

Social Inequality and Collective Efficacy in Community-Based Natural Resource Management

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Abstract: We explore the impact of social structure such as caste on social capital formation using data from community forest user groups from Nepal. We also provide a study of the impact of social capital on resource extraction. We found that upper caste and more educated households do participate more in social capital formation compared to their less privileged counterparts. Households from higher caste are engaging more in the collective action. Our results also suggest that increasing the level of participation of lower caste households in community level activities would facilitate the accumulation of village social capital. Further, the analysis revealed that the higher stocks of social capital are associated with lower levels of resource exploitation.

Key words: community forestry, caste, collective action, social capital, resource extraction, Nepal

1. INTRODUCTION

The role of social capital has emerged as a key concept in combating a vast array of political, social and economic problems. Social capital encapsulates the idea that social bonds are important for communities (Pretty 2001; Coleman, 1988). Generalized trust and access to social networks are both important for higher levels of performance in several policy areas, such as education, health, development, and public policy at large (Paraskevopoulos, 2007). Further, it has been argued that trust, the nature of exchange relations, the cultural significance and institutional constraints of a society shape the individual's expectations with regard to use of the natural environment (Adger, 2003). Communities that have higher levels of social capital are more likely to overcome opportunistic behaviors and enforce management rules. Communities can thus have higher cooperation among individuals because social capital lowers the cost of working together (Bromley, 1993; Pretty and Ward, 2001). Scholars have discussed the direct application of the concept of social capital such as social norms and networking for efficiency, equity and sustainability of common pool resource (CPR) management (Ollagon, 1991; Ostrom, 1992; Adger, 2003). Community-based management of common pool resources (CPRs) has been regarded as an appropriate system to achieve economic, environmental and social development goals and to overcome the 'tragedy of the commons' situation because of the existence of social capital in many rural settings that promote generalized trust and reciprocity (Ostrom, 1990; Berkes, 1989; Wade, 1988; Jodha, 1986; Baland and Platteau, 1996; Chakraborty, 2001; Agrawal, 2001; Edmonds, 2002). During the

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past decades, there is, indeed, overwhelming evidence of groups' formation for managing a wide range of local commons.³

While the role of social capital has been acknowledged for addressing social problems and facilitating collective action, very few empirical studies examine how institutional and social structure of the community hinders or facilitates the emergence of social capital. Particularly, the relationships between social capital and socially constructed inequalities such as caste and ethnicity have not been fully elucidated. Ethnic diversity is often viewed as not conducive to collective action as individuals tend to distrust members from other groups (Portes, 1998; Abrams et al., 2005). There is evidence, at the aggregate level, that cultural or ethnic diversity can lead to low social capital and failure of collective action (Alesina et al, 1999; Easterly and Levine, 1997; Miguel and Gugerty, 2004). The idea is that social capital is likely to be weaker in heterogeneous communities where people have less trust and feel uncomfortable interacting with other members who are different than themselves (Coffe, 2008). This may be particular relevant in countries like Nepal.

More homogeneous communities foster greater levels of social capital production (Costa and Kahn, 2003). Earlier focus on the study of social capital was more dominated by the structural approach (e.g. network connection, group size) and they fail to take into consideration the underlying institutional or social context in which these relationship are embedded (Ballet et al., 2007). Despite mushrooming of emerging work on social capital, there is still insufficient *micro* level empirical evidence on how socio-cultural differences within communities influence the development of social capital and functioning of local management institutions.

This paper seeks to contribute to this strand of literature by presenting evidence on the relationship between caste and social capital formation using Nepal as a case study. The focus on caste seems obvious because Nepal has a distinct social stratification based on the caste system and encompasses a wider socio-economic heterogeneity (Adhikari and Lovett, 2006). The caste system is a centuries-old institution that helps maintain power relations among different communities. There are four divisions of caste according to the Hindu religion: i) the Brahmans (priests, teachers, and scholars), ii) the Chettris (or Kshatriyas - kings and warriors), iii) the Vaishyas (traders and businessmen), and iv) the Shudra (peasants, laborers and service providers) who were made outcasts depending on the professions they were associated. For instance, communities that professed non-polluting jobs were integrated as Sudhra and those associated with polluting professions (working in what were seen as unhealthy, unpleasant jobs such as cleaning, sewage etc.) were considered "untouchable" (Adhikari and Di Falco, 2009). Caste generally governs the beliefs and practices about rights and responsibilities, and powers and privileges with respect to the different resource management activities (Singh, 2004). Caste differences, therefore, could be an important determinant of participation of households in various forms of collective action (i.e. Baker 1997; Adhikari and Di Falco, 2009).

The Nepalese government declared the caste system 'non-existent' many years back. As a result, the social barriers between higher and lower castes are gradually

³ Pretty (2003) estimated that since the early 90s up to 522000 groups have been formed.

breaking down (Adhikari and Di Falco, 2009). The social barriers were also lowered by the implementation of the community forest program (CF). The program envisioned a more inclusive approach to forest management by providing equal opportunities to various low-caste people, landless migrants or other ethnic groups in forest management decisions. A priori, one would expect an equal participation of all segments of the society as a result of this affirmative action. This includes the participation in the management of the local forest. Participation in community activities was defined by Putnam's (2000) as 'bridging social capital.' This is opposed to "bonding social capital" that glues together more homogenous groups within a community. Bridging social capital is defined as actions that reinforce bonds of connectedness that are formed across diverse social or ethnic groups (Bryant and Norris, 2002). This seems to be one of the most important dimensions of social capital formation in Nepal. It is the outcome of households' decision to participate in activities that require interaction with other ethnic groups. In this paper, first, we focus on this. How the existence of different caste affects household's participation in crucial forms of community-based actions? For instance, how belonging to different caste will affect the probability of taking parts in community meetings where management decisions regarding the local forest are taken?

The CF in Nepal has been implemented for more than thirty years⁴ and provides a prime case study to investigate the relationships between caste, social capital and resource extraction (forest exploitation). There is strong emphasis on CF with a realization that local communities can be better equipped to manage these crucial resources in a sustainable way (Edmonds, 2002). People living in communities within and around forests use forest products for food, fuel, medicine, construction, fodder for livestock, and as a fallback when agricultural and other economic activities are inadequate to sustain the household economy (Charnley and Poe, 2007). Further, they also depend on the ecosystem services that forests provide, such as water for household uses and soil for agricultural production that contributes to the welfare of local population (both in terms of supplementing rural livelihoods through alternative sources of income and providing inputs for forestry-based farming systems). We therefore need to extend the scope of the paper to investigate the role of bridging social capital on resource extraction. We thus include a, second, focus of the paper to address the question: are household that "invest" more in bridging social capital extracting more or less form the local forest?

The paper proceeds as follows. The next section will present a brief description of the concept of social capital and its relation with caste heterogeneity in natural resource management. This is followed by a description of the survey method and variables used in analysis. We then present the estimation strategy and the results. We conclude with a discussion on our findings in section six with some policy implications.

2. BACKGROUND ON SOCIAL CAPITAL, CASTE AND NATURAL RESOURCE MANAGEMENT

Although there are different definitions of social capital (Paldam, 2000), the concept generally describes the relations of trust, network, authority, relations, norms,

⁴ According to a recent National Database record, there are already about 14,500 CFUGs managing about 124,000 ha of forests, which cover more than 35 % of⁴ the population of the country (NPC, 2007).

solidarity, reciprocity, voluntary participation in the group and the evolution of common rules (Coleman, 1990; Putnam, 1993; Paldam, 2000; Adger, 2003). Social capital can be identified at different scales- from the micro-institutional to more macro scales-that examine its role in the formation of state-civil society relations and economic development in certain regions (Lyon, 2008). This concept has been applied in a variety of contexts such as family, education, ethnicity, democracy, health, happiness, crime and economic performance to explain the ability of communities to solve the problems of collective action. Findings from earlier research showed that increased social capital-measured most frequently by indices combining trust and civic engagement-promoted better political and economic outcomes (Nelson et al., 2004, p.6). In his work on democracy and civic traditions in modern Italy, Putnam (1993) highlighted a long-standing regional variation in the propensity for civic engagement between Northern and Southern Italy. He concluded that historical variations in civic engagement contribute significantly to the persistent gap in economic outcomes and governmental effectiveness between different regions (cited in Killerby and Wallis, 2002). Knack (2002) discussed that reciprocity in the form of trust such as volunteering and census responses were associated with differences between government performances in American states.

Scholars of commons and institutional theorists have shown that social capital facilitates a range of cooperative actions including crafting of institutions for sustainable management of natural resources at the community level (Ostrom 1992). Moreover, social norms and institutions enhance the ability of community groups to develop factors preventing over appropriation from CPRs and help achieve sustainable and efficient outcomes (Ostrom, 1992, McKean, 1992; Agrawal, 1999; Sethi and Somanathan 1996; 2006; Osés-Eraso and Villadrich-Grau, 2007). The level of social capital in a community influences institutional arrangements and interpersonal trust and thus strengthens social bonds between members (Baland and Plateau, 1996; Pretty, 2001; Pretty and Ward 2001; Uphoff and Wijayaratna, 2000). Arefi (2003) identifies consensus building – developing a shared interest and agreement among various actors to induce collective action- as a direct positive indicator of social capital. Social capital has a stock that can lead to a flow in the form of economic returns. Society or communities that have social bonds, trust and connectedness are more likely to overcome opportunistic behaviors and enforce rules with regard to the efficient utilization of environmental resources. If members of a resource-managing institution are able to form rules, agree to abide by them, and succeed in excluding those who do not follow these rules, then there is creation of values such as trust and reciprocity in that group (Ostrom, 2000). On the contrary, erosion of values like reciprocity may lead to destruction of a resource or public good (Oakerson, 1992).

One contested dimension is socio-economic heterogeneity and the formation of social capital at the community level. Some authors argued that heterogeneous communities have lower levels of trust because diversity and inter-group conflict created barriers to the virtuous circle of higher social capital and better performance (Nelson et al., 2004, Kanbur, 1992). For instance, in their study of growth strategy and ethnic divisions in Africa, Easterly and Ross (1997) found that ethno linguistic fractionalization greatly reduced growth rates in the post-colonial period. However, another strand of scholarship posits that heterogeneity facilitates group actions because actors with more economic interests and power usually initiate collective

action (Olson, 1965). This is also examined by Baland and Platteau (1997) who argued that it may be true in situations where collective action involves large start-up costs. Based on analysis of data collected from 307 Flemish municipalities, Coffe (2008) found that those municipalities with a more heterogeneous population indeed had lower levels of social capital. Stolle and Rochan (2000) observed that heterogeneous associations promote generalized trust and reciprocity. Andrews (2009) tests the assumption that political participation and associational activity can minimize negative externalities for social capital associated with ethnic heterogeneity, such as mistrust and lack of respect. He found that civic engagement can moderate negative externalities for social capital associated with ethnic heterogeneity. Other scholars have contended that institutions are embedded in the antecedent decisions and culture of the societies in which they emerge (Adger, 2003, p. 388). Bourdieu (1980, 1986) explained the social and cultural capital with an argument that cultural capital features among homogeneous social groups should be taken into account as they have to be transformed into 'symbolic' features to be assimilated by the members of the group and attributed among them and to each other in order to link them together (cited in Ballet et al., 2007, p.357). To date, little research has addressed the knowledge gaps regarding the potential for civic engagement to moderate negative externalities for social capital associated with ethnic heterogeneity such as mistrust and lack of respect (Andrew, 2009; Putnam, 2007). Although there are different forms of heterogeneity (see Adhikari and Lovett, 2006), in this paper we aim to consider a particular dimension of socio-cultural heterogeneity, notably how caste system influence the creation of social capital at the community level. Our measure of social capital in this paper is the interest group participation in various forms of community meetings related to the CF management. Our approach in measuring the social capital is similar to that of Ruston (2002) who considered social participation, social engagement, and commitment as one of the five specific themes of social capital. In their study of the role of social capital in household outcomes in rural Tanzania, Narayan and Pritchett (1999) constructed the social capital variable by a weighted average of memberships in various groups and the characteristics of these groups.

The caste system in the Indian sub-continent is one major component of ethnic heterogeneity. The role of caste is highly contested with some considering it an economic vehicle which provides opportunities for work specialization. Others view caste as bonds of connectedness, a sort of support system that people use to deal with society and the state. Vaidyanathan (2002) treated 'the caste system as a valuable social fabric, which helps provide a cushion for individuals and families to deal with society and the state. The positive side of the caste system is self-help within a similar caste. A handful of experiences from community-based approaches to local development demonstrate that the caste system acts as social glue that enables cohesive communities to pull together, help distressed members, mediate conflicts, penalize deviant behavior and reward desirable behavior, far more efficiently and cheaply than formal institutional arrangements (TTI, 2000). However, the association between ethnic heterogeneity and the level of social capital has also been scrutinized in the literature. For instance, members of minority groups have been found interacting only with members of that minority because of shared common interest and greater empathy towards individuals who remind them of themselves (Costa and Kahn, 2002). In their study of networks of social affinity, Arora and Sanditov (2009) argued that, 'many caste headmen, through active

participation in and control of village level institutions, buttress their caste-derived authority with newer forms of prominence in a South Indian village' (p.33). Although the caste is an ancient social institution in South Asia, it has been closely associated with a variety of ritual practices and with cultural beliefs about a person's station in life (Béteille, 1969). Challenging dominant social theories of caste, Natarajan (2010) described how caste systems emerged as cultural phenomenon so that the culture of a caste is produced, organized and naturalized in the process of transforming *jati* (fetishized blood and kinship) into *samaj* (fetishized culture). It is therefore caste that is shown to be embedded in a specific ecological and cultural niche of the community. Although previous research has addressed moderating effects of civic engagement on negative externalities associated with social capital at the individual level (Anderson and Paskeviciute, 2006), few studies have examined their presence at the aggregate level (Andrews, 2009: 429). In this context it seems interesting to examine whether or not the caste system facilitates collective action through their impact on the creation of social capital. Furthermore, the empirical evidence on the relationship between the levels of social capital and resource extraction will help identify opportunities that can move the natural resource management agenda in this area forward.

3. SURVEY METHODS AND SITE

Social capital is a multidimensional concept that means different things to different people (Dasgupta and Serageldin, 1999). Admittedly, in this study we narrow our focus on one specific dimension: bonds of connectedness of the household with the rest of the community. We argue that the level of existing social capital within a community is the product of the households' participation in its formation. One way of measuring this type of social capital is the number of community meetings attended by village members for the management of the community forests. We consider the formation of Community Forest Users Group (CFUG) group meetings, as well as various programs by communities as part of the process of creating and accumulating social capital at the village level. Data for this analysis is drawn from a survey conducted in two districts in the middle hills of Nepal, Kavre Palanchok and Sindhupalanchok. The middle hills comprise the central area of Nepal with a mixture of agricultural and forested land. The majority of the populations in this area are subsistence farmers, depending on the surrounding agricultural and forested land, with livestock playing an important part in their livelihood options. The middle-hills run from east to west across the centre of the country, wedged between the low lying Gangetic plains (Terai) and the snow-capped Himalayan Mountains. Altitude in the middle-hills ranges from 300 m in river valleys to 5,000 m on hill tops. Land uses in this region are categorized as cultivated land, non-cultivated inclusions, grasslands, forestland, shrub lands, and 'other' types of land use (Collett et al, 1996).

In order to address the research questions posed in this paper, eight CFUGs will be selected: four CFUGs (Saradadevi, Jyala Chiti, Mahavedsthan and Thuli Ban) in the Kavre Palanchok districts and four (Gaurati, Shree Chhap, Janghare and Karki Tar) in the Sindhupalanchok district. The characteristics of community forests and user groups are presented in Table 1. The area of community forests and number of households varies from 44 to 185 hectares and from 133 to 292 households with forest land per capita ranging from 0.33 to 1.29 hectare respectively. Three different forest types, i.e. coniferous forest (dominant species *Pinus roxburghii*), broad-leaved

forest (dominant species *Schima wallichii* and *Castanopsis indica*) and broad leaved and coniferous mixed forests were observed in the study sites.

<<TABLE 1 ABOUT HERE>>

The caste and ethnic groups represented, the number of households in each groups, and the percentage of the total households for the sample of 309 households are shown in Table 2. These data illustrate the diversity of caste groups in each study site. The data reflect the dominance of upper caste⁵ (Brahmin and Chhetris), which represents more than half of the sample of 309 households. Several minority ethnic groups appear under the Vaishyas and Sudra caste groups in the sample. The settlement patterns of each caste/ethnic group differ in that lower caste or households belonging to ethnic groups live in more isolated or higher altitude locations and the Brahmins and Chhetris frequently live near more accessible valley floors, which are often more productive, and contain infrastructure facilities.

<<TABLE 2 ABOUT HERE>>

Households are the final sampling units in the sampling design in our analysis. Within these CFUGs a sample of households was randomly selected for interview. A total of 309 randomly selected households were interviewed, with twenty one questionnaires being excluded from the final analysis because they were incomplete.

<<TABLE 3 ABOUT HERE>>

Female and lower caste participation in decision-making aspects of CF management was also measured by the number of women and lower caste households represented in the executive committee of the CFUGs. While representation of the upper caste households is fairly homogeneous, representation of lower caste households in CFUG executive committees is more heterogeneous. The analysis in Table 4 reveals that in all user groups there is representation of women in the decision-making bodies. However, four CFUGs do not have representation of lower caste households in the executive committee.

<<TABLE 4 ABOUT HERE>>

From the survey a set of variables was selected for inclusion in the econometric models (1) and (2). The variables used in this analysis are summarized in Table 5. There are four castes in this setting: The Untouchables, the Vaishyas, the Chhetris and the Bramin. A dummy variable to capture the role of caste is included in the analysis. To control for the role of age and education, the model incorporates the average years of education for the adults in the household and the age of the household head as covariates. Household income is divided into two categories: income from agricultural activities and income from other sources (i.e. off-farm income etc.). This should also provide information on forest dependency. Control

variables in (1) included labour allocated to fuel wood extraction, tools and the number of trees that the households own on private land.

<<TABLE 5 ABOUT HERE>>

4. ESTIMATION STRATEGY

As discussed earlier, the objectives of this paper are twofold. First we analyze the role of social capital on resource extraction. Second, we address the issue of caste and socio economic characteristics on social capital formation. Therefore, two equations are of interest in this study. Let E_i represent the quantity of fuel wood extracted from the common property forest per household,

$$E_i = S_i' \delta + \mu \quad (1)$$

S_i is our metrics of bonding social capital and μ is the random disturbance. We will refer to (1) as the extraction equation. We tested for alternative functional forms, also including interaction terms among explanatory variables. We found that the linear specification was more robust. To analyze the role of caste status, and the other socio economic characteristics (e.g. income, education, and age) on social capital formation we estimate a second equation. Let S_i represent the household's participation in social capital then:

$$S_i = X_i' \beta + u \quad (2)$$

where X_i' is a vector of covariates for household i -th. This includes socio economic characteristics and u is the random disturbance.

From an econometric standpoint, estimation of these equations poses two challenges. First, heterogeneity can play an important role in this analysis (Edmonds, 2002). There can be institutional and other unobservable effects of CFUGs on fuel wood extraction. We therefore need to estimate to insert a CFUG fixed effect. This will remove all the village invariant unobservables. Second, the variable social capital is likely to be correlated with the disturbance term. Thus, we need to test for endogeneity. If evidence of endogeneity bias is found we need to switch to an IV estimator.⁶ Also the extent of collinearity must be assessed. This can be particularly important in equation (2). Clearly socio economic characteristics can be correlated with each other. The extent of such correlation should be investigated. For instance, households with lower caste status can be associated with lower level of income or education.

[TABLE 6 ABOUT HERE]

We investigated the possibility of endogeneity bias. We implemented a Durbin-Wu-Hausman test. The result indicated that the variable social capital is indeed endogenous. We therefore switched to an instrumental variable estimator. In this context finding suitable instruments can be very difficult. On one hand, the absence

⁶ The use of the OLS when the dependent variable is discrete is standard. It is the linear probability model. For its use in the first stage regression see Angrist and Krueger (2001).

of lagged values reduces the possibility of candidate instruments. On the other hand, there is no previous study available that has identified some possible instruments. Screening the database reveals the number of potential instruments was very limited. We found two variables: the household size and the distance from the forest. To test if the instruments were uncorrelated with the error term, and that the excluded instruments are correctly excluded from the estimated equation, we implemented a Hansen-Sargan test of over identifying restrictions. We could not reject the joint null hypothesis that the instruments are valid instruments. Furthermore, we tested for the instruments' validity. To this end we used an Anderson likelihood test. We rejected the null hypothesis. The choice of instruments thus seems appropriate. The results of these tests are reported at the bottom of Table 6.

5. RESULTS

Table 6 reports the econometric results of the extraction equation. Two different models are provided. One instrumental variable estimator without fixed effects and an instrumental variables estimator with fixed effect. Qualitatively the results seem rather consistent.

[TABLE 7 ABOUT HERE]

Social capital is negatively correlated with resource extraction in all the three models. Therefore, more social capital is associated with lower levels of resource exploitation. The result is statistically significant in both models. The results obtained by the IV model appear to be the most robust. Other than social capital, both labour and tools are correlated positively with resource extraction. Bouma et al. (2008) shows that individual investments in soil and water conservation measures are positively correlated with the average level of social capital existing in a village. The estimated coefficients are statistically significant. The number of trees on private land is also statistically significant and positive. While this result, may seem counterintuitive it can "capture" prestige or power of the household.

Table 7 reports the role of socioeconomic variables on social capital formation. It appears that caste plays a very important role on social capital formation. The estimated coefficient for the untouchables is negative and statistically significant. There is a similar result for the coefficient attached at the caste Vaishyas, but it is statistically not significant. These results indicate that households from the lower caste seem to be participating less in social capital formation. On the contrary, those belonging to the caste of Chhetris are contributing positively to the formation of social capital. The estimated coefficient is positive and statistically significant. The other socio economic characteristics also seem to play an important role on the accumulation of social capital. More education is associated with higher attendance in meetings. Age on the other hand is found statistically not significant.

We found the variable "income from agricultural activities" to be correlated with most of the other explanatory variables (lower caste, income from other sources and education). All these correlations were all around 0.2. While this is not a level of correlation that implies severe collinearity, it can have an effect on the estimates' accuracy. We therefore ran an auxiliary regression between "income from

agricultural activities” and the correlated variables and used the residuals to instrument for it. The results are quite interesting. Households with larger income are also associated with larger social capital formation. This confirms some earlier observations of the effects of “income or wealth” in initiating collective action, as better off households would invest more in commons management. Olson (1965) observed that the greater the share in the benefits of a collective action for any single member, the greater the propensity of this “large” member to bear the costs involved in commons management. On the other hand, groups that depend heavily on daily wage labour find it difficult to attend a variety of community meetings, not because they do not have interest in collective action, but rather due to their income and livelihood constraints.

This applies irrespective of the source of income. Both income variables’ coefficients are positive. However, the statistical significance of the coefficient estimated income from other sources is rather weak. Nevertheless, its positive value may reflect the fact that fuel wood is a primary source of energy for both heating (in barns and houses) as well as for cooking. Households with a wider range of employment opportunities are not reducing the forest dependency. The findings that more educated and relatively better off households have a positive estimated coefficient in the social capital equation indicates the importance of *elites* in such a context. These are the households that are taking the leadership in the village. They show this by actively participating in the meetings that are important for the village livelihood. The relevance of the caste, however, provides an extra piece of information. Caste does matter in engaging in social capital formation. Irrespective of the mechanism through which caste affects the formation of social capital, being untouchable or Chhetris is *quintessential* in determining the engagement in life of the village. Note that we tested for endogeneity in the social capital formation equation. We questioned whether income variables were correlated with the error term. We adopted various instruments for the income variables: if the household receive remittances from migrated family members, the distance from the forests, and assets availability such as cattle and land. The results indicate that the estimation should not be subject to endogeneity bias. To conserve space we do not report the IV results here. These are available from the authors upon request.

6. CONCLUSION AND POLICY IMPLICATIONS

Community-based management of common pool resources has been gaining momentum in many developing countries due to its contribution to rural livelihoods, environmental conservation and sustainable development. In Nepal, the CF programme has been implemented for more than twenty years. There is a growing consensus that CF is helping to reconcile the goals of social justice, equity, improving local livelihoods, empowerment and environmental sustainability in the mid-hills of Nepal. This success is largely due to local ownership over these resources, as well as efforts in strengthening local institutions through the empowerment of CFUGs. Despite the huge success, researchers argued that there is a difference in the level of participation of households both in terms of crafting rules of community forests and the level of resource extraction by different users (Adhikari, 2005). More specifically, participation in a variety of community level meetings varies by caste and other socio-economic characteristics. Furthermore, it has been claimed that there is a difference in the level of contributions by

households in CF activities, especially those tasks to be decided by a variety of community meetings (Adhikari and Lovett, 2006). One of the main contributions of the paper is to provide empirical evidence for the link between caste and participation of household in a variety of meetings related to CF management (our measure of social capital), on the one hand, and the relationship between social capital and resource extraction at the community level, on the other. Arguing that the earlier focus of the study on social capital was more dominated by the structural approach (e.g. network connection, group size), this paper tries to advance a sort of institutional and social context of social capital formation, and especially that of the caste aspect of social capital which is key to understanding the contextual specificities of social inequalities in collective action.

Our analysis suggests that the accumulation of social capital is influenced by the institutional and social contexts of the community such as education, income and most notably the caste. For instance, upper caste, relatively better off and more educated households participate more in social capital formation through the attendance of community meetings. Better off households may be more concerned with resource conservation since they could greatly internalize the benefits generated from the commons and therefore have more incentive to contribute to the local commons. In other words, the greater the share in the benefits of collective action for any single member, the greater the propensity of this “large” member to bear the costs involved in commons management (Olson, 1965). However, this speculation could be tested in subsequent research building on this exploratory study. We further found that social capital is beneficial to the reduction of resource extraction from the common forests. Econometric analysis suggested that the quantity of forest products harvested from the CFs is associated with the stock of social capital. The analysis also supported the early argument that communities are less likely to engage in unfettered private actions with negative outcomes, such as the over exploitation of resources in the presence of higher stocks of social capital (Pretty, 2003).

Indeed, initiating collective action often involved large start-up costs, which are likely to be incurred in setting up a community-based management regime. The Olson hypothesis makes sense in this situation when the management of a CPR involves important “non-convexities” in its production function. Non-convexities indicate the large start-up costs, which are likely to be incurred in setting up a commons management regime (Bardhan and Dayton-Johnson, 2000). In this situation it would be impossible for poorer members to contribute and bear a significant part of these start-up costs. In another words, lower caste households, often poor, did not actually participate more in community meetings as they could not afford the costs of such meetings. As a result, our measure of social capital turned out to be lower for this segment of the community.

Local level non-governmental organizations (NGOs) and district level political units can help build awareness and empower such marginalized communities, help raise their participation, increase the level of equality in decision-making, bring transparency to the operation, and develop internal leadership within the community to manage local forests for the dual objective of local economic benefits and environmental conservation. Past research has confirmed that the involvement of NGOs in environmental protection projects would help in resource mobilization,

organizational strengthening and the institutional development (Neba, 2009). Capacity building measures such as social and gender awareness and knowledge for development workers are an important way to contribute to improving the situation of the poor and lower castes. However, this requires the institutionalization of the concepts and practices of participation and empowerment in rural development activities at all levels, from the grassroots to the national government. National development policies can foster social capital in the context of mainstream policies and programmes to make sure that social inequalities are addressed to enhance the broader participation of individuals and communities towards community-based approaches to forest management. Nonetheless, this kind of traditional approach may not be enough, as the ability of the leaders to build and maintain social capital and cultural values is also important but lacking within households belonging to lower castes. In such households with no tradition of leadership, it is crucial building capacities and abilities of these people that can help increase their participation and also make their engagement effective. Since the inequitable social structure can be detrimental for the participation of marginalized sections of the society, it is important to address these issues in the current decentralization effort towards forest management and rural development. We suggest that the role of social inequality such as caste in relation to the management of CPRs needs to consider the ways in which households belonging to lower caste are involved in local level decision-making – especially those aspects of social organization that affect resource management outcomes. Further insights in the link between institutional and social structure and performance of community-based groups such as CFUGs would also help to guide the optimal policy design in this area.

Literature Cited

- Abrams, D., Hogg, M.A., & Marques, J.M., 2005. *The Social Psychology of Inclusion and Exclusion*, New York: Psychology Press.
- Adger, W.N., 2003. Social capital, collective action, and adaptation to climate change. *Economics Geography*, 79(4):387-404.
- Adhikari, B., 2005. Poverty, property rights and natural resource: Understanding distributional implications of common property resource management. *Environment and Development Economics* 10: 7–31.
- Adhikari, B and Di Falco, S., 2009. Social inequality, local leadership and collective action: An empirical study of forest commons. *European Journal of Development Research*, 21:179-184.
- Adhikari, B., Lovett, J.C., 2006. Transaction costs and community-based natural resource management in Nepal, *Journal of Environmental Management* 78 (1):5-15.
- Adhikari, B and Lovett, J.C., 2006. Institutions and collective action: does heterogeneity hinders community-based resource management? *Journal of Development Studies*, 78 (1), 5-15.
- Agrawal, A., 2001. Commons property institutions and sustainable governance of resources. *World Development*, 29 (10), 1649-1672.
- Agrawal, A., 1999. *Grenner Pastures: Politics, Markets, and Community among a Migrant Pastoral People*, Durham, NC: Duke University Press.
- Alesina, A., Baqir, R. & Easterly, W., 1999. Public goods and ethnic divisions. *Quarterly Journal of Economics*, 114 (4), 1243-84.

- Angrist J.D. & Krueger A.B., 2001. Instrumental Variables and the Search for Identification: From Supply and Demand to Natural Experiments. *Journal of Economic Perspectives*, 15(4): 69-85.
- Arora, S. & Sanditov, B., 2009. Caste as Community? Networks of social affinity in a South Indian Village. Working Paper No. 37, United Nations University - Maastricht Economic and social Research and training centre on Innovation and Technology Keizer Karelplein 19, 6211 TC Maastricht, The Netherlands
- Andrews, R., 2009. Civic engagement, ethnic heterogeneity, and social capital in urban areas: evidence from England. *Urban Affairs Review*, 44 (3):428-440.
- Arefi, M., 2003. Revisiting the Los Angeles neighbourhood initiative (LANI): lessons for planners. *Journal of Planning Education and Research*, 22 (4):384.
- Baker, M., 1997. *Persistence, transformation and demise within the gravity flow irrigation systems (Kuhls) of Kangra Valley, Himachal Pradesh, India*. Workshop on Co-operative Management of Water Resources in South Asia, Centre for India and South Asia Research (CISA), University of British Columbia, Vancouver, Canada, December 15-17, 1997.
- Baland, J. & Platteau, J., 1996. *Halting Degradation of Natural Resources: Is there a Role of Rural Communities?* New York: FAO, Oxford University Press.
- Baland, J. & Platteau, J., 1997. Wealth inequality and efficiency in the commons, part I: the unregulated case. *Oxford Economics Paper* 49, 451-482.
- Ballet, J., Sirven, N., & Requier-Desjardins, M., 2007. Social capital and natural resource management: a critical perspective. *The Journal of Environment & Development*, 16 (4): 355-374.
- Bardhan, P. & Dayton-Johnson, J., 2000. *Heterogeneity and Commons Management*, Department of Economics, University of California, Berkeley, USA, mimeo.
- Berkes, F. (ed.) 1989. *Common Property Resources: Ecology and Community Based Sustainable Development*, London: Belhaven Press.
- Béteille, A., 1969 *Castes, Old and New: Essays in Social Structure and Social Stratification*, Bombay: Asia Publishing House.
- Beteille, A. (ed.) 1983. *Equality and Inequality: Theory and Practice*. Delhi, India: Oxford University Press.
- Bourdieu, P., 1980. Le capital social, notes provisoires: [The social capital, provisional grades]. *Actes de la Recherche en Sciences Sociales*, 31, 2-3.
- Bourdieu, P., 1986. The forms of capital. In J. Ridchardson (Ed.), *Handbook of theory and research for the sociology of education* (pp. 241-258). Westport, CT: Greenwood.
- Bouma, J., E. Bulte, D. van Soest, Trust and cooperation: Social capital and community resource management, *Journal of Environmental Economics and Management*, Volume 56, Issue 2, September 2008, Pages 155-166
- Bryant, C., and Norris, D., 2002. Measurement of Social Capital: The Canadian Experience. Paper presented at the International Conference on Social Capital Measurement, 25-27 September, London, UK.
- Coffe, H., 2008. Social capital and community heterogeneity. *Soc Indic Res*, DOI 10.1007/s1205-008-9275-y.
- Coleman, J. S., 1988. Social capital in the creation of human capital. *American Journal of Sociology* 94, S95-S120.
- Charnley, S. and Poe, M.R., 2007. Community forestry in theory and practice: where are we now? *Annu. Rev. Anthropol*, 36:301–36

- Collett, G., Chhetri, R., Jackson, W.J. and Shepherd, K.R., 1996. NACFP: Socio-Economic Impact Study. Canberra, ACT, Australia: ANUTECH Pty Ltd.
- Costa, D.L., & Kahn, M.E., 2003. Civic engagement and community heterogeneity: an economist's perspective. *Perspectives on Politics*, 1 (1): 103-111.
- Dasgupta, P. & Serageldin, I. (eds.) 2000. *Social Capital: A Multi-faceted Perspective*, Washington, D.C., the World Bank.
- Easterly, W., Levine, R., 1997. Africa's growth strategy: policies and ethnic divisions. *The Quarterly Journal of Economics*, 112 (4): 1203-1250.
- Edmonds, E., 2002. Government-initiated community resource management and local resource extraction from Nepal's forests. *Journal of Development Economics*, 68: 89-115.
- Jodha, N.S., 1986. Common property resources and the rural poor in dry regions of India. *Economic and Political Weekly*, 21 (27), 169-181.
- Kanbur, R., 1992. Heterogeneity, distribution and cooperation in common property resource management, Background paper for the 1992 World Development Report, Washington, DC: The World Bank.
- Killerby, P., & Wallis, J., 2002. Social capital and social economics. *Forum for Social Economics*, 32 (1): September, 2002.
- Knack, S., 2002. Social capital and the quality of government: evidence from the states. *American Journal of Political Science*, 46 (4): 772-285.
- McKean, M., 1992. Management of traditional common lands (Iriachi), in Japan', in National Research Council, Proceedings of the Conference on Common Property Resource Management, Washington DC: National Academic Press, pp. 533-589.
- Miguel, E., & Gigerty, M.K., 2002. Ethnic diversity, social sanctions, and public goods in Kenya. Unpublished manuscript: University of California, Berkeley.
- Narayan, D. and Pritchett, L., 1999. Cents and sociability: household income and social capital in rural Tanzania. *Economic Development and Social Change*, 47 (4): 871-897.
- Natrajan, B., 2010. *Crafting Caste in India: Caste as Cultural Community*. New Delhi: Routledge
- Nelson, B.J., Kaboolian, L., and Carver, K.A., 2004. *Bridging social capital and an investment theory of collective action: evidence from the Concord project*. American Political Science Association, Chicago, Illinois.
- Neba, N.E., 2009. NGO input and stakeholder participation in natural resource management: Example of North West Cameroon. *International NGO Journal*, 4 (3): 050-056.
- NPC, 2007. *Interim Plan*, National Planning Commission, Kathmandu: Nepal.
- Oakerson, R., 1992. Analyzing the commons: a framework. in D. W. Bromley (ed.) *Making the Commons Work: Theory, Practice, and Policy, USA: Institute for Contemporary Studies*, 41-59.
- Ollagon, H., 1991. Toward to patrimonial management of forests: biological quality protection. *Arbres, Forêts et Communautés Rurales*, 3:32-35.
- Olson, M., 1965. *The Logic of Collective Action: Public Goods and the Theory of Group*, Cambridge: Harvard University Press.
- Olson, M., 1965. *The Logic of Collective Action: Public Goods and the Theory of Groups*, Cambridge: Harvard University Press.
- Ostrom, E., 1990. *Governing the Commons: The Evolution of Institutions for Collective Action*, Cambridge: Cambridge University Press.

- Ostrom, E., 1992. *Crafting Institutions for Self-governing Irrigation Systems*, Institutions for Contemporary Studies Press. San Francisco, USA.
- Paldam, M., 2000. Social capital: one or many? Definition and measurement. *Journal of Economic Surveys*, 14 (5): 629-653.
- Paraskevopoulos, C.J., 2007. Social capital and sustainable development in Greece. Available online at: <http://www.lse.ac.uk/collections/ESOCCLab/pdf/SOCCOH%20Social%20capital%20and%20economic%20development%20in%20Greece.pdf>
- Portes, A., 1998. Social capital: its origins and applications in modern sociology. *Annual Review of Sociology*, 24:1-24.
- Pretty, J. & Ward, H., 2001. Social capital and the environment. *World Development*, 29 (2), 209-227.
- Pretty, J., 2003. Social capital and collective management resources. *Science*, 302 (5652):1912-1914.
- Putnam, R. D. (with R. Leonardi and R. Y. Nanetti) 1993. *Making Democracy Work: Civic Traditions in Modern Italy*, Princeton: Princeton University Press.
- Putnam, R., 2007. E pluribus unum: the evolution of social capital in contemporary society. *Political Studies*, 59 (4): 1143-72.
- Putnam, R., 2000. *Bowling alone: the collapse and revival of American community*. New York: Simon and Schuster.
- Ruston, D., 2002. Social Capital Matrix of Surveys, Social Analysis and Reporting Division, Office of National Statistics, U.K.
- Sethi, R. & Somathan, E., 1996. The evolution of social norms in common property resources. *American Economic Review*, 86 (4).
- Singh, N., 2004. Water management traditions in Rural India: valuing the unvalued, Department of Land and Water Resources Engineering, Royal Institute of Technology, Sweden.
- TTI, 2000. Harness the Caste System. *The Times of India*, June 4, 2000.
- Uphoff, N., & Wijayarathna, C.M., 2000. Demonstrated benefits from social capital: the productivity of farmer's organizations in Gal Oya, Sri Lanka. *World Development*, 28 (11): 1875-1890.
- Wade, R., 1988. *Village Republics: Economic Conditions for Collective Action in South India*, Cambridge: Cambridge University Press.

Table 1 Characteristic of FUGs

S.N.	Name of Forest User Groups	District	Forest Area (Hectare)	Number of Households	Forest types
1	Saradadevi FUG	Kavre Palanchok	44	133	Broad-leaved
2	Jayala Chiti FUG	Kavre Palanchok	25.92	222	Broad-leaved
3	Mahadevsthan FUG	Kavre Palanchok	72.25	147	Mixed
4	Thuli Ban FUG	Kavre Palanchok	54	292	Coniferous
5	Gaurati FUG	Sindhu Palchok	88.80	144	Coniferous
6	Shree Chhap FUG	Sindhu Palchok	45.00	216	Mixed
7	Janghare FUG	Sindhu Palchok	124	255	Broad-leaved
8	Karki Tar FUG	Sindhu Palchok	185.25	140	Broad-leaved

Table 2 Distribution of household by caste group

FUGs	Brahmin	Chhteri	Vaishyas	Sudra
Saradadevi FUG	15	11	2	2
Jayala Chiti CFUG	4	19	14	6
Mahadevsthan CFUG	21	3	2	5
Thuli Ban CFUG	39	9	2	8
Gaurati CFUG	0	4	25	0
Shree Chhap CFUG	21	10	11	0
Janghare CFUG	4	18	11	14
Karki Tar CFUG	14	11	2	2
% All sites	38	28	22	12

Table 3 Characteristics of sample respondents (household survey)

Attributes of respondents	Average value
Age	43.43
Average family education (# of school years)	4.38
Gender	
Male (%)	79.6
Female (%)	20.4
Household size (# of individual in a family)	6.37
Education	
Illiterate (%)	28.0
Primary school (%)	40.8
High school (%)	23.0
College (%)	4.9
University (%)	3.2
Caste	
Lower caste (%)	12
Higher caste (%)	88

Table 4 Definition summary statistics for the explanatory variables

Variables	Definition	Mean	Std deviation	min	max
Social Capital	Dummy for participation in village meeting related to the management of the forest (if more than their village average =1, 0 otherwise)	0.182	0.368	0	1
Untouchables	Household belonging to the untouchable caste (if untouchable caste =1, 0 otherwise)	0.120	0.326	0	1
Chettris	Household belonging to the Chhetris caste (if Chhetris caste =1, 0 otherwise)	0.120	0.326	0	1
Vaishyas	Household belonging to the Vaysia caste (if Vaysia caste =1, 0 otherwise)	0.120	0.326	0	1
Income from other sources	Income from non agricultural activities	58290.370	61028.050	1000	420000
Income from agricultural activities	Income from agricultural production and husbandry	34245.370	42965.880	0	248150
Education	Average education of adult family members (in years)	4.640	3.918	1	16
Age	Age of the household head (in years)	43.708	12.900	22	84
Household size	the number of household members	6.36	2.58	1	16
Distance	Distance from the community forest	0.7	0.54	0.01	3

Table 5 Correlation matrix

	Lower caste	Income from other sources	Income from agricultural activities	Education	Age
Untouchables	1				
Income from other sources	-0.1511	1			
Income from agricultural activities	-0.23061	0.1926	1		
Education	0.0052	0.1569	0.0205	1	
Age	-0.0373	0.0092	0.151	-0.0669	1
Social Capital	-0.159	0.1124	0.0925	0.051	0.0437

Table 6 Social Capital and Resource extraction

Variables	IV	IV Fixed Effect
Social capital	-0.778*** (0.3)	-1.36*** (0.29)
Labour	0.43*** (0.16)	0.175 (0.23)
Tools	0.2** (0.1)	0.085 (0.124)
Trees on private land	0.169*** (0.08)	0.254** (0.09)
Constant	0.99** (0.46)	2.19*** (0.38)

N: 230; Robust standard errors have been used. Hansen J statistic (over identification test of all instruments): 0.134; Chi- sq (1) P-value = 0.7140 - Anderson LR statistic (identification/IV relevance test): 7.687; Chi-sq (2) P-value = 0.0214. Durbin-Wu-Hausman chi-sq test: 20.4 Chi-sq (1) P-value = 0.00001. Significance levels are denoted by one asterisk (*) at the 10 per cent level, two asterisks (**) at the 5 per cent level, three asterisks (***) at the 1 percent level and ^(a) 10% two sided test.

Table 7 Caste, socio economic characteristics and social capital. FUG fixed effects

Variables	Coeffs	Standard Errors
Untouchables	-0.24***	0.107
Chhetris	0.448***	0.176
Vaishyas	-0.157	0.183
Age	0.00033	0.0049
Education	0.041***	0.017
Income from agricultural activities	0.049***	0.015
Income from other sources	0.072 ^a	0.05
Constant	0.232	0.701

R²:0.25; Durbin-Wu-Hausman chi-sq test: 3.78417 Chi-sq (2) P-value = 0.17. Hansen J statistic (overidentification test of all instruments): 0.187, Chi-sq (2) P-val = 0.9109. Robust standard errors have been used. Significance levels are denoted by one asterisk (*) at the 10 per cent level, two asterisks (**) at the 5 per cent level, three asterisks (***) at the 1 percent level and (^a) 10% two sided test.