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The Contested Role of Heterogeneity in Collective Action: Some Evidence from Community Forestry in Nepal

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Summary. — The role of heterogeneity in affecting the likelihood of collective action is strongly debated in the theoretical literature. We present evidence from a study of 18 forest user groups in Nepal. Heterogeneity is not a strong predictor of the level of collective activity. Rather, heterogeneity is a challenge that can be overcome by good institutional design when the interests of those controlling collective-choice mechanisms are benefited by investing time and effort to craft better rules. © 2001 Elsevier Science Ltd. All rights reserved.

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1. INTRODUCTION

During the past decade, considerable theoretical and empirical research has demonstrated that it is possible, but not necessary, for groups of individuals jointly using the same common-pool resource to organize themselves so as to achieve relatively efficient outcomes from the continued use of a resource (Bromley *et al.*, 1992; Blomquist, 1992; Tang, 1992; Lam, 1998; Ostrom, 1990; Baland & Platteau, 1996; Bardhan, 1993). Common-pool resources are man-made or natural systems that generate finite quantities of resource units so that one person's use subtracts from the quantity of resource units available to others (Ostrom, Gardner, & Walker, 1994). Most common-pool resources are sufficiently large that multiple actors are able to use the resource system simultaneously, and efforts to exclude potential beneficiaries are costly. Examples of common-pool resources include groundwater basins, irrigation systems, forests, and grazing lands. Examples of the resource units derived from common-pool resources include water, timber, and fodder.

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When resource units are highly valued and many actors benefit from appropriating (harvesting) them for consumption, exchange, or as a factor in a production process, the appropriations made by one individual are likely to create negative externalities for others. Until recently, most resource policies have been based on a presumption that the appropriators of a resource are trapped in an open access situation. The possibility that the appropriators would find ways to organize themselves was not earlier given serious consideration in much of the policy literature. The growing evidence from many studies of common-pool resources in the field has called for a serious rethinking of the theoretical foundations for the analysis of common-pool resources (see Berkes, 1986, 1989; Berkes, Feeny, McCay, & Acheson, 1989; McCay & Acheson, 1987). The consequence of these empirical studies is not to challenge the empirical validity of the conventional theory where it is relevant, but rather its generalizability. A substantial number of experimental studies of common-pool resources created in an experimental laboratory also challenge the generalizability of the conventional theory. [1]

A self-organized resource governance system exists where actors, who are major appropriators of the resource, are involved over time in making and adapting rules within collective-choice arenas regarding the inclusion or exclusion of participants, appropriation strategies, obligations of participants, monitoring and sanctioning, and conflict resolution. Some extremely remote common-pool resources are governed entirely by appropriators and are not governed at all by external authorities. In most modern political economies, however, it is rare to find any resource system that is governed *entirely* by participants without rules made by local, regional, national, and international authorities also affecting key decisions. Thus, in a self-governed system, participants make many, but not necessarily all, rules that affect the sustainability of the resource system and its use (Ostrom, 1991, 1997).

2. ON THE ORIGIN OF SELF-GOVERNED COMMON-POOL RESOURCES

The conventional theory of the commons is most successful in predicting outcomes in settings where appropriators are alienated from one another or cannot communicate effectively. This theory does not provide an adequate explanation for settings where appropriators are able to create and sustain agreements to avoid serious problems of overappropriation. Nor does it predict well the conditions under which government ownership or private ownership will improve outcomes. Scholars familiar with the results of field research substantially agree on a set of variables that enhances the likelihood of appropriators organizing themselves to avoid the social losses associated with open-access, common-pool resources (McKean, 1992, 2000; Wade, 1994; Schlager, 1990; Tang, 1992; Ostrom, 1992; Baland & Platteau, 1996; Ostrom *et al*., 1994).

Recent theoretical developments have begun to elucidate some of the conditions that are most likely to be conducive to local self-organization by those using a resource (Baland & Platteau, 1996; Kant, Berry, & Nautiyal, 1998; Ostrom, 2000a Ostrom, 2000b). General agreement exists that until modest levels of scarcity are apparent to users, little effort will be invested in trying to change local institutions. [2] Further, attributes of the resource that facilitate appropriators learning about the dynamic patterns of the resource stock and flow (such as predictability and reliable indicators of the condition of the resource) enhance the likelihood of local users organizing themselves. Further, it is thought that appropriators who are dependent on a resource, intend to use the resource over a long time-horizon, have achieved levels of trust, and possess some level of autonomy to make their own access and harvesting rules are also more likely to organize to govern and manage a local resource. In general, whether local users organize depends on the benefits and costs of changing institutional rules perceived by those who can change local institutional arrangements.

The growing theoretical consensus does *not* lead to a conclusion that appropriators using common-pool resources will always, or even usually, self-organize to establish their own rules. Many settings exist where the theoretical expectations are the opposite: Appropriators will continue to overuse the resource unless efforts are made to change one or more of the variables affecting their perceived costs or benefits of institutional change. Given the number of variables that affect these costs and benefits, many points of external intervention can enhance or reduce the probability of appropriators' agreeing upon and following rules that generate higher social returns. Both social scientists and policymakers, however,

have a lot to learn about how these variables operate interactively in field settings and even how to measure them so as to increase the empirical warrantability of the growing theoretical consensus (see Gibson, McKean, & Ostrom, 2000; Varughese, 2000).

3. HETEROGENEITY: A THEORETICAL PUZZLE

Beyond the consensus concerning the variables most likely to enhance self-organization, many unresolved theoretical issues still exist. One question relates to the effect of heterogeneity in a group of appropriators. The impact of heterogeneity on the capacity of individuals to self-organize and sustain a common-property regime is highly contested. For one thing, groups can differ along a diversity of dimensions including their sociocultural backgrounds, interests, and endowments (see Baland & Platteau, 1996, 1998; Keohane & Ostrom, 1995). Each dimension may operate differently under a variety of circumstances.

The sociocultural composition of a settlement or group of settlements may result in a difference of interests among forest users that influences the organization of forest governance and management. Differences in social class and ethnicity can make consensus-building and norm-enforcement difficult (Blair, 1996). Cernea (1988, 1989) has reported that class differences can cripple efforts at organizing resource management in villages. The presumption that groups from diverse sociocultural backgrounds will have a more difficult time self-organizing to govern a common-pool resource comes from the assumed problems of distrust and lack of mutual understanding. The process of trying to reach a set of rules that everyone may agree upon can involve high levels of conflict. Further, differing groups may be unwilling to abide by a single set of rules. If groups coming from diverse sociocultural backgrounds share access to a common resource, the key question affecting the likelihood of self-organized solutions is whether the views of the multiple groups concerning the structure of the resource, authority, interpretation of rules, trust, and reciprocity differ or are similar.

No necessary relationship exists between sociocultural diversity and conflict over the use of a common-pool resource. Wade's (1994) study of South Indian farming communities showed that accommodations can be made between members of groups that are socioculturally stratified. If the diversity is the result of new settlers moving to a region, the settlers may simply learn and accept the rules of the established group. On the other hand, new settlers can be highly disruptive to the sustenance of a self-governing enterprise when they generate higher levels of conflict over the interpretation and application of rules and increase enforcement costs substantially.

When the interests of appropriators differ, achieving a self-governing solution to common-pool resource problems is particularly challenging. This problem characterizes some fisheries where local subsistence fishermen have strong interests in the sustenance of an inshore fishery, while industrial fishing firms have many other options and may be more interested in the profitability of fishing in a particular location than its sustained yield. Two or more fundamentally different types of users can give rise to conflicting uses of a resource. A subgroup of farmers interested in preventing soil erosion and siltation in their irrigation tank may want to ban grazing in a forested area that is used by local or nomadic grazers (Sarin, 1996). Agreement in this case can be costly unless alternate grazing areas are provided. Actual and perceived differences in costs and benefits for women and men, and historical gender inequalities within households and communities, can lead to different interests for women and men (Molinas, 1998; Agarwal, 1994, 1997). Different interests for men and women can lead to different perceptions of costs and benefits.

A considerable amount of theoretical and empirical research has focused on the heterogeneity of assets. Theoretical arguments are made for how asset heterogeneity is positively, negatively, or unrelated to successful efforts to regulate the use of a common-pool resource. Some theoretical and empirical studies lead to a presumption of a U-shaped relationship. Johnson and Libecap (1982) reason that the difference in the skills and knowledge of different kinds of fishers frequently prevents them from arriving at agreements about how to allocate quantitative harvesting quotas (see also Scott, 1993). In this case, heterogeneity of endowments and of interests coincides. Heterogeneity of wealth or power may or may not be associated with a difference in interests. Shanmugaratnam argues that as market institutions penetrate rural areas formerly heavily dependent on common-property institutions, previously accepted ways of assuring cooperation may

> come under strain and may even completely break down as inequalities and divergence of interests among resource users increase along with the marketisation of the rural economy. . . . It would seem that sustainable common property resource management is more difficult to achieve in a community with highly uneven than in one with a relatively better distribution of private wealth (Shanmugaratnam, 1996, p. 166).

On the other hand, Quiggen (1993) disputes the assumption that participants need to be relatively similar in regard to their income and wealth in order to sustain common property since other factors, such as economies of scale, are the primary reason for managing resources in common.

While many have argued that heterogeneity of assets is negatively related to the capacity of a group to self-organize, Mancur Olson (1965) argued that groups were "privileged" when one or several members owned a higher proportion of assets that would be benefited by some form of collective action. Bergstrom, Blume, and Varian (1986) present a general model of a public-good setting where wealth redistributions that give more assets to a positive contributor to a public good induce a higher level of contribution from that individual. This theory was tested in the experimental laboratory by Chan, Mestelman, Moir, and Muller (1996) and given modest support. [3]

An alternative theoretical approach is presented in Dayton-Johnson and Bardhan (1998) where two players are independently deciding upon their harvesting strategies from a fishery. They explore the question of how inequality of assets affects the timing (and thus the conservation) of harvesting activities. Increasing inequality does not, in general, favor a conservation equilibrium. If inequality is relatively great, however, further inequality may result in conservation. Thus, the model supports the hypothesis that there is a U-shaped relationship between inequality of assets and economic efficiency.

Prior empirical studies have shown that the organization of cooperation can depend on the type and extent of heterogeneity that is seen in a given group of resource users. Further, the effect of certain kinds of heterogeneity on the expression of individual interests can be conditioned by the presence of prior experience in cooperation and by leadership. A study of 20 villages in Chota Nagpur, Orissa, India, shows that community-based forestry efforts are "more successful in villages with preexisting local organizations and slightly unequal patterns of wealth distribution" (Baker, 1998, p. 61). Baker argues that while too much disparity in wealth distribution diminishes shared interest in the collective good (and subsequent capture by elite), some inequality of wealth provides incentives for certain individuals in the community to bear a disproportionate share of the costs associated with organizing collective action.

A study of the Fulani of Mali, while unable to find a systematic relationship between heterogeneity and success in collective action, suggests that cooperation may possibly be enhanced by heterogeneous social structure except when such heterogeneity is "tantamount to heterogeneity in economic interests and political power" (Vedeld, 1997, p. 321). Heterogeneity of wealth and of ethnicity do not prevent "uniform interests" among elite and subordinate groups in collective agreements. Rather, Vedeld argues, the "political elite" (consisting of clergymen and cattle-rich craftsmen) can assume leadership in such a case and provide an authority structure for rule enforcement because the economic interests of all groups in the common-pool resource are similar (a mix of agriculture and pastoralism). On the other hand, conflict was observed in a similar setting when economic interests differed with regard to the use of the common-pool resource (agriculture versus pastoralism).

In a study of 104 local peasant committees in a poorer region of Paraguay, José Molinas (1998) evaluates the performance of all committees by the level of activities undertaken and a complex set of measures of local user participation and evaluation. Using this performance score, Molinas examines the impact of unequal land ownership as well as other key attributes of these groups on outcomes. He finds that in "highly equal communities a coordination problem may arise among peasants because nobody has a differentiated incentive to be the committee's organizer" (Molinas, 1998, p. 420). He also finds that a moderate level of inequality in the amount of land is associated with higher levels of committee performance, but that high levels of inequality make it more difficult for committees to operate effectively.

Thus, field research shows that, despite the recurrent argument that homogeneous groups are more effective, heterogeneity does not have a uniform effect on the likelihood of organizing collective action and little, if any, effect on the sustainability of such collective action. Studies

in the experimental laboratory are also calling into question earlier views of the uniform dysfunctionality of heterogeneous payoffs (Chan, Mestelman, Moir, & Muller, 1999; Croson & Marks, 1999; Hackett, Schlager, & Walker, 1994). The mechanisms by which differences or similarities among users may affect collective outcomes are not well explained. The conditions under which certain types of heterogeneity may undermine or enhance collective action remain largely unknown. Further, clarity is lacking as to whether it is simply the attributes of a given community of users that affect the likelihood of collective action, or whether, given those attributes, users have devised some institutional mechanisms to reduce costs and enhance cooperation. Extant field evidence shows that users may design institutions to cope effectively with heterogeneities. It is essential, therefore, to begin to understand how users act to cope with particular heterogeneities given the differences that arise in almost all communities in individual perceptions of costs and benefits.

4. DIFFERENCES AMONG FOREST USERS IN THE MIDDLE HILLS OF NEPAL

The physiographic zone of the Middle Hills of Nepal provides the broad setting of this study (see Figure 1). The population is largely rural. Fewer than 10% of the total population of this region can be found in towns and cities. Subsistence agriculture is the main occupation, although villagers do not hesitate to supplement their livelihoods by entering the market economy whenever opportunities arise. The rural population in the Middle Hills is mostly distributed in small villages or hamlets that are sometimes parts of larger, dispersed settlements. These are surrounded by a patchwork of agricultural land and smaller areas of forested land. Rain-fed agricultural lands may be found closer to the settlements, while canal-irrigated fields are found in the less steep lower lands. Forests of varying size and, frequently, of modest proportions, are found in spaces between these rain-fed and canal-irrigated fields. Forests are rarely immediately adjacent to any one house. These forests are vital sources of fuelwood, fodder, and leaf litter for animal bedding and composting, especially in the winter months when agricultural residues are exhausted.

The 18 cases included in this study are listed in Table 1. These cases are part of a larger set of studies conducted as part of the International Forestry Resources and Institutions (IFRI) research program in various physiographic zones of Nepal since 1992. [4] The data for these particular cases, which are all located in one broad ecological zone to facilitate comparison,

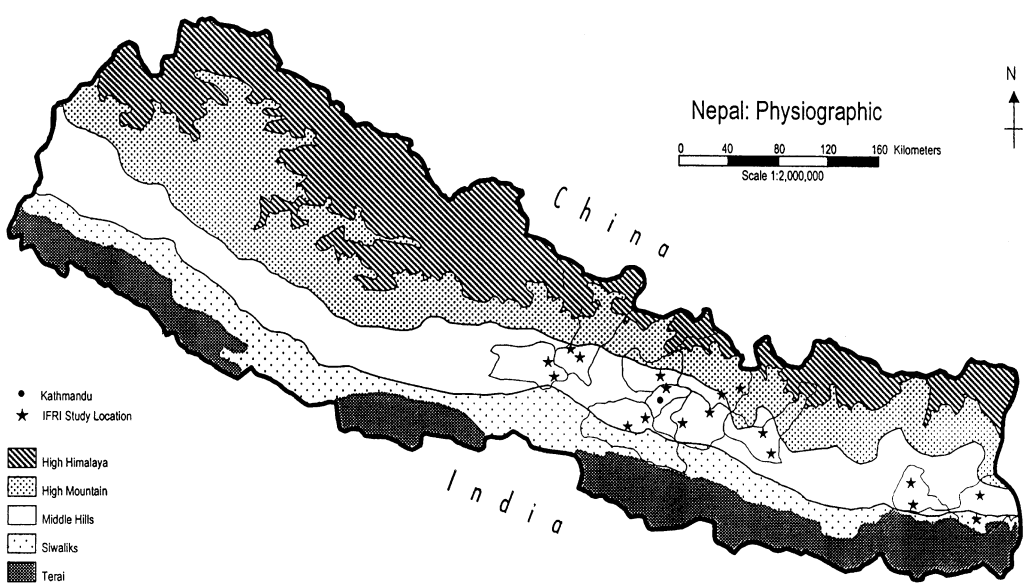

Figure 1. *Map of 18 locations in districts visited for IFRI studies.*

Table 1. *Number of households, forest area, levels of collective action, and forest conditions*[a]

Site	Location	Number of households	Forest area (ha)	Collective activity[b]	Trend in forest condition	Forest stock condition
1.	Churiyamai (Makwanpur)	750	85	H	I	A
2.	Bijulikot (Ramechhap)	145	53	H	I	A
3.	Doramba (Ramechhap)	26	107	H	I	A
4.	Raniswara (Gorkha)	404	300	H	I	A
5.	Bandipur (Tanahun)	183	75	H	I	AA
6.	Manichaur (Kathmandu)	242	115	M	I	A
7.	Riyale (Kavre Palanchowk)	92	29	M	S	BA
8.	Thulo Sirubari (Sindhupalchowk)	105	16	M	S	A
9.	Barbote (Ilam)	260	145	M	S	A
10.	Bhedetar (Dhankuta)	82	125	M	W	AA
11.	Baramchi (Sindhupalchowk)	36	75	L	S	BA
12.	Agra (Makwanpur)	70	190	L	W	A
13.	Chhimkeswari (Tanahun)	28	45	L	W	A
14.	Chunmang (Dhankuta)	152	225	L	W	A
15.	Bhagwatisthan (Kavre Palanchowk)	70	108	L	W	BA
16.	Sunkhani (Nuwakot)	144	290	L	W	BA
17.	Chhoprak (Gorkha)	106	25	N	W	BA
18.	Shantipur (Ilam)	29	90	N	W	A

[a] H—high; I—improving; A—average; M—moderate; S—stable; AA—above average; L—low; W—worsening; BA—below average; N—none.

[b] Collective activity: formally or informally organized collective-action level at the user level. Low—individuals may observe harvesting constraint on their own, no group activities; Moderate—as a group, individuals have harvesting constraints, minimal group activities, little or no monitoring; High—enforced harvesting constraints, organized group activities, monitoring by members.

were obtained over a period of three years. Each case was studied by a five-member team comprised of natural science and social science researchers over a period of four weeks using IFRI research methods (see Ostrom, 1998; Gibson *et al*., 2000). Each of the cases studied represents a discrete group of users for a single community forest. All of the user groups in this study were relatively homogeneous in regard to religion (Hindu). The information collected reflects one or two extended visits to the physical settlement(s) of each group and the community forest that is being used by that group. Information about the organization of collective action in each location is essentially based on in-depth group interviews and oral histories. Conclusions about organization, as well as success in collective action, are based both on these histories and firsthand observations of ongoing activities.

The cases in this study were conducted in locations within Village Development Committees (VDCs) in the Middle Hills of Nepal, and range from the easternmost district of Ilam in the Eastern Development Region to Gorkha and Tanahun districts in the Western Development Region (see IFRI, 1995, 1996, 1997a,b). For the purposes of this study, the names of settlements are omitted. Instead, locations are identified using the names of the VDC within which the settlements and forests were studied. All but two of the cases (Manichaur and Sunkhani) conducted in the Western and Central Development Regions were commissioned by the Hills Leasehold Forestry and Forage Development Project of the Government to monitor the effect of the project in those locations over time. As part of that monitoring plan, some of these locations have already been revisited since the first round of baseline studies. The Manichaur and Sunkhani locations were studied as baseline assessments of forest use patterns in the Shivapuri Integrated Watershed Development Project north of Kathmandu valley. In the Eastern Development Region, the cases are part of a longitudinal series of IFRI studies that examine forest resources and institutions in locations that have varying access to markets and roads, and that are in areas of high and low intervention by government and donor agencies.

Forest use and management in Nepal occur in settings characterized by a variety of physical and community attributes that can potentially

affect the organization of collective action. Some of the physical attributes are: the nature of the forest resource; its size, proximity to roads, and markets; and the topography of location. Some of the community attributes that affect their incentives to cooperate with one another are: the size of the community of resource users; locational differences among users with respect to forested areas; differences in forest users' incomes and presence or absence of economic/social/religious/ethnic disparities; and the availability of alternate forest resources. Each of these attributes, by themselves or in combination with other attributes, comprises the task environment that affects the organization of collective action in forestry. In particular, this study looks at locational differences, wealth disparities, and sociocultural differences among members of forest user groups.

(a) *Locational differences*

The distance some users have to travel, or their relative proximity, to forested areas they use in relation to distance traveled by other users affects the symmetry of relationships among forest users and their relationship with the resource. In many forest resource systems, users who live closer to the forest have a more secure and accessible supply of produce regardless of whether allocation rules are in place. Proximate users may not be as motivated to provide institutional arrangements to allocate duties and benefits as more distant users. Users who live farther away from a forest may raise questions about the allocation of duties and benefits. When some users have to walk much longer than others to participate in maintenance and protection activities, allocating duties and benefits in a way that is perceived to be fair is more difficult.

For some distant users, participation might be worthwhile if there were some assurance that closer users will not take more products, or that benefits will be allocated in a manner that takes account of additional costs to those who live farther away. Or, since it is easier for those who live closer, perhaps they should shoulder more provision responsibility and, no doubt, get more benefits? This becomes more complicated when users come from a settlement other than where the forest is legally located. It is even more complex when the forested area lies in more than one jurisdiction.

These problems are especially evident in at least two rural scenarios in Nepal, where households with diverse benefits and costs use a fairly contiguous area of forested land. In the first scenario, a group of user households are from a dispersed settlement, where houses are scattered throughout an area. For example, in some villages in Western Nepal, people who live farther away than others show less interest in contributing grain for the guard (*manapathi*) or actively involving themselves in protection and management because they feel that most of the benefits go to those living near the forest (Chhetri & Pandey, 1992). In the second scenario, user households are from more than one settlement and from settlements across political/administrative boundaries. For example, users who live closer claim "primary use-rights" and want those who live farther away, in another jurisdiction (i.e., ward), to pay for the forest products they use. The individuals from other wards are reluctant to participate in any maintenance activity related to this forest even though this is the only forest they could use for their needs. In both cases, differences in relative distance to the forest in question give rise to differences in the costs–benefits calculus of user households.

Significant variation in distances among user households relative to the location of the forest resource can also give rise to opportunistic behavior. Those who live closer may be tempted to sneak into the forest at unauthorized times or harvest unauthorized amounts that can be easily concealed in nearby houses. For a resource that has subtractable benefits, too many incursions can have deleterious effects, especially if a forest is on the verge of regeneration. Arrangements to monitor each other's use of a forest effectively may be costly and complicated when some users live much closer to the forest than others.

For some households, the effort of participation in one forested area may not be worthwhile because they have access to another, closer forested area. While frequently one forested area is used as a primary source of forest products, households do use other forested areas as well for at least two important reasons: availability of products and convenience of access. First, they may find that some types of forest products are available in better quality or quantity in different patches of forest. Thus, the supply from the primary forest is augmented or replaced by the secondary sources. Second, it may just be more convenient

(and less costly) to use other forests. Villagers may find that some forests are not regulated and, thus, see these as more attractive to use than a forest that has restrictions of access and use. Or, they may find that some patches of forest are closer to their homes and, therefore, easier to access.

The organization of groups with locational differences among user households can be complicated because of their alternate use of other forests located in and around the area. Four scenarios can be envisaged with regard to the interaction of locational difference and use of alternate forests (Table 1). In scenario S1, one would expect organization of collective action to be the most difficult because of the greater differences in distance to the patch of forest in question for most users and their current use of alternate sources of forest products. Some users may live close to the primary forest and an alternate forest, or some users may live far from the primary forest and close to an alternate forest. For the households with an alternative source closer at hand, cooperation to protect and maintain the primary forest farther away may be seen as an unnecessary cost, when some benefits are readily available in the alternate forest area at lower cost. Furthermore, since those who live closer to the primary forest have use of both primary and alternate forests, the proportion of benefits to costs varies radically from those who live farther away from the primary forest.

Most user households found in S4 could be expected to value cooperation at a higher level (all other factors being equal) because they have no alternatives, and the forest is at about the same distance for most households. Since less cheating can be expected (because of locational parity) and there are expectations that others will also participate (because most households have no alternatives), the potential benefits of cooperation are perceived to be greater than the costs.

In S2, households in a user group have low locational differences but do use products from other forests. The quality and quantity of products may vary across all the available forests, and/or access to the primary forest may be more restrictive than the alternate areas. In cases where households are at different distances from the primary forest and no other forests are used (S3), higher costs of organizing and sustaining collective action can be expected. Thus, both S2 and S3 are expected to force higher costs, but not as high as S1. In S1, the locational heterogeneity is substantial in addition to the availability of forest products from at least one other forest.

(b) *Wealth disparity*

In the rural areas of the Middle Hills of Nepal, differences in wealth (or economic endowments) relate directly to the extent of economic stratification within the group (or relative economic well-being) which, in turn, partially depends upon the occupation or livelihood strategy of each household. People's interest in forest resources differs based on whether they raise cattle for milk or goats for meat, run a teashop or restaurant, weave baskets and mats, make charcoal or furniture, prepare medicine from forest products, use oxen for draught, or just cook food for the family. Most households need the forest for almost all of the above reasons, but only for subsistence. In other words, in the general poverty of the Middle Hills, most user groups depend upon forests as an integral part of their daily subsistence, and few within any group have commercial interests in communal forests. The village blacksmith and the local teashop owner are two important exceptions.

So, while most are subsistence farmers, differences in wealth are evidenced by the extent of land and livestock holdings. Wealthier households have greater need for animal fodder and agricultural compost. Wealthier farmers are frequently able, however, to construct alternative fuel sources such as methane-gas-producing compost pits, which supply them with cooking and lighting gas. They tend to have some surplus food and cash for modern medicine as well, and depend less than the poor do upon forests for fuel, food, and herbal cures. These differences, even among subsistence farmers, can generate different incentives among them for forest use and for devising cooperative arrangements for forest governance and management.

In some cases, those with greater assets may bear the higher initial costs of organizing collective action, while the benefits from such organization may accrue to a larger, less wealthy community. Individuals with more livestock have an interest in assuring a secure and adequate supply of fodder. If these individuals also have large landholdings, they may have substantial interest in the compost benefits of forest byproducts. In this case, while assets may be distributed unevenly within a group, the

interests of both rich and poor are similar with regard to the need for forest resources. On the other hand, the wealthy of a community may have many more alternatives to using a particular forest for their livelihood than the less-endowed members of that community, making for an imbalance of interest in organizing governance and management of a forest.

In many Nepali villages, the wealth of some households can be attributed to regular remittances sent by male household members working in the British and Indian armies. In addition, retired soldiers have substantial savings and pensions that represent earnings well above the national average. Some of these households (especially those with male members still working abroad) may have less interest in participating in group activities related to forests because they have a steady cash income from an alternate source. All across Nepal's hills, however, retired soldiers can be found occupied in gainful enterprise and in leadership roles in their communities. Many village-level organizations spring up and flourish because of the ability of these retired servicemen to supply financial resources, time, and the knowledge obtained elsewhere to invest in activities that benefit their communities and themselves.

(c) *Sociocultural differences*

In Nepal, villagers of different ethnicity or caste frequently reside in physically separate clusters (hamlets or *toles*) in a given settlement. How this affects their ability to cooperate is neither well understood nor studied in depth. [5] It is not uncommon to find that user groups have one or two castes that outnumber the rest. This may not translate directly into dominance, however, since lower castes can frequently be found in greater numbers than higher castes. This may also be why some studies, citing examples of difficulties in organizing and sustaining cooperation within ethnically heterogeneous user groups (e.g., Chhetri & Pandey, 1992), did not observe such difficulties systematically across multiple cases.

Sociocultural composition has been observed to influence educational, economic, and political opportunities in Nepal. Whether this is less true now than in the past is unclear, but rural populations have generally shown an ability to cooperate in a variety of sociocultural settings. Numerous cases are documented within Nepal of rural communities cooperating over decades in the management of natural resource systems. In irrigation systems, irrigators of different ethnic or caste backgrounds have cooperated with success in multiple instances. The need for capital and labor to take care of maintenance and monitoring activities may override boundaries that separate different groups of users (Lam, 1998). The skills that one group brings may complement those of other groups and, in some cases, be indispensable. In forest user groups, the more educated are sometimes from the higher castes. These individuals bring writing and bookkeeping skills that are essential to organization. Thus, the secretary or treasurer may be of a higher caste. Lower castes who use forests for more specialized products than others, such as the artisans who work with iron and leather, bring their knowledge of flora and fauna to the group. For marking boundaries or trees, a tradeoff may be applied, whereby some of the lower castes do most of that work.

5. FINDINGS: THE ASSOCIATION OF COLLECTIVE ACTION WITH DIFFERENCES AMONG USER GROUPS

A look at Table 1 shows the association of collective action with trends in forest condition and with forest stock conditions. The measure of collective action is called *degree of collective activity* and indicates the extent to which local residents have organized themselves to manage forest use (see Varughese, 1999). The degree of collective activity is derived from a set of questions that asks whether there are rules (formal and informal) related to entry into a forest, harvesting in a forest, and monitoring of a forest, and how the group organizes its forest-related activities. A low degree of collective activity (L) is recorded for cases where individuals are aware of forest degradation and resource scarcity and observe harvesting constraints on their own, without any group-level activities or rules of harvest. In Tables 4–6, low collective activity is classified along with no collective activity. A moderate level of collective activity (M) is recorded when a group of individuals has harvesting and entry rules, and planned minimal forest-related group activities, but has little or no monitoring of rule breakers. A high level of collective activity (H) is recorded when a group of users has harvesting and entry rules, monitoring by members, and organized forest-related group

activities. These, of course, comprise just a small portion of the repertoire of rules that may exist at any location and are used here as minimum indicators of collective activity. The locations shown in Table 1 are arrayed according to the level of collective activity, from high to low or none. Neither the size of the user group nor the area protected is related to level of collective activity.

The indicators used for forest condition are of two kinds: *forest stock* and *trend in forest condition*. The indicator forest stock provides a subjective assessment of forest condition at the time of the study by the forest specialists on the research team with respect to speciation and abundance of vegetation. In most of the 18 cases, the professional assessments of the district forest officials in those study sites were also obtained to validate the research team's subjective assessment. The trend in forest condition is a subjective assessment of forest condition derived from the historical perceptions of diverse local forest users, and, in many instances, of local government forest officials, about the relative abundance of produce, disappearance of valuable species, and change in forest area. "Worsening" indicates their assessment of a clear depletion of species and reduction in forest area, and "improving" indicates their perception of an increase in abundance of tree species and shrubs. By itself, this assessment is not a good longitudinal indicator of forest condition, but when combined with a measure of change in forest condition, one is able to obtain a general picture of resource use patterns and management. A validation exercise performed to establish the relative accuracy of these subjective assessments supports the assessments (see Varughese, 1999).

In Table 1, five of the six improving forests are associated with high levels of collective activity, while one forest is associated with a moderate level of collective activity by users. All six had stocks that were at least average in condition for this physiographic zone. Four of five forests in stable condition have a moderate level of collective activity associated with them, while one has a low level of collective activity. Three of these stable forests have average stocks and two have below-average stocks. Six of seven forests in worsening condition had low or zero levels of collective activity by villagers, while one forest had villagers engaging in a moderate level of collective activity (see Table 2).

The level of collective activity is consequently strongly associated with forest condition, as shown in Table 3 (tau = 0.80). A high level of collective activity related to forest management is seen in 83% of all forests that are improving in condition. In 86% of locations where forests were found to be deteriorating, the local community was undertaking little or no collective activity. In the majority of locations where the forest resource was seen to be neither deteriorating nor improving, i.e., stable, the users were engaged in at least moderate collective action. [6]

Now, we wish to ascertain whether heterogeneity is associated with the level of collective activity in a site. Information was obtained

Table 2. *Interaction of locational differences and alternate sources*

	Alternate used	No alternate
High locational differences	S1 (hardest for cooperation)	S3 (intermediate for cooperation)
Low locational differences	S2 (intermediate for cooperation)	S4 (easiest for cooperation)

Table 3. *Association of level of collective activity with forest condition*

Forest condition	Collective activity			Total
	High	Moderate	Low or none	
Improving	83% (5)	17% (1)	0	100% (6)
Stable	0	60% (3)	40% (2)	100% (5)
Worsening	0	14% (1)	86% (6)	100% (7)
Total	5	5	8	18
tau = 0.80				

regarding: *locational differences* for each user group; the size of each settlement and distribution patterns of all houses within the user group; number and distribution pattern of forested areas used; and the distance from each settlement in the user group to the forested areas used. This information was utilized to create an index of locational differences from low to high for each of the 18 groups. Groups with fragmented (or noncontiguous) forest patches at a distance from settlement were considered high on the index of locational differences. Groups with one contiguous area of forest in close proximity to settlement were considered low on the index of locational differences.

Across the 18 locations studied, 11 had less difficulty with regard to the location of settlements and forest distribution (Table 4). Among these 11, five groups manifested higher levels of collective activity and six groups manifested lower levels of collective activity. While areas with greater difficulty due to distances were expected to have lower levels of collective action, the finding was contrary to expectations. Five of seven cases with greater locational differences had higher collective activity. A negligible positive association exists between locational differences and the organization of collective action for this group of 18 sites (tau = 0.25). To examine the effect of alternate forest usage on collective action in cases with and without locational differences, the set of 18 cases is further categorized by whether there is alternate forest resource use.

For the 18 cases studied, villagers in 10 sites use other forest resources (communal or government) *in addition* to their own communal resources (Table 5). Within this set of 10 cases, where more than one forest is used, three groups faced high locational differences while the other seven groups faced low locational differences. Although we did not expect collective action to take place at a high level in this category (S1 = high locational differences and alternate forest usage), one group showed a high level of collective activity while two groups showed a moderate level of collective activity. Five of seven groups in S2 (over 70%) showed low levels of collective action while the remainder (two groups) showed high levels of collective action. The surprising association between groups who use alternate resources *and* have locational differences is moderately strong (tau = 0.65), but the number of cases is small.

Among cases that had *no* alternate forest resource usage (S3 and S4), the distribution of groups with locational differences was even (two each) across levels of collective action while three of four cases without locational differences showed higher collective action. There is a negative but negligible association

Table 4. *Collective action by locational differences*

Collective activity	Locational differences		Total
	High	Low	
High/moderate	50% (5)	50% (5)	100% (10)
Low	25% (2)	75% (6)	100% (8)
Total	7	11	18
tau = 0.25			

Table 5. *Collective action by locational differences and alternate use*[a]

Collective activity	Locational differences and					
	Alternate forest(s) used			No alternate forest(s) used		
	S1 (HiDiff)	S2 (LoDiff)	Total	S3 (HiDiff)	S4 (LoDiff)	Total
High/moderate	3	2	5	2	3	5
Low	0	5	5	2	1	3
Total	3	7	10	4	4	8
		tau = 0.65		tau = −0.26		

[a] S1—high locational difference; alternate used; S2—low locational difference; alternate used; S3—high locational difference; no alternate; S4—low locational difference; no alternate.

between collective action levels and locational differences in this category of cases (tau = −0.26), but again for a small number of cases.

Wealth disparity in a group was determined by obtaining information on the local definition of wealth; the number of households who were wealthy and poor by that definition; and any obvious wealth disparities in a group. Wealth was usually viewed by users as being in possession of land, livestock, food surplus, and remittances from family members working elsewhere, in order of relevance for that community. These factors were assigned different values by users themselves. Thus, they were also able to comment on whether their group was more or less uniformly poor or whether there were noticeable disparities. This information was then used to create an index of wealth disparity in a group. This index was then utilized to separate the 18 groups into high and low categories of wealth disparity. Of the 18 locations studied, six were viewed by users to have higher levels of wealth disparity between forest users while 12 had little or no disparity of wealth between users (Table 6). In cases where there was a low disparity of wealth, eight out of the 12 cases had collective activity ranging from moderate to high. But, where the disparity of wealth was greater, four of six cases had not organized for collective action. The measure of association indicates a modest negative relationship between level of wealth disparity and collective action (tau = −0.32).

Sociocultural differences in a group were determined by information obtained on a minimum of three (if present, with no maximum) caste and ethnic types for each of the 18 groups. An index of fractionalization was used to measure sociocultural heterogeneity (caste/ethnic), computed by

$$A = 1 - \sum_{i=1}^{n} (P_i)^2,$$

where P_i is the proportion of total population in the ith ethnic/caste type. A varies from 0 to 1 and measures the probability that two randomly selected persons from one user group will not be of the same sociocultural type. This index was then used to separate the 18 groups into low, moderate, and high categories of sociocultural heterogeneity.

Across the 18 locations studied, 13 were observed to be more heterogeneous in sociocultural composition, varying from moderate to high levels of heterogeneity (Table 7). The proportion of cases where sociocultural heterogeneity was greater (over 60%) was also where collective action was seen to be high (eight of 13 cases). In the cases where heterogeneity was lower (five of 18 or about 28%), there is almost no difference in the level of collective action. The measure of association indicates a negligible positive relationship between sociocultural heterogeneity and the organization of collective activity for the 18 cases studied (tau = 0.20).

In Table 8, we array the level of collective action and the measures of heterogeneity for all 18 cases. Heterogeneity is certainly not a strong predictor of successful collective action. Only one of the five most successful user groups (Doramba) is relatively homogeneous across all of the attributes we have examined in this paper. What is apparent in examining Table 8 is that groups with similar patterns of attributes in regard to location, wealth, and sociocultural composition do not have similar levels of collective action. Doramba, Riyale, and Chhoprak (Sites 3, 7, and 17), for example, all have *low* levels of differences in regard to location, wealth, and sociocultural attributes (while two of these have alternative usage), but Doramba has a high level of collective action, Riyale has a moderate level of collective action, and Chhoprak has a low level of collective action. Alternatively, Bandipur, Barbote, and Chunmang (Sites 5, 9, and 14) are all coded as having *high* differences in all three attributes

Table 6. *Collective action by disparity of wealth*

Collective action	Disparity of wealth		
	High	Low	Total
High/moderate	20% (2)	80% (8)	100% (10)
Low	50% (4)	50% (4)	100% (8)
Total	6	12	18
tau = −0.32			

Table 7. *Collective action by sociocultural heterogeneity*

Collective action	Sociocultural heterogeneity			
	High	Moderate	Low	Total
High/moderate	40% (4)	40% (4)	20% (2)	100% (10)
Low	12% (1)	50% (4)	38% (3)	100% (8)
Total	5	8	5	18
tau = 0.20				

Table 8. *Comparison of collective activity with differences among forest users*[a]

Site	Location	Collective activity	Locational differences	Locational differences × alternate usage	Wealth disparity	Sociocultural heterogeneity
1.	Churiyamai (Makwanpur)	H	H	S1 (Hardest)	H	H
2.	Bijulikot (Ramechhap)	H	L	S4 (Easiest)	L	M
3.	Doramba (Ramechhap)	H	L	S4 (Easiest)	L	L
4.	Raniswara (Gorkha)	H	H	S3 (Intermediate)	L	H
5.	Bandipur (Tanahun)	H	H	S3 (Intermediate)	H	H
6.	Manichaur (Kathmandu)	M	M	S2 (Intermediate)	L	L
7.	Riyale (Kavre Palanchowk)	M	L	S2 (Intermediate)	L	L
8.	Thulo Sirubari (Sindhupalchowk)	M	M	S2 (Intermediate)	L	M
9.	Barbote (Ilam)	M	H	S1 (Hardest)	H	H
10.	Bhedetar (Dhankuta)	M	H	S2 (Intermediate)	L	M
11.	Baramchi (Sindhupalchowk)	L	M	S4 (Easiest)	L	M
12.	Agra (Makwanpur)	L	L	S1 (Hardest)	H	L
13.	Chhimkeswari (Tanahun)	L	M	S2 (Intermediate)	L	M
14.	Chunmang (Dhankuta)	L	H	S2 (Intermediate)	H	H
15.	Bhagwatisthan (Kavre Palanchowk)	L	M	S2 (Intermediate)	L	L
16.	Sunkhani (Nuwakot)	L	M	S3 (Intermediate)	H	M
17.	Chhoprak (Gorkha)	N	L	S2 (Intermediate)	L	L
18.	Shantipur (Ilam)	N	H	S3 (Intermediate)	H	M

[a] H—high; M—moderate; L—low; N—none.

but vary from high to low levels in terms of collective action.

In some of the cases with high levels of collective action and who also face substantial heterogeneity, forest users have designed a set of rules that specifically take into account the heterogeneity they face. This is particularly the case when users face locational differences. Sites 4 and 5, Raniswara and Bandipur, present particularly interesting cases for further analysis. Both sites have highly organized user groups or associations with written rules and regulations governing user behavior with regard to the forest. In fact, both associations have overtly recognized that their membership is scattered and that the access to forested areas varies by settlement. In both cases, including settlements that are farther away generates substantial advantages to the group, and the rules of the group have been crafted accordingly. Both have a two-tier system of user membership. Those who live farther away can pay an extra fee in exchange for reduced monitoring duties. In addition, those who cannot participate in joint maintenance, harvesting, or monitoring activities can pay special membership fees so as to avail themselves of forest products at special, below-market rates. In Raniswara, special membership is noted after payment of a fee; written requests for forest produce have to be processed by the Harvest Subcommittee; and the committee provides products to the member at a special rate.

Over time, membership can increase to include users from the most distant settlements.

The Raniswara user group has been particularly receptive to the opportunities as well as the constraints of an increasing membership, and the importance of carefully defining the harvesting rights related to a specific forest patch located nearest to a member rather than related to the entire community forest. In addition, attention is paid at the time a member joins (or wishes to change their membership category) to the responsibilities they are expected to bear via either labor contributions or monetary fees.

In Bandipur, members have to purchase tokens of different colors, each color specific to their membership type. These tokens are to be shown upon request of any member at any time in the forested area. In both associations, members who live at a distance but prefer to participate are organized by settlement. Each settlement is assigned the closest forested area for harvesting and maintenance activities. A member of the association committee is responsible for monitoring that subgroup's behavior. During periods of greatest danger to the forested areas, guards from two different settlements are assigned to the same area.

For Raniswara, the members who live at a distance from the forest are mainly traders, teashop owners, or restaurant owners in Gorkha bazaar. Some are salaried as teachers or government employees as well. While most of these second-tier members use gas for their everyday cooking needs, they also need large quantities of firewood for their businesses. The costs of buying firewood in the open market are prohibitive as opposed to obtaining it at a discounted rate as a group member, even after paying higher membership fees. These members do not have the time to invest in forest maintenance activities but do have the resources to substitute cash for limited participation. The group requires income on a regular basis, both from membership fees as well as sale of wood. Thus, the benefits to the group and individual members exceed the costs of arriving at a cooperative agreement. A similar calculus applies to members of the Bandipur group who live in the market area. In addition, past experience of scarcity always encourages members to stock up on firewood supplies, especially when available at a lower-than-market rate.

The supply of timber for house construction is another highly valued benefit of membership in forest user groups. Despite the fact that there are considerable disparities in distance, members who live farther away are willing to pay more, both for membership and for timber, because this enables them to obtain timber at relatively low cost in contrast to the open market. The prices of timber and firewood as well as membership are negotiated and agreed upon at group meetings. Supplies of both timber and fuelwood, while plentiful, are still subject to annual quota review by the Harvest Subcommittee (for Raniswara) and the regular Users Committee (for Bandipur).

A third site that faces high internal locational heterogeneity and, in addition, now faces the problem of alternative forest use is Churiyamai (Site 1). When the users first organized in 1990, villagers lived in three separate settlements and used a community forest comprised of two distinct blocks. One of the blocks is a 27-year old former government research tract. The other block is a tract initially developed as a government community forestry project seven or eight years ago. At that time, the households of the two proximate settlements formed a forest association with a committee to manage both blocks as one community forest. The third settlement disputed this arrangement because the villagers in this settlement were also traditional users and because some parts of the forest were within their administrative boundaries. Further, as a countermove, this settlement formed a forest association and committee for its own area of the forest. This arrangement was not satisfactory and led to conflicts over boundaries and membership between the three settlements. Resolution to the problem of differences in distance was reached by several meetings conducted among the three settlements. Residents agreed to a merger of the two groups into a new forest association that would, in turn, allow all three settlements to avail themselves of the entire forest area.

This larger group of users from the three settlements functions as a well-organized association, with rules specifying membership, entry, harvest of particular products and related fees, and times of harvest. Fees and proceeds from the sale of deadwood or fallen trees provide cash income for the association. The income is used to pay for two full-time forest monitors at present. These measures have considerably improved the condition of the two blocks of forest used by the three settlements. The association has placed severe restrictions on both blocks of the community forest. As alternatives to cutting fodder, some

members now stall-feed their animals or graze animals in fields and by the roadside. The rules regarding firewood are strict. Consequently, many members now walk a considerable distance (two hours by foot) to a third forest owned by the government. It is hard to say at this point whether the complex relationship between strict rule enforcement in the community forest and the opening of an alternative supply will lead either to the destruction of the alternative forest or to a lack of interest in the community forest.

When users are unable to come to an agreement over an issue such as locational differences and the allocation of benefits, even within organized user groups, collective action is likely to falter. The mechanism for such failure can be complex in its working. In Barbote (Site 9), for instance, collective action is moderate, forest condition is stable, and forest stock is average (see Table 1). This group is unable, however, to reach a quorum for any group meeting. A mistake in identifying two kinds of members at the time of forming this group gave rise to a "quorum" problem in Barbote. Some of the households using the Barbote Forest lived around a distant market. These households wanted access to forest products but did not want to walk a great distance to undertake maintenance activities. The inability of this group to distinguish between members with different interests (based partly upon their location) resulted in net benefits being disproportionately large for those who lived at a distance (because they would not participate in maintenance activities yet could obtain products). Those who lived at a distance numbered more than those who lived closer to the forest; thus, their bargaining position was stronger. In such a case, the implementation of a faulty membership rule exacerbated the problems of cooperation, given locational differences.

Another issue that adds to the problem of sustaining cooperation among members of the Barbote group is the extensive use of alternate patches of forest by users who live farthest away from the community forest. Residents of settlements that are almost an hour away from the community forest observe that it makes little sense for them to trek 2–3 h for a load of firewood when the nearby government forest is accessible, albeit in poorer condition. Similarly, for those users who live near the market or trade there, there are small patches of forests that are closer than the community forest. These forest patches can be readily accessed since there are no rules that restrict access or harvest for them. Core members of this group have tried several times to reconstitute their community forest user group to take account of these differences in interest, but have been unable to do so because they have been outvoted by those receiving substantial benefits due to the old rules.

In Bhedetar (Site 10), collective activity is observed to be moderate, forest condition is worsening, and forest stock is above average (see Table 1). The five settlements in this site use one forested patch as their main source of forest products with two other patches as supplementary sources. The main forested patch has a major highway bordering it on two sides. The majority of households are settled immediately above this forest in three settlements and farm for a living, while there are two settlements at the forest base, along the highway, selling food, tea, and liquor. This forest has had an active user group for the past five years and is among the first to be formally recognized by the District Forest Office (DFO). The alternate patches of forest lie away from the settled area. These patches of forest were until very recently parts of another large community forest area located above this site. When the user group initially created to manage this community forest failed over a period of three to four years, a forest patch was demarcated and handed over to the five settlements by the district forest office to use as a community forest, in addition to their own main forest below.

Although the DFO cites the Bhedetar community forest as a successful example, the villagers and user committee officers themselves are dissatisfied with the level of participation of users, the support of the DFO, the level of conformance to rules constraining harvest of timber, and the poaching of valuable timber species along the road. Political ferment exists in the settlements despite the homogeneity of wealth and caste. Some users who live closer to the alternate patches are excluded from rights of usage from the main forest because, it is argued, they use more of the alternate forests and show less interest in managing the main forest. For now, there are no complaints about the adequacy of forest products, though most fear that the lack of cohesion in the groups could lead to a breakdown in monitoring activities and to an increase in illegal sale of timber from the fringes of the forest farthest from the settlements.

Groups with privileged subgroups can be detrimental if the privileged discount the value of the forest and do not depend upon it. In Chunmang (Site 14), a community of users who have had recurring difficulties in organizing governance for their forested area, a dominant sociocultural group (also wealthy) has resisted all attempts at creating a forest user group. While this case is characterized by severe locational differences, the dominant sociocultural subgroup lives in close proximity to the forest and is known to engage in unrestrained harvesting. While other subgroups scattered near and far have no objection to forming a user group that has rules to allocate benefits in proportion to costs, this particular subgroup demurs. The politicians and wealthy of this area come from this subgroup. They have large landholdings, a grain and oil mill, and employ some of the poor families of the group. Since they also have land bordering another forested area, they have become members of that distant user group. While they live closer to one forest and choose not to support cooperation nearby, they have taken membership in a distant user group by virtue of owning land there! Thus, living close to a forest may not make much of a difference to the organization of collective action if individuals with more assets in a group also have low discount rates related to that forest.

6. CONCLUSION

The findings from this study of 18 sites in Nepal indicate that differences among users do pose *challenges* for groups of forest users in overcoming the incentives to free ride and shirk. Heterogeneities, however, do not have a determinant impact on the likelihood or success of collective action. The attributes of different groups affect the structure of constitutional and collective-choice arenas within which users decide how to organize themselves and which rules to adopt to allocate rights and duties as well as costs and benefits. Successful groups overcome stressful heterogeneities by crafting innovative institutional arrangements well-matched to their local circumstances. Thus, just the presence of heterogeneities is not sufficient to predict outcomes in field settings where participants do have considerable autonomy to make their own rules, if they take hold of this opportunity.

Instead of focusing on wealth, locational differences, sociocultural differences by themselves (or, on the size of the group by itself), it is important to ask how these variables are embedded in situations that themselves vary substantially in regard to the benefit–cost calculus of those involved in negotiating and sustaining agreements. Where there are very substantial benefits to be obtained through collective action, users may be able to do as the users from Bandipur (with high differences on all three attributes) and Raniswara (with high locational differences) did, and create diverse forms of membership with different rights and duties. They thereby found a way to capture benefits of value to those who lived farther from the forests as well as to receive the monetary resources they were willing to contribute. Their rules are consistent with Design Principle Two in Ostrom (1990). Further, they helped neighboring groups to organize their own forests so that the benefits of membership are not diluted by lax enforcement over community forests nearby.

The group in Churiyamai consciously expanded group size as a way of reducing conflict that arose due to the location of forests used in more than one jurisdiction. In another site (Chunmang), the debate over benefits and costs to villagers who lived at varying distances from the forest completely hobbled any efforts to start collective action. This was not helped by the differences that existed in economic and political assets in that group. In yet another site (Barbote), locational differences were a considerable barrier to the continued organization of labor for maintenance and protection activities and could not be overcome due to the flawed rules governing membership. Further, in Barbote as well as in Bhedetar, the use of alternate sources by user group members exacerbated the problems posed by locational differences. In the former case (Barbote), users were struggling to find an institutional solution with the leadership of a very knowledgeable resident. In the latter case (Bhedetar), the community and the District Forest Office concerned had yet to establish the costs of opening neighboring forests to unrestrained use while trying to sustain cooperation for the community forest.

That differences among users can lead to differences in interests comes as no surprise. But differences in interests lead to a multiplicity of outcomes that are impossible to predict in the absence of knowledge about institutional

arrangements that constrain user behavior, stabilize mutual expectations, and provide some assurance of reliability. Even in a group that differs on many variables, if at least a minimally winning subset of appropriators from a threatened but valuable resource is dependent on it; share a common understanding of their situations; have a low discount rate; include some with more assets and similar interests among their members; trust one another; and have autonomy to make their own rules, it is more likely that they will estimate the expected benefits of governing their resource greater than the expected costs (Ostrom, 2000b). If the benefits of a change of rules are substantial for an elite (or for the majority of members where changes in rules require majority vote), one can expect a change. But when those in control of a rule change are disadvantaged, one can expect obstruction of cooperation. [7]

Thus, the evidence from these 18 cases increases the confidence we can have in the evolving theory of institutional change briefly summarized above. Where there are substantial benefits to be gained from an effort to devise rules to cope with heterogeneities, users may be able to invest more heavily in finding effective rules that are considered fair, effective, and efficient to most users. In other words, where the incentive to change is substantial, it is possible for users to pay higher costs of devising new rules, and monitoring more complex rules (Ostrom, 2000b). Whether the rules agreed upon distribute benefits and costs fairly depends both on the collective-choice rule used and the type of heterogeneity existing in the community. Heterogeneity is not a variable with a uniform effect on the likelihood of organizing and sustaining self-governing enterprises.

We are, however, learning more about the conditions facilitating self-organization. If appropriators can engage in face-to-face bargaining, have the autonomy to change their rules, and there are substantial net benefits to be obtained by so doing, they are more likely to organize themselves. Whether they organize depends on attributes of the resource system and the users themselves that affect the benefits to be achieved and the costs of achieving them as well as the rules used for changing rules (Ostrom, 2000b). Whether their self-governed enterprise succeeds over the long-term depends on whether the institutions they design are consistent with design principles underlying robust, long-living, self-governed systems (Ostrom, 1990). The theory of common-pool resources has progressed substantially during the past half century. Many challenging puzzles, however, remain to be solved.

NOTES

1. See Ostrom (1998, 1999) for an overview of these studies and Ostrom *et al.* (1994) for the presentation of the studies themselves.

2. See Ostrom (2000b) for a full exploration of the theoretical developments briefly reviewed here.

3. The theory predicts the direction, but not the magnitude, of the change that occurs in group contributions to a public good when income is redistributed toward those who already had contributed.

4. The IFRI research program is a network of Collaborating Research Centers (CRCs) committed to using a set of 10 research protocols developed from a combination of forest mensuration techniques and social science methods and is coordinated by colleagues at Indiana University. The Nepal Forest Resources and Institutions research program is located in Kathmandu at nepal@ifri.wlink.com.np. The program is unique in its focus both on ecological variables and on the rules that communities may use, on the structure of communities themselves, and on careful measurement of forest conditions. An initial set of case studies from multiple countries is presented in Gibson *et al.* (2000).

5. Locational differences may operate quite independently of sociocultural differences although these may be correlated in the Middle Hills since different ethnic/caste groups tend to live in their own hamlets, which may be at different distances from forested areas.>

6. See Varughese (1999) for an examination of the mechanisms that lie behind these positive associations.

7. We thank Lore Ruttan for her comments regarding these points.

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