PROPERTY RIGHTS AND RESOURCE CONDITION:
A STUDY FROM THE WESTERN HIMALAYA

By

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This proposal seeks to 1) compare the impact of institutional arrangements vs. broad socio-economic and demographic factors on resource conditions, and 2) examine whether different types of institutional regimes lead systematically to different resource-related outcomes. Property rights are the form of institutional arrangements that will be the focus of the research.[1] Forests constitute the resource type to be studied. The research will be carried out in the Kumaon region of the Indian Middle Himalaya where nearly 5000 village-level community forests exist side by side with privately held forests and other forests managed by the Revenue and the Forest Departments of the Indian government.[2] I aim to select 100 cases where four different forms of tenure over forests exist in each case. The existence of four different tenurial forms in the same region provides an ideal setting in which to examine 1) the effect of property rights in comparison to other factors that are often asserted to influence the condition of resources (the research will pay specific attention to population, migration, market, and cultural perceptions of resources), and 2), the differential impact of variations in property regimes on forest condition, and 3) the role of different monitoring and enforcement mechanisms in the effectiveness of property rights regimes.[3] The data set constructed and analyzed through the proposed research will complement an earlier data set I have already constructed through research in the Kumaon region to study intensively forest management institutions in 24 villages. The existing data was collected using a set of ten questionnaires that allow one to relate resource conditions to biological, climatic and edaphic, socio-economic, demographic, and institutional variables. I was an active participant in their development at Indiana University under the leadership of Elinor Ostrom.

The proposed research draws its significance from a number of factors. Although property rights are often asserted to exert significant influence on how resources are managed by influencing individual incentives, few studies have undertaken a comparative examination of the

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[1]See Riker and Sened (1996: 283-86) for an institutional interpretation of property rights. There are, of course, many other authors who hold a similar perspective, among them Bates (1989), Ostrom (1990), and North (1990).

[2]Forests in Kumaon have been managed under their particular institutional regimes for long periods, often for more than sixty years (Agrawal and Yadama, 1997)

[3]Drawing on Lichbach (1997) and Little (1993), I view the cases selected for the proposed research, where each contains four different forms of tenure over forests located in or around a particular village, examples of "social kinds." They resemble each other sufficiently closely that their similarities warrant a comparative study.

influence of different property regimes. Where comparative studies exist, they are usually based on a small number of cases to produce their generalizations rather than on a systematic statistical analysis. The proposed research, instead, seeks to collect data on approximately 100 cases, and analyze it using structural equation modeling. The study differs as well from existing statistical work on the subject. The few statistical studies of the relationship between property rights and resource conservation have usually been at country level, preventing a real understanding of institutional mechanisms that promote resource conservation by hiding immense in-country, and within category variations in institutional design and enforcement. In consequence, it has been difficult to understand the specific effects institutional incentives have on the actions of those subject to institutional incentives. In contrast, the proposed research will pay close attention to variations in institutional arrangements regarding rule formation, monitoring mechanisms, enforcement, and adjudication to understand the effects of these variations on the condition of resources, especially focusing on community forests. Kumaon may be one of the few regions in the world where village-level institutional data are available to provide historical information on different tenurial arrangements and on socio-economic and demographic indicators.

WIDER CONTEXT AND THEORETICAL FRAMEWORK

The proposal focuses on forest resources because quite apart from the fact that there is a significant body of research on forest use and its relationship to institutional arrangements, investigation of forest management processes is also important for more practical reasons. Deforestation occurs worldwide at a rapid pace. In South Asia, average annual rates of deforestation may be close to 1% of the total forest cover.[4] Loss of forests is a serious threat the lives and livelihoods of millions of poor families. Studies have argued that additional consequences of deforestation include soil and slope erosion, desertification, global climate change, flooding, water pollution, biodiversity loss, rural outmigration, and destitution of indigenous and tribal peoples. Some of these adverse processes may be irreversible in human time frames.

There is a wide range of processes and social forces that affect forest cover and changes in cover. Faulty government policies, increasing population pressures, and increasing market have been seen as three of the most significant possible culprits. Local populations and their subsistence needs are often posed as an additional factor that adversely affect forest condition. Analysts draw upon different theoretical frameworks to emphasize which factor will have the greatest impact on resource condition.

Indeed, there is strong support for each of these factors as being primarily responsible for deforestation. Concern with overpopulation is ubiquitously present in writings on deforestation, soil degradation, and loss of biodiversity. An immense and impressive scholarship explains, thus, how higher population pressures have contributed to forest decline, and environmental degradation in general (Abernathy 1993; Ehrlich and Ehrlich 1991; Meadows et al. 1992; Meffe

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[4]Data on forest loss are often unreliable, The figure of 1% shgould be considered in light of the fact that for most South Asian countries, forests cover only a small proportion of their land. See FAO 1993; Goodland 1991; Lynch and Talbott 1995; and WRI, UNEP, and UNDP 1994 for some relevant statistics.

et al. 1993; Myers 1991; Wilson 1992). By focusing on changes in human fertility, mortality, migration and numbers; examining alternative scenarios of regional and global population change; the relationship of population, inequalities, and poverty to environmental degradation; and issues related to the carrying capacity of the planet, demographers have successfully underlined the dangers stemming from continuing population growth and its momentum.[5] But writings on demographic change suffer from a tendency to link environmental degradation in a relatively straightforward fashion with population growth (Abernathy 1991; Avise 1994; Demeny 1986; Durning 1989; Fischer 1993; Hardin 1993; Holdren 1992; Low and Heinen 1993; Ness et al. 1993; and Pimental et.al. 1994).

If thoughtful research on the relationship between population and environment has made one fact evident, however, it is that the relationship is highly complex.[6] Conceptualizations of the links between population and environment, as described above, pose a stark choice--one between people's needs and conservation of the environment (Arizpe et al. 1994: 1). Scholars who blame rising population for environmental degradation (Li 1991; Raven 1991; Wilson 1988; 1992: 328), therefore, appear hasty, even naive. Population growth is an important variable in influencing resource use but its specific impact depends on a multitude of other factors and their interactions.

Assessments of the relationship between increasing marketization and environmental degradation are similarly, and usually, negative. A powerful intellectual tradition, from Adam Smith and Karl Marx to present-day environmentalists, emphasizes the role of markets in transforming economic relations of production and resource use patterns. Both Smith and Marx were confident that capitalist economic expansion, through markets and trade, will inevitably transform pre-capitalist productive relations (Brenner 1977: 26-7). By implication, as market forces expand, local resource systems, these analysts would argue, develop closer connections with external market systems and find a greater exposure to demands from a larger system. Greater harvesting and degradative pressures, thus, would come to impinge on finite local resources. The role of roads and better transportation links is viewed as critical in this regard (Chomitz 1995; Verma and Partap 1992; Young 1994).

These theorists ignore the fact that the impact of markets is always mediated by institutions of use that are not the direct or linear result of particular levels of demand or the balance between demand and supply. Under the influence of norms and institutions of use, rural users may forego cash incomes from sale of forest products.

In response to the writings from many demographers and resource economist who suggest that overpopulation and market pressures lead to overharvesting, a vehement group of scholars protests the efficacy of local resource managers (Acheson 1989; Chhetri and Pandey 1992; Feeny et. al. 1990; McCay 1992; McKean 1992a; Ostrom 1990). According to these theorists, local communities can create and sustain local institutions to manage their collectively owned resources quite successfully, often in the face of adverse pressures from the state, demographic

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[5]See essays in Arizpe et al. 1994.

[6]See Bilsborrow and DeLargy 1991: 125; Blaikie and Brookfield 1987; Caldwell 1984; Jolly and Torrey 1993: 11; Netting 1993: 320; and Whitmore et al. 1990.

changes, and market forces (Acheson 1987; McKean 1992b; Peters 1994; Wade [1987] 1994). As O'Connor (1989), Merchant (1989), and Gadgil and Guha (1992) have argued, scarcities are a consequence of the inability to reproduce a given set of productive relationships. They do not represent a situation where 'society runs headlong into "nature" or natural constraints' (Collins 1992: 181).

Theorists who focus on the successful and sustainable use of renewable resources by small communities have produced a much needed corrective to numerical views of environmental degradation. Their emphasis on institutions as humanly devised rules (Bates 1989; North 1990) that soften, attenuate, structure, mould, accentuate, and create human actions has helped show that institutions usually mediate the relationship between human behavior and resources. But this work, in turn, suffers from several deficiencies. Theorists of community management tend often to reconstruct 'traditional' social organizations, viewing them as relatively harmonious ideals, and as closed system uninfluenced by external factors (Dyson-Hudson and Dyson-Hudson 1980: 16). Few of these studies examine the impact of changing demographic variables. In highlighting community, they often ignore politics and how it structures interactions among local populations, both within, and between communities. Much of this writing also tends to valorize local participation, without adequately focusing on the specific types of participation that may be critical to the success of resource management. These lacunae, and the focus on single cases, threaten to hobble the persuasive power of the writings on community management of resources.

Thus, although there is a vast literature that examines the role of different types of factors in influencing deforestation (and resource degradation more generally), there is little work that examines these different factors comparatively by paying attention to the micro-level processes that prompt users of forests to use them.[7] Nor does most of the current research examine the relative impact of multiple variables simultaneously. One of the major bottlenecks in carrying out such analysis is the lack of reliable data at local, or intra-national levels. Much of the existing literature that uses statistical analysis focuses primarily at the macro-structural level. In looking at aggregate national or provincial figures on forest area, population, and economic growth, and neglects 'the findings and perspectives of micro level research on specific communities and regions' (Arizpe et. al. 1994: 1). By incorporating insights from detailed studies of forest use and management, and by focusing on relationships that affect forest use at the more micro-level, it is possible to gain a more processual understanding of how broad structural variables work themselves out as they affect people's behavior regarding forests. Such an understanding is significant not only theoretically since it would permit a more precise appreciation of how larger social forces influence the actions of users within a community, it is also indispensable if one is to begin the move towards institutional solutions to problems of resource degradation and depletion.

To understand the impact of different independent variables on forest condition and use, institutions can be seen as mediating variables influencing the impact of other socio-economic, demographic, and cultural forces. Thus, population change or migration might affect resource

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[7]Billsborrow (1994), in a review of causes of deforestation, could not find a single comparative study at the community level that used statistical methods.

condition, but only through the mediating presence of institutional rules that provide incentives to facilitate, constrain, or prevent certain actions from being undertaken. This view of the relationship between institutions and other social forces allows a bringing together of much research on resource use and management and permits a simultaneous examination of different variables affecting resource condition.

If existing work has not pursued the varying impacts of different factors on deforestation by examining micro-level processes, it has been even more deficient in empirically testing the impact of different regimes of property on forest use and management. Although the belief is widespread that privatized access, use, management, and control over resources leads to efficient use, this belief has seldom been tested systematically or empirically. Two issues are at stake: the significance of efficiency in the context of resource use and the role of monitoring and enforcement.

It is not clear whether efficiency in terms of maximizing the net present value of benefits from a given plot of land is the best criterion to evaluate the effectiveness of a given property regime where renewable resources are at stake. Often these resources, especially those such as forests, fisheries, and grasslands, play a role in a livelihood system that cannot be substituted by a simple monetary compensation. It is necessary, therefore, to investigate the impact of different types of property institutions on more than one outcome related to resource use. In the proposed research data will be collected on three separate outcome indicators: biomass density, number of species, and subsistence benefits derived from forests in terms of fodder and fuelwood. The effect of socio-economic, demographic, institutional and other variables will be assessed on various outcome indicators.

Monitoring and enforcement concerns are another reasons not to jump to conclusions about which property regime may be the best in managing resources. The issue raises questions that need more careful attention than they usually receive in writings on resource management. All forms of ownership and management require monitoring and enforcement mechanisms to be in place if resources are not to be (illegally) harvested by those without ownership rights. Although it is fair to conclude that effective excludible ownership is more likely to lead owners to use their resources to produce the best returns on investment (McKean 1998), the effectiveness of property rights depends to a great extent on means of monitoring and enforcement. The costs of such enforcement may well be higher for private property in some contexts than for community owned and managed property or other forms of organizing property rights (Agrawal, 1996). Further, different forms of monitoring and enforcement may come into being as a result of underlying factors that give rise both to the form of property regime as well as to the form of enforcement.

I propose to take an initial cut at this critical issue of enforcement by examining the relationship of group size with two different forms of monitoring and enforcement that are common in the context of community-managed resources: mutual monitoring, and third party monitoring (Ostrom 1992, Singleton and Taylor 1992). I will examine the hypothesis that as groups become larger, third party monitoring is likely to replace mutual monitoring methods.

SPECIFIC RESEARCH QUESTIONS AND HYPOTHESES

The above discussion leads to three important questions whose answers the proposed research

will seek.[8]

1. What role do property rights play in influencing resource condition and management in comparison to more diffuse socio-economic factors such as demography, market pressures, or cultural perceptions about resources?

Hypotheses:

1.1. Property rights exert a greater impact on the condition of forests than such factors as population density, levels of migration, market pressures, or cultural views regarding forests.

1.2. Further, the effects of demographic and market-related variables on forest condition are mediated by local-level property institutions. By property institutions, I refer not just to rules prescribing access and ownership, but also the mechanisms of enforcement for these rules.

To test the above, I will use data on forest conditions, institutional arrangements, social and demographic conditions, and cultural perceptions regarding forests in 100 villages in Kumaon, focusing mainly on community-level institutions and community-owned forests.

2. What is the relationship between different forms of property regimes and resource management outcomes?

Hypothesis: Different forms of property regimes over resources lead to systematically different outcomes in relation to the condition and use of resources. I will examine the following more specific hypotheses:

2.1. Forests owned and managed by the Forest Department will have the highest vegetation densities and levels of biodiversity, followed by community forests, private forests, and finally, Revenue Department forests.

2.2. Forests that are owned and managed by communities will provide their owners with the highest levels of subsistence benefits (fodder, and fuelwood), followed by privately owned forests, Revenue Department forests, and finally those owned by the Forest Department.

Data on forest condition under four different forms of property rights in each of the 100 cases will allow this proposition to be examined systematically.

3. How does group size relate to the selection of different forms of monitoring and enforcement? What accounts for the effectiveness of enforcement in determining resource condition?

Hypotheses:

3.1. With increasing group size, third-party monitoring mechanisms are more likely to be selected by a given group in preference to mutual monitoring.

3.2. The effectiveness of monitoring and enforcement depends on the resources devoted to the task.

This proposition will be examined mainly using the data on community forests and the different

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[8]The following hypotheses are statements to be examined empirically rather than declarations of belief.

mechanisms chosen by villagers to protect such forests.

THEORETICAL FRAMEWORK OF THE INVESTIGATION

According to the analytical framework I propose to use in this study, factors such as market pressures and population density, where the affect resource management practices do so only through the mediating influence of institutions. Institutions can be seen as sets of formal and informal humanly created rules that enhance stability of expectations in human interactions and guide human-nature interactions. They constrain some and facilitate other human activities; indeed, without them, social interactions are impossible.[9] The manner in which they mediate, soften, attenuate, structure, mould, accentuate or facilitate particular effects raises the costs of some actions in comparison to others. Rules, laws, norms, social conventions, networks, families, clans, organizations, and markets -- all of these entities can, thus, be viewed as social institutions and analyzed within an institutional framework.

In the context of forest management in Kumaon, institutions critically modulate the influence of larger socio-economic and physical variables on human actions. These variables include market pressures, demographic factors, and cultural beliefs. Through their influence on human actions, institutions influence the condition of resources such as forests. The condition of forests is also likely to be influenced by physical factors as soil conditions and climatic variations in rainfall and temperature. The model suggested by the proposed relationships is depicted in Figure 1 below.

The figure provides a simplified framework for understanding the complexity of resource-related outcomes, human actions, institutional arrangements in the shape of property

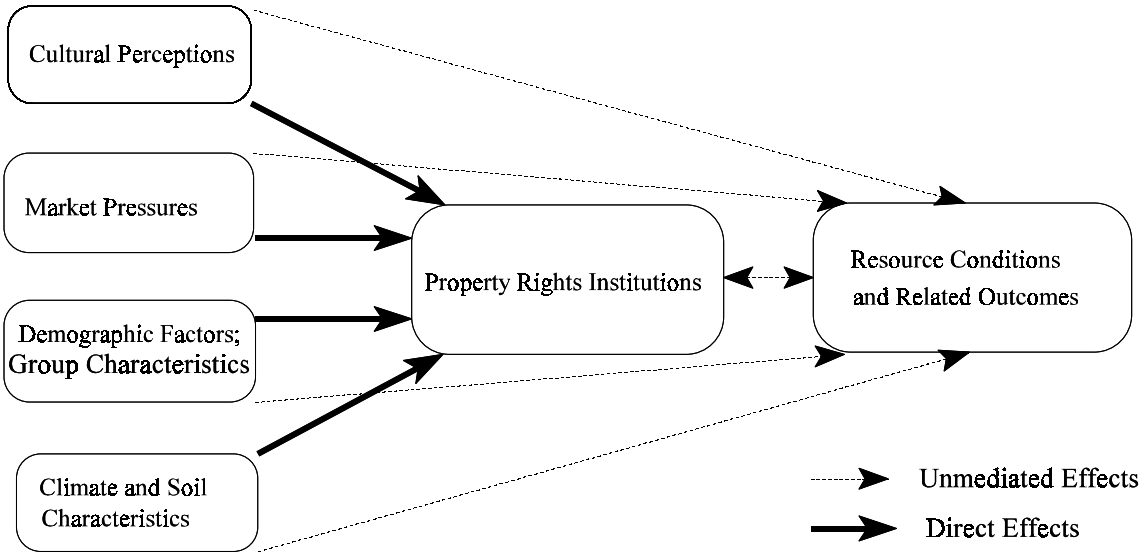

Figure 1

[9]See Bates (1989), Ensminger (1992), North (1990).

regimes over resources, socio-economic variables, and physical factors. This framework suggests that factors related to market, population, migration, cultural perceptions exert a direct (represented by broken lines) on resource conditions as well as a mediated effect through institutional arrangements (represented by solid arrows).[10] The dotted arrows in the figure, especially those running between resource related outcomes and culture, market, and demography related factors, stand for direct effects, which I hypothesize will be weaker than the mediated effects of these variables.

The factors listed in figure 1 should be viewed as convenient summary statements. In an empirical context such as Kumaon, they will be represented by sets of manifest indicators. Thus, for example, demographic variables can be assessed by manifest indicators such as human and animal population per unit of land, biomass availability per livestock unit, or forest area per household. Property rights institutions may be reflected, for instance, in the level of mutual monitoring or the number of months a guard is hired to protect the forest, the number of rules or constraints on harvesting forest products, the use of particular distributive mechanisms to allocate forest products (auction to the highest bidder *vs.* equal benefits to each member of the group). For each of the research questions, the manifest indicators on which data will be collected are listed in Appendix 1.

SIGNIFICANCE OF THE RESEARCH

Although the research propositions focus on a specific resource, in a distinct region, on seemingly particular issues, they resonate with themes that are far more general in the social sciences. The question of whether institutions and rules are more important in influencing collective outcomes in comparison to more diffuse social forces is one that occupies many scholars other than those who refer to themselves as new institutionalists. The issue finds resonance, to name just three examples: in Marxist writings when the question is one of forces *vs.* relations of production; in the literature on social movements when scholars debate the importance of political opportunity structures and market shifts in relative prices when discussing success of labor movements; and in debates over state and civil society. To list these examples is not to claim a line of causal reasoning that would connect these examples to the proposed research on resource management in Kumaon. Instead, the proposed research seeks to analyze systematically, and by extension provide an example of, how to explore the interconnections between institutions and social forces as they influence collective outcomes in relation to resource management.

Quite apart from the theoretical significance of the research, the proposed study is also important because of the emergence of communities in the past decade as the preferred option for resource use and management. The preference for community can be observed among policy

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[10]It is to be noted that the figure does not present a causal model of institution formation. The arrows leading to property rights institutions indicate that the shape of these institutions is indeed influenced by some of the general variables listed in the figure, but the precise institutional contours in any given case are better seen as the result of the actions of local populations who are as much agents in creating their institutions as objects of external, structural variables outside of their control.

makers, social activists, donor agencies, as well as many academics (Lynch and Talbott 1995, Poffenberger 1990, Western and Wright, 1994). The turn to community today occurs as a result of many different reasons, among them the perceived failure of privatization and government intervention to produce desired resource management outcomes (Agrawal 1998a, Agrawal 1998b). This shift in preferences potentially affects the lives of populations around the world as governments have now begun to adopt community-oriented resource management policies, but often without attention to existing experiences or sufficient analysis. In short, the move toward community has occurred without sufficient evidence about whether communities are indeed better managers of resources than other actors. This research proposal, by focusing directly on four different sets of actors associated with the four different property rights regimes under consideration will illuminate systematically the debate on the role of community in resource management.

KUMAON: THE REGION AND ACTORS

Three districts comprise Kumaon - Almora, Pithoragarh and Nainital. In these districts, forests are managed under four major institutional arrangements: Reserved Forests controlled by the Forest Department; Civil Forests managed by the Revenue Department; Community Forests managed by village forest councils, and private forests owned and managed by individuals (Agrawal and Yadama, 1997). The area under different forms of property regimes is provided in Table 1.

Table 1
Forests in Kumaon

	Name of District			
Property Regime	*Almora*		*Pithoragarh*	
	Area	Percent of Total Foresst	Area	Percent of Total Forest
Forest Department	550	13	1401	42
Revenue Department	423	10	534	16
Community	2959	70	1001	30
Private	296	7	400	12

Note: Figures for area are in sq. kms.
Source: District Collectorates in Almora and Pithoragarh.

To understand the distribution of forests under these different property regimes, it is useful to trace their history to the activities of the colonial British state in the late 19th century and the 1900s. With the creation of new Reserved Forests between 1910 and 1917 the British transferred more than 2,500 sq. kms. of prime forest land to the Imperial Forest Department (*Kumaon* Forest Grievances Committee (KFGC) 1921). Villagers could no longer use these forests for their everyday subsistence purposes. This incursion by the state into local use patterns and customary rights raised the special ire of the villagers and stirred them into widespread

protest. Whether rural residents never understood the new rules (as government officials often suggested) or refused to accept them, their incessant, often violent, protests forced the government to appoint the *Kumaon* Forest Grievances Committee to look into the local disaffection. The Committee made 30 recommendations of which the most significant suggestions were 1) dereserve the larger part of the newly created reserved forests, and 2) create community forests to be managed under a broad set of rules framed by the government, but for which villagers themselves would craft the specific rules for everyday use to fit the local environmental conditions.

At the recommendations of the committee the government first reclassified forests into Class I and Class II forests. Class I forests were of little commercial but significant subsistence value and contained mainly broad-leaved tree species. They were handed over to the Revenue Department. Class II forests were those stocked with Chir, Sal, Deodar, Spruce and Silver Fir and were to be retained under the control of the Forest Department. Almost simultaneously, the government also passed the Forest Council Rules of 1931 which empowered village communities to create forest councils and bring under their own control lands that was managed by the revenue department as Class I and Civil Forests, or other uncultivated land within the village boundaries. With time, villagers have slowly brought a significant proportion of forests under their control (Agrawal and Goyal 1998).

The Forest Department has owned the greater proportion of forests in Kumaon since the late 19th century. Today it owns and manages the largest continuous tracts of forest land in the region, and provides technical assistance to other government departments (such as the Revenue Department) and to the village forest councils in managing forests. The Revenue Department owns a significant proportion of forests as well. The forests under this category are scarcely managed, and are under the control of the office of the District Magistrate[11] in each district. Community forests have grown in area as villages have sought to transfer land into this category over the last sixty years. The smallest proportion of forests are under private property regimes. Individual private forest holdings are possibly the smallest in their average size.

Each of these different sets of owners uses different management options for managing their forests. The Forest Department creates Annual Action Plans for the forests under its control. These plans are implemented, and its forests managed and protected by a vast bureaucracy whose officials are selected in India-wide examinations. The Revenue Department uses the help of the Forest Department to manage its forests and the services of village-level departmental officials to protect them. Villagers themselves craft the specific rules that govern withdrawal of benefits from their community or private forests. They create monitoring, sanctioning and arbitration devices to resolve the vast majority of disputes within the local space, elect leaders from the community, select guards to enforce rules, fine rule breakers, manage finances, and often deploy surplus earnings for the public good within the community. The particular management regimes for private forests depend on individual owners.

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[11]The District Magistrate is the highest ranging Revenue Department official in each district in India. This officer is also in charge of civil cases.

RESEARCH DESIGN AND SAMPLING

The juxtaposition of different social forces and institutional regimes for managing forests provides an ideal context for examining the research questions with which this proposal is concerned. The districts in Kumaon are divided into administrative blocks, and each block is further subdivided into *patwari* circles. Each patwari circle contains between 10 and 25 villages of varying size. In or near a given village there can be forests that are owned and managed under each of the four different property regimes. The unit of analysis for the purposes of this proposal, therefore, are forests under different property regimes at the village level. To select the cases for investigating the research question regarding the impact of different property regimes, I propose to begin by identifying the appropriate villages. Data available at the district level offices of the Revenue Department and the Forest Department will be deployed to construct a sample. I will select cases only from Almora and Pithoragarh districts since they are both located in the Middle Himalayan ranges, and a significant proportion of Nainital district lies in the plains.[12] I propose to use the lists of villages with community forest to identify the relevant cases for the proposed research.

The office of the District Magistrate possesses lists of all villages with community forests, and basic data on these forests. The data includes information about the year of formation of the community forest, the size of the forest, the type of the forest (mixed broad-leaved species versus evergreen tree species). Using information available in District Census Handbooks, it will be possible to find out for each village its distance from a motor road, and the availability of other public infrastructure that might influence resource condition (such as availability of electricity, drinking water, and schools). The first step of the sampling plan will be to eliminate all villages where forests have been under community management for less than 25 years. We expect that 25 years is a sufficiently long period of time to reflect variance in management practices for forest lands.[13]

As the second step, I will use the Annual Action Plans from the Forest Department offices at Almora to locate those villages where forests under all four different tenurial regimes coexist for those villages where community forests are more the 25 years old. I anticipate finding around 500 such cases. Forests under private, and under Revenue and Forest Department ownership and management have existed in Kumaon for as long as the community forests (60 years or more), and are scattered all over Kumaon. Of the approximately 500 cases, 100 will be selected using random number tables for research data collection. The selected villages will be

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[12]Together the three districts have 30 development blocks that lie in the hills. Of these, five are in Nainital (Dhari, Betalghat, Ramgarh, Okhalkanda, and Nainital). The remaining 25 lie in Almora (Hawalbagh, Lamgarha, Bhaisiyacheena, Kapkot, Bageshwar, Garud, Takula, Dwarahat, Chaukhutiya, Tarikhet, Syaldevi, Salt, and Bhikiyasain) and Pithoragarh (Champawat, Lohaghat, Pati, Barakot, Kanalicheena, Bin, Monakot, Gangolihat, Berinag, Didihat, Munsyari, and Dharchula).

[13]Almora and Pithoragarh have approximately 3,000 villages with community forests, many of which came into being before India's independence in 1947 (Agrawal and Yadama 1997).

categorized by their administrative classification into development blocks and patwari circles since a large amount of the data to be collected, especially on human and animal population figures, land use classification, village history, and forest area is available at these administrative locations and gaining this data from the office of the development block or the *patawari* will reduce the time needed in specific village sites.

This sampling process will provide a set of villages that have forests under each of the four property regimes with which the research is concerned. The variations in other independent variables that are often seen to affect resource condition--population, climatic conditions, migration, market pressures, and cultural perceptions regarding forests--are likely to be small **within** each of the villages where the four types of forests are located. We expect that the main differences in the conditions of these forests will be a consequence of the difference in the property regime and the incentives and rules in such regimes for the use and management of forests.

The above sampling process will also provide a set of villages that have been randomly selected for variance in independent factors such as population, migration, market pressure, and institutional arrangements. Different villages in Kumaon are located at varying distances from roads and major markets, have differing levels of population density per unit of forest and total land, and exhibit differing levels of outmigration. Variance in these independent variables for the selected villages will provide us with the necessary data to investigate the relative impact of markets, population, migration, and institutional arrangements on resource condition. Finally, for each case there will be a community forest for which data can be collected on the form of enforcement used by the community.

DATA AND SOURCES OF DATA

The necessary data for the research will be collected through three sources: government documents in the Forestry and the Revenue Departments, questionnaires administered to village populations and semi-structured interviews with officials in the Forest and Revenue Departments, and finally, village level records available with the patwari and the community forest officials.

The Annual Action Plans at the district offices of the Forest Department, and documents available in the Revenue Department in Almora and Kumaon will yield information on each of the selected villages as regards the size of the forest, population and livestock figures over time (the two together yielding population density levels), distance from a motor road (proxy for market pressures),[14] and the availability of other public amenities. The annual plans contain information on the monitoring and enforcement of forest conservation for departmentally owned forests, and on improvement measures such as tree planting, thinning, or brush clearing undertaken by the forest department on specific plots of land. The District Census Handbooks in the Revenue Department provide detailed information on each village in the district regarding the geographical size of the village, use categories for the village land, and its population. In addition, the documentation on forest councils at the district level will reveal details about the

[14]For similar use of distance from motor roads in analysis of resource management, see Chomitz (1995), Fearnside (1986) and Young (1994).

size of the community forest, its species composition, and the funds available with the forest council.

To collect information on levels of migration, forest condition, tree species, and changes in forest condition we will use a questionnaire that will be administered by a team of two researchers in person in each village. Each team will comprise one individual who has had some training in forestry and forest mensuration, and another individual who is a social scientist. The team members will be selected from among university students in the districts, and will work under the supervision of the principal investigator. The semi-structured questionnaires used for interviews with the Forest and Revenue Department officials will contain questions to elicit information on the extent to which the plans for improving forests are actually implemented.

The questionnaire for the village level will be based in part on a subset of variables from a set of ten questionnaires developed at the Workshop in Political Theory and Policy Analysis at Indiana University, Bloomington. This questionnaire will gather data on numbers of households, distance of the village from the road, indicators of market pressure and migration levels, and finally, perceptual variables on the condition of forests under different regimes. To check the accuracy of people's perceptions about forest conditions, we will collect forest measurement data on a 20% randomly selected subset of the 100 cases. These data will be for slope, soil condition, tree cover, species lists, biomass density (tree count and diameter at basal height). The measurements on these will be correlated with the perceptual variables on which information will be collected from interviewed individuals in the village. To check the accuracy of village level data on population, market pressure, and migration, I will interview the *patwari* for those patwari circles in which selected villages lie.

The third source for the collected data will be the accounts and records of council meetings that are maintained by each village forest council, and village records that are available with the patwari, the village level revenue official. The accounts and council records will provide the necessary information about management of council forests at the village level. The village records available with the patwari contain information on changes in village population, its cattle population, caste composition of the village, land use figures, and spatial boundaries of different types of forests in relation to the village settlement. These data will be available for all villages that lie within a patwari circle. Some of the data may throw light on why it is that particular villages were able to form community forest management institutions and others could not do so.

DATA ANALYSIS: STRUCTURAL EQUATIONS MODELING

The collected data will be computerized in a database program such as Microsoft Excel, and will be used to test the three hypotheses listed earlier by examining the theoretical framework in Figure 1. The precise relationships among the manifest indicators on which data will be collected to test the hypothesized relationships among the conceptual variables will be based on in depth studies I have already carried out in Kumaon on 28 cases of community forest management institutions. I will use the software LISREL in which unlike traditional path analytic models where one obtains reduced form equations first and then solves for the structural parameters. In LISREL a path model is considered as a system of equations, all structural coefficients are estimated directly, and the reduced form is obtained as a by-product. Thus LISREL allows simultaneous estimation of direct, indirect, and total effects of a series of

variables or constructs, including the estimation of reciprocal causation and interdependence.[15] In testing a theoretical model of inter-related variables, this type of analysis allows the linking of the measurement model--how well have the constructs been measured, and the structural model--what are the direct, indirect, and the total effects of the constructs in the theoretical model. I hope to find a close fit between the way I propose that the different constructs will affect each other and the actual relations among the variables in the data.

TIMELINE AND SCHOLARLY OUTPUT

I propose to start the research in late summer, 1999. I will spend the month of August 1999 in Kumaon to complete the sampling plan and put together three research teams of two persons each to carry out the task of data collection in the coming year. I will select a research manager from Kumaon University's Pantnagar campus who will supervise the data collection effort. The village level data to be collected for each case will take approximately two days. Some additional time will be taken by each team for travel. To be conservative, I have estimated that in one month, the four research teams will collect data on approximately 20 cases. If the data collection starts in September 1999, it will be completed by February 2000. I do not have to teach any classes in Fall 1999, and will travel to India in November to assist in data collection and to solve any problems that might have arisen. The funding for the first of these trips to India has already been provided by the Yale Center for International and Area Studies. In January 2000, I propose to hire two full time research assistants at Yale University to begin computerizing the collected data. I expect the computerization of the data to be completed by May 2000. I will continue with one research assistant over summer and Fall 2000 to assist in the analysis of the computerized data. In the summer and Fall of 2000, I will complete three papers, one each on the three research propositions listed earlier. One or two of these will be published independently. All three will form part of the book manuscript I am completing on *Property Rights and Forest Management in Kumaon*. Three chapters of the book are already complete: one on the history of resource management in Kumaon, the second on the emergence of community in writings on resource management (Agrawal 1998b), and the third on the relationship between group size and resource management in Kumaon (Agrawal and Goyal, 1998). I propose to refine the arguments of the book in Spring 2001, and submit the book to press for review by the end of Spring 2001.

B. NO PREVIOUS SUPPORT FROM NSF.

[15] Joreskog and Sorbom 1993.

Appendix 1: **Research Hypotheses, Research Design, Variables, Data Sources**

Research Hypotheses	Research Design	Main Variables	Data Sources
1. Property rights institutions influence resource condition more than do general socio-economic variables such as population density, market pressures, migration levels, or cultural views of forests (Focus on community institutions)	Selection of 200 comparable cases of village-level forest management that vary on important independent variables such as institutional arrangements, population and market pressure, and cultural perceptions about forests.	*Independent*: human and animal population, village and forest size, land use categories, distance from road, in-and out-migration figures, villager perception about forests, soil quality, slope. *Institutional*: rules for guiding access, use, management, income and expenses, enforcement mechanisms *Dependent*: villager perception and records of forest condition, species diversity, subsistence benefits	1. Village level records available with the *patwari*. 2. Records of meetings and accounts at the village level. 3. Structured questionnaires with villagers. 4. District Census Handbooks. 5. Annual Action Plans available with the Forest Department. 6. Semi-structured interviews with forest department officials
2. Specific property regimes over resources lead to systematically different outcomes in relation to resource use.	Selection of 200 cases in each of which four broadly different property regimes exist for managing forests: communal, open access, government owned, and privately owned.	*Independent*: Same as above *Institutions*: Same as above, but for all four property regimes in each site, instead of just for community forests *Dependent*: Same as above, for all types of forests	Same as above.
3. As group size increases, third party monitoring becomes more likely to be adopted by group members rather than mutual monitoring	Selection of 200 different sized villages in which different types of monitoring and enforcement mechanisms exist.	*Independent*: number of village households *Dependent*: Type of monitoring and enforcement mechanisms (mutual vs. third party monitoring), resources spent on enforcement.	1. Village level records available with the *patwari*. 2. Records of meetings and accounts at the village level. 3. District Census Handbooks.

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