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DOES THE ACTOR CENTRED POWER INSTITUTION OF COMMUNITY FORESTRY FAVOUR TO NON-POWERFUL ACTOR IN BENEFIT DISTRIBUTION IN NEPAL?

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ABSTRACT: This study collected data from forest user groups from Baglung and examined the distribution rules determining the selection of open periods for the distribution of Community Forestry (CF) products. The regression analysis results showed that there were Powerful actor (Powerful actor referred to rich, and elite caste households for this research) influences on the distribution rules in terms of the open periods of CF for CF product extraction. The open periods for the collection of timber, firewood, and fodder were allocated by the Community Forestry User Groups (CFUGs) where decisions are based on the rational interests of the local Powerful actor. The descriptive analysis showed that when there was a longer CF opening, particularly for the collection of leaf litter, non-powerful actor (Non-powerful actor referred to lower, poor, poorest and disadvantaged households for this study) collected considerably higher amounts of leaf litter than those of powerful actor category households. The regression analysis showed that the relative distribution of timber, firewood and fodder were relatively higher to Powerful actor households than to non-powerful actor households with shorter open periods of the CF. The policy implication from this study is that the policy makers should enable non-powerful actor households to be involved in EC positions that develop the rules that, benefit them.
Key words: local Powerful actor, timber, firewood, fodder, leaf litter, CFUG organisation, non-powerful actor, Powerful actor influences.

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INTRODUCTION

Community forestry in Nepal emerged with the 1978 Forest Act and was based on the participatory principle. It was established by the introduction of Master Plan for the Forestry Sector (MPFS) 1989, the Forest Act 1993, and the Forest Regulations 1995, as an example of Community Based Natural Resource Management (CBNRM). It could be a model of community driven development for the successful implementation of administrative processes, such as constitution, operational plans and Executive Committee (EC) structures for the conservation of natural regeneration of forests [1]. The participatory approach is expected to lead to better designed projects, better targeted group benefits and more equitable benefits delivered with less preference to powerful actors and other rent seeking activities from the CF project [2,3]. However, recent literature suggests that local powerful actor ship in decision-making has still not been become inclusive of the needs and interests of non-powerful actor [4, 5,6, 7]. Moreover, [8] found that there may be trade-offs between rich and non-powerful actor households ensuring benefits' distribution, but the non-powerful actor are far worse off in terms of sharing the benefits from community forestry.

Appropriate rules, regulations and practices for the distribution of forest resources could make a large contribution to resolving poverty-based socio-political instability and enhancing biodiversity conservation and sustainable forest management, in processing and selling forest products and supporting other development vehicles in rural societies [9, 10, 11,12]. In addition, it could also prove to be a potential tool to set up good governance.

Despite the potential of community forests to alleviate poverty, the results have been controversial. Studies show that the CF programme has been successful in increasing forest stocks including conservation and regeneration in Nepal [13, 14, 15]. However, it has not been as successful in alleviating poverty [16, 17] and the share of CF benefits has gone to fewer non-powerful actor households than powerful actor ones (14, 70).

There are two schools of thought regarding what is preventing CF programmes from benefitting the non-powerful actor and successfully alleviating poverty. One school argues that central government policies might have constrained the use of forests under CF in a way that limits the pool of benefits (70, 17). The effect of the government policy constraint has been studied by (17) who found that policy constraints can limit the economic benefits from CF and the ability of non-powerful actor households to meet their basic needs from community forestry.

The other school argues that the CFUG organisation (Institution and organization are the synonymous words for this research.), based on the social structure of Nepal with its traditional caste and wealth structures, can lead to decision-making and forest management by CFUGs that does not meet the needs of non-powerful actor people (33). Consequently, the CFUG organisation has meant that power relationships effectively leave the non-powerful actor out of decision-making (44,34). The forest policy does not dictate how forest users should behave in terms of sharing power (39). However, there is little understanding of how the CFUG based on social structure affects the distribution of community forest benefits to non-powerful actor households.

Previous studies have attempted to understand benefit distribution issues. However, there are many limitations with these studies. For example, (70) studied household level factors determining benefit distribution from community forests, but did not look at institutional problems at the user group level. (45) studied the people participation effect on benefit distribution at the CFUG level, however, the study was based on only one user group. (26) studied institutional characteristics determining benefit distribution of community forests but limited the analysis to charcoal distribution, which is a special case. That study did not cover on how the distribution rules for major products including timber, firewood and fodder, are formulated and influence the distribution. (13) found that elite capture, social disparity, inequitable benefit sharing and exclusion of poor. However, they did not find out the factors that influence the rules of benefit distribution of CF in the way that not favour to non-powerful household.

This study attempts to remedy the deficiencies in previous studies by examining the CFUG organisational arrangement based on **s**ocial structure and how this affects the formulation of the rules, regulations and practices for benefit sharing from community forests**.** In particular, the aim of this research is to address the following research question and hypotheses.

Research question and hypotheses

What are the CFUG institutional flaws that do not favour to the non-powerful actor households in benefit distribution?

The outlined research question will be scrutinized by rational choice theory that will help to develop the conceptual framework to test the following hypotheses.

CF product distribution rules favour the local Powerful actor.

The structure of the EC affects the formulation of rules in a way that impacts on CF benefit distribution to the non-powerful actor.

The conceptual framework and the theories required to examine these hypotheses are explained in the next section.

Conceptual framework

Rational choice theory is a social physics that explain human behaviour to take decisions for the welfare of a community through institutions for the distribution of economic resources (38). A pioneer psychologist George Homans, who established rational choice theory in 1961, set out a basic framework on the assumptions of human behaviour (57). The fundamental theorems of rational choice theory are based on subjective probability, expected utility, welfare economics, asset pricing and resources allocation (71,72) The rules used in rational choice theory, particularly for collective action in Community Based Natural Resources Management (CBNRM)to change the day-to-day operational rules related to appropriation, affects whether an institutional change, favoured by some and opposed by others, will occur. For any collective-choice rule, such as unanimity, majority, ruling Powerful actor, or one-person rule, there is at least one minimum coalition of appropriators (55). As (73), (74), and (75) explain, rational choice needs other perspectives to help explain why people have the interests they do, how they perceive those interests and the distribution of rules, powers and social roles that determine the preferences and constraints on their actions.

The underlying assumption of the rational choice theory is that an actor, when deciding which course of action to choose among those available in the actor's opportunity set, always will always choose a course of action that best satisfies the interests of the actor (76). (77) explain that rational choice models do have a role in sociology in terms of explaining which action is picked from the feasible set. One could for example, use this model to maximize their expected utility.

It explains much of this behaviour in terms of rational choice. First, it is time efficient to follow norms, so that rational choice could well end up by recommending the use of norms. Secondly, it is possible that norms are beneficial to particular users.

Thirdly, it is possible that norms are better for motivating humans since emotions may be stronger than reason (so that unconditional rules prevent a slippery slope development of conditional statements about net benefits). Thus rational choice theory provides a conceptual with which to address research question and benefit distribution rules and its allocation obtained from community forestry. The conceptual framework developed to analyse research question and analytical hypotheses is as follows:

		Power Structure	
		Powerful Actor	Non-powerful actor
Power status of stakeholders	Powerful actor	Powerful actor has an interest in a high outcome (HIDO +1)	Powerful actor has no interest in a specific outcome (PIDO 0)
	Non-powerful actor	EC structure A	EC structure B

Figure 1 Conceptual model of Actor- centred power in CFUGs (Source: Adapted: 37)

Assumptions of the model

The major assumptions of the conceptual model of the rules of benefit distribution through the CFUGs (Figure 1) are as follows. First, in a community where the EC is structured by the higher proportion of Powerful actor households, powerful actor has an interest in a high outcome (HIDO +1) one would expect to the powerful actor dominating the EC (Structure A); this would be reflected in the rules of distribution favouring the Powerful actor. Second, in a community where the EC is structured with the mixture of powerful and non-powerful actors on the basis of a higher participation of non-powerful actor, or where the EC has a large proportion non-powerful actor, one would expect to find only the non-powerful actor dominating the EC (Structure B), and this would be reflected in the rules of distribution favouring the non-powerful actor. Finally, it is also assumed that when the powerful actor has no interest in a specific outcome (PIDO 0) then also it would also be reflected in the rules of distribution that favour to the non-powerful actor households.

Empirical framework

An empirical model is designed to show how the rules of benefit distribution flowing from the CF and formulated by the CFUG (Figure 2) are explained. All components in Figure 2 are equally important for the benefit distribution obtained from community forestry. If any component does not function properly the benefit distribution flow from the CF will be inequitable and unbalanced. A brief description of each component, correlated with the benefit distribution rules, regulations and practices, is explained in the next section.

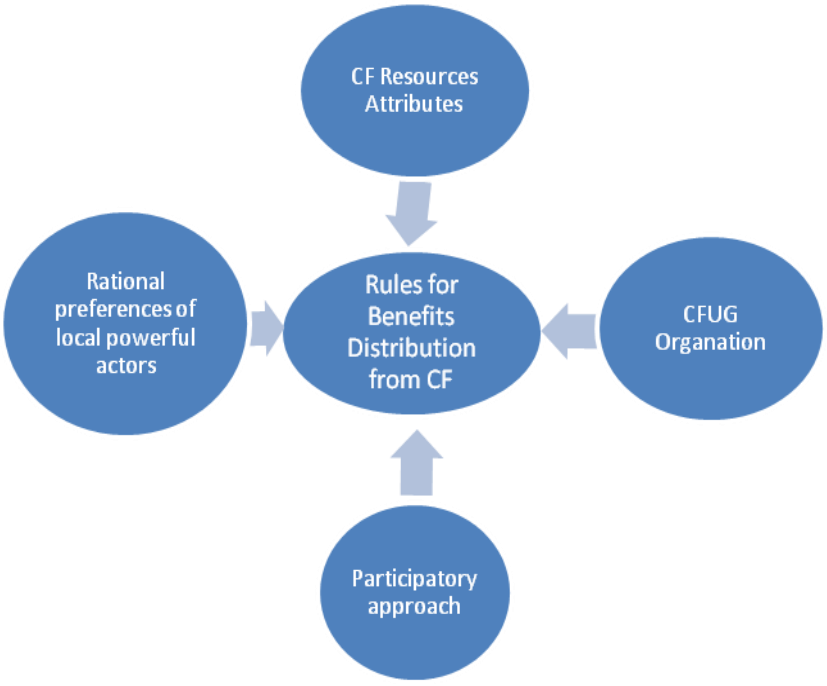

Figure-2: Conceptual framework of the formulation of rules and benefit distribution from CF

Rules for the Benefit distribution

The quantity of CF products distributed is determined by certain rules, regulations and practices of the institution that are formulated and implemented by the decision makers of the CFUG. Formal and informal resource management and the distribution of benefit rules have been found to be crucial for decision-making collective action (27, 78, 5). The CFUG organisation (the executive committee, EC) forms these rules and regulations as well as the practices of resource distribution. It is hypothesised that the Powerful actor have formulated CFUG rules, regulations, norms and practices to maximise their benefits from CF. (66) and (67) found that there was a lower level of satisfaction with benefit distributed from CF in small and landless non powerful households. They argued that forest product distribution rules/systems do not meet their needs and they lack participation in the decision-making processes. Hence, the dependent variables are the rules for the relative distribution of CF products guided by community structure. Other factors, including forest type, forest crown cover and forest area, also play substantial roles in the formulation of benefit distribution rules. However, these factors are less important than the social structure of the community in the formulation of rules, regulations and practices for the benefit distributions from CF.

CFUG Organisations

The CFUG structures and the benefit distribution perspective include the importance of local institutions for the determination of institutional development and benefit distribution. After the massive deforestation in tropical countries and the collapse of the Californian sardine fishery and other ocean fisheries, a scholarly consensus emerged that successful local level organization of stakeholders is necessary to resolve problems and to derive management plans for Common Property Regimes (55,80). 'Institution' refers to groups of people, players and similar interest groups of people who come together for a common goal and purpose to achieve specific objectives (37,24).

Community-based management of forests, in the form of conventional or indigenous systems, has a long history in Nepal (20,29, 30, 49). This institution is known by various names according to region. For example, the *Kipat* system of forest management was well established in eastern Nepal particularly in the Koshi Hills (35). Similarly, in the west, the *Talukdar and Jimbal Mukhiya* systems of forest control were recognized, particularly in the *Dhaulagiri* zone (29). The *Birtabal* and *Raikar* systems were well known in the Terai region of Nepal (50).

Participatory approach

The concept of the participatory approach emerged towards the end of the 1980s with the notion of *Participatory Development* or *Participation in Development*. The major development agencies, like the Food and Agriculture Organisation (FAO), World Bank, United Nation Children's Fund (UNICEF) and other international development agencies, "all have 'latched on' to the concept of *participatory development* and have begun to see it as an antidote to the woes which befall their development programmes" (54 p7). Participation is perceived as a key indicator of a socially healthy, engaged, and equal society (79). In contemporary rural development, participation has provided an emphasis on the capacity building of rural people based on community-based initiatives and partnerships (54). People's participation involves empowerment of rural people for the contribution to and sharing of benefits from the development activities through local organisations such as forest user groups, co-operatives, farmers' associations, irrigation management committees, drinking water committees, and health committees (53,58). (54 p8) advocated participation regarding rural development as follows:

> "Participation includes people's involvement suggested in the key stages in the participation processes, decision-making, implementation programmes and sharing in the benefits for the development programmes, and the involvement in efforts to evaluate such programmes."

Collectively, the above statement emphasizes a new paradigm of community participation to employ rural people, including the non-powerful actor and underprivileged groups, in a dialogue about power, inequality and oppression. The priorities and actions are decided by local people rather than outsiders, which empowers them for collective decision-making (23).

CF Resource Attributes

The CF attributes are reflected in forest type, forest area and crown cover class. It is expected that large areas of CF per household provide more yield than small areas. (80) found that per household large areas of CF provided greater yield and had flexible extraction rules and practices for CF products. Similarly, broadleaf forest provides more firewood than conifer forest. It is believed that non-powerful actor households are likely to maximise their benefit with a mixed forest or broadleaf forests rather than conifer forests because the conifer forests areas are acidic and there is little chance to grow broadleaf fodder species and lawn grass that are very important commodities for non-powerful actor households (32).

Rational Preference of Powerful actors

According to the most influential theory of human behaviour the self-interest of powerful actor plays own confirmation towards people's actions and opinions to lead decisions to achieve material self-interest than they do (72). According to the most influential theory of human behaviour the self-interest of powerful actor plays own confirmation towards people's actions and opinions to lead decisions to achieve material self-interest than they do. Moreover, explanatory power of self-interest has focused on logical dialogs to achieve goods and material (28).

As permitted by the MPFS 1989, Forest Act 1993 and Forest Regulations 1995, the CFUG, built by local Powerful actor, is able to use all CF products from its forest. The CFUG powerful actors have authority to distribute CF products both inside and outside the community and to sell in markets. They are able to manage how the forest is to be used and change the rules, regulations and practices for managing the CF. In the middle hill of Nepal, where the community forestry programme has been widely spread, rural people, particularly the disadvantaged (non-powerful actor) segments of Nepalese society, began to rely on the forest to a greater extent for their livelihood. The significant problem of benefit distribution on equitable basis, particularly for disadvantaged households, has emerged nationwide. The local Powerful actor, who formulated the rules, conduct the CFUG and distribute CF products on their rational preferences and interests (59, 60,64,80). Disadvantaged households have been excluded from the formation of the rules and regulations because they have very less opportunity to participate as an EC member of the CFUG that plays a crucial role in decision-making and CF benefit distribution (69). The question is how the CFUG organisation can most efficiently and fairly distribute the CF products to non-powerful actor households. How can the CFUG be changed from the rational preference-based decisions of the Powerful actor who used to lead the "tragedy of the commons" (81) in terms of CF resources and how can the exclusion of disadvantaged members from decision-making for benefit distribution be avoided (46, 36).

The CFUG (The CFUG is understood as rules, regulation and practices that coordinate social relationship help balance behaviours and solve the assurance problems of Powerful actor influences in decision-making and benefit distributions.) is one of the most influential and empirically powerful actor attempts to address these questions. The primary conception of this approach is that the CF users have the ability to craft the CFUG organisation in terms of the formulation of rules and building of the organisation that governs the decision-making and distribute of CF benefits. It is assumed that the conceptual framework (Figure 1) was designed to address the hypothesis and questions in the methods section.

Reason for selection of Research Site

The *Baglung* district is one of the middle hill districts of Nepal where the community forestry programme has been conducted since 1990. This district is considered to be a very active district among the mid hills districts, particularly in the management of CF. Also, the existing species composition of the forest in *Baglung* is similar to the mid hills throughout Nepal. The Nepal UK Community Forestry Programmes (NUCFP) conducted by the Department for International Development (DFID), UK, has supported the development of CF since 1991. Currently, it is conducted by the Livelihood and Forestry Programme (LFP). The main contribution of the programme has been to support the District Forest Office (DFO) in strengthening and developing the institutional buildings, including developing a database of CFUGs regarding CF. Hence, relevant secondary data are easily available from the CFUGs and district forest office records. In addition, many studies have been conducted on other aspects of CF management, particularly for the pro-non-powerful actor programme to raise the livelihoods of non-powerful actor households through CF, which is new in other regions of the country. The district headquarters are easily approachable and a wide range of CFUGs are available for study.

One of the objectives of this research was to study the effect of social structure on benefit distribution from CF. As stated previously, Nepal is a country of diverse social structures particularly in religion, culture and ethnicity, and *Baglung* itself is also diverse in religion, culture, ethnicity, altitude and temperature, like other mid hills and mountainous districts in Nepal. Hinduism and Buddhism are the major religions. *Brahmin, Chhetry, Newar, Magar, Gurung, Chhantyal* and *Thakali* are the main ethnic groups in a population of 268,938 (82). Hence, the district represents a typical hill region of the country so that the findings could be applied widely to other hill and mountain districts of Nepal.

Data and methods

Baglung district, situated in the middle hills physiographic zone of Nepal, was selected for the study. A random selection of 31 CFUGs was done based on the information from the District Forest office, and the District Level Community Forestry User Group Federation (FECOFUN) of Baglung. The data were collected using structured questionnaires from two groups, current executive committee members of CFUGs and heads of the households of non-executive CFUG members. With the assistance of the CFUG executive, the household sample was divided into four income groups, non-powerful actor (poor, poorest) Powerful actor (medium, and rich) household income groups. Generally, these household groups also represent the different ethnic groups and castes.

The open period for distribution of CF products is the dependent variable. The hypothesis is that, if there are non-powerful actor on the EC, the open period will be longer. The independent variables included for the study of the distribution rules are forest type, CF area per household, forest crown cover classes, relative proportion of EC positions by the non-powerful actor. This relationship is shown in equation 1:

Number of days of opening CF $=f$ (Relative proportion of EC positions held by non-powerful actor and disadvantaged, forest type, forest crown cover classes, forest area per household). 1

In this model, the hypothesis is that CF product distribution rules have been developed in a way that reflects the composition of the EC. Three regression models are used based on the number of days the community forest is open for harvesting and distribution of timber, firewood and fodder. This relationship is shown in Equation 2:

$$Y_i^z = \beta_0^z \sum_{j=1}^{n} + \beta_{ij}^z X_{ij}^z + e^z \qquad 2$$

Where Y_i^z represents the number of open days for the distribution of timber, firewood and fodder per year for the CFUG; j = timber, firewood, and fodder; X_{ij} represents the j^{th}explanatory variable for the ith CFUG; and the error term is e^z.

Discrete Choice Ordered (Ordered Logit model) regression is preferable because the dependent variable is open period and the responses assume discrete values of 0, 1, 2 or 3. The model is estimated using the maximum likelihood estimation and the log likelihood function for observed choices (31, 62). Independent variables are discussed below.

Findings

The results are presented in the descriptive and econometric analysis. The descriptive results are explained in the next section.

Descriptive results

In this study, the descriptive statistics are used to explain the basic features of the data. The data are virtually quantitative measures and samples of data in the form of summaries and tables.

Representation of wellbeing household in CFUGs and on ECs

The average household wellbeing of the 31 CFUGs is presented in Figure 2. On average, Powerful actor (rich households were 22% medium 43%) non-powerful actor (poor 28% and poorest 9%) in the CFUGs of the surveyed area. There were 37% of households in the non-powerful actor categories represented by a large proportion of the CFUGs. National data show that these categories of household wellbeing are 41.8% (83). Thus there is a lower percentage of non-powerful actor households in surveyed area than nationally.

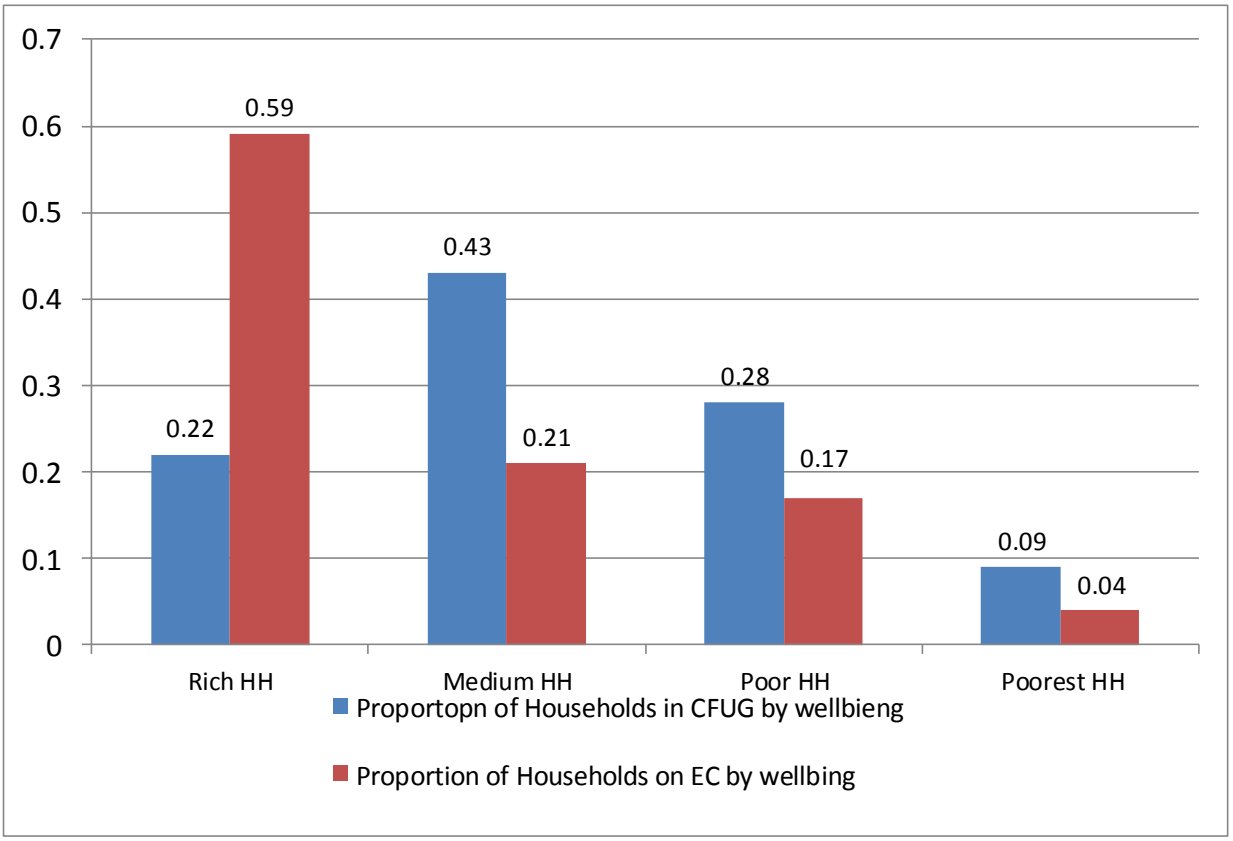

Figure-2: Average proportion of households by powerful and non-powerful actor household on CFUG and EC in 31 CFUGs in the sampled area

The average percentages of households represented on the EC from the categories were: Powerful actor (rich 59%, medium 21%), non-powerful actor (poor17% and poorest 4%). This result indicates that rich households were considerably over represented on the ECs of CFUGs compared with their representation in the communities. The non-powerful actor households were under represented on the ECs of the CFUGs.

The relative distribution

The relative distribution CF product was calculated by the open periods for the wellbeing household category. In each CFUG, 10 households were surveyed. The average distribution of firewood, timber and fodder to the 10 households was calculated, the distribution to each household was then divided by the average of the 10 households. After this, the relative amount was derived for each household actor category (rich, medium, poor and poorest) in each CFUG. The relative distribution was analysed to see whether the average relative distribution was less than or greater than 1. If the relative distribution is 1, it means that the household gets an average (good distribution), if it is more than 1, then it means that the household gets over the average (over distribution), and if it is less than 1 it means that the household gets less than the average (low distribution).

Relative Distribution of CF Products by Wellbeing Category and Open Period

The households were separated into four wellbeing categories: Powerful actor households (rich, medium), non-powerful actor household (poor and poorest). As discussed earlier, the wellbeing category was locally determined on the basis of landholding, off-farm income, food sufficiency and social status within each household, such as membership in a local NGO. The relative distribution of CF products by wellbeing category with open periods is presented in Table 1.

Table-1: The relative distribution of CF products and wellbeing category by open period in community forests

Category of open period	Number of households (CFUGs)	Rich households	Medium households	Poor households	Poorest households
		Firewood per household			
<7 days	50 (6)	1.81	1.25	0.52	0.41
>7days to 1.5 months	60 (6)	1.41	1.15	0.93	0.51
>1.5 to 3 months	60 (5)	1.37	1.11	0.96	0.56
>3 to 6 months	80 (8)	1.39	1.11	0.71	0.78
>6 months	60 (6)	1.31	1.08	0.82	0.79
		Fodder per household			
<7 days	50 (6)	1.67	1.36	0.54	0.42
>7days to 1.5 months	60 (6)	1.42	1.12	0.93	0.54
>1.5 to 3 months	60 (5)	1.48	1.15	0.86	0.51
>3 to 6 months	80 (8)	1.32	1.11	0.98	0.58
>6 months	60 (6)	1.09	1.02	1.12	0.78
		Timber per household			
<7 days	50 (6)	2.17	1.15	0.48	0.21
>7days to 1.5 months	60 (6)	2.13	1.03	0.52	0.32
>1.5 to 3 months	60 (5)	2.05	0.97	0.62	0.36
>3 to 6 months	80 (8)	1.89	0.88	0.74	0.48
>6 months	60 (6)	1.77	0.71	0.81	0.71
		Leaf litter per household			
<7 days					
>7days to 1.5 months	70 (8)	0.41	0.38	1.45	1.77
>1.5 to 3 months	60 (5)	0.38	0.36	1.48	1.79
>3 to 6 months	120 (12)	0.35	0.31	1.52	1.83
>6 months	60 (6)	0.31	0.25	1.61	1.84

There was variation in the relative amount of firewood distributed between the powerful and non-powerful household categories for open periods. Considerably higher relative amounts of firewood, fodder, leaf litter and timber were distributed to the rich and medium households than to the non-powerful actor households. The non-powerful actor households collected a relatively higher amount of firewood, fodder, leaf litter and timber when the open periods of the CF increased. This could be because the rich households had an adequate labour force and could afford the wages for labour in a short open period. Hence, the rich and medium households gained relatively more from shorter extraction periods. In many cases, the non-powerful actor may not be able to use the shorter time provided to them for harvesting and extraction because they are short of labour.

CFUGs do not usually have fixed open periods for the use of leaf litter, which does not have a market value except as thatching material for houses and bedding material for livestock. Most CFUGs in the surveyed area allowed free collection of grass and leaf litter. Table1 shows that rich and medium wellbeing households collected considerably lower relative amounts of leaf litter than the non-powerful actor households.

The reason for this could be that the CF was open longer for collecting leaf litter than for timber, firewood and fodder and also the non-powerful actor households could collect leaf litter in free of cost and powerful actor household has no interest in specific outcomes (PIDO 0) particularly in leaf litter whereas could be an interest in a high outcomes specific interest (HIDO+1) in timber, firewood and fodder as assumed in Figure 1.

It is concluded that non-powerful actor households collect relatively more CF products when the collection period is increased. The possible reason could be a labour constraint for the collection and extraction period for the non-powerful actor households. Why is there a shorter collection period? One reason could be that the rich and Powerful actor households dominate the EC and powerful actor household has no interest in specific outcomes (PIDO 0) about the impact of the decreased collection periods. Therefore, further analysis is required to examine the impact of the relative distribution of CF products relative to the open period length by regression. The definition and description of the variables chosen for the regression analysis are explained in Table 2.

Table-2: Definitions and descriptions of variables used in the econometric regression analysis of 31 CFUGs

Dependent Variables	**Descriptions of variables**
No. of opening days of the community forest for firewood collection	Household member collecting firewood (Bhari) from community forest in a year
No. of opening days of the community forest for timber collection	Household member collecting timber (cft) from community forest in a year
No. of opening days of the community forest for fodder	Household member collecting fodder (Bhari) from community forest in a year
Independent Variables	
BRDLEAF	Dummy variable: if forest type of community forestry broadleaf 1, otherwise 0
CNOVER70	Dummy variable: if above 70% forest crown cover 1, otherwise 0
FAREAHH	Community forestry area in hectares
PRRMEDHH	Dummy variable: if proportion of rich medium households in a CFUG 1, otherwise 0
PRSRMEC	Dummy variable: if proportion of relative sharing of rich medium household on EC position 1, otherwise 0
PRPPSTHH	Dummy variable: if proportion of non-powerful actor(poor and poorest) households in a CFUG 1, otherwise 0
RSPPRTEC	Dummy variable: if relative sharing of proportion of non-powerful actor (poor and poorest) household on EC 1, otherwise 0
PRPFHH	Dummy variable: if proportion of Powerful actor households in the CFUG 1, otherwise 0
PRSDCHEC	Dummy variable: if proportion of relative sharing of disadvantaged household, on EC 1, otherwise 0

Findings of regression analysis

Regression analysis was conducted to examine the factors that determine the length of the open period. The dependent variable is the open period, which could assume only four discrete values 0, 1, 2, or 3 that correspond to the open periods for timber, firewood and fodder, respectively. Under this condition, the discrete choice ordered probability regression model (ordered logistic model) is the best model to analyse the problem (19, 47, 48). The LIMDEP econometric programme was used to analyse the model (31, 62). Multicollinearity among the explanatory variables was tested before running the model. As discussed earlier, there are three major products: (a) timber (b) firewood (c) fodder and grass. For each dependent variable, the explanatory variables were loaded into the discrete choice ordered probability regression model. As explained by (19) and (41), with a linear term, the least explanatory variables were deleted in a step by step process until the model was stable. Thus, the variable deletion creates a stable (restricted) model.

Factors determining the open periods for timber extraction

The result for the open period for timber is shown in Table 3. The McFadden Pseudo R^2 is 0.21. The R^2 for the discrete choice model at the upper bound is 0.22 (R. Shrestha & Alavalapati 2006). Hence, the R^2 value of 0.21 suggests that the discrete choice ordered model has reasonable explanatory power. The Likelihood Ratio test shows that regression model explains a high percentage of the observed variance (McFadden Pseudo R-squared =0.213. The chi-square value is 12.07778. The log likelihood = -22.28966, the restricted log likelihood -28.32855 and $p< 0.01$). The explanatory variables of the model have the expected signs.

The result for the open period for firewood distribution, Table 3, shows that the McFadden Pseudo R^2 is 0.49. The log likelihood function is =-12.71474, and the restricted log likelihood function is -23.80177. The F-statistic value for the log likelihood ratio test for firewood extraction = p<.00113. Chi-square Prob = 22.17406. The explanatory variables of the ordered model have expected signs.

The result for the open period for Fodder, Table 3, shows that the McFadden Pseudo R^2 for the open period of CF for extracting fodder and grass is 0.39. The model significance level is p<.00022. The log likelihood function is -25.5224 and restricted log likelihood function is -35.2603 with a chi- Square 19.4758.

Table-3: Ordered logistic regression results showing determination of open period for firewood, timber and fodder distribution for 31 CFUGs in Nepal

Variables	Firewood		Timber		Fodder	
	Coefficient	Std Error	Coefficient	Std Error	Coefficient	Std Error
CONSTANT	3.5476**	1.3585	-1.3612**	1.3234	3.2246**	1.2003
AREAHH	2.6973***	.02061	2.2429***	.2013		
CONIFER	-2.1327***	.0614				
BROADLF			2.5871***	.0873	2.7320***	.4644
NASSMEET	2.8478***	.0560			2.7320***	.1817
RSPPRTEC	2.8657***	.1093	-.02188***	.0213	2.0703***	.0642
ASSOP	2.0458***	1.358	0.1845**	1.3231	2.5882***	.5471
Note: ***, **, * = Significance at 1%, 5%, 10% level	McFadden Pseudo R^2 =0.21,		McFadden Pseudo$R^2$0.49		McFadden PseudoR^2 =0.39,	

Open Period for Firewood Extraction

The area of CF per household (AREAHH) is statistically and positively significant at the 1% level. The greater per household area of CF, the greater the open days for fire wood extraction. (52) found that a 5.66% higher yield in the large area than from a small area when they applied equal four scenario treatments under Intensive Forest Management (IFM) in Sweden. Similarly, (25)) found that a large area of forest was one of the factors for a farmer's willingness to obtain mortgage loans from the bank. They argued that if there is larger area of forest it could provide a greater yield and with longer open days it enabled them (farmers) to pay their mortgage after selling the larger amount of forest products.

Conifer forest (FCONIFER) is negative and statistically significant at the 1% level. With conifer forest, the open periods for extraction of firewood were shorter. The possible reason is that firewood of pine is considered to be a bad smoke producer for using for domestic purposes in the hills in Nepal. This indicates that conifer forests are not so useful; broadleaf forest provides a much better quality firewood than conifer. This result is similar to those of (63), (18), and (68) who found that conifer forests are opened for shorter periods than broadleaf. They argued that the juvenile conifer forest such as*Pinus roxberghii* and *Pinus patula* are less suitable for firewood, particularly because those species produce bad smoke for cooking, than broadleaf and hence have shorter open periods.

The number of assembly meetings (NASSMEET) is positively and statistically significant at the 1% level. The greater the number of assembly meetings the longer the open periods for firewood extraction from the CF. This illustrated one of the major arguments advanced by mass movement theories that involving all user households frequently in a number of assembly meetings resulted in better decisions (22, 12) that favour the extraction of more firewood than when there are fewer assemblies with higher representation of powerful actors. As a consequence, CF is open for longer periods.

Relative share of EC positions by poor and poorest actor households (RSPPSTEC) is positive and statistically significant at the 1% level. As the proportion of the non-powerful actor (poor and poorest) households on the EC increased, the open period for firewood collection increased. This agrees with the hypothesized relationship. The non-powerful actor households have no large private landholdings as do powerful households.

This result is similar to those of (6), (38), (65), and (18) who found that non-powerful actor households could not collect firewood in a short time because their needs differed from powerful actor households. Hence, they depended on CF to collect firewood. That, in turn, leads them to decide in EC meetings to fix a longer open period.

Assembly meeting involvement in the preparation of the operation plan (ASSOP) is positively and statistically significant at the 1% level. The positive sign indicates that the greater the involvement of households in the preparation of OP in assembly meetings, the longer are the open periods of CF that in turn means a greater amount of firewood collected from the CF. The greater households' involvement in the preparation of the OP, the better the opportunity to develop an OP that could increase the amount of firewood. It is assumed that greater households' involvement means greater numbers of non-powerful actors are represented in decision-making that influence the meeting in the way that favour to the non-powerful actors.

This result is similar to that of (3) in their work on Community Based Driven Development (CBDD) for joint forest management in India. (42) found there was an improved benefit from CF in Nepal. They argued that the involvement of a large number of people in decision-making could favour the non-powerful actor, resulting in higher firewood extraction from CF.

Open Period for Timber Extraction

The area of CF per household (AREAHH) is statistically and positively significant at the 1% level. The greater per household area of CF, the longer the open periods of the CF. As expected, the greater the area of the CF, the longer the open periods of CFfor the average quantity of timber extracted compared with small community forest holdings managed by CFUGs. (25) found that a large area of forest was one of the factors for farmers' willingness to obtain mortgage loans from the bank. They argued that if there is large area of forest, it could provide a large yield with a longer open period and it makes it easier for them (farmers) easy to pay their mortgage after selling the larger amount of forest products from the longer period.

Broadleaf forest (BRDLEAF) is positive and statistically significant at the 1 % level. The greater the proportion of broadleaf forest, the longer the open period for the extraction of timber. This indicates that broadleaf forests are more useful since broadleaf forest provides a much better quality of timber. This result is similar to that of (18) and (68), who argued that broadleaf offers longer distribution periods for timber because timber like *Adena cordifolia, Spondius* and oak provide better quality timber and produce a long-lasting close texture grain (43). This is because they have a higher texture content per cord so they last longer period and thus, have a longer open period.

The relative share of EC positions by non-powerful actor (poor, lower caste and disadvantaged) household (RSPPRTEC) is negative and statistically correlated at the 1% level with the open period for the harvesting of timber. As the proportion of non-powerful actor households on the EC increased, the open period of the CF decreased. This indicates that when the non-powerful actor households have the opportunity to make decisions as EC members, they decrease the open period. This is based on the interests of the decision makers because the non-powerful actor EC members do not require large amounts of timber. Hence, as the non-powerful actor households get the opportunity on the EC as decision-makers, they allocate shorter open periods for harvesting timber.

The number of assembly meetings (ASSOP) is positively and statistically significant at the 5% level. This indicates that the greater the number of assembly meetings, longer the open periods of CF for the greater the amount of timber extracted from the CF. The higher the number of assembly meetings the more time for discussion they have, which results in longer open periods for larger amounts of timber to be extracted from the forest. This result is similar to the results of (56) and (12) who argued that a higher number of assembly meetings provided maximum opportunity for users to discuss their timber requirements, which results in longer open periods for timber extraction from the forest.

Open Period for Fodder Extraction

Broadleaf forest (BRDLEAF) is positive and statistically significant at the 1% level. With a broadleaf forest, there will be longer open period of the CF for collecting fodder. The reason could be that users who used fodder perceive broadleaf forest as very useful since it provides better quality palatable fodder and twigs for their ruminants. This supports the hypothesis that broadleaf forests produce multiple products with a longer open period and non-powerful actor households are more likely to benefit in CFUGs with a broadleaf forest. This result is similar to those of (18) and (68) who found that juvenile broadleaf offers fodder like *Artocarpus, Leucaena, Ficus* species, *Cajanus cajan, Sesbania sesban* and *Albizia* and produced a higher amount of palatable fodder in the CF and, in turn, had longer open periods for collecting fodder.

The relative share of non-powerful actor (poor and poorest) households on the EC (RSPPRTEC) is negatively and statistically significant at the 1% level. The greater the relative share of the non-powerful actor households on EC, the shorter the open period for fodder extraction from the CF. The non-powerful actor and households potentially have less livestock that results in less fodder being needed. This result is similar to the findings obtained by (51), (40) (8), (84) who argued that non-powerful actor households, holding less livestock, resulted in less fodder being taken from the CF.

This is the consequence of non-powerful actor households on the EC influencing the decision not in the favour of rich households obtaining larger amounts of fodder with longer open period of CF. They could reflect on the condition of the forest and consider the sustainable use of fodder from the CF.

The number of assembly meetings (NOASMEET) is positively and statistically significant at the 1% level. This indicates that the greater the number of assembly meetings, the longer the open period for amount of fodder extracted from the CF. The higher the number of assembly meetings the more time for discussion they have, which results in a longer open period for fodder extraction from the forest. This result is similar to the result of (12) who argued that a higher number of assembly meetings provided maximum opportunity for users to discuss their fodder requirements, which results in a longer open period of the CF with higher amounts of fodder extracted.

Assembly involvement in the operational plan (ASSOP) is positively and statistically significant at the 1% level. This indicates the greater the proportion of households involved in the preparation of the OP, the longer the open period of CF for a greater volume of fodder produced from the CF. More household involvement in the preparation of the OP, the better the development of the OP that increases the production of fodder. This result is similar to that of (3) who described their work on community forestry management and Community Based Driven Development (CBDD) in India. They argued that the involvement of larger numbers of people in decision-making; provided more emphasis on improving forest conditions for fodder species by a longer open period of CF for increasing household contributions to better management and extraction of trees for fodder.

CONCLUSIONS AND POLICY IMPLICATIONS

This study examined the factors determining the open period for CF product distribution. The descriptive analysis showed that this is an important factor for the non-powerful actor since the relative amount they receive increased as the open period increased.

The results from the regression analysis show that the factors important for the open period for the distribution of timber and firewood are forest type, CF area per household, crown cover class and proportion of non-powerful actor households on the EC. In addition, the open period for firewood distribution was linked to the proportion of non-powerful actor households on the EC and the proportion of disadvantaged households on the EC. For the open period for only fodder and grass distribution, the area of CF per household and forest type were important. In general, it seems that, as the relative participation of non-powerful actor household increases on the EC, the distribution period is likely to favour those households. The findings of both the descriptive and regression analyses support the conceptual model (Figure 1) where the EC was structured on the basis of full participation (higher proportion) of non-powerful actor and lower caste households favoured a longer open period.

Thus, the findings answer the research question: Does the structure of the EC affect the formulation of rules in a way that impacts on CF benefit distribution to the non-powerful actor and disadvantaged? The results show that when the Non-powerful actor households can influence decisions for the formulation of rules, regulations and practices through the EC positions, the rules were favourable to them. It means that powerful actor ship experience provided by external agencies to enable election to the EC and discussion by the non-powerful actor brings fundamental changes in the CFUGs and the effects on the non-powerful actor.

The policy implications are that the thinking, behaviour and approaches of policy makers need to change to place more emphasis on enabling the non-powerful actor and lower caste segments of Nepalese society to be involved in EC positions that have an influence in developing the rules, regulations and practices that, in turn, benefit them.

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