Journal of Geoscience and Environment Protection, 2024, 12, 12-30
https://www.scirp.org/journal/gep
ISSN Online: 2327-4344
ISSN Print: 2327-4336

Participatory Forest Management and Gender Inclusiveness within the Community Forest Management Groups of Bhutan

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How to cite this paper: Zangmo, N., Hiroshima, T., Sibanda, S., & Dorji, J. (2024). Participatory Forest Management and Gender Inclusiveness within the Community Forest Management Groups of Bhutan. *Journal of Geoscience and Environment Protection, 12,* 12-30.
https://doi.org/10.4236/gep.2024.124002

Received: March 8, 2024
Accepted: April 19, 2024
Published: April 22, 2024

Abstract

Community forest management groups (CFMGs) in Bhutan exhibit participatory forest management practices that recognize the importance of community's collective participation in the management of natural forest resources. This approach involves the community in the stewardship of designated forest areas and resources to ensure sustainable livelihoods and realization of forest conservation objectives. The increase of CFMGs in the country has been successful. However, research on the extent of gender-inclusive participation in CFMGs is either insufficient or missing vis-à-vis the allocation of decision-making power. Therefore, this study analyzes the factors influencing gender participation in CFMGs and their integration into decision-making processes. Primary data were collected from 12 study sites spanning 4 regions, complemented by secondary data from the Forest Department. Regression models were used to identify factors significantly influencing CFMG member participation in decision-making. The empirical results of this study reveal that gender is a significant factor influencing participation in CFMG decision-making. The study concludes that there is insufficient participation of women members in decision-making processes. Therefore, consideration of gender should be included in the development phase of the CFMG policy in addition to promoting awareness of inequity between gender and the promotion of leadership roles for women in CFMGs.

Keywords

Decision-Making, Face-to-Face Interview, Regression Analysis, Women

1. Introduction

The adoption of participatory forest management (PFM) by South Asian countries in the early 1990s, primarily to conserve nature, has evolved over time to address broader concerns (Lund et al., 2009). It recognizes rural communities' reliance on natural resources for their livelihoods, specifically participation in decision-making for forest resource management (Agarwal, 2001).

Several approaches adhering to the PFM principle have been implemented, and community forestry (CF) exhibits considerable differences in its application, contextualized by specific policies, socioeconomic situations, and people's relationship with nature across countries (Charnley & Poe, 2007). This variation seemingly underscores the intrinsic link between the well-being of a community and the ability of local inhabitants to sustain their livelihoods.

As for Bhutan, substantial forest management initiatives have been undertaken since the mid-20th century. The Social Forestry Program (SFP) was an initial PFM program launched after the issuance of the Royal Decree in 1979, with the goal of engaging the people in forest conservation (Penjore & Rapten, 2004). In subsequent years, CF came into force as a people's participation program to alleviate rural poverty and minimize forest degradation, as the SFP faced challenges in achieving this expected outcome (Dhital, 1997; Penjore & Rapten, 2004).

In an era not intercepted by modern development, forests supported the agrarian communities of Bhutan, and resources were managed in a sustainable manner. A crucial aspect linking the relation between the people and the forest, as accounted by Webb & Dorji (2004), emphasized the emergence of forest-related institutions in Bhutan back in the 17th century and the significance of the forests. The forestlands surrounding the villages were mutually delineated as boundaries, allowing local communities to maintain dispute-free areas for resource collection. Furthermore, it facilitated the transfer of agricultural goods, including forest produce, which were collected as tax from local communities during that period.

Even today, the rural communities continually rely on forests to extract timber for building houses, wild fruits, fiber, medicinal herbs, firewood, fodder for livestock, and non-wood forest products, which are essential for the sustenance of households (Penjore & Rapten, 2004; Webb & Dorji, 2004).

Eventually, to fulfill the overarching goal of nature conservation, the CF program was instituted to support and improve the livelihood of local communities through their actual engagement in the sustainable management of forest areas handed over to them (Buffum et al., 2010).

In Bhutan, CF entails a piece of forest area being handed over to the formalized community forest management group (CFMG) in the rural community, along with certain authorities, to manage the forest to alleviate poverty, uncompromising its sustainability aspect (DoFPS, 2021).

The decision to support the CF program was also largely influenced by the experience gained from forest nationalization, which led to the rapid increase in forest degradation and exploitation (Dhital, 1997; Tshering, 2006; Wangdi & Tshering, 2006).

Over the past two decades, the number of CFMGs across the country has increased considerably, as illustrated in **Figure 1**. The case studies by Temphel & Beukeboom (2006), Tshering (2006), Wangdi & Tshering (2006), Buffum et al. (2010), and Phuntsho et al. (2011) conclude that the CF program of Bhutan is benefiting the local communities but with room for more enhancement.

However, a core principle driving the local community to engage in forest management is an equal right of access to forest resources and opportunities to participate in decision-making. These rights are legitimately recognized by the Forest and Nature Conservation Act 2023 (RGoB, 2023a, 2023b). Having a legal indication in place, the engagement of both men and women in decision-making is allegedly ensured. However, women's inclusion in forest management has not received much acknowledgement, and there is a lack of knowledge of the extent of their participation in decision-making within the group. Approximately 61% of the total population are rural communities (NSB, 2022) that rely on natural resources necessary for their household sustenance, and women play an equally important role in forestry as men.

The outlook of Bhutanese women in education, information and communications technology, health, and general well-being has been examined by Yangden (2009), Seden & Maxwell (2016), and Verma & Ura (2022). However, it does not adequately showcase women's participation in socioeconomic development (Dema, 2017), which is also evident in CFMGs, where women's involvement remains invisible.

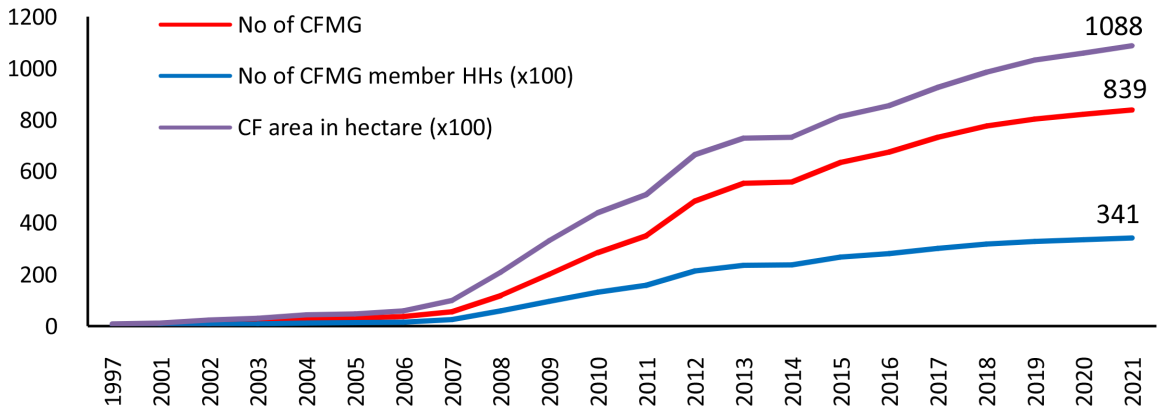

Figure 1. Changes in total number of CFMG, number of CF member households (HHs) and CF area as of 2021 (Source: DoFPS, 2022).

In previous case studies on CFMGs, member participation in decision-making has not been a priority, although it undoubtedly remains a critical aspect for establishing a reliant system embodying equity and equality.

To address this gap, this study aims to develop empirical evidence on members' participation in decision-making across CFMGs. This work is the first of its kind to focus on less-studied topics to understand gender engagement in the forest management system and factors likely to influence participation in decision-making.

2. Materials and Methods

2.1. Study Site

The CFMGs in Bhutan are the focus of this study. Bhutan is a tiny South Asian country nested at the base of the Eastern Himalayas, constituting a total geographical area of 38,394 sq·km with a population of just over 0.7 million (NSB, 2023). Notably, 69.1% of the area is under forest cover and 2.8% thereof is managed by CFMGs (DoFPS, 2022). The 11 forest types are prevalent across a wide range of altitudinal gradients (500 to >7000 m·asl), attributed to the presence of rich biodiversity favored by 4 seasonal variations (DoFPS, 2022).

As of 2022, 842 CFMGs have been established in the country, engaging a total of 34,266 rural households (DoFPS, 2022). The study sites encompass 12 CFMGs (**Figure 2**), which are selected based on a set of criteria, such as location, years since establishment, and total membership, to obtain unbiased and representative datasets. For site selection, the 20 administrative regions (districts) were grouped into 4 regions: The traditionally acclaimed central, eastern, western, and southern regions. 3 CFMGs were selected from each region. Members of the CFMGs are enriched with conventional skills and knowledge of forest management, and they belong to diverse socioeconomic backgrounds.

2.2. Data

The primary dataset mainly encompasses the socioeconomic components of CFMG members, including members' participation status in decision-making perceptions. Field visits were conducted in September and October 2022. The visits were made to the respective CFMG areas, and face-to-face interviews were conducted individually with CFMG members. The administered survey questionnaires were fully structured to enable us to record and encrypt their personal forest management experiences. The questionnaires were designed to collect quantitative and qualitative information using Google Forms. The qualitative answers to the open-ended questions were evaluated and summarized as binary outcomes such as yes or no and provided for quantitative analyses. The secondary data were acquired from the Department of Forests and Park Services, Bhutan that not only served as a secondary source but also assisted in the site selection process.

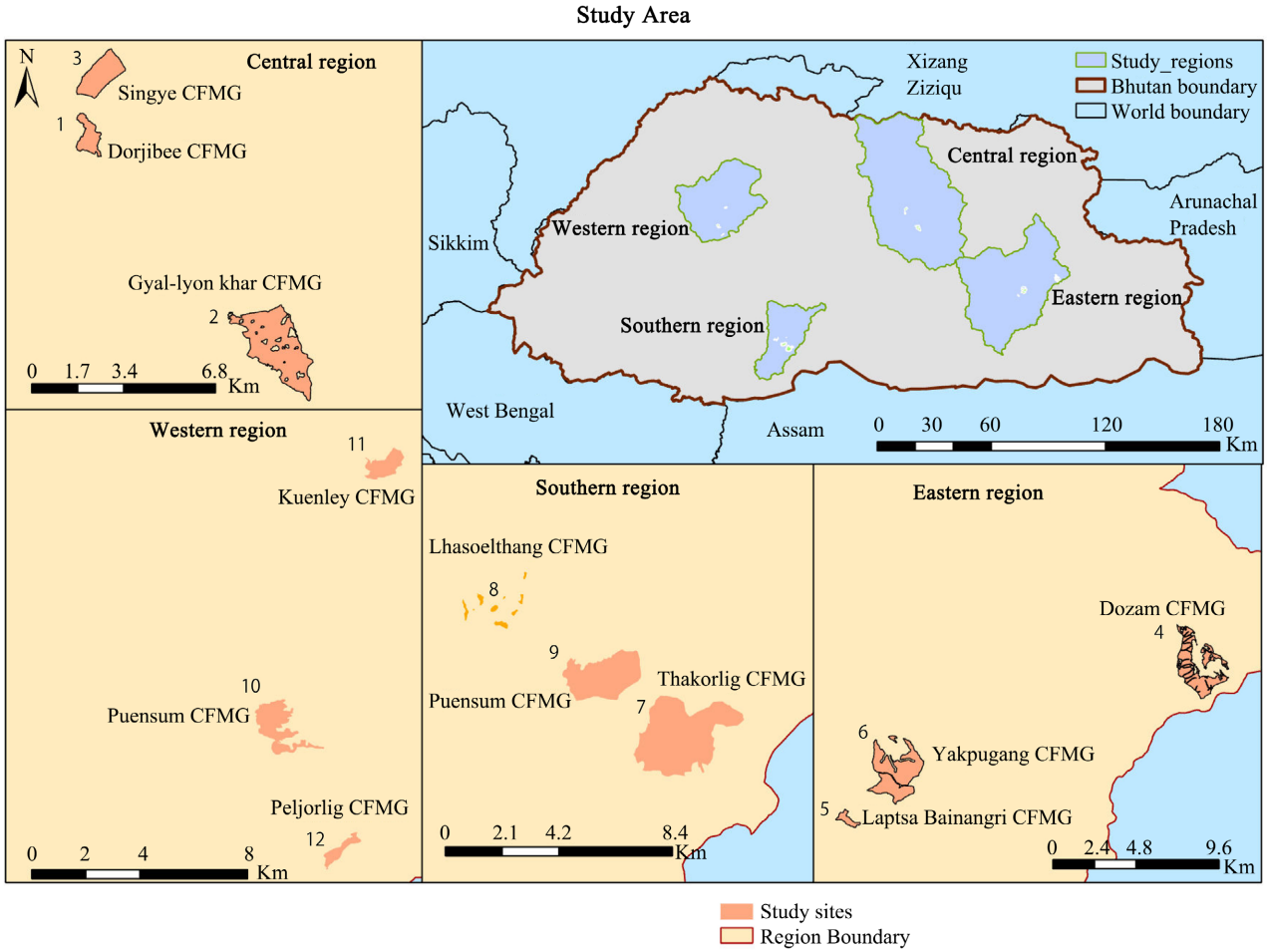

Figure 2. Study site map.

The CFMG members were the main sources of information for this study. These groups are at the center of the management system, receiving direct experience, and are best suited to offer unbiased information. These members are engaged in various management activities beginning with CF proposals, preparation of management plans, and implementation at the ground level, with forestry officials providing technical and funding support. Exposure to a series of activities offers ample opportunities to participate in decision-making. Engagement in various activities encapsulates an individual's liberty to participate in decision-making, which serves as indicators or proxies of participation in decision-making within CFMGs. The indicators are categorized into administrative and fieldwork components, and member participation in these categories is analyzed.

The primary dataset, consisting of both quantitative and qualitative, i.e., continuous and categorical, data comprise socioeconomic factors and participation in CFMG administration and fieldwork. Then the CFMG members' socioeconomic status and participation in the decision-making process were analyzed by regression analyses (detailed in the following section). Eventually, the indepen-

dent variables listed in Table 1 are included in the regression models because of their significance and to enhance the robustness of the model. The primary goal of this study is to predict gender participation in the decision-making of CFMGs, so "Gender" is the most important independent variable. To determine its significance, it is assigned a value of 1 for woman and 0 for man, as described in Table 1.

Table 1. Description of dependent and independent variables.

Variables in the model	Description of variables	Data type	The expected impact
Dependent variable: Making CF decisions	A member who makes the decisions related to the CF program at the household and for CFMG. Value 1 is assigned for a member who makes the decisions of CFMGs and 0 otherwise.	Binary outcome	
1) Gender	Gender of the respondent member. Gender is assigned a value of 1 for women and 0 otherwise.	Binary	±
2) Breadwinner	Primary breadwinner of a family. If a member is a breadwinner assigned a value 1 and 0 otherwise.	Binary	+
3) Education	No. of years that member has spent in schooling.	Discrete	+
4) Family size	Total number of people in the household together for more than 6 months.	Discrete	+
5) The household decision maker	A respondent responsible for making the decisions related to the household. For this value 1 is assigned for yes and 0 otherwise.	Binary	+
6) Employment period	No. of months a respondent has spent working in their field. The working period is grouped into 12, 9, 6, and <3 months.	Discrete	-
7) CF training	CF skill training and workshop attended by the members. Members attend the training to enhance management capacity. Value 1 is assigned to those who have attended the training and 0 who have not.	Binary	+
8) CF management committee	If a member is a chairperson or secretary or treasurer or supporting staff then the value 1 is assigned and 0 otherwise.	Binary	+
9) Region	Research sites are grouped into central, eastern, western, and southern regions. Assigned values are 1, 2, 3, and 4 in respective sequence.	Nominal	±

Many independent variables were excluded from the models because of their lack of significance, which weakened the model's robustness. Independent variables, such as member's age, household head status, marital status, land ownership, total income, and years of experience in forest management, were excluded in the regression analysis.

2.3. Statistical Analysis

This study aims to identify the factors that influence member participation in decision-making in CFMGs.

The units of statistical analysis are 102 CFMG members (49 men and 53 women) belonging to 12 CFMGs surveyed during the fieldwork. A statistical regression method was used to predict whether the interviewed members participated in the decision-making process. The analysis had a binary outcome, that is, "yes" for member participating in decision-making and "no" for non-participation.

To ensure the reliability and robustness of the relationship, three regression models are developed using multilevel mixed effects logistic regression (MMLR), binary logistic regression (BLR), and ordinary least squares (OLS) based on the Stata/SE 17 software. The results of regression models are consistent in predicting the same significant independent variables and model robustness.

The likelihood of the independent variables influencing the binary outcome (dependent variable: yes or no for participation in decision-making) was estimated. The MMLR model uses 4 regions as an independent variable to determine how differently members from various regions participate in decision-making. However, the estimated interclass correlation coefficient (ICC) value is 0.0000029, which is small due to the lower unit level (4 regions), showing no significant differences within these regions regarding participation in decision-making by the members.

2.3.1. Multilevel Mixed-Effects Logistic Regression

The first regression model was developed using the MMLR method (Yamana, 2021). It was carried out mainly to predict the presence of variation within and among regions regarding participation in decision-making by members. The ICC values were extremely small, indicating the absence of variation.

However, despite the low ICC value, the MMLR model was developed to determine which independent variables were significant and influenced member participation in the CFMG decision-making process (Equation (1)).

$$\ln\left(p_i/1-p_i\right)=\beta_0+\beta_1 x_{ij}+u_{0j}+u_{1j}x_{ij} \quad (1)$$

where:

- $\ln(p_i/1-p_i)$ is the log odds of the probability of the binary outcome (CF decision-making) for observation within the 4 regions.
- p_i represents the probability of the binary outcome for the i-th observation within the 4 regions.
- β_0 represents the fixed intercept, which is the expected log odds of the outcome when all predictor variables are 0.

- β_1 represents the fixed coefficient for the predictor variable x_{ij}, which represents the effect of the predictor on the log odds of the outcome.
- u_{0j} represents the random intercept that captures the variation in the baseline between different higher-level units (4 regions).
- u_{1j} represents the random slope that captures the variation in the effect of predictor x_{ij} across the regions.

2.3.2. Binary Logistic Regression

The likelihood of a relationship between the dependent and independent variables was explored via BLR (Pohlmann & Leitner, 2003). This statistical method is suitable for predicting relationships because the outcomes are binary. Using this method, independent variables influencing member participation in CFMG decision-making were constructed (Equation (2)).

$$\ln\left(p/1-p\right)=\beta_0+\beta_1 x_1+\cdots+\beta_k x_k \tag{2}$$

where:

- p represents the probability of the dependent variable (making decisions related to community forest management by the sample members), taking the value of 1 for yes and 0 otherwise.
- β_0 represents the intercept (constant term).
- β_1 to β_k represent the coefficients for each independent variable (slope term).
- x_1 to x_k represent the independent variables.

2.3.3. Ordinary Least Squares

The maximum field information is qualitative. The binary outcome of the analysis is categorical and includes several independent variables that are not advisable or fit for OLS regression modeling (Pohlmann & Leitner, 2003). Despite not being the most appropriate method, the OLS model was developed to validate the robustness and crosscheck the findings of the two models to determine which independent variables were significant (Equation (3)).

$$y=\beta_0+\beta_1 x_1+\cdots+\beta_k x_k+\varepsilon \tag{3}$$

where:

- y represents the dependent variable (making decisions related to community forest management).
- β_0 represents the intercept (constant term).
- β_1 to β_k represent the coefficients for each independent variable (slope term).
- x_1 to x_k represent the independent variables.
- ε is the error term (the difference between the predicted value and the actual value of y).

3. Results

3.1. Descriptive Statistics

Table 2 provides a descriptive summary of socioeconomic parameters. The total number of male and female members from the respective CFMGs interviewed is

Table 2. Descriptive summary on the socioeconomic component of interviewed members.

Region	Name of selected CFMGs	Men (n = 49)	Women (n = 53)	Avg. age	Avg. schooling year	Avg. family size	Avg. annual income
1) Central region	1) Dorjibee CFMG	2	5	47	4	5	Nu. 270429
	2) Gyal-Lyon Khar CFMG	5	3	45	6	3	Nu. 256375
	3) Singey CFMG	5	1	45	3	4	Nu. 235500
2) Eastern region	4) Dozam CFMG	3	3	48	2	3	Nu. 179571
	5) Laptsa Bainaring CFMG	2	5	47	2	3	Nu. 161167
	6) Yakpugang CFMG	2	6	40	0	7	Nu. 186429
3) Southern region	7) Thakhorling CFMG	7	5	40	6	4	Nu. 196833
	8) Lhasoelthang CFMG	4	5	42	6	5	Nu. 147889
	9) Phuensum CFMG	5	5	55	4	5	Nu. 241900
4) Western region	10) Puensum CFMG	5	5	60	1	8	Nu. 140200
	11) Kuenley CFMG	4	5	49	1	3	Nu. 190778
	12) Peljorling CFMG	5	5	43	3	4	Nu. 183000

1 US dollar ~ 80.5 Nu. (Bhutanese currency).

clearly specified by average age, schooling year, size of family, and annual income.

The administrative activities of fund management, organizing meetings and fieldwork, managing data, and exchanging information, as enclosed in Table 3, were assessed and served as indicators of participation.

These activities are vital for the sound functioning of CFMGs, and all CFMGs undertake these activities. Members can share their participation in these activities in any capacity. Ideally, the management committee must bear the responsibilities for these duties; however, non-committee members with experience can assume these responsibilities. The extent to which members participate in these activities is associated with their engagement in decision-making. Participation in any activity is expected to define members' capacity to make decisions regarding forest resource management. For instance, a member managing funds is responsible for informing the group and influencing budgetary spending. The group, functioning as a forest management institution, has its own bylaws to regulate its annual activities to achieve its goal.

The participation results of 49 men and 53 women in administrative activities showed a lower percentage of women participating in various administrative activities than men. Men's participation level was slightly higher, indicating a low level of women participation.

The fieldwork activities of plantation, monitoring, patrolling, and maintenance in Table 4 are a second indicator of member participation in CFMG decision-making. These activities are important and implemented in all CFMGs. Members are engaged in these activities and offer them the opportunity to discuss and make decisions that are important for the functioning of CFMGs.

Table 3. List of CFMG administrative activities and member participation.

CFMG administrative activities	Men (n = 49)		Women (n = 53)	
	% Yes	% No	% Yes	% No
1) Fund management	13.7	34.3	9.8	42.2
2) Organize meeting	21.6	26.5	13.7	38.2
3) Organize fieldwork	22.5	25.5	13.7	38.2
4) Data Management	17.6	30.4	9.8	42.2
5) Messenger	20.6	27.5	14.7	37.3

Table 4. List of CFMG fieldwork and member participation.

CFMG fieldwork	Men (n = 49)		Women (n = 53)	
	% Yes	% No	% Yes	% No
1) Plantation	40.2	7.8	45.0	7.0
2) Monitoring and patrolling	34.3	13.7	20.0	32.0
3) Maintenance	36.4	11.9	26.3	25.4

The results in Table 4 show a difference in the proportion of men and women participating in fieldwork; only for plantation, the women's participation percentage is slightly higher than that of the men. Plantation does not involve rigorous discussion, as it is based on existing plantation guidelines and procedures.

Women's participation in both indicator categories projected a lower percentage than did men's overall participation. This would require us to conduct a study to gather information to develop a good understanding of member participation in settings, such as CFMGs.

The preferences for natural resources by men and women participants were recorded, and the results are depicted in Figure 3, which illustrates that 28 men and 7 women prefer timber, while 36 women and 12 men favor firewood as distinctive features. This finding is important for propagating reliable knowledge of user preferences to support strategic management that includes gender-inclusive plans and programs. Shanley and Gaia (2001) have distinguished between the differences in the knowledge of forest resources and their utilization by women and men, shaping how they can access, harvest, and use forest resources.

3.2. Regression Results

The results of the three regression models are summarized in Table 5. The independent variable's co-efficient and average marginal effect (ME) value against the dependent variable are used to estimate the significance level and model robustness. Gender, breadwinner, household decision maker, employment period, and CFMG committee are predicted to be significant variables, as they are expected to influence member participation in decision-making.

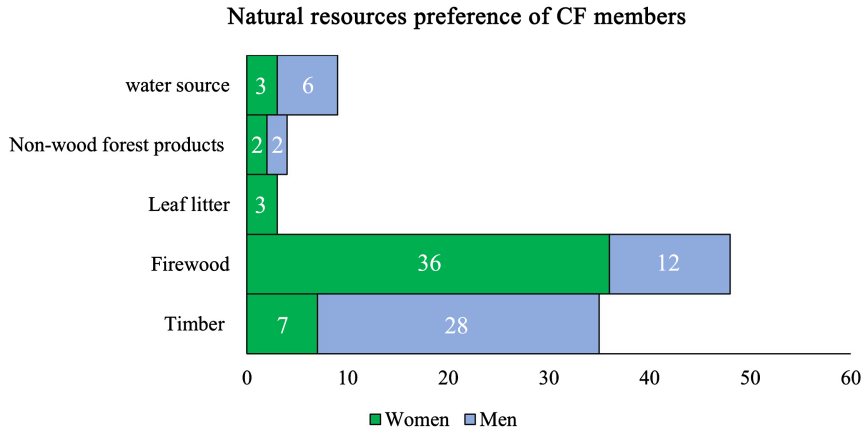

Figure 3. Natural resource preference status.

Table 5. Result summary of regression models.

Independent Variables	Model 1: MMLR		Model 2: BLR		Model 3: OLS	
	Coeff. (*p*)	Avg. ME (*p*)	Coeff. (*p*)	Avg. ME (*p*)	Coeff. (*p*)	Avg. ME (*p*)
Gender*	−2.062** (0.011)	−0.228 (−0.395)	−1.848** (0.015)	−0.277 (−0.499)	−0.245** (0.018)	−0.245 (−0.445)
Breadwinner*	1.372** (0.03)	0.152 (0.026)	1.214** (0.037)	0.197 (0.003)	0.182* (0.042)	0.182 (0.009)
Education	−0.079 (0.275)	−0.009 (−0.024)	−0.106 (0.107)	−0.016 (−0.035)	−0.01 (0.263)	−0.010 (−0.028)
Household decision maker*	1.909** (0.016)	0.211 (0.053)	1.69** (0.019)	0.273 (0.036)	0.223** (0.012)	0.223 (0.052)
Family size	−0.049 (0.596)	−0.005 (−0.025)	−0.008 (0.925)	−0.001 (−0.026)	−0.005 (0.729)	−0.005 (−0.030)
Employment period*	−0.206* (0.05)	−0.023 (−0.044)	−0.179* (0.075)	−0.027 (−0.056)	−0.023* (0.055)	−0.023 (−0.047)
CFMG training	−0.97 (0.188)	−0.107 (−0.264)	−0.822 (0.233)	−0.135 (−0.379)	−0.153* (0.039)	−0.153 (−0.327)
CFMG committee*	2.213*** (0.01)	0.245 (0.064)	1.868** (0.015)	0.246 (0.082)	0.188** (0.015)	0.188 (0.012)

Coefficient and average marginal effects with *p*-value in parenthesis (at *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$ significance level) refer to the annexure **Tables A1-A3**; the results of three regression models.

All the three models have predicted gender as a significant variable, with women "unlikely" to participate in decision-making by 22.8% (MMLR), 27.7% (BLR), and 24.5% (OLS) at the 5% significance level.

The likelihood of the breadwinner to influence member participation in decision-making is estimated at 15.2% (MMLR), 19.7% (BLR), and 18.2% (OLS) at 5% - 10% significance level. Similarly, other significant variables of household

decision-maker and CFMG committee are likely to have a positive influence on the CFMG decision-making process while employment period has a negative influence.

Education, family size, and CFMG training are not statistically significant, although they were expected to influence member participation.

Notably, MMLR examined the effect of region on member participation in CFMG decision-making based on ICC values and the results indicate that CFMG member participation across regions is similar and demonstrates homogenous CFMGs across regions. The MMLR model results are comparable to those of the BLR and OLS. Independent variables that were found to have a positive/negative significant influence in the MMLR were also found to be positively/negatively significant in the BLR and OLS models. The overall robustness of all three models remains strong.

4. Discussion

Owing to the country's prolonged isolation and rich traditional norms, Bhutanese communities are closely associated with the forest, which is crucial for livelihood sustenance, and even today, people rely on it extensively for various purposes (Webb & Dorji, 2004). Conventional forest management systems integrate scientific strategies, skills, and expertise to ensure effective management in Bhutan (Dhital, 1997). India and Nepal pioneered PFM in the early 1990s (Agarwal, 2001). Its emergence underscores that women in rural areas rely on the forest to collect resources important for household sustenance, and that including women in decision-making enhances forest conservation and sustainability though concerns regarding the capacity of local communities, practice of good governance, and women's participation in decision-making ascended (Agarwal, 2001, 2009; McDougall et al., 2013; Tyagi & Das, 2017; Leone, 2019; Kahsay et al., 2021). Similarly, in Bhutan, its first CFMG was established in 1997 and numerous case studies have shown the benefits of CF programs for local communities (Moktan, 2010; Rahut et al., 2015); nonetheless, women's participation in decision-making has neither received sufficient acknowledgement nor research attention (Rajput, 2019). Accordingly, this research aimed at providing valuable insights into member participation in CFMG decision-making, in addition to the factors influencing the participation (Dolisca et al., 2006; Coulibaly-Lingani et al., 2011), and underscored the significant yet undervalued role of women in the sustainable management of forest resources, echoing broader themes of gender, participatory governance, and sustainable development.

Drawing on participatory governance theory, our analysis highlighted the importance of equitable participation in natural resource management for enhancing environmental conservation and gender inclusive management practices. Despite the principle of inclusivity, the assessment of both administrative activity and fieldwork indicators suggested a lower involvement of women than their male counterparts (**Table 3** and **Table 4**). Nevertheless, women's participation in plantations being slightly higher than men's participation could mean

that women preferred participating in activities requiring a less intense discussion. This study hypothesizes that women are unable to participate in CFMG decision-making because they are inadequately engaged in sustainable forest management (Sarker & Das, 2002; Priyadarshini, 2014; RECOFTC, 2015). The result of the above assessment supports this hypothesis.

Member participation in CFMG decision-making is homogeneous in nature and indicates the absence of variation across the four regions, as demonstrated by the MMLR analysis with small ICC value. This could be attributed to the fact that CFMGs have been established using the same guidelines and have received technical backstopping and funding support from the Department of Forests and Park Services.

The regression models also examined the factors influencing member participation in decision-making. Gender, breadwinner status, household decision-maker, employment period, and management committee were significant variables with a certain likelihood of influencing decision-making (**Table 5**).

Among them, the most important significant factor is gender. Its likelihoods of women not participating in the decision-making were estimated at 22.8%, 27.7%, and 24.5% in the MMLR, BLR, and OLS models, respectively. This finding is consistent with those of Agarwal (2001, 2009), Dolisca et al. (2006), Coulibaly-Lingani et al. (2011), Coleman & Mwangi (2013), Leone (2019), and Kahsay et al. (2021). According to them, women's participation in decision-making is deemed important, but is often excluded due to societal norms restricting their involvement unless they hold positions in decision-making bodies. The exclusion of women from decision-making bodies leads to inequalities in the distribution of costs and benefits, biased functional inefficiencies, inconsistent communication, inaccurate assessment of resource depletion, and the non-incorporation of women-specific plant knowledge and preference (Agarwal, 2009; United Nations, 2020; Bocci & Mishra, 2021). Similarly, Agarwal (2001) recognizes that women in rural communities in Nepal and India have significantly contributed to managing and protecting natural resources when they are adequately engaged in decision-making and have the power to bargain. Gender-inclusive community forest management can develop better rules of extraction and protection norms that are more acceptable and minimize violations by communities (Agarwal, 2000; Kahsay et al., 2021) highlight that the management outcome of forest user groups in Ethiopia is not robust when there is a lack of women's participation in formal decision-making. In Bhutan, efforts to promote women's participation at the community level are being initiated (Moktan, 2010). To strengthen women's participation in forest management, the existing provision of appointing at least one woman to the management committee should be made as a policy to encourage women's participation.

Other significant factors such as breadwinners are assumed to be opportunistic and make the best use of available opportunities to enhance and secure their livelihoods (Rahut et al., 2015). At the same time, members responsible for making household decisions have a higher chance of influencing the decision-making

process. Management committee members, as anticipated, influenced CFMG decision-making and were a significant variable. It could offer opportunities to address and negotiate issues relevant to women in the group through discussions, use their knowledge of plant species and extraction methods, and achieve sound cooperation among women (Agarwal, 2009; Bocci & Mishra, 2021).

5. Conclusion

Notably, PFM was initiated across many developing countries in the 1990s, and the CFMGs formulated specifically for Bhutan involved the transfer of forest area and its resources to the local communities guided by the plan prepared by the groups assisted by forest officials. Communities that have a certain authority to manage forests and utilize resources may not necessarily uphold women's engagement in CFMG-related decision-making. There is a lack of knowledge on how women associate their dependency on forest with sustenance.

This study offers an overview of CFMG members' participation in various management activities in Bhutan, covering 12 CFMG study sites and 102 member interviews with a wide range of forest management experience. The result of administrative activity and fieldwork assessments suggested lower overall participation by women than men. Moreover, this study is the first of its kind to focus on member participation in CFMG-related decision-making. The regression models predicted gender as a statistically significant variable, indicating that women's participation in CFMG decision-making was less likely than men's participation.

Overall, this study focuses on the crucial aspects of CFMGs, and its findings present preliminary empirical evidence on women's participation in CFMG decision-making in Bhutan. This study provides valuable information for developing future programs and policies to integrate women into CFMG decision-making and strengthen sustainable forest management. Nonetheless, in-depth investigations and assessments are required to gain insight into how local communities are associated with forests and the roles played by men and women for our future challenges.

Acknowledgements

The authors would like to extend sincere gratitude to Tashi Wangchuk, Tashi Dhendup, Tashi Dorji, Chimi Dorji, Kinley Dorji, Kinley Rabgay, Tenzin Drukgyel, and Sonam Cheoda for providing invaluable support throughout the fieldwork in Bhutan. This study was supported by the Project for Human Resource Development Scholarship by Japanese Grant Aid (JDS) provided by Japan International Cooperation Agency (JICA) 2021-2023.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Annexure

Table A1. Multilevel mixed effects logistic regression result (Model 1).

Independent variables	Coef.	St. Err.	*t*-value	*p*-value	95% Conf. interval		Sig.
Gender	−2.062	0.811	−2.54	0.011	−3.651	−0.473	**
Breadwinner	1.372	0.631	2.17	0.03	0.135	2.609	**
Family size	−0.049	0.092	−0.53	0.596	−0.229	0.132	
Education	−0.079	0.072	−1.09	0.275	−0.22	0.063	
Household decision maker	1.909	0.791	2.41	0.016	0.359	3.459	**
Employment period	−0.206	0.105	−1.96	0.05	−0.412	0	**
CFMG training	−0.97	0.736	−1.32	0.188	−2.412	0.473	
CFMG committee	2.213	0.856	2.59	0.01	0.536	3.891	***
Constant	0.295	1.443	0.20	0.838	−2.533	3.123	
Mean dependent var.		0.706	SD dependent var.			0.458	
Number of obs.		102	Chi-squared			22.593	
Prob. > Chi-squared		0.004	Akaike crit. (AIC)			108.972	

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Table A2. Binary logistic regression result (Model 2).

Independent variables	Coef.	St. Err.	*t*-value	*p*-value	95% Conf. interval		Sig.
Gender	−1.848	0.762	−2.43	0.015	−3.341	−0.356	**
Breadwinner	1.214	0.583	2.08	0.037	0.072	2.355	**
Family size	−0.008	0.083	−0.09	0.925	−0.171	0.156	
Education	−0.106	0.083	−1.61	0.107	−0.236	0.023	
Household decision maker	1.69	0.718	2.35	0.019	0.3283	3.097	**
Employment period	−0.179	0.101	−1.78	0.075	−0.376	0.018	*
CFMG training	−0.822	0.69	−1.19	0.233	−2.174	0.53	
CFMG committee	1.868	0.769	2.43	0.015	0.36	3.376	**
Constant	2.5	1.288	1.94	0.052	−0.024	5.024	*
Mean dependent var.		0.706	SD dependent var.			0.458	
Pseudo r-squared		0.330	No. of obs.			102	
Chi-squared		40.790	Prob > Chi−squared			0.000	
Akaike crit. (AIC)		100.793	Bayesian crit. (BIC)			124.417	

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Table A3. Ordinary least squares result (Model 3).

Independent variables	Coef.	St. Err.	*t*-value	*p*-value	95% Conf. interval		Sig.
Gender	−0.245	0.102	−2.41	0.018	−0.447	−0.043	**
Breadwinner	0.182	0.088	2.07	0.042	0.007	0.357	**
Family size	−0.005	0.013	−1.35	0.729	−0.031	0.021	
Education	−0.01	0.009	−1.13	0.263	−0.028	0.008	
Household decision maker	0.223	0.087	2.56	0.012	0.05	0.396	**
Employment period	−0.023	0.012	−1.94	0.055	−0.047	0.001	*
CFMG training	−0.153	0.088	−2.09	0.039	−0.009	0.022	*
CFMG committee	−0.188	0.09	1.0	0.015	0.36	0.366	**
Constant	0.866	0.161	5.39	0	0.547	1.186	***
Mean dependent var.		0.706	SD dependent var.			0.458	
Pseudo r-squared		0.322	No. of obs.			102	
F-test		5.516	Prob > Chi−squared			0.000	
Akaike crit. (AIC)		107.501	Bayesian crit. (BIC)			131.125	

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.