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Population and Forest Dynamics in the Hills of Nepal: Institutional Remedies by Rural Communities

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Introduction

Projections of massive declines in Himalayan forest cover and dire predictions for the future of forests in Nepal initiated worldwide concern in the 1970s (Eckholm, 1975, 1976; World Bank, 1978). Initially, the source of the problem was seen as domestic fuelwood use compounded by rapid population growth. Then expansion of agriculture, commercial logging, and tourism were blamed. However, the actual rates of deforestation, as well as its causes and consequences, remain very much in question. Studies indicate that while there is degradation from overharvesting in the hills, the total loss of forest cover has been relatively small (for example, Ives and Messerli, 1989). Others argue that losses have even been reversed in both forest area (HMG, 1988; Bajracharya, 1983; Metz, 1990; Gilmour and Nurse, 1991) and tree density (Messerschmidt, 1986; Gilmour and Fisher, 1992). Still others contend that while forest area is not decreasing in the hills, the quality of existing forests is suspect (Chakraborty et al., 1997; Subedi, 1997).

This debate notwithstanding, the future remains insecure and disturbing for Nepal's rural majority who depend on forests. Even though the claims of dire environmental crisis might have been exaggerated, rising population, migration, increased industrial and commercial activity, and developmental pressures continue to place heavy demands on the forest resource base. In a country where over 80 percent of the population depends entirely on agricultural and forest products for food, fodder, and fuel, forested lands always face the risk of being used at an unsustainable

rate. Consequently, the issue of how to best govern forest resources in Nepal remains of critical concern to policymakers.

Population change lies at the heart of this debate, as it does for resource-management and -development policy globally. While for many population growth is accepted as a primary or intermediary cause of resource degradation (Ehrlich and Ehrlich, 1991; Brown, Wolf, and Starke 1987; Bilsborrow and DeLargy, 1991), for others an increasing population is a stimulus to economic development and innovative resource-management practices (Boserup, 1965, 1981; Simon, 1981, 1983, 1990-Binswanger and Pingali, 1989). In general, it has been difficult to find agreement on what the relationship is between population growth and natural-resource condition.

This study examines the relationship between the governance of forest resources and population in the middle hills of Nepal. Specifically, it investigates the significance of local institutions in forest resource management to gain a better understanding of how such institutions shape the actions of individuals at the community level. By focusing on local institutions, this study becomes less concerned with what or who is the agent of environmental degradation than with what has helped forest users to cope with environmental and population change. Indeed, for the 18 locations in this study, the findings indicate that change in forest conditions is not significantly associated with population growth. Rather, change in forest conditions is found to be strongly associated with local forms of collective action. This implies that policymakers' preoccupation with population growth as a primary determinant of resource degradation may be ill-advised. Instead, the facilitation of institutional growth and innovation at the local level may be more relevant to the robustness of the natural-resource base.

The first section of this chapter provides a general overview of the ongoing debate about the relationship between population growth and the environment. This overview provides the backdrop for a review in the second section of research that addresses forest resources in Nepal. The third section provides a description of the research setting and the approach used to conduct the study. The fourth section introduces the variables used for the study and reports the findings for the 18 locations. The fifth section provides a closer look at a set of six cases selected to understand differences in physical outcomes across the 18 locations. The chapter concludes with a discussion of some of the key factors that help explain differences between communities that have coped with population and resource change.

Population and the Environment

A great deal of research has focused on the relationship between population change and the environment, and the debate continues. Since Malthus, scholars have argued forcefully that population growth is the primary cause of environmental degradation (Abernathy, 1993; Brown, Wolf, and Starke, 1987; Ehrlich and Ehrlich, 1991; Myers, 1991; Wilson, 1992). While demographers in this tradition have shown that population growth has some negative consequences, others have shown that population growth can also lead to technological advances and innovative uses of natural resources (Simon, 1983, 1990; Boserup, 1965, 1981; Binswanger and Pingali, 1989). Increasingly, research addressing the relationship between population change and the environment demonstrates that their linkages are complex and yet to be understood fully (Bilsborrow and DeLargy, 1991; Cruz et al., 1992; Jolly, 1994; Netting, 1993; Shivakoti et al., 1997). While it is clear that demographic change does influence resource use, population growth is but one variable of a larger set of important variables whose numerous interactions affect the natural-resource base.

Part of the difficulty in understanding the linkages between population change and the environment is that, methodologically, much of the extant research examines agents of environmental change at a high level of aggregation. By resorting to a macro perspective, most of these studies have handicapped their ability to exploit micro-level research to understand the complex workings of population and environment linkages (Arizpe, Stone, and Major, 1994). Scholars of microinstitutional solutions to commons problems have long argued that local communities can craft durable institutional arrangements that enable them to successfully manage local natural resources, even when confronted with political, economic, and demographic pressures (Acheson, 1989; Feeny et al., 1990; Ostrom, 1990). These scholars recognize, however, that successful local solutions

are more difficult to achieve where (1) demographic change is rapid (2) a local community is not dependent on the resource in question, (3) substantial heterogeneities of interest exist, (4) little local autonomy exists to make and enforce rules, and (5) the resource system itself is very large (see, for example, Ostrom, 1998b). Thus, studying how local communities cope with different kinds of population pressures is a major topic of theoretical and policy interest.

In more focused research on factors that mediate environment-population interactions in the Kumaon Himalaya of India, Agrawal and Yadama (1997) have argued that by studying micro relationships at the community level it is possible to gain an understanding of how variables such as population, economic growth, and forest area get aggregated at a macrostructural level. Their study of 275 rural communities finds that local institutions play a critical role in mediating demographic and socio-economic influences.

This study explicitly recognizes that factors such as population change can influence resource use in a variety of ways. But rather than be determinative of human behavior, the study investigates how resource users might craft institutional arrangements to cope with demographic and environmental forces.

Research on Nepal

The growth of population and its supposed effect on the Nepali Middle Hills has been the subject of several studies. The earliest and most influential was conducted by Eckholm (1975, 1976), who drew attention to population growth in the Nepali hills and rather tenuously linked it to "denuded hillsides" and "deteriorating environments" where "the pace of destruction is reaching unignorable proportions" (1975, 764-65). Subsequently, it was shown that this connection between an increase in population and catastrophe in the hills was simplistic and misleading (Bajracharya, 1983; Ives, 1987; Ives and Messerli, 1989; Mahat, Griffin, and Shepherd, 1986a, 1986b).

In addition to rapid population growth, government policies of nationalization in the 1950s and 1960s have been identified by most researchers as one of the main causes of deforestation. Placing the ownership of forests with the national government disrupted preexisting and traditional practices of communal resource management. Since the government lacked sufficient human or economic resources to look after newly nationalized forests, what was once communally governed property became open to anyone to exploit. Traditional management practices that have endured and more recent innovative community forestry legislation, on the other hand, have been credited for enabling the forest conservation and regeneration that has taken place in the Middle Hills since the 1960s (Arnold and Campbell, 1986; Mahat, Griffin, and Shepherd, 1986a, 1986b, 1987a, 1987b; Messerschmidt, 1986; Griffin, 1988; Hobley, 1990; Exo, 1990; Gilmour and Fisher, 1992; Chhetri and Pandey, 1992; Dahal, 1994; Pradhan and Parks, 1995; Subedi, 1997).

Recent studies of Nepal's forest-management practices have directed attention toward the importance of institutional arrangements and social mechanisms. Some researchers have pointed to the role played by local institutional arrangements in sustainable resource use (e.g., Gronow and Shrestha, 1991; Gilmour and Fisher, 1992), but none have undertaken a study of institutional arrangements and their mediating effects on resource conditions. In a similar vein, studies have incorporated some descriptions of institutional arrangements within detailed descriptions of forest-user groups (Chhetri and Pandey, 1992; Dahal, 1994; Karki, Karki, and Karki, 1994; New ERA, 1996). While this work represents progress in Nepali forestry research, there is a paucity of social scientific research that brings an institutional approach to the study of local forms of community organization in forestry.

While the population in the Middle Hills continues to grow close to an annual rate of 2 percent at present, its effects on the surrounding patchwork of forest land are not so clear. One reason has been the absence of longitudinal data on forest condition and forest use. Few researchers have studied the same location over time. One notable exception is the study conducted by Jefferson Fox in a Nepali village in the Middle Hills in 1980 and 1990. Fox found that forest conditions were improved substantially, even though population density increased significantly over a period of ten years. Fox's finding had little to do with the dynamics of population parameters. Rather, changes in the authority of villagers to manage nearby forests, the construction of a road that

reduced the costs of inputs needed to adapt traditional agricultural practices, and the provision of external help in the form of knowledge rather than financial aid appeared to be the most important factors for improved forest conditions (Fox, 1993). Clearly, population parameters alone did not drive these outcomes.

Another reason for the lacuna in research on forest condition and use in Nepal has been the lack of consistently collected cross-sectional data (Subedi, 1997). Frequently, the inherent weaknesses of a study done in a single time period can be overcome if a sufficient number of similar studies are done using the same research methodology and theoretical framework in a single time period. This study seeks to address this gap in knowledge by looking at local-level information on demographic and forest parameters across several locations in the Middle Hills visited in a single time period.

The Study Setting

The physiographic zone of the Middle Hills of Nepal provides the broad setting of this study. In the Middle Hills, the population is estimated at 8.4 million (45.5 percent) with a growth rate of 1.61 percent for 1981 to 1991 (Central Bureau of Statistics, 1995). (Nepal's total population was 18.5 million with an annual growth rate of about 2.08 percent for the same time period.) The population remains largely rural, with fewer than 10 percent of the total in towns and cities. Subsistence agriculture is still 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 mainly distributed in small villages or hamlets that are sometimes parts of larger, dispersed settlements. A common pattern of forest-land distribution in these hills is for small patches of forests to be scattered throughout larger areas of cultivated land. These are vital sources of fuelwood, fodder, and leaf litter for animal bedding and composting, especially in the winter months when agricultural residues are exhausted. In 1985 to 1986, forest land (of about 5.5 million hectares) accounted for a substantial proportion (38 percent) of the total land area (about 14.7 million ha) in the country. The Middle

Hills contained about 1.8 million ha (32.6 percent) of forest land in this time period (HMG, 1988).

The change in use of forest resources in the hills has not been ascertained with any accuracy. However, a recent study of over 3,300 households in Nepal found that 93.7 percent of rural households collected firewood, and 86.8 percent used firewood as cooking fuel. Of all the households collecting firewood, 25.3 percent collected from their own land, 12.5 percent collected from community forest land, 59.7 percent used government forest land, and 2.6 percent obtained firewood from other sources (Central Bureau of Statistics, 1996). Evidently, nonprivate forest lands continue to supply the majority of firewood for households in the hills, upwards of 70 percent. The figures for community and government forest-land usage are only useful in estimating nonprivate land use. Frequently, what is officially government land is actually communal by use. The figures also do not supply acreage of various lands used for forest products. It could well be that the community forests and private lands are less used because of management regimes in effect.

Community forestry in the Middle Hills is being implemented through the administrative structure of the Department of Forests, facilitated by various donor-aided programs. These range in size from bilateral projects covering one or two districts (such as the Nepal-Australia Community Forestry Project) or seven districts (the Nepal-UK Community Forestry Project) to the largest (the Community Forestry Development Project), which is providing technical assistance and financial support, by way of World Bank assistance, to 35 hill districts. The 18 sites included in this study are from districts in the Middle Hills, most of which have various sorts of community-based integrated-development program activities, including the community forestry program of the Nepali government.

A Study of Eighteen Cases in the Middle Hills of Nepal

To examine the roles of institutions and population in forest-resource change, this study employed a two-stage analysis. The first stage of analysis provides a broad understanding of trends in population changes and the association of these trends with (1) foresters' and villagers' perceptions of forest conditions (changes in tree density and in forest area) and

(2) evidence of local-level organization and cooperation in resource management in the set of 18 cases. The second stage of analysis focuses on six cases that help illustrate the patterns discerned in the initial analysis. The task is to identify and examine how the crafting and operation of institutional arrangements generate different outcomes.

The cases included in this study are shown in table 8.1 in the chronological order in which they were visited by the International Forestry Resources and Institutions (IFRI) research program team in Nepal. These cases comprise a larger set of IFRI studies conducted in various physiographic zones of Nepal since 1992. The data for these particular cases 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, 1998a; see the appendix to this volume).

The 18 cases in this study represent 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 figure 8.1). For the purposes of this study, the names of settlements are omitted, and instead, locations are identified using the names of the VDC within which the settlements and forests were studied. All but two of the studies (Manichaur and Sunkhani) conducted in the Western and Central Development Regions are part of a series 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; other locations are being revisited in the spring of 1998. 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, funded by the MacArthur Foundation, 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. Thus, the locations of study were

Table 8.1
Descriptive statistics for 18 sites

Site Location	Date of Visit	Population		Average Household Size	Forest Area (hectares)	Forest Stock Assessment[a]
		Individuals	Households			
Churiyamai VDC (Makwanpur)	March 1994	4,500	750	6.0	85	Average
Baramchi VDC (Sindhupalchowk)	May 1994	244	36	6.7	75	Below average
Riyale VDC (Kavre Palanchowk)	May 1994	644	92	7.0	29	Average
Bijulikot VDC (Ramechhap)	June 1994	980	145	6.7	53	Average
Thulo Sirubari VDC (Sindhupalchowk)	April 1995	843	105	8.0	16	Average
Doramba VDC (Ramechhap)	May 1995	139	26	5.3	107	Average
Agra VDC (Makwanpur)	June 1995	434	70	6.2	190	Average
Bhagwatisthan VDC (Kavre Palanchowk)	June 1995	471	70	6.7	108	Below average
Manichaur VDC (Kathmandu)	June 1996	1,550	242	6.4	115	Average
Sunkhani VDC (Nuwakot)	September 1996	1,065	144	7.4	290	Below average
Chhimkeshwari VDC (Tanahun)	December 1996	192	28	6.8	45	Average
Chhoprak VDC (Gorkha)	January 1997	781	106	7.4	25	Below average
Raniswara VDC (Gorkha)	February 1997	2,661	404	6.6	300	Average
Bandipur VDC (Tanahun)	February 1997	1,021	183	5.6	75	Above average
Barbote VDC (Ilam)	May 1997	1,467	260	5.6	145	Average
Shantipur VDC (Ilam)	May 1997	162	29	5.6	90	Average
Chunmang VDC (Dhankuta)	June 1997	922	152	6.1	225	Average
Bhedetar VDC (Dhankuta)	June 1997	477	82	5.8	125	Above average

Note: Names in parentheses are districts.
a. Assessed by a forester based on tree density and speciation during the period of study and cross-checked where possible with district forest officials.

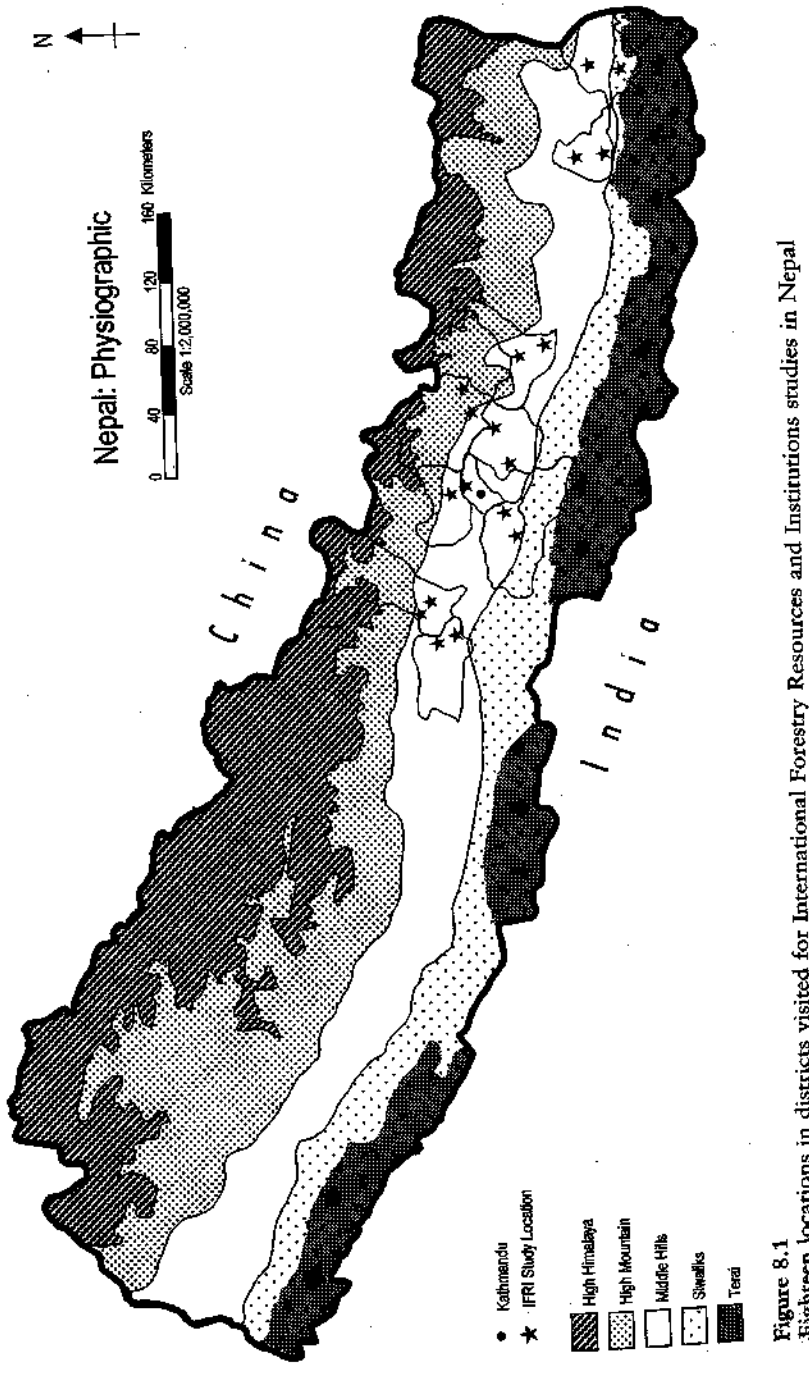

Figure 8.1
Eighteen locations in districts visited for International Forestry Resources and Institutions studies in Nepal

mainly determined on the basis of project or agency criteria. However, the data obtained show variation on the factors I examine in this study—the indicators of population growth and change in forest conditions and the degree of collectively organized activity by forest users.

The study initially uses descriptive indicators such as household and individual population, average household size, and forest area and stock condition to provide some idea of the locations visited (table 8.1). In particular, 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. This assessment also gives researchers an initial idea of the natural endowment that each group of users possesses. By itself, this assessment is not a good longitudinal indicator of forest condition, but when combined with some measure of change in forest condition (see table 8.2), one is able to obtain a general picture of resource-use patterns and management.

At the time of this study, forest data were still being compiled from revisits to several of these locations, and, therefore, the indicators used here for forest condition are limited to those based on assessments made by villagers and foresters. In other IFRI studies, more rigorous measures of vegetative stock are used in addition to measures based on assessments by villagers and foresters (see, for example, Becker, Banana, and Gombya-Ssembajjwe, 1995; Varughese, *1999).*[1]

In the 18 locations studied, household and individual population, average household size, and forest area exhibited considerable variation (table 8.1). The number of individuals in a group of forest users varied from 139 to 4,500, and the number of households per group varied from *26* to 750. Across the sites studied, this gives a range of 5.3 to 8 individuals per household for average household size across the sites studied. The average household size across all 18 locations is *6.43* individuals per household. In comparison, a recent survey by the Central Bureau of Statistics (CBS) on Nepal living standards found the average household size to be 5.33 in this physiographic zone (CBS, *1996).* The area of forest land used as a primary source of forest produce by villagers in these

Table 8.2
Preliminary comparisons of population growth with forest condition

Site Location	Population Growth Rate (percent)	Households per Hectare	Trend in Forest Condition[a]
Doramba (Ramechhap)	7.37	0.24	Improving
Churiyamai (Makwanpur)	5.42	8.82	Improving
Shantipur Ilam)	5.22	0.32	Worsening
Bhedetar (Dhankuta)	5.14	0.66	Worsening
Raniswara (Gorkha)	4.71	1.35	Improving
Chunmang (Dhankuta)	4.13	0.68	Worsening
Baramchi (Sindhupalchowk)	4.00	0.48	Stable
Barbote Ilam)	3.64	1.80	Stable
Bijulikot (Ramechhap)	3.39	2.74	Improving
Riyale (Kavre Palanchowk)	3.00	3.17	Stable
Sunkhani (Nuwakot)	2.68	0.50	Worsening
Bhagwatisthan (Kavre Palanchowk)	2.60	0.65	Worsening
Chhoprak (Gorkha)	2.55	4.24	Worsening
Manichaur (Kathmandu)	2.28	2.10	Improving
Thulo Sirubari (Sindhupalchowk)	2.11	*6.56*	Stable
Bandipur (Tanahun)	1.44	2.44	Improving
Agra (Makwanpur)	0.29	0.37	Worsening
Chhimkeshwari (Tanahun)	-1.33	0.62	Stable

a. Assessed by villagers based on local historical understanding and corroborated, in most instances, by district forest officials.

locations varied from 16 ha to 300 ha with an average across sites of 116.56 ha. The condition of most of these forests was found to be within the average range in this physiographic zone. Only two locations had above-average stocks, and three had below-average stocks. This assessment is made relative to typical forest stocks to be found in this zone as determined by the Department of Forests.

Table 8.2 provides comparisons of population growth rate, average households per hectare of forest area, and trend in forest condition. The population growth rate is obtained by taking the difference in households

(from the time of the visit to five years prior) and averaging it over five years. The five-year rate is preferred here because the assessments of forest condition in this study are also based on a five-year period. The 10- and 20-year growth rates were also available but are used only to supplement the discussion. 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 a clear depletion of species and reduction in forest area; "improving" indicates at least a perceptible increase in abundance of tree species and shrubs. The locations are arrayed from high to low rates of population growth in table 8.2.

Table 8.2 is more useful in understanding changes for each site and provides some interesting findings. In general, the population growth rates (averaged over five years) vary from a negative growth rate of —1.33 to well over 7 percent per annum with a range of 8.70 and a mean of *3.26* percent per year. For a 10-year period, the growth rates vary from 0.37 to 10 percent per annum with a range of *9.63* and a mean of 4.08 percent per year. It is important to note that these growth rates are well above the national average for this physiographic zone, calculated to be 1.61 in 1991 (CBS, *1995).* The household-to-forest ratios in these locations also exhibit dramatic variation, from 0.24 to 8.82 households per hectare of forest area with an average of 2.10 households per hectare. These figures show that there can be considerable variation from place to place in demographic characteristics across a physiographic zone.

However, is this variation reflected in forest condition? Across the 18 locations, there are six forests in improving condition, five in stable condition, and seven in worsening condition. But if the growth rate is taken as a first demographic measure, the two highest rates (7.37 and 5.42) seen in Doramba and Churiyamai have a forest stock that is average and improving. The lowest rates (—1.33 and 0.29) seen in Chhimkeshwari and Agra have a forest stock that is average in condition but is stable (in Chhimkeshwari) or worsening (Agra). Furthermore, if we number of households per hectare of forest available is taken as a

Table X.5
Association of population growth with forest condition

Forest Condition	Population Growth: Above Average	Population Growth: Below Average	Total
Improving	4 (45%)	2 (22%)	6
Stable	2 (22%)	3 (33%)	5
Worsening	3 (33%)	4 (45%)	7
Total	9 (100%)	9 (100%)	18

tau (τ) = 0.21

second indicator, the two highest ratios (8.82 and *6,56)* seen in Churiyamai and Thulo Sirubari, respectively, have an average forest stock that is improving (Churiyamai) or holding stable (Thulo Sirubari). The two lowest ratios (0.24 and 0.32), in Doramba and Shantipur, are associated with an average stock that is either improving (Doramba) or worsening (Shantipur).

Furthermore, table 8.3 indicates that there is little association between forest condition and population growth for these 18 communities even though they experienced higher growth rates than others in the region. The tau measure of association between the two variables is quite low at 0.24. In locations with above-average population growth, *61* percent of forests are improving or stable in condition. In locations with below-average population growth, 55 percent of forests are improving or stable, while 45 percent are worsening. These data demonstrate that a simple negative relationship between population growth and forest condition does not hold for these 18 cases.

These brief comparisons illustrate a simple point: explanations of forest condition that rely primarily on population pressure may be too simplistic. The entire range of forest conditions can be seen to be associated with high or low values of demographic indicators. Clearly, demographic variables by themselves do not appear to satisfactorily explain forest condition. Two pertinent questions emerge from this finding: (1) how is it that some forests are in better condition in locations where population growth and population density per unit area of forest is high, and

Table 8.4
Preliminary comparisons of forest condition with collective activity

Site Location	Forest Condition Trend	Forest Stock Condition	Collective Activity
Churiyamai (Makwanpur)	Improving	Average	High
Bijulikot (Ramechhap)	Improving	Average	High
Doramba (Ramechhap)	Improving	Average	High
Ranis war a (Gorkha)	Improving	Average	High
Bandipur (Tanahun)	Improving	Above average	High
Manichaur (Kathmandu)	Improving	Average	Moderate
Riyale (Kavre Palanchowk)	Stable	Below average	Moderate
Thulo Sirubari (Sindhupalchowk)	Stable	Average	Moderate
Barbote (Ham)	Stable	Average	Moderate
Baramchi (Sindhupalchowk)	Stable	Below average	Low
Bhedetar (Dhankuta)	Worsening	Above average	Moderate
Agra (Makwanpur)	Worsening	Average	Low
Chhimkeshwari (Tanahun)	Worsening	Average	Low
Chunmang (Dhankuta)	Worsening	Average	Low
Bhagwatisthan (Kavre Palanchowk)	Worsening	Below average	Low
Sunkhani (Nuwakot)	Worsening	Below average	Low
Chhoprak (Gorkha)	Worsening	Below average	None
Shantipur (Ham)	Worsening	Average	None

a. 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.

(2) how is it that locations with low population growth and density have deteriorating forests?

A look at table 8.4 shows the association of trend in forest condition with a different kind of measure. This measure, called *degree of collective activity,* indicates the extent to which local residents have organized themselves to manage forest use. The degree of collective activity is derived from a set of questions that ask 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 is noted for cases in which 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. For this study, I classify low collective activity along with no collective activity. A moderate level of collective activity is noted when a group has harvesting and entry rules, planned minimal forest-related group activities, but little or no monitoring of rule breakers. A high level of collective activity is noted when a group 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 in table 8.4 are arrayed according to the trend in forest condition observed, from improving to worsening.

In table 8.4, 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. Of these seven forests, one had above-average forest stock, three had average forest stocks, and three had below-average forest stocks.

A strong degree of association is evidenced by the tau measure of association for table 8.5. Where a high level of collective activity related to forest management was seen, all forests (100 percent) were improving in condition. There was little or no collective activity being undertaken by the local community in locations where more forests (75 percent) were found to be deteriorating. In the majority of locations where the users were engaged in at least moderate collective action, the forest resource

Table 8.5
Association of level of collective activity with forest condition

	Collective Activity			
Forest Condition	High	Moderate	Low or None	Total
Improving	5 (100%)	1 (20%)	0	6
Stable	0	3 (60%)	2 (25%)	5
Worsening	0	1 (20%)	6 (75%)	7
Total	5 (100%)	5 (100%)	8 (100%)	18

tau (τ) = 0.80

was seen to be neither deteriorating nor improving—that is, forest conditions were stable.

Discussion of Selected Cases

For almost all of the locations in this study, the level of collective activity undertaken by users is found to be positively associated with forest condition. To understand the mechanisms that lie behind these positive associations, this section examines in greater depth two cases for each type of forest trend observed (table 8.6). These cases are selected because they are representative of the larger set in terms of the variance of the factors to be examined and because their case histories provide the most salient detail for the purposes of this study (IFRI, 1995, 1996, 1997a, 1997b).

Improving Forest Conditions

Raniswara This location is marked by large size, a high level of population growth, and fluctuating migratory patterns. It is also very close to the bustling Gorkha bazaar, the major commercial center in the area. The residents of this VDC have one of the most successful, nationally recognized, active, and well-endowed community forest associations. There are 11 settlements around a large forest (300 ha), with all but two divided along caste lines. There has been no external intervention to speak of in this area; villagers regard the government as a source of neither support nor hindrance.

Table 8.6
Cases selected for discussion

Site Location	Population Growth (percent)	Households per Hectare	Forest Stock	Forest Condition	Collective Activity
Raniswara (Gorkha)	4.71	1.35	Average	Improving	High
Churiyamai (Makawanpur)	5.42	8.82	Average	Improving	High
Riyale (Kavre Palanchowk)	3.00	3.17	Below Average	Stable	Moderate
Barbote (Ilam)	3.64	1.80	Average	Stable	Moderate
Agra (Makawanpur)	0.29	0.37	Average	Worsening	Low
Chunmang (Dhankuta)	4.13	0.68	Average	Worsening	Low

The forest association for this group of users was formed informally seven years ago (with no prior history of organizing in this manner) and legally registered two years later, making it the oldest registered group in the district and one of the oldest in the country. The primary reason for forming the association was to initiate an organized way of protecting a completely denuded hillside—the result of prolonged government neglect^ overuse by locals, and land grabbers. In time, the protected area increased, and the association has now petitioned the forest office to add an additional 125 degraded ha to the forest area. In anticipation of a positive response it has initiated planting and protection of seedlings. Forest products are plentiful, but consumption is strictly regulated by the association. Although timber trees are abundant, the annual consumption of timber is being reduced and closely monitored. Very minor infractions take place. Most of the users have switched to using privately grown fodder trees and agricultural residue for their stall-fed cattle, although grass may be cut from the forest floor at all times. Less and less agricultural land is being used for staples because most of the youth labor force is in school. Many farmers are experimenting with fruit trees and vegetables.

This forest association has fashioned several innovative solutions to day-to-day forest-related problems. To deal with political partisanship (which is wrecking many user groups in Nepal), it has banned political discussions in any forum related to this association. To deal with its large numbers (over *2,600* individuals), it has created smaller subcommittees specifically oriented to reducing the load on the executive committee and enhancing the association's ability to cope with large, complex tasks. Users' households are divided along ward lines into subgroups for weeding and protecting the forest area closest to their settlements. To use their time most efficiently in forest-related work, users synchronize weeding, pruning, and coppicing activities with forest-product allocation and distribution activities.

To monitor the use of valuable products such as timber, this association has an investigative subcommittee that monitors the amount requested for a particular use by a user, the amount granted by the association harvest subcommittee, and the ultimate use of the harvested timber by that user. During periods of high usage the association increases

the number of forest guards and patrols. To reduce the use of fuelwood, it gives small grants to those who want biogas plants—enough to cover expenses incurred in addition to the available government subsidy.

The association has a regular outreach effort that encourages settlements near the forest borders to join the association or to form their own association. The rationale is that if currently unauthorized users were to become part of the association, costs related to monitoring and sanctioning would decrease, and the pool of labor available for protection and maintenance activities would increase. If unauthorized users form their own association for forest land in their own areas, heretofore unprotected forest lands get protected, and there are fewer occasions of unrestrained harvesting in surrounding forested areas. The Raniswara forest association also regularly sends two trainers to participate in government-sponsored training programs that are held for fledgling forest associations in the region.

Churiyamai This site is located about 8 km northeast of Hetauda municipality, the center of Makawanpur district, and is accessible by an all-weather road. The three settlements in this site comprise an informal forest association with a total of 750 households and 4,500 individuals. This association has a 19-member executive committee to manage its community forest of about 85 ha. While agricultural production is comparatively low, most residents here have supplementary cash income from selling milk and some poultry. The milk-producing buffalo is stall-fed in all homes. Most of the other livestock is grazed in fields, bunds, and risers. Almost every household has someone working on an off-farm job in neighboring Hetauda or in Kathmandu. Twenty-five percent of the households also have a member working as seasonal labor.

The community forest has two distinct blocks—one of which is a 27-year-old former government research tract and the other a tract initially developed by the Terai Community Forestry Development Program seven or eight years ago. In 1990, 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 boundaries.

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 among the three settlements. Resolution to the problem was reached by merging the two groups into one forest association and allowing all three settlements to avail of the entire forest area.

This larger group of users from the three settlements operates on an informal level and is yet to be registered as a forest association under community forestry law. However, they function as a well-organized association, with rules specifying entry, harvest of particular products, and times of harvest. Grazing and felling of live trees is prohibited. Collection of fallen leaves and grass is permitted on payment of a fee. These fees and proceeds from 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 forest. The association members also feel that once their application for formal recognition is accepted by the forest office, they will be able to further this improvement by implementing some forest-management, plantation, and erosion control activities that they have planned.

The strict conservation practices have resulted in people planting fodder trees on private land and using a government forest that is almost two hours distant by foot. Residents have also increased their use of agricultural residue and grass from fields and roadsides to supplement animal feed requirements. Like Raniswara, this group has a large repertoire of enforced rules on entry and harvest, and users have high levels of rule awareness and compliance. There are no plans to ease restrictions on cutting of tree fodder or felling of trees.

Stable Forest Conditions

Riyale Three settlements with a total of 92 households constitute the users of a forest area of 29 ha in this location in Riyale VDC. The forest is within a 20-minute walk of the settlements. There is a market 10 km distant and accessible by a fair-weather road. This VDC is geographically close to Kathmandu valley, but residents have not taken advantage of

their location to obtain agricultural inputs or exploit markets for their produce. There is a dairy cooperative nearby that obtains some of its milk supply from the residents of this group.

The forests in this area did not have an organized form of forest protection or management in the past. There was an increasing trend toward degradation until the late 1980s, when mature trees of several valuable timber species were removed. As the forest area deteriorated, villagers started restricting their own harvest of timber as well as any use of their forest by outsiders. The local forest office underwrote a major plantation effort in 1992 and deputed a forest watcher for a period of five years to help monitor the plantation.

This forest association has been able to close the forest to grazing and harvesting of tree products but allows collection of grass and deadwood. There have not been any efforts to raise funds for the association, and besides the initial plantation of saplings, members have not participated in maintenance and protection activities. This is the extent to which they have implemented their management plan. Activities like weeding, thinning, and pruning are planned but yet to be carried out. The presence of a government-paid monitor has reduced illegal activities but not stopped them. There are some violations of the timber harvesting, grazing, and tree fodder rules. However, no fines are levied, and no records are kept of violations.

The forest has not deteriorated since the association was organized in 1991. The general restriction on tree harvest and grazing, and the presence of the forest watcher, has resulted in some regrowth of natural vegetation.

Barbote Barbote VDC of Ham district is about a two-hour walk by all-weather road (40 minutes by bus) from Ham Bazaar. This VDC contains a large forested area (120 ha) that has been looked after by a formally registered forest association for the last six years. There are nine settlements in the immediate surroundings with several others nearby. While the forest in this area did not undergo the rapid deforestation that occurred in central and west Nepal in the 1970s, there was a distinct period of time about eight to 10 years ago when the forest had degraded. The forest improved after villagers started protecting the area. However, in the last three years or so, the forest has begun to show signs of degradation again, and villagers have begun to worry about the future availability of supplies of timber, fuelwood, and fodder.

The community forest boundaries have not been demarcated at any time; a rough estimate was made at the time of the formation of this association. Many members of this association dispute the existing boundaries of the community forest. These members have maintained agricultural plots within, or encroaching on, existing forest land. They hope to claim ownership over these plots if and when the community forest gets demarcated properly.

Population growth is stable with very little fluctuation. Most of the villagers have been here for five or six generations. The executive committee of this association has undergone some upheavals in the past two or three years owing to the resignation—on corruption charges—of the secretary and chair. The users in the immediate vicinity are not very active but do participate in a bare minimum fashion that allows them to remain members.

There are more registered users than actual users: merchants in the nearby market are registered as members but in reality do not use the forest and do not help with any maintenance activities. Villagers point to this membership problem as the reason for the breakdown in cooperation. Falsely registered members outnumber actual members in the register and are able to affect quorum requirements for any change in rules, especially those related to membership. Thus, by their absence they guarantee their membership. When approached by executive committee members to help in the matter, the district forest office has stated that the forest is now a community forest, and, therefore, unless the majority of users complains about a problem, the government can do nothing.

One member acts as the organizer, facilitator, and adviser-at-large for this association. He mobilizes users from time to time for certain activities but now says that it has been getting harder and harder to get the association enthused about the community forest, especially because of the membership and politics problems. As in Riyale, the users in Barbote also have rules constraining entry and harvest, but there is no arrangement for regular monitoring, and there are infractions that are not punished. Because of an ugly history of abuse of authority by office bearers of this

association and, now, politics, there is always suspicion among the general body of users about the motives of any activity proposed by an office bearer. There is limited interaction between users, and they rarely assemble in full strength. Decisions requiring general body agreement are not made and, in the case of Barbote, are almost impossible to make because of the difficulty in reaching the quorum requirement.

Worsening Forest Conditions

Agra This site is within a half-hour walk from a national highway and market. The forest used is about 190 ha and is within a 15-minute walk of the two settlements in the site. Residents of both settlements belong to the same ethnic group and religion and are the traditional users of the forest, although residents of neighboring villages are not barred from harvesting forest products in this forest. For a period of 18 years up to 1989, there was some system of forest protection by the villagers of the locale. In fact, from 1987 to 1989, the users had formed an executive committee to oversee forest-management activities in a formalized manner for the users of the two settlements. In 1990, following political upheaval in the country, this system broke down, and there was no organized form of forest protection or use. Users divided along party lines, and few were willing to reconcile in the matter of resource protection and management. In 1993, villagers from the two settlements again defined a group of users for this forest and elected an executive committee with the objective of preventing tree felling by anyone and of stopping neighboring villages from using the forest. This lasted until 1995 and then again dissolved because there was no agreement over the fines to be levied on rule breakers.

Although there is no organized activity at present, the users of these two settlements have once again defined a user group for this forest, formed an executive committee, and drafted an article of association in preparation for being recognized by the district forest office. The neighboring villagers, however, are opposed to this limited user group and want to be part of it. The main reason these neighbors want to be members appears to be the presence of a slate quarry of 10 to 12 ha that lies within the forest boundary closest to their villages. Several members of those villages have profited from the slate quarry until now, and this important source of income would become off limits once the proposed user group is recognized by the forest office. The application for the forest association is stalled at the forest office because of this opposition, partly because the license for quarrying slate was issued by the district development committee office, a higher-level authority.

Villagers of the two proximate settlements have appealed to the district soil conservation office to stop the slate mining because large-scale erosion is taking place at the site. The erosion gullies and runoff are destroying vegetation in the immediate forest area. In the meantime, valuable herbs are being harvested indiscriminately and sold to outside contractors, and unrestrained grazing and cutting of fodder takes place.

Chunmang The site in this VDC is not very accessible: a steep downhill walk of three hours from the road head, Hile (at 2,300 m), gets one to the site (between 600 and 900 m). The nine settlements in this location are scattered on the west-facing slope of a mountain, six settlements are closer to the area's forest, and three settlements are farther away. All the settlements are situated higher than the forest area, which ends at the streambeds along the base of the mountain. The residents of this site live in settlements differentiated mainly along caste lines; all castes are present. One particular caste is dominant, politically and socioeconomically, by virtue of their numbers. The local representative to the political party in power is from this caste. They also have a loyal following of some members of lower caste, who depend on them for employment and land.

There has been discord over organizing these settlements to manage the nearby forest in the past several years, owing mostly to the various hindrances put up by the dominant caste. Of the nine settlements using this forested area over the last several decades, there is divided opinion over the options for managing the forest area. The users have been discussing variations of two options: (1) to combine all nine settlements and form one association and one large forest area with different management units or (2) to form two associations and split up the forest area according to relative distance to forest from settlements. Of the six settlements that are closer to the forest, two (led by the dominant caste) are unwilling to form a large association that combines both far and near settlements and

utilizes the entire forest area. Their first proposal is to have one portion (the larger, more valuable forest) allocated to the six settlements and another portion (the smaller, more degraded) allocated to the three distant settlements, thus forming two associations with two separate areas. Their second proposal is simply to exclude the three distant settlements and form one association for the entire forest area. Neither option is acceptable to the three settlements because they see the allocation of forest area as unfair in the first case and their complete exclusion from forest use as an insult to their traditional rights in the second case.

The opposition put up by the dominant caste members in one of the six proximate settlements has been frustrating to the more cooperative villagers who belong to other castes in these six settlements, especially because the forest is currently open to anyone for use. As a result, many areas in the forest are getting degraded, with other areas soon to follow. Most of these villagers are willing to form a single association with the three distant settlements or even participate in an equitable apportioning of the forest land to two associations. Without some form of collective action, all agree, there will be problems in the near future with regard to forest products.

This situation has also been frustrating for the staff of the district forest office, who tried about four years ago to establish an association but were rebuffed in their efforts by the dominant caste. Since then, however, there has been no attempt by anyone outside these communities to try again. There are several individuals in and around the area who would like to assist in forming an association for this forest, but these individuals say that they would like a third party to act as an intermediary to mediate and give advice on other options for all these forest users. In the meantime, the forest is a source of timber, fodder, and fuel for all these settlements and even for some outsiders.

As in Agra (and Barbote), district officials have failed to act on petitions in Chunmang. This lack of action has created uncertainty for the users and has helped opportunistic individuals take advantage of the lack or any organized form of forest protection by harvesting timber and encroaching on forest land. In both Agra and Chunmang, villagers are aware of the deteriorating condition of their forest resources, but no group activity is evident, partly because of factionalization of the community owing to politics and economic ties. However, there was a time in both locations when some form of organized activity had started and subsequently failed; both locations have had group-building efforts by outside agencies four or five years in the past, but none are going on at present.

Conclusion

This study examined the relationship between population, institutions, and forest conditions in the Middle Hills of Nepal. The study indicated that the variation in population growth rates across the locations studied had almost no discernible correlation with the variation of forest condition in those locations. The study did, however, show a strong association between local collective action and variation in forest conditions across the 18 cases.

By identifying some of the characteristics of institutional arrangements used by villagers, this study sought to appraise an undervalued facet of the complex presentation of the population-environment dynamic. That local forest users can cope with perceived changes in resource condition and in user population is evident from the cases studied in this chapter. In the more successful cases, arrangements for identifying genuine users, determining harvest amounts and timing, and active monitoring by users themselves emerge as important factors in managing forest resources (table 8.7).

Table 8.7
Some institutional characteristics of select cases

		Institutional Characteristics		
Site Location	Forest Condition	Entry and Harvest Restrictions	Monitoring Arrangements	Adaptive or Innovative Mechanisms
Raniswara (Gorkha)	Improving	Yes	Yes	Yes
Churiyamai (Makawanpur)	Improving	Yes	Yes	Yes
Riyale (Kavre Palanchowk)	Stable	Yes	Yes	No
Barbote (Ilam)	Stable	Yes	No	No
Agra (Makawanpur)	Worsening	No	No	No
Chunmang (Dhankuta)	Worsening	No	No	No

Where users were unable to define the extent of forest boundaries or the number of users in a group clearly, the ambiguity allowed opportunistic individuals to encroach on forested land. Investments in monitoring, in particular, significantly determine the difference between a flourishing resource and one just able to meet the needs of users. In the locations with higher populations but improving resources, Raniswara and Churiyamai, user groups invested in monitoring, even to the point that extra guards were assigned during seasons of greater need. This finding follows a study by Agrawal and Yadama (1997), who, in their sample of 279 communities, found that the most important form of user participation was the level of investment by the user group in monitoring and protecting activities.

Much of the literature on collective action has discussed the negative association between group size and collective action. Yet in groups such as in Raniswara, users had ways to deal with large numbers. The adaptation of user-group structure by creating levels of subgroup activity was one way to deal with the increased complexity of tasks and the difficulty of coordination that is brought on by large memberships. This sort of innovation was facilitated at times by the village administration and forestry officials who participated in the meetings that assign duties and responsibilities to various subgroups.

The group in Raniswara has also actively pursued the objective of increasing the area of forest it uses by soliciting the membership of neighboring villages, which then attach their adjacent forest lands to that of the group. Arranging for regular interactions between users, other villagers, and external parties in positions of authority and influence had the effect of reducing suspicion, facilitating information diffusion, raising awareness throughout the area, and garnering public support for management and conservation ideas. A breakdown in community relations and an undermining of collective organization and action was seen in Barbote, Agra, and Chunmang, where the public was divided in its opinion (due to kinship, economic ties, allegations of corruption, and politics) and no third party was available (or interested) to mediate the conflict.

The World Bank has stated that "because the people who cut or plant trees typically *have no incentive* [emphasis added] for considering th

environmental and social consequences of their actions, externalities inexorably lead to excessive deforestation and insufficient planting of new trees" (World Bank, 1991, 9). Such statements have been acted on in the past with the result that disproportionately large funds have been allocated to reforestation and strengthening the administrative functioning of government forest offices. However, the findings of this study suggest a different direction and point of emphasis in policy research and application. The recognition of the mediating effects of local institutional arrangements in the population-environment dynamic has important ramifications for those who seek to support community forestry and, more generally, participatory approaches to governing natural resources. This study suggests that development policy aimed at preserving the environment must recognize the significance of institutional arrangements at the local level to resource conditions at that level. Ultimately, the benefits and costs associated with resource conditions at the local level have considerable bearing on larger environmental issues. Furthermore, the study suggests that government policy on participatory resource management will be more successful if it is facilitative of institutional innovation and adaptation at the village level.

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Note

1. Varughese (1999) sampled six of the 18 cases to examine the change in forest condition after a period of four years. Tree, sapling, and shrub species were counted using stratified random sampling during revisits to the sites. Five of the six sites returned stem counts, girth, and species richness that validate the perceptions of the residents and foresters. The sixth case differed only on the density for shrub species.

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