Household characteristics and perception of users towards the environmental changes within community forests in the Dhaulagiri hills of Nepal

Ashok Baniya[1]

This paper investigates how households' characteristics, in light of community forestry intervention in the Western Hill of Nepal, influence the perception of environmental quality. Two types of data were used in this study, survey data on household's characteristics and environmental perception from 212 households and individual level survey data. It was found, taking from the evidences from community forestry, that households' characteristics are associated with perception of environment quality. Perception on environment quality is important from two angles that is firstly, it indicates objective environment quality degradation; secondly, it pave the way for designing the programme aiming to change the environmental behavior of forest users within community forestry.

Key words: *environment quality, perception, logistic regression, and variable*

Community forestry in the Hills of Nepal is a more success story in terms of expansion on the forest cover area on the one hand and conservation of bio-diversity on the other. As the spill over effect of the community forestry on sphere like livelihood among others continue, it is less evident that whether forest user's perception towards change in the crop production, grazing land area, number of tree species, water spring and time spent in collecting firewood and fetching water and on the occurrence of flooding, is well documented.

People's perception towards changing environment is important for several reasons. Firstly, the perception on the environmental change may serve as a tool for further objective investigation on the environmental changes. The second reason is attributed to the influence of this perception in the participation of people in the environmental programme implementation such as community forestry activities aiming to make difference in the livelihood of rural people mostly relying on subsistence agriculture. Thirdly, and most importantly, perception on the environmental change may have effect on the individual behavior. That is to say that increase in the soil fertility due to application of green manure produced from the fodder collected from the community forests motivate people to realize that community forestry is beneficial to them.

The purpose of this study is to document the influence of socio-economic characteristics on perception of forest users towards the environments as stated above. Available literature on environment degradation focuses more and relies on the aggregate data implying at macro level (e.g., large catchments area, country level). On the contrary, the study focused on the local context as it affects on the daily lives of local people where they are directly in touch with the environment.

Environment assets and Nepal

Rural population in Nepal relies on subsistence agriculture for their livelihood. It is supplemented by milk and meat from animal husbandry. To large extent, agriculture and animal keeping largely depend on the availability of forest products, for example, animal feed in the form of fodder comes from the forest, that is either under the control of state, or private or community. So it is imperative that the quality and productivity of forest at large, affect on the lives of rural dwellers. Agrawal (1992) has rightly mentioned that the south Asian studies focus on the population and environment nexus. Similarly, part of the fuel requirement is fulfilled from the wood and it continues to be dominant in the rural area as no viable alternative energy source is available in most of the rural areas. United Nations estimates that 84 percent of the household energy comes from firewood and the time taken to collect this biomass material ranges from 1.2 hrs to 2.5 hours per day (UN, 1995). This is consistent with the recent study which reported that

[1]Research Fellow, Social Development and Research Centre (SDRC), Jwagal, Kupondole, Lalitpur, email:sdrc_org@yahoo.com

women spend between 1.27 and 2.04 hours per day for firewood collection (Baniya, 2005).

It is evident that poor have little land and virtually no land at all to cope with the survival stress primarily at the time of vulnerable context. They tend to keep few goats and chickens that don't require more land. Equally important is that common grazing land may be panacea for them as no fees is charged to graze their goats.

Theoretical framework

Although the data available is not sufficient to test the mechanism that tells us about the objective link between household characteristics and perceive change in the environment, it is assumed that a link exists between them. This is attributed firstly to the fact that idiographic characteristic such as education and family with comparatively large members influence on the perception entailing to changes on the environment. The second is that perception change is the direct result of change in environment. Agrawal (1997), Marx (1976) and Barber & Axinn (2003) indicated that there are links between socio-economics facilities and environmental degradation. They argued that capitalist mode of production results in human interacting less directly with natural environment, which in turn leads to its exploitation. For example; a buyer of firewood living in urban areas doesn't/needn't bother about the prevailing condition of forest that meets the demand of firewood. Thus he/she becomes less interactive with the forest.

Some analysis on the relationship between population and environment reveals that there is little agreement on this sort of relationship. According to Panayotou (2000), empirical researches are unable to resolve the issue because of limited data, divergent methodologies, and varying levels of analysis. Consequently, he has not been able to decide the relationships between population and environment, not only on magnitude but also on direction.

Barber & Axinn (2003) have argued that there exist relationships between neighborhood facilities and perceived environmental degradation. They have further claimed that increasing neighborhood facilities are associated with environmental degradation such as depletion of common forest resources, increased chemical fertilizer requirement and lower water table.

The available literatures focus more on development and environment; however, it does not tell us about the mechanism aiming at common property resource management and its effect on the environment. This study endeavours to fill this gap and intend to establish the links between the households' characteristics and perceived environment changes not only on magnitude but also in direction.

Materials and methods

Households for the study were selected in two stages. First, Community Forestry User Groups (CFUG) were selected from each of the Jyamrokkot and Pulachaur Village Development Committee (VDC) of Myagdi district through purposive sampling with considering the sizable deciduous forest (>0.1 ha per household), deciduous forest, same altitude (1000-1500m) altitude categorized by District Forest Office Myagdi and Livelihood and Forestry Programme (LFP).

The VDC selection was done with motive to cover both households from the animation and non-animation areas and to compare the 'with' and 'without' situation. The LFP has implemented its animation programme in Myagdi District after selecting the best Non-Government Organizations that aims at strengthening the internal management system of CFUGs. 45% of households were selected on the basis of systematic random sampling from each CFUG of both the animation and non-animation areas for questionnaire survey. Accordingly, 212 households, including 125 animated households' and 87 non-animated one were selected. The sample accounts for about 59% of all households in selected CFUGs and 22 % of all two VDCs. Considering the probability that some of the respondents might not be available for interview for various reasons, reserves of 15% were taken.

Some key characteristics of animated and non-animated households are presented in Table 1.The information is presented separately.

With respect to various socio-economic characteristics (such as land holding, household size, education level), on average, the animated and non-animated households were similar. However, animated and non-animated households were different considerably in term of non-irrigated land and goats. For example, the average non-irrigated land size was 3.76 for animation area and 1.96 for non-

Table 1 : Key characteristics of project and non-project households

Characteristics	Animation area	Non-Animation area
Household size (mean)	**5.49**	**5.39**
Poor	5.05	5.65
Medium	5.54	5.15
Rich	5.82	5.60
Population engaged in Agriculture %		
Bhramin/Chhetri	74.5	90.3
Others (DKS)	83.3	26.7
Land Holding (mean)		
Irrigated (Ropani)	4.49	6.13
Poor	2.18	2.65
Medium	4.41	4.98
Rich	6.33	12.05
Non Irrigated	3.76	1.96
Poor	1.82	0.98
Medium	4.54	1.81
Rich	4.37	3.31
Mean schooling (yrs)	3.65	3.08
Poor	2.17	2.0
Medium	2.59	2.61
Rich	2.94	2.95
Bhramin/ Chhetri	4.28	3.51
Other (DKS)	0.96	1.00
Livestock size		
Cattle	1.78	1.21
Buffalo	1.47	1.45
Goat	1.30	0.63
Ethnicity %		
Bhramin/Chhetri	81.0	19.0
Others	82.8	17.2
Gender %		
Male	40.5	59.5
Female	50.6	49.4
Mean Age		
Male	44.72	
Female	38.39	

Source: Field Survey, 2005

animation. This difference was significant (P=0.05). Similar significant difference was observed between animation and non-animation area in terms of goat rearing. The rich forest users of animation area entitled large tract of land that was significantly different with other economic groups of animation and non-animation area. Similar was observed in terms of number of school years between upper caste *(Bhramin/Chhetri)* and other caste *(Damai/Kami/Sarki)* in both animation and non- animation area.

Model Specification

The research is attributed to causal type of study on the pattern and the strength of the relationships between dependent and independent variables. For empirical analysis, five separate binary variables as dependent variables were taken into account assigning value '1' if it is yes and '0' if it is no.

The first binary *dependent variable* is grain production (assigning value '1' if production increase is yes and '0' otherwise). Other dependent variables include availability of grazing land, number of tree species, firewood collection time, number of water springs, landslides/flooding incidences and water fetching time.

Independent variables (inputs) are class, age, gender, caste, education, occupation, and household size. These variables are supposed to influence the environment attributes for this study.

I. *Class* is nominally defined as the economic status of the user groups. The operational definition involves the categorization of entire users into three main groups; rich, medium and poor based on agreed criteria set by them at the time of exercising wealth-ranking exercise.

II. *Age* is defined as the age of the respondents at the time of household survey.

III. *Gender* is nominally defined as all the socially given attributes, role and activities connected to being a male and female in a given society. The operational definition of gender involves two categories (i) Male (ii) female

IV. *Caste* is nominally defined as the system of dividing Hindu society into classes. Operationally, the definition of caste is the categorization of forest users *(Bhramin/Chhetri, Kami, Damai and Sarki)* based on social system prevailed in the forest user groups.

V. *Household Size* is defined as the number of family members living together under the same roof and sharing common stoves for food.

VI . *Education* is nominally defined as teaching someone using formal system of school, or university, to give knowledge or particulate understanding of a particular subject. Operationally it is defined as the capacity to read and write (i.e. literate/illiterate)

VII. Agriculture occupation is nominally defined as the farming that is designed to grow goods and services required to the survival of human being. Operationally, it is the practice and process of growing food grains such as rice, maize, wheat etc.

Logistic regression equation

For this study, logistic regression is employed owing to the Yes/No binary variables and is of the form;

$$ln[p_i/1-p_i] = B_0 + B_1X_{1i}+.....+B_kX_{ki}$$

Where subscript *i* denotes the ith observation in the sample is the probability of the outcome, B_0 is intercept term and B_1 ,B_2 ..... B_k are the coefficients of the explanatory variables X_1,X_2.....X_k the coefficients reflect the effects of individual explanatory variables on their log of odds $ln[p_i/1-p_i]$. If the log of odds is positively associated to an explanatory variable, odds are also positively related to the independent variables. In addition, log of odds are linear and non linear for odds.

Explanatory variables

Most of the variables in the table are self-explanatory. The sample was divided into three income groups based on household wealth ranking made by user themselves on their own rating and criteria. The income status is represented by the dummy variables POOR and RICH. Likewise, education, caste and gender are also set as dummy variables, which are also hypothesized to influence in. Household size and age are hypothesized to affect on the benefits collected from the community forestry.

Table 2 : Explanatory variables

Variables	Description
Income group	Rich or medium =1,0=otherwise
Gender	Sex, Male=1,0=otherwise
Caste	Higher caste=1,0=otherwise
Occupation	Agriculture =1,0=otherwise
Age	Age of the respondents
Education	Literate=1,0=otherwise
Household size	Number of members in the family

Results and discussion

Quantitative analysis

Table 3 entails the descriptive statistics, which tells us about the different environmental conditions pertaining to whether these assets are increasing or decreasing. The Likert Scale entailing points ranging from 1 to 3 was employed resulting mean value 2 for each of the environmental assets. Considering this benchmark-mean value 2- forest users perceive that cereal crop over the past five years is decreasing as the computed value is less than 2. This happens owing to decrease in the fertility of soil. This happens because the bedding material necessary for making compost is restricted after the community forestry intervention and the result is that forest users compel to keep small size of livestock due to the unavailability of fodder on the one hand and grazing land on the other. Hence, small number of livestock seriously constrained on the production of organic manure leading to decrease in soil fertility causing decline, virtually, in the yield of crops.

Availability of grazing land decreased after complete restriction imposed by the forest users themselves to let regenerate the grazing land. Obviously, Forest Department implicitly encouraged forest users to plant seedling there and the result was the reduction in the availability of grazing land in the hilly area.

Table 3 : Descriptive statistics (N=212, Range 1-3)

Environmental assets (condition)	Sum	Mean
Crop production	339	1.60
grazing land	215	1.01
Tree species	597	2.80
Decrease in time to collect firewood	527	2.47
Water spring	409	1.93
Decrease	481	2.27
Flood/Landslide		
Decrease in	607	2.85
Time to fetch water		

Source: Field Survey, 2005

However, as the analysis on the numbers of trees species reveals that these environmental assets are perceived to be increased over the past five years as the computed value is greater than 2. This is due to the fact that Forest users explored the ways to plant seedling in their private land for couple of reasons. First, to meet the growing demand for firewood and fodder to feed their livestock. Second, the government encouraged farmers to plant seedling by providing seedling free of cost. Hence, the number of trees increased in the private owned land in general and slopping terrace land in particular.

Forest users perceived that their time has been saved in term of collecting water and firewood over the past five years. The possible reasons for these happening include: easy availability of firewood in community forest, more production of firewood and fodder in their own land and investment of FUG fund in drinking water schemes.

Perception of forest users towards decrease in the incidents of flood and landslide may be attributed to the result of the soil conservation practices adopted by forest users in their cultivated land (both irrigated and non-irrigated). The situation improved as the water drainage system improved and regulated by well managed community forest.

Qualitative analysis (logistic regression analysis)

Table 4 presents the bivariate relationship between the households' characteristics and perceived environmental quality. All of 6 measures of environmental condition –cereal crop production, time to collect firewood, flooding incidence, water fetching time; number of tree species and water spring is related to the independent variables.

Cereal crop production

It is found that the coefficient for education was most significant *(p<0.05)* in inverse manner. In other words, given the negative sign, literate respondents perceived a decrease in the cereal crop production. The possible reasons for this happening is that literate forest users are more exposed to theoretical knowledge based on text book knowledge claiming decrease in soil fertility. Similarly, aged respondents perceived skeptical on the production of cereal crops.

In contrary to this, respondents whose occupation is agriculture, who are rich with upper caste status, and are male perceive increase in the production of cereal crops over the five years. The plus sign to all these variables reveals that production is increased over the last five years not significantly.

Time to collect firewood

It is found that perception towards decrease in the time to collect firewood is significant *(p<0.05)* but inversely associated with education level. In other words, educated respondents strongly disagreed with the notion that time for collecting firewood had decreased. Remaining variables are non significant to odds ratio despite the direction varies.

Flooding

Literate respondents said that the incidences of flooding have significantly increased after community forestry intervention. But the family with large size did not agree with this saying. Remaining variables are non significant to odds ratio despite the direction varies.

Water fetching time

Analysis on which variable is significantly associated with water fetching time reveals that male respondents are most likely to perceive decrease in the water fetching time. It is important to note that after the initiation of community forestry, forest users are aware of the fact that women's plight in terms of collecting water is responded by diverting CFUG fund in water scheme. Other variables except age and education are positively, though not significantly, associated with the water collecting time.

Number of trees

It is found that perception towards increase in the number of trees is significantly *(p<0.05)* associated with education level. In other words, educated respondents strongly agreed with the notion that

Table 4 : Logistic regression estimates of bivariates relationship between households characteristics and environment quality (N=212)

household characteristics	cereal crop production		time to collect firewood		flooding		time to fetch water		Tree species		Water Spring	
	B	Ex (B)	B	Ex (B)	B	Ex (B)	B	Ex (B)	B	Ex (B)	B	Ex (B)
Education (literate=1)	-1.20	0.3*	-2.04	.129*	-2.213	.109*	-.280	.756	2.046	7.736*	.957	.384
Occupation (Agriculture =1)	.495	1.64	.182	1.19	-.005	.995	.546	1.726	.041	1.042	-.304	.738
Class (rich=1)	.703	2.0	-.04	.959	-.006	.994	.186	1.204	-.182	.834	.063	1.065
Caste (Upper caste =1)	.183	1.20	.590	1,80	.889	2.4	.528	1.696	-.590	.554	1.178	3.247*
Gender (male=1)	.591	1.80*	.458	1.58	.291	1.33	.909	2.481*	-.096	.908	-.071	.931
Age	-0.13	.98	-.015	.98	-.007	.993	-.024	.976	-.458	.633	-.432	.649
HH size	.068	1.07	.096	1.10	.157	1.17*	.369	1.447	.015	1.015	-.001	.999
Constant	-.169	.845	1.316	3.7	.510	1.66	.112	1.118	-1.316	.268	2.305	10.022

* Significant at 5% level

number of trees in community forest has increased. Remaining variables are non significant to odds ratio despite the direction varies.

Water springs

It is found, of the variables, that the coefficient for caste was most significant *($p<0.05$)* in positive manner .In other words, given the positive sign, upper caste respondents perceived an increase in the number of water springs. Remaining variables are non significant to odds ratio despite the direction varies.

Chi-square test confirms that household and respondent characteristics and environmental quality is associated significantly ($p<0.00$) in all environmental attributes.

Conclusion

Measures used in these analyses are based on the respondent's perception of environment degradation. It is more interesting that particular groups of people have different perception though all experience the same real environmental conditions. For example, educated respondents are convinced that environmental degradation is evident either in terms of production of cereal crop; time to collect firewood or flooding situation. Similar is the case with age variable, which suggests that aged respondents are skeptical over the deteriorating environmental condition. However, educated men perceive that number of tree species in the farm land has increased significantly but poor, lower caste and women don't, those not significant, think so. In other words, poor, women and lower caste do not agree with the notion that environmental quality has increased as perceived by upper caste, and rich people. One important factor that should not be neglected at all is that those who are pessimist are the real users in the sense that they have close touch with the environment whether they are women or lower caste or poor people.

There is long way ahead to bring positive changes in the environment assets of rural dwellers. From the welfare perspective, it is necessary to take confidence of women, occupational caste, and more importantly poor in the 'real' planning cycle of community forest's institutional arrangement at the micro level such augmented livelihood feeling that they are asked, their voiced is listened and virtually executed and witnessed by them. Recent days are evident that some practices, in and within community forestry, are directed towards bringing the tested underprivileged groups into confidence in the banner of 'social inclusion' to bring justice. Such efforts, though not sufficient, are and can be beneficial only if the power center of forest user groups-committee-is truly occupied by them. Social mobilization is one of the viable options to do so.

To sum up, findings in this study highlight the need for further research to better understand what shapes perception of environment. Direct and objective measures of environmental degradation such as cereal crop production, number of flooding incidences, number of trees, number of water springs as well as time to fetch water and firewood collection will allow us to establish link between household and other characteristics supposed to have strong explanation power as the regression model presented in this study, to predict the effects of household's characteristics for each environmental attributes, have little explanatory power in all cases because independent variables aren't significantly affecting the dependent variables. Therefore, there should be other strong variables, and so, further research incorporating direct and objective measures to assess those all and/or strong variables have been recommended.

References

Agrawal, B. 1992. The Gender and Environment Debate: Lessons from India. *Feminist Studies*, **18**(1): 119-158.

Agrawal, B. 1997. Gender, Empowerment, and Poverty Interlinks: Regional Variations and Temporal Shift in Rural India, 1971-91.*World Development*, and **25**(1): 23-52

Baniya, A. 2005. **Effect of Community Forestry on Human Development of Women and Poor: Some Evidences from the Western Hill of Nepal**. (Unpublished Master Thesis), Kathmandu University, Nepal.

Barber J.S. and Axinn, W. 2003. Neighborhood Social Change and Perceptions of Environmental Degradation. *Population and Environment*, **25**(2): 77-108.

Marx, K. 1976. **Capital: A Critique of Political Economy**, (vol.1). New York: Vintage.

Panayotou, T. 2000. **Environment and Development Paper No. 2**. Center for International Development at Harvard University, USA.

United Nations. 1995. **The World's Women: Trends and Statistics.** New York: United Nations.