Socio-economic Conditions and Participation in Community Based Forest Resource Management: An Analytical Study from Hills of Nepal

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1. Introduction

Community based natural resource management (CBNRM) has evolved recently as a result of successful implementation of decentralized policy in common pool resources management making people from all walks of life able to share the benefits of the natural resources and their sustainable management. Community participation is the main component in CBNRM, which has also emerged as an important policy of government in Nepal. Government of Nepal has successfully introduced the community based forest resource management institution by implementing Community Forestry Program with the help of different international society through the adoption of Forest Sector Master Plan 1988 and introduction of Forest Act 1993 and Forest Rule 1995. The goal of CBNRM has often been to increase participation of local people in over all management that includes formulation of rules and regulations, program development and implementation, and usage, maintenance and conservation of resources through distribution of the benefits locally to all the stakeholders. It is done through organizing the local resource users of the community. Such organized community is known as Community Forest Users Group (CFUG) and the forest areas are Community Forest (CF). As of December 2005, 14,337 CFUGs that covers 1,647,444 households are managing 1,219,111 ha of CF locally [DoF, 2007].

After more than a decade of implementing the CBNRM policy there is still lots of arguments on nature of participation and distribution of benefits in sustaining the CFUGs. This issue is important for Nepal as many rural communities are highly differentiated and stratified in terms of economic conditions, social status, their

access to forest and dependency on its resources. Apparently, those households that participate more in the CFUG program are the ones that get more benefits from the forest resources and vice versa. However, not much research has been done on these aspects in Nepal. Hence, this research will try to address the issues of socio-economic conditions of the CFUG member households that are related to their participation in community based forest resource management. Thus the key question of this study is; what are the major factors that influence participation of local households in community based forest resource management. To address this question, the study hypothesizes that the participation in community based forest resource management is greater for households that (1) belong to the high social status; upper Hindu caste and with higher education level, (2) enjoy a greater level of economic well being with possessions of more land, labour and other resources, including animal holdings and nonfarm cash income, (3) stay near the CF, and (4) use more resources from the CF.

Examining the hypothesis will help to find out whether present economic and social inequalities have any relations with participation, helping the wealthier and higher social status households gain a greater proportion of the benefit from such programs and understand the nature of participation and its determinants so as to facilitate better policy design that would address the inequalities, encourage participation of deprived groups and ultimately increase their benefit share from the program.

2. Study Areas and Data Collection

The analysis of this study is based on three villages¹⁾

from hill areas of Nepal, in different locations but with similar socio-economic and geographical conditions. Bahun and Chhetri, the upper Hindu caste people are the dominant groups in all the study villages followed by lower occupational caste and indigenous ethnic groups of Tamang, Magar, Nagarkoti and Raute. In the social hierarchy indigenous ethnic groups are categorized in between the upper and the lower castes, although such categorization is at times contested for some indigenous ethnic groups.

Agriculture in integration with livestock is the main occupation of the people in the study villages followed by skilled and non-skilled labouring. Hence, not many households have nonfarm cash income. Average members per household are 5.7 and literacy rate is 56%. Land and livestock holdings per household are minimal, mostly at subsistence level. All the study villages are around two hours drive from the nearest market centres. But, within the study village it may take a day to travel from one side of the village to another side of the same village due to the rugged terrain of the hills. More than 90% of households depend upon the firewood for the daily fuel usage. Homestead areas of the people are within the travel distance of an hour on foot to the CF. All of these information was collected through census surveys of the study villages and the field visits, mainly in 2001 and 2005 with follow ups as per need in between.

There are altogether 16 CFUGs in three study villages. Most of the CFUGs are formed during 1996–1997 with the support from different international donor agencies in coordination with District Forest Office through Community Forestry Program. The member households need to participate in rules and regulation making, program selection, implementation, and maintenance and sustainable use of resource from the beginning of the formation of CFUG. The questionnaire survey conducted to the CFUG members were designed to determine their degree of participation in the program, in terms of participation in formulation of rules and regulations, program selection, program implementation, and maintenance and sustainable use of the resources. The survey covered 82 member

households (nearly 13% of total member households) selected randomly 5 to 6 households from each CFUGs. Key-person interviews were conducted to assess the different forms of participation, rules and regulations, and policy of CFUGs. Besides, historical information on the CFUGs was also collected from key persons.

3. Selection of Variables and Analytical Model

Pervious studies in South Asia on participation on natural resource management have generally examined the socio-economic variables, incentives to the individuals or cost and benefit of participation [B. Adhikari et al. 2004, A. Agrawal and K. Gupta 2005, S. Kant 2000 and S. Kumar 2002]. Such studies highlight more on the economic status of the participating households and economic incentives to relate the participation. This study, in line with the previous studies, also takes consideration of such social and economic status of households as main variables that would influence the participation in community forest resource management programs. Normally, the influencing factors for social and economical status are land and animal holdings, cash income, family size, and education status. In subsistence farming system which most of the villages are following, the cash income is nominal. In study villages, the main sources of cash income are handicraft making, day labouring, teaching, driving and remittances. So income from these sources is undertaken as nonfarm cash income. In addition, considering the context specificity of hills of Nepal, caste/ethnicity and distance of the forest from the homestead area are also considered as social and geographical variables in this study. Authors are not aware of analytical studies in community based forest resource management considering such variables in Nepal, hence feel this study to be important to overcome such dearth.

The simple regression model for k numbers of variables is given by,

$$E(Y|X_2, X_3, \dots, X_k) = b_1 + b_2 X_{2i} + b_3 X_{3i} + \dots + b_k X_{ki} + u_i$$

where Y is dependent variable; $X_2, X_3 \dots X_k$ are independent variables and u_i is stochastic disturbance

or error term for i^{th} observation. The term $E(Y|X_2, X_3, \dots, X_k)$ can be understood as expectation of dependent variable Y condition by independent variables $X_2, X_3, \dots, X_k$ in i^{th} observation. The term b_1 is the intercept term and $b_2, b_3, \dots, b_k$ are regression coefficients for respective variables $X_2, X_3, \dots, X_k$.

The multi linear regression model for the participation of the CFUG members in community forest resource management programs, where variables considered that might reasonably shape the different degree of participation are, social status of household, economic conditions of household, benefit to the household from the community forest, and distance to the community forest from homestead areas, can be represented as,

$$E(\text{Participation} | \text{Social, Economic, Benefits, Distance}) = b_1 + b_2 \cdot Ce + b_3 \cdot Fs + b_4 \cdot Ed + b_5 \cdot Lh + b_6 \cdot Ah + b_7 \cdot Ci + b_8 \cdot Fd + b_9 \cdot Fw + b_{10} \cdot Ds + u$$

Where,

Participation = Average of degree of participation in CFUG programs as perceived by the program participating household members. Participations in CFUG programs have been divided into four broad categories. Participation in formulation of rules and regulations of CFUG, which is normally done through the CFUGs executive committee; participation in program selection, commonly done in annual general meetings, regular periodical meetings and executive committee; participation in program implementation normally related to training programs, plant nursery making, tree plantation, fencing, forest resource collection and so on; and participation in maintenance and sustainable use of resources normally related to forest guarding, cleaning and pruning of grass, twigs and bushes, abiding by the rules and regulations and so on. Participation was measured in degree of ranking with attribution of values from 1 to 5, where 1 = almost never participated (*naganne*), 2 = participated at times (*kehi*), 3 = participated half the times (*adhi*), 4 = participated most of the times (*dherai*), and 5 = participated all the times (*sabai*).

It is well understood that each categories of participation would have individual relations with each of the

independent variables. But, their average value is considered here for getting the continuous distribution of the dependent variable and hence facilitate using this model for the analysis.

Social Variables = Caste dummy (Ce ; household belonging to upper caste being attributed 1 and others 0), family size (Fs , total number of members in the household) and education (Ed , total adult schooling years in a household, if the household has a literate member who do not have formal years of education, it is considered as having five years of schooling experience)

Economic Variables = Agricultural land holding (Lh) in hectares, livestock animal holding (Ah) in Livestock Unit, (LSU)² and cash income (Ci) which measures households with supplementary nonfarm cash income being attributed 1, else 0.

Benefits from CF = Fodder (Fd) in *bhari* that approximately equivalent to 30kgs and fuelwood (Fw) also in *bhari*³.

Travel Distance (Ds) = Time to travel the distance to the CF from homestead areas in hours.

And b_1 is constant or intercept term and u is stochastic disturbance or error term.

The model was run using the SPSS software in the personal computer.

4. Empirical Results and Discussion

The descriptive statistics of the dependent and independent variables are shown in Table 1. Mean value of participation is 4.17 meaning that the member households participate in CFUG programs most of the times which is contributed by the higher ranking by some of the newly formed CFUGs in far western villages. Caste/ethnicity dummy mean value of 0.82 indicates that upper caste people are dominant groups in the study villages. Average numbers of household members are 5.65 and average education level of households as indicated by total schooling years of all the household members is 16.8. Average land and animal holdings per household is 0.65 ha and 1.49 LSU, respectively. Only 35% of the households have nonfarm cash income that supplements their household expenses. Households are highly dependent upon CF

Table 1. Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Aver. Participation	82	2.40	5.00	4.17	.83
Caste Dummy	82	.00	1.00	.82	.39
Family Size	82	2.00	9.00	5.65	1.50
Education_level	82	.00	30.00	16.80	6.21
Landholding	82	.00	1.60	.65	.34
Animal Holding	82	.00	3.40	1.49	.75
Cash Income	82	.00	1.00	.35	.48
Fodder	82	20.00	240.00	174.46	38.36
Firewood	82	76.00	261.00	189.89	44.47
Distance	82	.10	1.00	.33	.176

Table 2. Coefficients of Selected and Final Independent Variables

Model						Collinearity Statistics	
		b	Std. Error	t	Sig.	Tolerance	VIF
Model 1 Selected Variables	(Constant)	1.90	.52	3.68	.00		
	Caste Dummy	.23	.14	1.64	.11	.90	1.11
	Family Size	.08	.05	1.65	.10	.56	1.77
	Education	.00	.01	-.32	.75	.87	1.15
	Landholding	.71	.21	3.48	.00	.56	1.77
	Animal Holding	-.22	.10	-2.13	.04	.47	2.15
	Cash Income	-.08	.12	-.67	.50	.83	1.21
	Fodder	.00	.00	-.02	.98	.12	8.37
	Firewood	.01	.00	3.05	.00	.10	10.15
	Distance	-1.67	.41	-4.03	.00	.50	1.98
Model 2 Final Variables	(Constant)	1.88	.48	3.91	.00		
	Caste Dummy	.24	.14	1.77	.08	.93	1.07
	Family Size	.07	.04	1.70	.09	.59	1.68
	Landholding	.70	.20	3.50	.00	.58	1.72
	Animal Holding	-.20	.10	-2.10	.04	.50	2.00
	Firewood	.01	.00	5.27	.00	.30	3.31
	Distance	-1.76	.37	-4.71	.00	.60	1.66

for fodder and firewood and on an average reap 175 *bhari* (5,250 kg) of fodder and 190 *bhari* (5,700 kg) of firewood from the CF. Average time taken to travel on foot to CF from homestead areas of the member households is 20 minutes with the minimum required time being 6 minutes and the maximum, one hour.

Table 2 reports the coefficients and significant levels of the independent variables selected and final variables provided by the backward stepwise elimination method represented by Model 1 and Model 2, respectively. Model 1 includes all variables hypothetically

considered and Model 2, which is the final model, provides the variables that could be best predictors in determining the participation with significant level of 10 percentage criteria. In the final model exercise, three independent variables, total schooling years, nonfarm cash income, and fodder usage was rejected. The result is statistically highly significant with R^2 value of 0.71 and F statistic is highly significant, indicating that the simultaneous test of each coefficient being rejected 0 time. The t statistics/distribution for statistically significant variables are well above the

Table 3. Correlation Coefficient and Significant Level of Variables

	Participation	Caste Dammy	Family Size	Education	Land Holding	Animal Holding	Cash Income	Fodder	Firewood	Distance
Participation	1	.248*	.602**	.095	.188*	.270**	-.238*	.548**	.557**	-.738**
Caste	.248*	1	.016	.042	.122	-.012	-.205*	.068	.073	-.191*
Family Size	.602**	.016	1	.192*	.124	.268**	-.154	.403**	.448**	-.558**
Education	.095	.042	.192*	1	.056	.198*	-.111	.164	.188*	-.042
Landholding	.188*	.122	.124	.056	1	-.098	-.168	-.329**	-.394**	-.242*
Animal	.270**	-.012	.268**	.198*	-.098	1	-.215*	.643**	.658**	-.188*
Cash	-.238*	-.205*	-.154	-.111	-.168	-.215*	1	-.094	-.087	.347**
Fodder	.548**	.068	.403**	.164	-.329**	.643**	-.094	1	.933**	-.388**
Firewood	.557**	.073	.448**	.188*	-.394**	.658**	-.087	.933**	1	-.367**
Distance	-.738**	-.191*	-.558**	-.042	-.242*	-.188*	.347**	-.388**	-.367**	1

*: Correlation is significant at 0.05 level.

**: Correlation is significant at 0.01 level.

+1.7 and well below the -1.7, which is normally used as a guide for useful predicted variables in six degree of freedom at 10 percent significant level. All of the independent variables are individually correlated to the dependent variable. Hence, the independent variables considered here fit in the model used.

Under the assumption of linear regression analysis, no independent variables should be highly correlated with other independent variables, which is normally termed as multicollinearity. In Table 2, Model 1 the collinearity statistics of fodder and firewood (with lower tolerance, i.e., near zero and higher variance-inflating factor, VIF) indicate that there is higher possibility of multicollinearity problem between them. As suggested rule of thumb, the multicollinearity problem should be judged by looking pair-wise correlation coefficients. When checking the correlation coefficient of variables it is found that the fodder and firewood is highly correlated with coefficient 0.93 at 1% significant level (Table 3). In actual practice also the households collect firewood and fodder together, i.e., persons who collect the firewood also collect the fodder from CF when ever in need. One of the simplest methods to remove the multicollinearity problem is to drop the collinear variables as done in Model 2. Dropping a variable from the model may cause the specification bias. But, since the fodder is not statistically significant in Model 1, dropping it from the model is not a problem.

Two of the three social variables, caste and family size are statistically significant at 10% level. Upper caste people in study villages participate relatively more in the CFUG programs. It proves the hypothesis that the participation in CFUG programs is greater for households who belong to the upper caste. The size of the household is also statistically significant at 10% level. Household with more members can more frequently participate in CFUG programs, sometimes taking turns in participation among the household members. Thus, the household labour force is well used in participation and supports the second hypothesis. This confirms earlier findings of plain villages (Agrawal and Gupta 2005) also holds in the hill villages, such as the studied villages in this research. The education variable is not statically significant and was dropped in the final model even though it shows the negative sign suggesting the tendency not to participate in CFUGs programs with the increase of schooling years of the household members. Thus, this finding cannot strongly agree with Agrawal and Gupta 2005, which shows that education level is statistically significant with negative sign in relation to participation in community forestry program⁴⁾.

Out of the three economic variables landholding is statistically significant at 1% level, thus support the corresponding part of the second hypothesis, as well. Livestock animal holding is also significant at 5% but with negative sign. Hence, it contradicts the second

hypotheses and earlier studies of Adhikari et al. 2004. This could be due to different reasons at the study villages of two districts. In Lalitpur village stall-feeding is introduced in raising the dairy animals making the member households busy when they possess more numbers of dairy animals. Whereas in Dadeldhura villages grazing animals in herds are a common practice, again making the member households the busier with the more numbers of animal holdings. These situations of the study villages are different from ordinary montane villages where fodder must be collected to feed the animals, hence, making the member households likely to participate more in the CFUG programs even to secure fodder.

Nonfarm cash income variable is not statistically significant and was also dropped in the final model. It means there is not much effect of nonfarm cash income in the participation of the CFUG programs. After all the opportunity to engage in nonfarm activities is low in the study villages and not many member households have cash income from them.

Distance variable is also statistically significant at 1% level but with negative sign. It proves that the member households who live at far places from the CF areas have fewer tendencies to participate in the CFUG programs. Conversely, member households near to the CF tend to participate more in the CFUG programs, thus proving the third hypothesis.

One of the two variables related to benefits from the CF; firewood is statistically significant at 1% level. This means member households that use more firewood from the CF are more likely to participate in the CFUG programs. This supports a part of the fourth hypothesis. However, the variable of fodder is not statistically significant and is dropped from the final model. This may be due to its high multicollinearity with the variable of firewood⁵⁾ in addition to implication of the changes in nature of animal raising in the study villages.

5. Conclusion

In this study the multi linear regression model analysis found out that the people of upper caste, with

bigger family size, possessing more land, using more firewood from the CF and living nearby the CF tend to participate more in CFUG programs, consequently getting more benefits from such programs. This would mean that present socio-economic inequalities are influential in making people participate in such programs, hence wealthier and higher social status households gain a greater proportion of the benefit from such programs. This leads us to say that CBNRM has not been fully able to address the socio-economic disparities, such as, highly differentiated and stratified rural communities in terms of economic conditions, social status, their access to forest and dependency on its resources.

Moreover, in the current dynamics of village development where infrastructure building regarding rural electrification and rural road network is given utmost policy priority, firewood usage may become a disincentive for the member households any time, making them not participate in CFUG programs. In such a case marginalized and deprived people with lower social status, less landholdings and living far away from the CF could be first ones to not participate in CFUG programs, consequently affecting the CBNRM policies.

Hence, policies such as production and harvesting of non-timber forest product that give preferences to marginal and deprived people could be designed to provide more incentives to participate in CFUG programs. This would not only increase their participation in the CFUG programs and consequently increase their share of the benefit but also contribute in more successful implementation of CBNRM, becoming participatory and more inclusive.

More holistic measures would be necessary to address the disincentives of firewood. One of such measures could be carbon trading under Clean Development Mechanism of Kyoto Protocol⁶⁾.

Notes

- 1) Of the three study villages (village development committees), one is from Central Hills in Lalitpur district and two are from Far-western Hills in

Dadeldhura District. The caste/ethnicity wise population in Dal Choki, the village in Lalitpur is 36% upper caste, 26% Magara, 23% Tamang, 13% Nagarkoti and 2% Dalit (lower occupational caste). The figures for Bagarkot, the village in Dadeldhura are, 74% upper caste, 24% Dalit and 2% Magar, while the figures for Shirsha, another village in Dadeldhura are, 79% upper caste, 18% Dalit, 2% Raute and 1% Magar.

- 2) A livestock unit=1 buffalo=1.2 cattle=5 goats or sheep.
- 3) This is measured by the observation and the estimates provided by the families. The survey also measured the other benefits like extraction of timbers, fruits, resin and other non-timber forest products. But incidence of those households and amount is not significant, differs largely from forest to forest and not done on institutional basis. Hence, they are not considered here.
- 4) However, it is not clear here if the schooling years of individual members or the total schooling years of all the household members is being more influential. Moreover, opportunities to find jobs in and around the study villages for educated people are rather less.
- 5) Villagers generally tend to collect fodder along with firewood when ever in need.
- 6) A study shows that with such carbon trading, CF in the hills of Nepal can generate around US\$ 0.4–0.8 million at the rate of US\$ 10–20 per ton of carbon consumed by the CF in 2000 [S. P. Dhungana et al. 2007]. To trap this opportunity the government has to design appropriate policies so as to benefit the mem-

ber households of CFUGs, who are the actual people planting and taking care of the trees in CFs.

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