari-7, Makawanpur	288.22	1993/11/10	23
2	Nawalpur-Saraswati CF	Hetauda-11, Makawanpur	234.2	1995/08/08	22
3	ChitrePani LHF	Hetauda-15, Makawanpur	9	1994/10/31	9
4	Janakinagar CFM	Janakinagar-, Sarlahi	1294.27	2017/12/14	35
5	Laxmi LHF	Lalbandi-10, Sarlahi	3.17	2014/07/14	4
6	Shiva Parbati LHF	Lalbandi-10, Sarlahi	3.82	2014/07/14	5
7	Shanti CF	Arjundhara-2, Jhapa	412.02	1997/07/05	26
8	Sukhani CF	Mai-4, Ilam	619.61	1998/04/26	29
9	Tintale CF	Rong-4, Ilam	435.94	1998/07/16	27

2.2. Sampling Design

Primary data includes analysis of Operational Plan (OP) of User Groups, and Forest user's survey for people's perspectives. Simple random sampling method was applied for the generation of data. A total 180 forest users (stakeholders) survey was carried out along with 1 focus group discussion in each user group [17].

Furthermore, forest user's perspectives towards forest management approach and forest conservation were determined through three scale (i.e. agree, neutral to disagree (1-3) Likert scale approach [18]. Then, weighted mean was calculated by the following formula:

$$Weighted\ mean = \sum(W_i * X_i) / \sum W_i$$

Where, W_i = Respondents response in % and X_i = Value assigned to agree to disagree.

2.3. Data Analysis

Data were analyzed through Statistical Package for Social Science (SPSS) tool. Standard methods were utilized to examine both qualitative and quantitative data, using suitable statistical tools and techniques. Qualitative data was examined through descriptive text analysis to identify important themes and insights while quantitative data was subjected to rigorous analysis, with results presented through tables, figure, bars etc.

3. RESULTS AND DISCUSSION

3.1. Socio-Economic Characteristics of the Respondents

For the socio-economic survey, 180 households (HHs) were randomly selected from 9 forest user groups in order to gather data regarding the opinions of forest users regarding various forest management practices. Out of the total, 104 were male and 76 were female. Respondents between the ages of 20 to 60 were interviewed to generate reliable information using a questionnaire survey. This was done to reflect the respondent's appropriate insight on the subject matter (Table 2).

Table 2. Socio-economic characteristics of the respondents.

Category	Indicator	Number	Percentage (%)
Gender	Male	104	57.80
	Female	76	42.20
Age group	20-35 years	47	26.11
	36-50 years	70	38.89
	51-60 years	63	35
Education	Illiterate	27	15
	Primary	38	21.11
	Secondary	80	44.44
	University	35	19.45
Occupation	Agriculture	74	41.11
	Government services	69	38.34
	Private services	37	20.55

3.2. Implementation of Forest Management Practices

Within the studied Operational plans of CF, CFM, and LHF the forest management practices included or prescribed were cleaning, thinning, pruning, improvement felling and climber cutting. No any specific silvicultural system-based practices were prescribed and implemented, except in the Scientific Forest management plan in which Irregular shelter-wood system is prescribed for *Shorea robusta* (Sal) forest. Irregular shelter-wood system is a system under which the crop to be regenerated is opened up in an irregular manner and the resulting forest is uneven aged. Basnyat [11] also reported that cleaning, thinning, pruning, and improvement fellings are major silvicultural practices mostly applied in community-based forest management in Nepal.

To implement this system, the entire forest area is divided into compartment and sub-compartments for executing aligned silvicultural operations over a rotation of 80 year. The number of compartments was determined by forest area, while the number of sub-compartments (i.e. periodic blocks) was designed using the rotation (R) and regeneration period (P). For instance, if the rotation period is 80 years and regeneration period is 10 years then, number of sub compartment = R/P = 80/10 = 8 (with equal area). Key silvicultural operations involved were regeneration felling, preparatory felling, thinning and improvement felling in mature stands as well as regeneration promotion. Regeneration felling is focused in a single sub-compartment of each compartment where majority of over-mature trees exist and regeneration is relatively inadequate. Preparatory felling is recommended in one sub-compartment of each compartment where majority of over-mature trees are in second place, there is less regeneration, and the regeneration felling is planned after the completion of existing plan. Thinning and improvement felling is planned in sub-compartments of each compartment where pole and sapling were densely populated. Subedi, et al. [19] also recommended 80 year rotation based Irregular shelter-wood in for the management of community managed *Shorea robusta* forest in Terai and mid hills in Nepal. Furthermore, Adhikari [20] emphasized the socio-economic and ecological implication of silvicultural practices for the sustainable forest management, particularly in Terai and Mid hills of Nepal.

3.3. Forest User's Awareness About Forest Management Practices

During the study users were asked about the awareness about forest management practices (such as thinning, pruning, improvement felling or any particular silvicultural system). Majority of the users (70.56%) responded that they are unsure about such forest management practices included or prescribed in the OPs (Figure 2). Only 29.44% respondents are reported to be known about the forest management practices included in OPs. Most importantly, all of the respondents were in dilemma about what is a silvicultural system is and why it is important for forest management? So, it is critical that forest users' needs to be trained about the forest management practices and its implications.

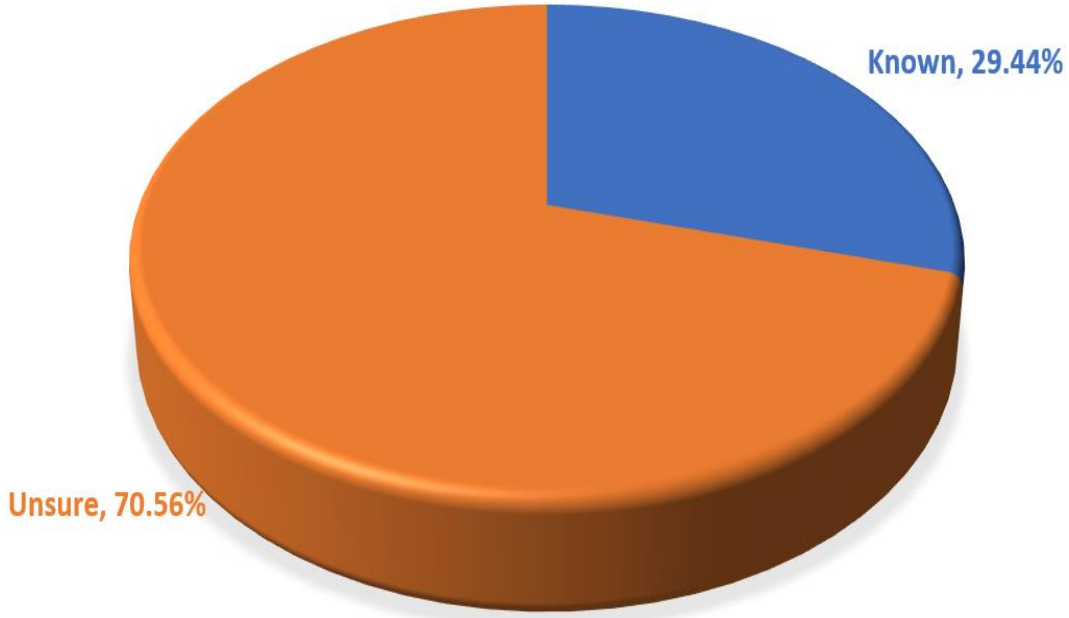

Figure 2. User's awareness about forest management practices.

3.4. Forest User's Perspectives about Sustainable Forest Management Practices

Majority of the respondents were unsure about the provision in Operation Plan of forest management modalities. In that regards peoples are asked about the contribution of different forest management modalities related to regeneration conditions, forest production and biodiversity conservation and they are determined by using Likert Scale.

Majority of the users agree (mean 1.21) with the statement that the regeneration conditions of the forest has increased after the regular and planned application of silvicultural activities like thinning, pruning, improvement felling, and even selection felling of unwanted species to provide space for desirable species (Table 3).

Accordingly, in the second statement, 48.33% users agree (mean 1.68) that the production of forest increased after the application of silvicultural practices and 35.56% remains neutral about it. Bhusal, et al. [5] in their study in community forest users groups of western Nepal also stated that forest management interventions (such as improvement felling, thinning) have positive impacts on the production of forest goods and services. Devkota and Ghimire [12] and Baral and Ghimire [21] recommended that sustainable forest management practices are essential for socio-economic and ecological state of the forest resources in Nepal.

Table 3. User's perception towards forest management role on regeneration condition, forest production and biodiversity conservation.

Statements	Response (%)			Weighted mean
	Agree (1)	Neutral (2)	Disagree (3)	
1. Regenerations of tree species has increased after the intervention of silvicultural management practices (Such as thinning, pruning, improvement felling etc.)	79.45% (143)	20.55% (37)	-	1.21
2. Forest production or yield has increased with application of silvicultural management practices	48.33% (87)	35.56% (64)	16.11% (29)	1.68
3. Forest management modalities like CF, CFM and LHF are protecting biodiversity reducing environmental risks	92.78% (167)	7.22 % (13)	-	1.07
4. Forest users are getting enough forest products (Timber, firewood, fodder etc.) form forest management modalities like CF, CFM and LHF	69.44% (125)	17.78% (32)	12.78% (23)	1.43
5. User groups are getting appropriate technical support from divisional forest offices for forest management	52.22% (94)	14.44% (26)	33.34% (60)	1.81
6. OPs are need to be revised with silviculture practice and sustainability base management practices	96.11% (173)	3.89% (7)	-	1.04

Similarly, 92.78 % respondents agree (mean 1.07) that participatory management modalities like CF, CFM, LHF and RF area contributing notable to the conservation of local biodiversity. About 70% of the respondents (mean 1.43) agree with the statements that forest management modalities like CF, CFM, LHF and RF are fulfilling the user's demand for forest products. However, people feel that forest guideline related to forest harvesting and distribution need to be revised with present scenario and situation of the local. Furthermore, 52.22% users agree (mean 1.81) with the statement that Division Forest Offices are providing enough technical support to users group for the forest management while 33.34 % disagree and 14.44 % remains neutral. Out of the users' 173 believe that Ops need to be revised with appropriate silvicultural practice and sustainability-based approach. It is evident that local users observed that the regeneration condition of the forest has been improved after the implication of planed silvicultural treatments like thinning, pruning, cleaning and climber cutting that has also contributed to the improvement of forest quality. On the other hand, respondents argued that the apparent effectiveness of Scientific Forest management (SciFM) did not encourage them to adopt it as the program because it was seen to be complex and costly. In addition, heavy dependency of forest groups on the techno-bureaucrats; high-handedness of contractors in felling, selling and distribution of woods; and financial transparency has emerged as a challenging issue of SciFM for the various forest user groups. Hence, intensifying the discourses around the various aspects of SciFM in the greater interest of community benefits has become urgent. This study revealed that different forest users have understood forest management practices and its implication on forest regeneration, forest produce and biodiversity conservation differently (Table 3). However, their dominant views converged on the point that application of appropriate forest management practices can supports sustainable development through improved wood supply scenarios and reduced environmental risks. Gautam and Devoe [9] in their study in Nepal stated that sustainable forest management practice can improved the production of forest goods and reduced environmental consequences.

Table 4 presents the perspectives various stakeholders on forest management and its implication for community based forest management modalities. Dominant respondents from CFs, CFMs and LHFs stressed that silvicultural practices need to be applied in appropriate and planned manner to improve forest regeneration and increase forest produce. Similarly, majority of the respondents also agreed that participatory forest management modalities are protecting biodiversity and reducing environmental risks. Likewise, understanding of local FUGs was mixed, indicating their confusion and the dearth of discussion on the topic. Their dominant view on forest management practices was that it is a form of management under which they can harvest the green trees and fulfil the demands of local people. However, people believe that arbitrary policy changes was the main challenges for proper

implementation of sustainable forest management practices. Basnyat [11] in his study reported that unpredicted policy changes is key hindering factor for successful implementation of sustainable forest management practices in Nepal.

Table 4. Perspectives of stakeholders on forest management practices and its implications.

Stakeholders	Users' perspectives	Number of responses
CF	Need of silvicultural management practices for improved regeneration condition	96 (75.60%)
CFM		29 (82.85%)
LHF		18 (100%)
CF	Forest produce has increased after the implication of silvicultural management practices	47 (39.16%)
CFM		23 (71.87%)
LHF		18 (100%)
CF	Participatory forest management modalities are helping in protecting biodiversity and reducing environmental risk	121 (95.27%)
CFM		28(80,00%)
LHF		18 (100%)
CF	Participatory forest management modalities are creating employment opportunities (Wood based) and increased income of users	117 (92.15%)
CFM		24 (68.57%)
LHF		18(100%)
CF	User groups are getting enough technical support from divisional forest offices for forest management activities	58 (45.66%)
CFM		21(60.00%)
LHF		15 (83.33%)
CF	User groups need to be trained about harvesting technology and forest science and sustainability	125(98.42%)
CFM		33(94.28%)
LHF		15 (83.33%)

4. CONCLUSION

The study found that about one third of the users (70.56%) in the studied forest user groups were unsure about silvicultural management practices. Majority of forest users opined that forest management practices need to be applied in appropriate and systematic manner to enhance forest regeneration and improve forest produce. Forest users also stressed that community-based forest management modalities area critically supporting in protecting biodiversity and reducing environmental risks. Though, forest management practices are step towards fulfilling increasing timber demand, it seems that it is largely driven by economic and social concerns and interests, rather than ecological concerns. The economic and environmental outcomes of production forests are governed by forest management policies and practices. However, the understanding and teamwork of major stakeholders are necessary for such policies and practices to be effective.

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Institutional Review Board Statement: The Ethical Committee of the Agriculture and Forestry University Faculty of Forestry, Hetauda, Nepal has granted approval for this study on 20 April 2022 (Ref. No. 223).
Transparency: The authors declare that the manuscript is honest, truthful and transparent, that no important aspects of the study have been omitted and that all deviations from the planned study have been made clear. This study followed all rules of writing ethics.
Competing Interests: The authors declare that they have no competing interests.
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