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Farmers' perceptions of participation and institutional effectiveness in the management of mid-hill watersheds in Nepal

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ABSTRACT. In the mid-hills of Nepal, as in many developing countries, gradually developing urban centers and increasing demand for agricultural produce, due to population growth and early development activities, have persuaded farm households to reorient their subsistence farming to become farm systems growing surplus food to be sold in the markets. To cope with these changes, institutions play an important role and, for these institutions to be effective, farmers must perceive their participation as not being coerced. Their participation is influenced by individual household characteristics and proximity to support services and markets. Our main findings from the analysis of household surveys based on the level of market participation included: (1) the education level and amount of training attended by family members are influencing social variables, while farm size and gross farm income are dominant economic variables influencing household participation and perceived institutional effectiveness; (2) these variations revealed significant differences in the levels of market economy for household participation and institutional effectiveness within the watershed; and (3) the factor analysis further categorized several socioeconomic variables into three major factors explaining household participation and institutional effectiveness; these included labor quality and resources, supplementary income coming from migration and off-farm activities, and awareness and modern skills acquired by farm household members living within the watershed.

1. Introduction

Institutional intervention and the problems associated with the adjustment and development of farming systems, as well as the management of natural resources for long-term sustainability, are the prime concerns of many developed and developing nations. This becomes more important in the mountain areas where development facilities and options for improvement are inadequate and the majority of the population lives at a subsistence level, and has very high dependency on natural resources. Despite several problems, mountain people are gradually moving towards engagement in markets that vary across locations (Thapa and Shivakoti, 2000). Thus,

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understanding perceived institutional effectiveness and the level of community participation under existing socioeconomic contexts has become a major research issue (Shivakoti *et al*., 1999).

In the context of farming systems transitioning towards a market economy, institutional intervention is essential in terms of providing support and services, as well as playing an intermediary role in linking farming communities to the mainstream of development processes. Institutions not only provide materials and technologies for the improvement and adjustment of farming systems but also help strengthen local institutions in the common property resource management system, which are necessary for the long-term sustainability of farm production and management systems (Bromley, 1982; Ostrom, 1990). Several institutions, such as government line agencies, non-government organizations (NGOs), and local community based organizations (CBOs), have intervened in different sectors at different levels with the primary objective of improving the socioeconomic condition of rural communities through an adjustment of the production and management of farming systems and natural resources (Shivakoti, 1992). The integration of rural peoples' needs and priorities and their participation in institutional programs and activities have been widely recognized as being crucial to the effectiveness and long-term sustainability of development programs (Dent and Campbell, 1986; Cernea, 1991; Chambers, 1993; Jensen 1995; Axinn and Axinn, 1998). Moreover, institutional participation contributes positively towards innovativeness and makes an appropriate adjustment to farming systems (Karim and Dey, 1995). However, both participation and institutional effectiveness are highly influenced by individual household characteristics (Shivakoti, 2000).

From our earlier analysis of findings based on the household survey and group discussion in three different watersheds of central and western mid-hill regions in Nepal, results indicate that in areas where rapid changes in farming systems are occurring, farmers are expanding their private landholdings and increasing their marketing participation through replacing local rice and maize varieties by improved ones, with improved livestock management practices; off-farm wage labour has also increased to the point where it contributes significantly to the household income. Multiple regression analysis identified income from different farm enterprises and the ratio of improved to local species as important variables in determining the level of commercialization (Thapa and Shivakoti, 2000). In this paper, we provide the results of an evaluation of present levels of household participation in institutional activities and the household's perceived judgment of institutional work performance under the present mode of farming systems in transition from three sub-watersheds within a watershed with different levels of market participation. The relevance of this analysis lies in understanding the relationships between household participation, institutional effectiveness, and socioeconomic variables, which help to evaluate the present level of institutional involvement in the farming system adjustment process, as well as to identify the socioeconomic variables that facilitate or obstruct farmers' participation. Moreover, it is hoped that this evaluation brings to light a further need for institutional

involvement, in terms of support and services, to promote the market economy. In order to identify the socioeconomic variables that influence household participation and institutional effectiveness, farm size, levels of market participation, and the age of household heads were taken to be influencing variables, and inter and intra sub-watershed level evaluations were also preformed. The selection of these variables is based on an earlier analysis that exhibited significant correlations between socioeconomic variables, household participation, and institutional effectiveness. In addition, regression analysis was also performed to identify the variables that significantly influenced the variations in household participation and the institutional effectiveness of the development institutions involved in development activities.

2. Study area overview

The research sites are the sub-watersheds located in Tanahun district of Nepal, situated between 27°36′ to 28°05′ east longitude and 83°57′ to 84°34′ north latitude, comprising a total geographical area of 1,546 square kilometers. The district represents the typical environment of a middle mountain region in Nepal. The topography of the district is characterized by northwest to southeast running hill chains with moderate to very steep slopes, deeply cut river valleys, and gentle to moderately sloped plains with elevations ranging from 187 meters to 1,650 meters above mean sea level. Of the total landmass, around 57 per cent of the area is under steep to very steep mountain terrain, and the rest is about equally divided into moderate and less steep terrain.

The climate of these areas is sub-tropical with three distinct seasons: a hot and dry season from March to May, a hot and wet season from June to September, and a cool and dry season from October to February. The annual rainfall in all the three locations averaged 1,229 mm with minimums and maximums ranging from 850 mm to 2,710 mm. The monsoon starts in June and continues until September, and almost 80 per cent of the total annual rainfall occurs during this period. The average annual temperature is 18° Celsius, fluctuating between 10° and 32° Celsius.

The Prithivi Highway passes from east to west through the district, providing easy access to large market centers such as Kathmandu, Pokhara, and Narayanghat. Damauli is the district headquarters where several basic government and non-government administrative institutions are located. The District Agricultural Development Office, Agricultural Input Corporation, Agricultural Development Bank, District Soil Conservation Office, District Irrigation Office, and District Forestry Office are the major government organizations serving these areas. There are also a few international non-government organizations (INGOs) working in different parts of the district such as Redd Barna (Norwegian Save the Children), Rural Energy Development Project (UNDP), Rural Road Development Project (ADB), and Participatory District Development Project (UNDP). In addition to these, there were 491 local institutions registered with the Chief District Office in 1997, among them 48 per cent were actively involved in different rural development works.

3. Research methods

This study was conducted with the main objective of identifying factors that influence household participation in rural development activities, in general, and watershed management and development, in particular. This study was also conducted to assess the effectiveness of institutions involved in implementing such development programs and activities in the rural areas. Given the comparative approach of the research, three sub-watersheds that drain into the Marshyangdi river basin, namely Aandi, Chiti, and Dhawadi of the Tanahun district, were selected for the household survey and an in-depth empirical study. These sub-watersheds were identified as appropriate sites based on different levels of household involvement in the market economy. A household survey questionnaire was administered to gather information from 311 households out of a total of 1,083 households in three sub-watersheds.[1]

The level of household participation in the market economy was treated in relative terms in this study based on the average percentage of production and sales of farm produce inside and/or outside the villages. Households selling more than half of their total farm produce were designated as at a higher level of market involvement, and those between a quarter and a half as medium involvement, and less than a quarter as lower involvement. The pre-baseline information showed that the majority of the households from the Aandi sub-watershed were relatively more inclined towards a market economy, followed by the Chiti and Dhawadi sub-watersheds. In this respect, the relative percentage of household involvement in the market economy across sub-watersheds suggested that the Aandi sub-watershed was found to be more inclined towards a market economy and was at a rapid transition stage. Thus it was designated as an area with higher market involvement (HMI), followed by the Chiti sub-watershed as medium market involvement (MMI), and Dhawadi sub-watershed as lower market involvement (LMI) (table 1).

The Pearson product moment correlation was employed to examine the interrelationship between social and economic variables, such as the age of the household head, family size, years of education, amount of agricultural labor, farm size, livestock holding, annual off-farm and gross household incomes, and the reported mean scores of institutional effectiveness and household participation. Regression analysis was done to examine the socioeconomic variables that significantly influenced the variation in household participation and institutional effectiveness. Likewise, to

[1] The sample size was determined based on the equation (Arkin and Colton, 1963: 22) given below:

$$n = Nz^2pq/nd^2 + z^2pq$$

where, n = sample size, N = total population (1,083), z = Abscission of normal curve i.e. confidence interval (at 95%, $z = 1.96$), p = proportion of sample of population estimate (95%, $q = 1 - p$, d = margin of error, i.e. error limit $\pm 4\%$).

All 1,083 households in three sub-watersheds were listed assigning every household a unique number. A total of 311 households were selected through a simple random sampling procedure with replacement using a random table.

Table 1. *Household participation by levels of market involvement (% of households)*

Levels of market involvement	*Sub-watersheds*			
	Aandi (N = 108)	*Chiti (N = 100)*	*Dhawadi (N = 103)*	*Total (N = 311)*
Higher market involvement (HMI)	31	11	3	15
Medium market involvement (MMI)	40	22	9	24
Lower market involvement (LMI)	29	67	88	61
Total	100	100	100	100

Note: N = total number of household surveyed.

examine the relationship between variables, such as farm size, age of the household head, the level of involvement in the market economy, and the institutional effectiveness and household participation, one-way analysis of variance (ANOVA) and *post hoc* tests using Tukey procedures were adopted.

Institutional effectiveness was measured through the households' responses concerning their perception on the effectiveness of the institutions involved in the development activities. These included farming system and natural resource management-related institutions and their development programs and activities. Effectiveness is a relative term that generally differs by individual perception. Hence, effectiveness of institutions and their programs/activities can best be measured through the perceptions of stakeholders. A multi-dimensional scale was constructed to measure institutional effectiveness in the study areas. The major indicators used for comparative evaluation include: (i) farmers' perceived judgment of institutional programs for farming systems improvement; (ii) farmers' perceived judgment of institutional programs for natural resources management; and (iii) farmers' perceived judgment of institutional programs for off-farm and other economic improvements. Seven-item statements for each indicator were used to estimate institutional effectiveness. These perceptions were estimated by using a five-point Likert-type scale, with five being 'strongly agree' on the item statement, and one being 'strongly disagree'. Therefore, a higher aggregated average value indicted higher effectiveness and vice versa. The average scores of the three indicators were used to estimate perceived institutional effectiveness.

To determine reliability, Cronbach's alpha (α), which has been reasonably accepted as an indicator of the internal consistency of instruments, was employed for responses obtained from each sub-watershed. Item analysis in the HMI area produced an alpha (α) coefficient of 0.778 and a standardized item alpha of 0.797, which justified summing the scale values to form a composite index score.[2] Likewise, the item analysis in the MMI and LMI areas produced an alpha (α) coefficient of 0.878 and 0.879 with a

[2] The F-test significance at 0.000 level ($P < 0.000$) on the farmers' perception of institutional effectiveness further verified the appropriateness of the analysis. The generally agreed upon lower limit for Cronbach's alpha is 0.700, although it may be decreased to 0.600 in exploratory research studies (Hair *et al.*, 1998).

Table 2. *Association between socioeconomic variables, household participation, and institutional effectiveness*

	Higher market involvement (HMI) (N = 108)		*Medium market involvement (MMI) (N = 100)*		*Lower market involvement (LMI) (N = 103)*	
Socioeconomic variables	*Part.*	*Effect.*	*Part.*	*Effect.*	*Part.*	*Effect.*
Age of the household head[#]	0.001	0.085	0.074	0.067	0.249*	0.051
Family size[##]	0.039	0.113	0.310**	0.301**	0.012	0.238**
Years of education	0.397**	0.469**	0.224**	0.343**	0.357**	0.421**
Family members attended training	0.456**	0.357**	0.420**	0.306**	0.237**	0.246**
Agriculture labor	−0.138	−0.150*	−0.020	−0.151*	0.186*	−0.178*
Farm size	0.172*	0.195*	0.324**	0.307**	0.205**	0.171*
Livestock holding	0.253**	0.194*	0.403**	0.328**	0.140*	0.121
Off-farm income	0.134	0.202*	0.131	0.230*	0.051	0.179*
Gross farm income	0.299**	0.376**	0.336**	0.420**	0.269**	0.347**

Notes: 1 tail significance: * = 0.05 and ** = 0.01.
Part. = household participation. Effect. = Institutional effectiveness.
[#] = young (below 35 years), adult (36–59 years), and old (above 60 years).
[##] = small (below 0.60 ha), medium (0.65–1.00 ha), and large (>1.00 ha).
N = total number of household surveyed.

standardized item alpha of 0.881 and 0.875, which showed an acceptable level of internal consistency of item statements respectively.

Likewise, household participation in government organizations (GOs), non-government organizations (NGOs) and CBOs were estimated by: (i) level of satisfaction with institutional performance; (ii) level of involvement in institutional development work; (iii) adequacy of institutions in the area; (iv) stages of participation in institutions' work; and (v) perceived levels of participation. Farmers' perceived judgment in each item statement were measured by using a four-point Likert-type scale, where four was given to the 'most positive' responses and one to the 'most negative' responses. Therefore, a higher average value indicated a higher level of participation and vice versa. The reliability of the instrument was measured by Cronbach's alpha, which was 0.897, 0.918, and 0.863 for areas with HMI, MMI, and LMI respectively. These coefficients indicated the consistency of the survey responses of the respondents.

Finally, factor analysis was done to group statistically uncorrelated variables into different groups that influenced the variation in household participation and institutional effectiveness.

4. Association between socioeconomic variables, household participation and institutional effectiveness

The Pearson product moment correlation was computed to assess the statistical association between socioeconomic variables and the mean scores of household participation and institutional effectiveness using levels of market participation (table 2). In the area with HMI, social variables

such as years of education and training attended by family members were significantly and positively correlated with household participation and institutional effectiveness. On the other hand, agricultural labor was significantly and negatively correlated with institutional effectiveness. The possible reasons for such relationships might be that agricultural labor forces were gradually switching their activities to off-farm activities, resulting in the negative relationships with household participation and institutional effectiveness. As expected, the age of the household head and family size were positively correlated with participation and effectiveness, but were non-significant. The economic variables such as farm size, livestock holding, and off-farm and gross farm incomes were significantly correlated with institutional effectiveness, especially with the strong influence of gross farm income. Similarly, all these economic variables, except off-farm income, were positively and significantly related with household participation.

In the MMI area, social variables such as family size, years of education, and family members attending training were positively and significantly correlated both with participation and effectiveness. Agricultural labor showed an inverse relationship with participation and effectiveness and the association was significant only with the latter. All economic variables, except the off-farm income, showed positive and significant correlation with household participation and institutional effectiveness.

In the LMI area, years of education, family member attending training, and agricultural labor were significantly correlated with participation and effectiveness, similarly the age of the household head and family size were significantly correlated with participation and effectiveness respectively. Among the economic variables, farm size and gross farm income were directly and significantly related with household participation and institutional effectiveness. Livestock holding was significantly associated only with participation, whereas off-farm income was significantly correlated only with institutional effectiveness.

Since, the correlation between social and economic variables, as well as household participation and institutional effectiveness, showed varying magnitudes and directions of statistical association within the three levels of market participation, no specific conclusion could be drawn. Therefore, regression analysis was done to examine the functional relationships between household participation and institutional effectiveness as dependent variables, and social and economic variables (presented in table 2) as independent variables at three levels of market involvement separately. These three levels of market involvement were used as the explanatory dummy variables in the overall regression models.

The output of stepwise regression analysis is presented in table 3. The results show that both training and education of family members were significant variables that influenced household participation in the HMI areas, whereas training, livestock holdings, agricultural labor, and family size significantly influenced household participation in the MMI area. Likewise, training, gross farm income, and the age of the household head significantly influenced participation in the LMI area. In the fourth model, social variables such as agricultural labor, training, education of

Table 3. *Significant explanatory variables in household participation and institutional effectiveness regression models*

	Explanatory variable				
Dependent variable	*Variable*	*Coefficient*	t-*ratio*	R^2	*Adjusted* R^2
Household participation model					
1. Higher market involvement (HMI)	b_0	8.563	21.711	0.265	0.251
	b_4	0.757**	3.895		
	b_3	0.159**	0.258		
2. Medium market involvement (MMI)	b_0	7.961	14.808	0.328	0.300
	b_4	0.547**	2.522		
	b_7	0.272**	3.354		
	b_5	−0.467**	−3.209		
	b_2	0.235*	2.383		
3. Lower market involvement (LMI)	b_0	8.831	10.508	0.232	0.208
	b_3	0.284**	3.312		
	b_9	0.000**	2.671		
	b_1	−0.034*	−2.515		
4. Overall (HMI, MMI, and LMI)	b_0	8.086	18.262	0.351	0.335
	b_4	0.682**	4.673		
	b_3	0.118*	2.505		
	b_7	0.229**	4.045		
	d_1	0.567**	2.700		
	b_5	−0.202*	−2.056		
Institutional effectiveness model					
1. Higher market involvement (HMI)	b_0	58.593	33.399	0.315	0.302
	b_3	−1.112**	−4.543		
	b_9	−0.000**	−3.698		
2. Medium market involvement (MMI)	b_0	63.808	19.708	0.295	0.276
	b_2	−1.553**	−3.238		
	b_9	−0.000**	−2.882		
3. Lower market involvement (LMI)	b_0	50.006	10.672	0.286	0.264
	b_9	0.000**	−3.991		
	b_3	−1.372**	−3.196		
	b_2	1.858*	2.489		
4. Overall (HMI, MMI, and LMI)	b_0	59.084	38.209	0.230	0.219
	b_9	0.000**	−3.799		
	b_3	−0.836**	−3.462		
	b_4	−1.609*	−2.065		

Notes: b_0 = intercept, b_1 = age of household head, b_2 = family size, b_3 = average years of family education, b_4 = family members attended training, b_5 = agricultural labor, b_6 = farm size, b_7 = livestock holding, b_8 = off-farm income, b_9 = gross farm income, Dummy variables for overall regression models: d_1 = HMI, d_2 = MMI, and LMI as a reference group.
** and * = Significant at the 0.01 and 0.05 levels respectively.

family members, and economic variables, such as livestock holdings in the HMI area, significantly influenced household participation in development programs and activities (equation (1)). A 35 per cent variation ($R^2 = 0.351$) in household participation was explained by these variables. As expected, the influence of agricultural labor was negative, whereas the influence of other variables was positive. The agricultural laborers were mainly engaged in farm activities and, thus, have less time for participation in development

activities. Considering the number of significant variables, the relevance of the variables in the light of the given theory, and the coefficient of multiple determination (R^2), the fourth overall regression model was selected as the best model for explaining the variation in household participation.

$$\text{Overall household participation} = 8.086 + b_4\,0.682 + b_3\,0.118 + b_7\,0.229 + d_1\,0.567 - 0.202b_5 \quad (1)$$

In the institutional effectiveness model of the HMI area, family education and gross farm income were the significant explanatory variables. For the MMI area, family size and gross farm income were the significant explanatory variables, whereas for the LMI area, gross farm income, family education, and family size were the variables that significantly explained the variations in institutional effectiveness. Gross farm income and education and training of family members significantly influenced the variation in institutional effectiveness, with levels of market participation as explanatory variables in the overall regression model. An examination of the significant variables showed that gross farm income appeared in all models, but with a negative influence on institutional effectiveness. Similarly, family education appeared in all, but with a negative influence on institutional effectiveness in the MMI area. Similarly, family size appeared in the MMI and the LMI areas with a negative influence in the former and a positive influence in the latter. The negative influence of these variables on institutional effectiveness was contradictory to expectations. Considering the number of significant variables, conformity of sign of coefficients and the R^2 value, the third model (equation (2)) with an R^2 value of 0.286 was selected to estimate institutional effectiveness.

$$\text{Institutional effectiveness} = 50.006 - b_9\,0.002 - b_3\,1.372 + b_2\,1.858 \quad (2)$$

5. Levels of market involvement influencing household participation

To examine the significance of different levels of market involvement on household participation, analysis of variance (ANOVA) and a *post hoc* test using the Tukey procedure were employed. The test results showed that the HMI and MMI areas had a significantly higher influence on household participation than the LMI area (table 4). This implies that higher market involvement leads to significantly higher household participation in development programs and activities. It was also observed that a higher level of market participation led to integration of external resources. Thus, it can be inferred that higher market involvement (HMI and MMI) offers a conducive environment for enhancing household participation in development programs and activities related to watersheds.

There was no significant difference in household participation by levels of market involvement in the watershed with MMI (table 4). It implies that levels of market participation are not serious concerns to be considered in watershed areas with MMI. In a watershed area with LMI, there was a significant difference in household participation between the MMI and LMI areas (table 4). It implies that the HMI areas should be encouraged to increase household participation in watershed management and other

Table 4. *Household participation and institutional effectiveness mean scores by level of market involvement, farm size and age of household head and significant differences between their mean scores*

		Household participation mean score			*Institutional effectiveness mean score*		
Variables	*Comparison between variables*	*Level of market involvement*	*Farm size*	*Age of household head*	*Level of market involvement*	*Farm size*	*Age of household head*
1. HMI area or Aandi sub-watershed							
Higher market involvement (G_1)	G_1–G_2	2.172 (50)	2.021 (44)	2.117 (15)	3.777 (50)	3.660 (44)	3.787 (15)
Medium market involvement (G_2)	G_2–G_3	2.124* (33)	2.111 (47)	2.071 (62)	3.746* (33)	3.690 (47)	3.644 (62)
Lower market involvement (G_3)	G_3–G_1	1.856* (25)	2.173 (17)	2.095 (31)	3.511* (25)	3.868 (17)	3.791 (31)
2. MMI area or Chiti sub-watershed							
Higher market involvement (G_1)	G_1–G_2	1.950 (20)	1.743 (44)	2.000 (3)	3.733 (20)	3.486 (44)	3.698 (3)
Medium market involvement (G_2)	G_2–G_3	1.893 (20)	1.904 (45)	1.821* (57)	3.602 (20)	3.672* (45)	3.572 (57)
Lower market involvement (G_3)	G_3–G_1	1.803 (60)	2.054 (11)	1.880* (40)	3.560 (60)	3.792* (11)	3.641 (40)
3. LMI area or Dhawadi sub-watershed							
Higher market involvement (G_1)	G_1–G_2	1.913 (4)	1.741 (67)	1.846 (14)	3.786 (4)	3.571 (67)	3.633 (14)
Medium market involvement (G_2)	G_2–G_3	2.089* (9)	1.902* (31)	1.855 (64)	3.831 (9)	3.727 (31)	3.637 (64)
Lower market involvement (G_3)	G_3–G_1	1.763 (90)	1.900 (5)	1.622 (25)	3.595 (90)	3.686 (5)	3.583 (25)
4. Cross-market/sub-watershed participation							
Higher market involvement (G_1)	G_1–G_2	2.085* (108)	na	na	na	na	na
Medium market involvement (G_2)	G_2–G_3	1.850 (100)	na	na	na	na	na
Lower market involvement (G_3)	G_3–G_1	1.797* (103)	na	na	na	na	na

Notes: * = Pairs significantly different at the 0.05 level.
Figures in parentheses are number of respondent households.
na = Not applicable.

development activities. A comparison of household participation between levels of market involvement also showed significantly higher household participation by higher market involvement watersheds than lower ones (table 4). Therefore, it can be concluded that household participation is directly related to higher levels of market participation.

6. Socioeconomic variables influencing household participation within different levels of market participation

ANOVA and a *post hoc* test using the Tukey procedure were used to evaluate the difference in mean scores of household participation with major socioeconomic parameters such as the age of household head, farm size, and household involvement in the market economy. Given the comparative nature of analysis, assessments were made independently of all levels of market participation in order to identify intra market or sub-watershed variations.

6.1. Household participation in the HMI area

An analysis of variance with a *post hoc* test did not show significant differences in participation scores of responses by age of the household head and farm size (table 4). This implies that, in the watershed areas where farming systems are in transition, the age of the household head and farm size are not the conditional factors that need to be considered in institutional programs and activities. In other words, all farm households participate equally, irrespective of age and farm size, in watershed areas with HMI. It was illustrated by the involvement of larger farmers in crop production and smaller families in livestock production through effective institutional support. Owing to inclination towards a market economy, all households in the HMI area were shifting towards the use of modern tools and technologies for improvement in production and management of farming systems; thus their participation level was higher.

6.2. Household participation in the MMI area

In the MMI watershed, ANOVA with a *post hoc* test of household participation showed non-significant difference by age group but significant difference by farm size (table 4). This implies that composition of age group does not influence household participation when market participation is at the medium level. However, farm size should be considered if household participation is an important consideration in the implementation of watershed management and development programs or projects. The test result indicates that it is easy to obtain higher participation from larger (large and medium) farm households than the smaller ones. Lower participation from smaller farm households in institutional programs might be due to their higher involvement in subsistence activities.

Owing to growing motivation of farm households to move towards a market economy in the MMI areas, farm households are gradually replacing local crop and livestock breeds with improved crops and animals, and at the same time adopting the use of imported inputs, particularly fertilizers and insecticides. However, the larger farm households have had more opportunities to absorb external resources due to their larger

farm size and relatively higher economic condition. For the adoption and effective utilization of external resources, institutional support and services were considered indispensable and, thus, farm size appeared as an influential factor for household participation. To avoid the 'richer getting richer' paradox, farm-size-specific pilot programs or projects should be implemented to encourage the participation of smaller farm households in the main stream of development.

6.3. Household participation in the LMI area

In the area with LMI, the majority of farm households were either at just sufficient or at a deficit level of food production. Hence, there was very limited market involvement, which led to low household participation in development programs and activities. An analysis of variance of socioeconomic variables showed that the adult age group was participating significantly more than the old age group (table 4). This indicates the innovativeness of the adult age group in the changing context of commercialization, where use of modern tools and techniques are essential to produce surplus for increased market participation. There was no significant difference in household participation by farm size (table 4). This implies that farm size is not an inhibitor that needs serious consideration when implementing programs and projects in the LMI areas.

In summary, variations in household participation by different socioeconomic attributes, such as the age of the household head, farm size, and level of involvement, in the market economy, with their respective mean scores clearly indicated the importance of these characteristics in enhancing household participation. However, there is wide scope for involving all categories of farm households in greater household participation and opportunities through increased institutional activities. Discrimination in the distribution of support and services by farm size might be one of the reasons for the lower involvement of small farm households in the market economy. This indicates the need for reforms in institutional activities to promote equal participation among household of different farm size. It has implications for watershed management activities as well.

7. Levels of market involvement influencing perceived institutional effectiveness

The perceived effectiveness pertains to the farmers' general attitude towards the effective functioning of institutional programs and activities in a specific area. In general, the attitude is based on the social and economic incentives to households, as well as improvement in the common property resources that are served by institutional programs and activities. Therefore, it is not necessary that household participation in institutional activities always reflects their attitude towards effective institutional activities. Farmers' perceptions related to the improvement in farming systems, management of natural resources, and expansion of off-farm opportunities were taken into consideration while evaluating institutional effectiveness in the study areas.

A *post hoc* test of differences in institutional effectiveness by levels of market involvement showed significant differences only in watershed

areas with HMI (table 4). This implies that levels of market involvement are not significant factors that need consideration when implementing development programs and projects, when market involvement of the area under consideration is at a medium or lower level. However, it should be seriously considered when market involvement is at a higher level.

8. Socioeconomic variables influencing perceived institutional effectiveness by levels of market involvement

Differences in perceived institutional effectiveness by socioeconomic variables such as the age of the household head, farm size, and the levels of market involvement were analyzed separately by sub-watersheds and the results are presented below.

8.1. Socioeconomic variables influencing institutional effectiveness in the HMI area

Institutional effectiveness was not significant with respect to the age of the household head and farm size in the area with HMI (table 4). This implies that socioeconomic variables need not be seriously considered while implementing development activities in watershed areas with HMI because institutional effectiveness is the same irrespective of farm size and the age of the household head.

8.2. Socioeconomic variables influencing institutional effectiveness in the MMI area

In the MMI area, the farm size was identified as a significant variable that affected perceptions of institutional effectiveness, which was evidenced by significant differences in participation rates between larger (large and medium) and small farm sizes (table 4). However, the effect of the household head's age and household involvement in market participation was not significant.

8.3. Socioeconomic variables influencing institutional effectiveness in the LMI area

It is interesting to note that none of the socioeconomic variables identified influenced farmers' perceptions of the effectiveness of institutional activities in the area with LMI (table 4). This might be a consequence of the limited household involvement in the market economy and limited institutional activities in the area.

Table 5 summarizes significant differences in household participation and institutional effectiveness by socioeconomic variables. Based on variations and associated socioeconomic variables, the following points portray institutional roles and activities relevant to the study area:

- In the areas where the majority of farm households were taking part in the market economy, for example in the Aandi sub-watershed (HMI), this was a major factor in determining household participation in institutional programs and activities, as was their judgment of the effectiveness of institutional performance.

Table 5. *Summary of socioeconomic variables influencing household participation and institutional effectiveness in areas with different levels of market participation*

	HMI (N = 108)		*MMI (N = 100)*		*LMI (N = 103)*	
Socioeconomic variables	*Part.*	*Effect.*	*Part.*	*Effect.*	*Part.*	*Effect.*
Farm size				**	*	
Age of the household head			**			
Levels of market involvement	**	**			*	

Notes: Significant difference: * = one pair. ** = more than one pairs.
Part. = Household participation. Effect. = Institutional effectiveness.

- In the areas where the market economy had just started to 'take-off', for example in the Chiti sub-watershed (MMI), land resource, particularly farm size, appeared to be an influencing factor for household participation and institutional effectiveness.
- In the areas where the majority of farm households were still at the subsistence level, for example in the Dhawadi sub-watershed (LMI), the age of the household head (who usually makes major farming and economic decisions at the household level in the Nepalese context) and household involvement in the market economy were the most important factors determining participation in institutional activities.

9. Explanatory socioeconomic factors for household participation and institutional effectiveness

The comparison of means has further led to the identification of other socioeconomic factors that explain household participation and institutional effectiveness. Prior to finalizing the factors for participation and effectiveness, Bartlett's test of Sphericity was done to test the overall significance of all correlations within a correlation matrix and to verify the appropriateness of factor analysis. Likewise, the Kaiser–Meyer–Olkin Measure of Sampling Adequacy (MSA) was employed to quantify the degree of inter-correlation among variables and for evaluating the appropriateness of applying factor analysis, where MSA equaling 0.5 or above was considered for interpretation as measurable, indicating the lower acceptable limit.

9.1. Factors influencing participation and effectiveness in the HMI area

The analysis of the HMI area resulted in an MSA index of 0.745, indicating that each variable extracted in the analysis predicted a 'middling' sample size for factor analysis.[3] A total of 25 variables representing the socioeconomic characteristics of farm households were analyzed, and 11

[3] The calculated Bartlett's test of Sphericity shows an approximate chi-square value of 692 at a 0.000 significance level, revealing the appropriateness of the model. Similarly, the maximum correlations among factors were estimated as being not significant (0.228), indicating the mutually exclusive nature of factors.

Table 6. *Final statistics: household participation and institutional effectiveness in the HMI area*

Variables	*Communalities*	*Factors*	*Eigenvalue*	*Pct of Var.*	*Cum Pct.*
Age of household head (years)	0.7042	1	4.6236	42.0	42.0
Total family members (number)	0.7749	2	1.6927	15.4	57.4
Agricultural labor (number)	0.7764	3	1.4341	13.0	70.5
Total farm size (hectare)	0.5146				
Active age group (number)	0.7238				
Total off-farm income (NRs.)	0.4271				
Total gross farm income (NRs.)	0.8081				
Total family members attended training (number)	0.5116				
Livestock standard unit (LSU)	0.8402				
Total migration for off-seasonal activities (number)	0.7959				
Education Index (scale)	0.8735				

variables with a significant co-variance (> 0.30) at a 0.01 significance level were identified and entered into the factor model. The oblique rotation method extracted three sets of uncorrelated variables in an oblimin convergence of eight iterations (table 6).

The communality, expressing the linear association between a particular variable and other variables in the model, were more than 0.51 for all included variables except for off-farm income. Despite lower values of off-farm income, it was included in the model due to its significant contribution to the household economy. Eigenvalues greater than 1.0 was set to limit the number of factors to be extracted. The extracted factors cumulatively explained 70.5 per cent of the total variance associated with factors for household participation and institutional effectiveness. The individual variance explained by each factor revealed that the first and the most important factor, explained 42.0 per cent, followed by 15.4 and 13.0 per cent for the second and the third factors respectively.

The first factor was comprised of six variables with high loading indicating the combination of social and economic variables for household participation and institutional effectiveness. These variables exhibited the quality of household members (family size, active members, education, and migration for off-farm activities) and resources (farm size and off-farm income) that primarily influenced farmers' decisions to participate in institutional activities and also the variables that affected their perceptions of institutional effectiveness. All these variables were positively related to satisfactory factor loading (table 7). Thus, this factor was labeled 'labor quality and resources'. The highest factor loading was observed in migration and education, indicating awareness and a higher level of understanding of participation and community work.

There were three variables associated with the second factor, namely gross farm income, total household members attending activity-specific training, and livestock holding. These variables articulated the economic well-being of households and the technical knowledge of family members.

Table 7. *Pattern matrix: factor loading in the HMI area*

Variables	*Factor 1*	*Factor 2*	*Factor 3*
Total family members (number)	0.7533		0.341588
Total farm size (hectare)	0.5439		
Active age group (number)	0.8122		
Total off-farm income (NRs.)	0.6517		
Total migration for off-seasonal activities (number)	0.9263		
Education Index (scale)	0.9173		
Total gross farm income (NRs.)		0.8788	
Total family members attended training (number)		0.4729	
Livestock standard unit (LSU)		0.8937	
Agricultural labor (number)			0.8591
Age of household head (years)			0.7635

It is difficult to label this factor. However, a sort of relationship was identified between technical knowledge and household economics. The number of household members who participated in training activities and acquired a technical knowledge of farming systems helped families improve production and management practices and consequently their gross income.

The third factor was found to be strongly related to the number of active age group members in the family and the age of the household head. These variables were related to the social attributes of a household's composition. In labor-intensive mountain farming systems, where production and management activities of farming systems depended primarily on family labor, and major decisions regarding farming and economic activities were made by household heads, the age composition of households significantly influenced the decision-making process. The active and educated members of the family were equally involved in off-farm activities and earned a large portion of income for future investment in the production and management of farming systems.

9.2. Factors influencing participation and effectiveness in the MMI area

An MSA index of 0.659 in the MMI area indicated the middle level of the sample size for factor analysis.[4] Out of a total of 25 variables representing social and economic characteristics of farm households, 11 variables with significant co-variance (> 0.30) at a 0.01 significance level were entered into the factor model. The oblique rotation method was employed and

[4] The calculated Bartlett's test of Sphericity showed an approximate chi-square value of 572 at a 0.000 significance level indicating the appropriateness of the model. Similarly, the maximum correlation among factors was estimated at the lower value of 0.254, indicating that each factor was unique and uncorrelated.

Table 8. *Final statistic: household participation and institutional effectiveness in the MMI area*

Variables	*Communalities*	*Factors*	*Eigenvalue*	*Pct of Var.*	*Cum Pct.*
Age of household head (years)	0.4474	1	3.9902	36.3	36.3
Total family members (number)	0.7793	2	2.0239	18.4	54.7
Agricultural labor (number)	0.8567	3	1.4354	13.0	67.7
Total farm size (hectare)	0.5731				
Active age group (number)	0.7063				
Total off-farm income (NRs.)	0.6328				
Total gross farm income (NRs.)	0.8273				
Total family members attended training (number)	0.4356				
Livestock standard unit (LSU)	0.6449				
Total migration for off-seasonal activities (number)	0.7312				
Education Index (scale)	0.8146				

an oblimin convergence of 12 iterations finally extracted three sets of uncorrelated variables known as factors (table 8).

Despite the lower communalities values for training attended by family members and the age structure of household heads, these factors were included in the model as they were perceived to have a higher influence in the farming systems adjustment process in the Nepalese context, where major decisions are made by the household head and contribute considerably to awareness generated by training programs. The communalities for the rest of variables were more than 0.57, indicating the appropriateness of the included variables. The extracted factors cumulatively explained 67.7 per cent of the total variance with a higher factor explaining a variance of 36.3 per cent as the first factor. The second and the third factors explained 18.4 and 13.0 per cent respectively. It should be noted that the relationship was indicated by a positive correlation among all factor loadings.

The first factor loading included three variables: total migration for off-farm activities, educational status of family members, and off-farm income. These variables indicated the level of awareness of household members and the income source. Although farmers had migrated for off-farm employment, they were affiliated with external institutions and continued in the same way in the institutions functioning in their area. The income generated from off-farm employment had significantly contributed to the adoption of materials and technologies prescribed by institutions and finally steered their perception of institutions and their effectiveness (table 9). These factors have been termed as 'awareness and supplementary income'.

There were four variables associated with the second factor, namely gross farm income, total households members attending training, livestock holding, and farm size. These variables exhibited household resources (capital, land, and livestock holdings) and the modern operational skills

Table 9. *Pattern matrix: factor loading in the MMI area*

Variables	*Factor 1*	*Factor 2*	*Factor 3*
Total migration for off-seasonal activities (number)	0.8724		
Education Index (scale)	0.6579		0.3136
Total off-farm income (NRs.)	0.8158		
Total gross farm income (NRs.)		0.9338	
Total family members attended training (number)		0.5297	
Livestock standard unit (LSU)		0.7580	
Total farm size (hectare)		0.7598	
Total family members (number)	0.4062		0.6341
Agricultural labor (number)			0.9666
Active age group (number)	0.5127		0.5469
Age of household head (years)			0.6330

of household members (training). Thus, the second factor has been labeled as 'resources and modern skills'.

Likewise, the third factors were related to satisfactory factor loadings and included four variables, namely family size, agricultural labor force, active age group members of households, and the age of the household head. These variables were related to the labor force quality and characterized the farmers' attitudes towards the participation of household members and the effectiveness of institutional activities. The significant factor loading of household size and active age group to the first factor further revealed that awareness of family members and supplementary household economy through off-farm employment were also related to these variables. The variables therefore could be labeled as 'labor force quality'.

9.3. Factors influencing participation and effectiveness in the LMI area

In the LMI area, an MSA index of 0.600 indicated the middle level of sample size for factor analysis.[5] As in the HMI and MMI areas, a total of 25 variables representing the socioeconomic characteristics of farm households were included at the first stage of analysis, and ten variables that had a significant co-variance (> 0.30) at a 0.01 significance level were extracted for further factor analysis. The oblique rotation method was employed and the oblimin convergence of 13 iterations finally extracted four sets of uncorrelated variables (table 10). The aptness of variables included in the model was explained by communalities, which were estimated at more than 0.68, and the Eigenvalues, estimated at greater than 1.0. The cumulative variance showed that the included variables explained 80 per cent of the total variance associated with factors for household participation and institutional effectiveness. The contribution of each factor was estimated

[5] The appropriateness of the factor model was revealed by the approximate chi-square value of 508 at a 0.000 significance level estimated by Bartlett's Test of Sphericity. The estimated maximum correlation among identified factors were non-significant (0.137), which verified the suitability of the model.

Table 10. *Final statistic: household participation and institutional effectiveness in the LMI area*

Variables	*Communalities*	*Factors*	*Eigenvalue*	*Pct of var.*	*Cum Pct.*
Total family members (number)	0.7505	1	2.9753	29.8	29.8
Agricultural labor (number)	0.6904	2	2.0297	20.3	50.1
Total farm size (hectare)	0.8309	3	1.6344	16.3	66.4
Active age group (number)	0.7905	4	1.3584	13.6	80.0
Total off-farm income (NRs.)	0.7796				
Total gross farm income (NRs.)	0.8368				
Total family members attended training (number)	0.9441				
Total training attended (number)	0.9469				
Total migration for off-seasonal activities (number)	0.6846				
Education Index (scale)	0.7432				

Table 11. *Pattern matrix: factor loading in the LMI area*

Variables	*Factor 1*	*Factor 2*	*Factor 3*	*Factor 4*
Total family members (number)	0.8657			
Agricultural labor (number)	0.6117		−0.5848	
Active age group (number)	0.8723			
Education Index (scale)	0.6967		0.3259	
Total family members attended training (number)		0.9599		
Total training attended (number)		0.9660		
Total migration for off-seasonal activities (number)	0.3299		0.7321	
Total off-farm income (NRs.)			0.8492	
Total gross farm income (NRs.)				0.9084
Total farm size (hectare)				0.8830

at 29.8, 20.3, 16.3, and 13.6 per cent by the first, second, third, and fourth factors respectively.

Family size, agricultural labor, age of active group members of households, and the educational status of family members were found to be associated with the first factor characterizing the 'quality of the labor force' in households and influencing household participation and institutional effectiveness (table 11).

The second associated factor included two variables, namely total amount of training and number of household members attending training. Many institutions working with rural communities have incorporated training as a program component for creating awareness, strengthening rural capabilities, and providing information and techniques for farming and natural resource production and management. Training activities related to farming systems become an essential attribute of modern farming

systems in terms of community participation and adoption of new tools and techniques for farming; thus the factor has been termed 'modernization'.

The third factor included the number of households who had migrated for off-farm employment and total off-farm income. Off-farm employment was the supplementary source of income essential for investment in modern tools and technologies and increasing the production and productivity of farming systems. This also served as motivation to participate in institutional programs and activities in order to acquire modern working skills and knowledge, skills necessary for obtaining more economic benefits in the future. Thus, these factors can be labeled as a 'supplementary income source'. The migration variable was also found to be associated with the first factor, indicating a relationship between labor force quality and the rate of migration for off-farm activities. As also identified in a previous analysis, there was a growing tendency among educated and active family members to become involved in off-farm employment whenever opportunities were available. This has significantly contributed to labor shortage problems in the area, as was illustrated by negative factor loading (-0.585) of agricultural labor in the third factor.

There were two variables associated with the fourth factor: gross farm income and total private landholding. These variables exhibited household resources and, thus, could be labeled as 'resources'. Resources (capital and land) are important variables that encourage farmers to optimize production by incorporating external inputs and consequently seek external supports and services.

In sum, by taking into consideration of socioeconomic variables, the factor analysis resulted in three sets of correlated variables in the Aandi and Chiti sub-watersheds, while four sets of factors were identified in Dhawadi sub-watershed (table 12). The variables associated with the first factors varied across sub-watersheds both in type and number. In the Aandi sub-watershed, both resources and labor force quality, represented by six variables, were identified as the major influencing factors for household participation and institutional effectiveness, while only labor quality, represented by four variables, was identified as an important factor in the Dhawadi sub-watershed.

In the MMI area, there were three variables representing migration and a supplementary source of income as the major conditional factors for participation and effectiveness. However, in all levels of market participation, education was identified as a common socially influencing variable. Therefore, it would not be erroneous to assert that education is a primary factor for household participation and institutional effectiveness. This has been further evidenced by the fact that, in the areas where the majority of farmers were involved in the market economy, household involvement and its perceived effectiveness were significantly influenced by both resources and labor force quality, while in a subsistence economy where very few households were taking part in the market economy, labor force quality was more influential. Similarly, in the areas where market economy had just been pronounced, the household economy factor, contributed to by supplementary sources (off-farm income), appeared to be more influential.

Table 12. *Summary of factors influencing household participation and institutional effectiveness*

Factor	*HMI*	*MMI*	*LMI*
First	1. Family size (TOTALMF) 2. Farm size (FARMSIZE) 3. Active age group (ACTIVEAG) 4. Off-farm income (OFFINCOM) 5. Total migration (TOTALMIG) 6. Educational status (EDUINDX).	1. Total migration (TOTALMIG) 2. Educational status (EDUINDX) 3. Off-farm income (OFFINCOM)	1. The household size (TOTALMF) 2. Agricultural labor (AGRLABOR) 3. Active age group (ACTIVEAG) 4. Educational status (EDUINDX)
Second	1. Total gross farm income (GROSSINC) 2. Total family members attended training (TRAINMF) 3. Livestock holding (LSU).	1. Total gross farm income (GROSSINC) 2. Total family members attended training (TRAINMF) 3. Livestock holding (LSU) 4. Farm size (FARMSIZE).	1. Total number of training (TRAINATT) 2. Total family members attended training (TRAINMF).
Third	1. Active age group (ACTIVEAG) 2. Age of household head (HHAGE).	1. Family size (TOTALMF) 2. Agricultural labor force (AGRLABOR) 3. Active age group (ACTIVEAG) 4. Age structure of household head (HHAGE)	1. Off-farm employment (TOTALMIG) 2. Total off-farm income (OFFINCOM).
Fourth			1. Total gross farm income (GROSSINC) 2. Total private landholding (TOTALLAN).

Likewise, in the second factor, household economics, training, and education factors attributed to institutional participation and effectiveness. These were represented by two, three and four variables factor loading in the LMI, HMI, and MMI areas respectively. It is interesting to note that the total number of family members attending training was a common variable in all areas, indicating the second important factor for participation and effectiveness.

10. Conclusion and policy implications

In the context of the increasing importance of people's participation in the development process, several socioeconomic variables were found to be influencing household participation and perceived institutional effectiveness. With the age of the household head, family size, education, training of family members, and agricultural labor representing social variables, and livestock holding, gross farm income and HMI representing economic variables, these variables were entered into regression models

with different levels of market participation. These variables were found in different groups of factors in the factor analysis, confirming the validity of the factor analysis adopted as a core analytical framework in the study. However, the fourth regression model that explained the variations in household participation, which included education and training of family members, the age of the household head, agricultural labors, livestock holding, farm size, and HMI as significant variables, was selected as the best model to estimate household participation in development activities. In institutional effectiveness models, only four socioeconomic variables, such as family size, education and training of family members, and gross farm income, were entered into regression models with various levels of market involvement. The third model that included family size, family education and gross farm income was selected to explain and estimate the effectiveness of institutions that are involved in various development activities.

The factor analysis grouped several socioeconomic variables into three major factors to explain household participation and institutional effectiveness. The first major factor identified was associated with participation and effectiveness and included resources and labor force quality, such as farm size, gross farm income, family size, education status, age structure, and number of agricultural labor force. The second factor explained supplementary income sources, such as migration of family members and off-farm activities. Finally, the third factor represented awareness and modern skills, including frequency of training attended by family members. The association of variables in each factor for different sub-watersheds implied that education and family size were the common variables across locations, while resource holding and income were more influential in the areas with a higher level of involvement in the market economy, like the Aandi and Chiti sub-watersheds. Labor force quality, such as age group, agricultural labor, and training attended, were influential in the areas with a lower level of involvement in the market economy, like the Dhawadi sub-watershed.

Based on the findings, the following policy implications of the study can be drawn:

- The study findings have shown that a higher level of market involvement was one of the significant variables that influenced household participation in development activities. Hence, the adoption of policy for the integration of watershed areas to market centers has been recommended to promote market involvement as well as enhance household participation in watershed management and development activities.
- Another important study finding was the significant influence of gross farm income and training on household participation and institutional effectiveness. Hence, a policy to promote the teaching of improved farm practices to increase gross farm income and also a policy to promote training of the marketing of farm and natural resource-based local products is recommended to enhance household participation and institutional effectiveness in watershed management and development programs and activities.

- The study findings also showed a significant and positive relationship between larger farm sizes and higher levels of market involvement, resulting in farm households' higher participation in various development activities. This has led to the 'rich get richer' paradox. Hence, implementation of a policy that strategically and specifically promotes the participation of smaller farm households has been recommended.

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