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My research interests broadly encompass human-environment interactions with a focus on resource management in the Third World. I am committed to scholarship that centers on social and ecological sustainability and issues of equity. Specifically, I examine community forestry management in the Mugu District of northwestern Nepal. My work most closely falls within the geographical sub-discipline of political ecology (Peet 1996; Bryant 1998), but I emphasize a feminist and ecological perspective that is often lacking in other political ecology research. Forest management in Nepal provides an especially rich context within which to investigate human-environment interactions because of the collision between villagers' daily needs and corresponding harvesting practices, the long-term management goals of the locally based user-groups and the State, and forest ecological changes.

Forests are considered central for survival in Nepal and the gathering of forest products occupies a large portion of most women's time. Villagers use composted leaf litter and animal manure as their primary source of fertilizer and gather firewood for cooking and green leaves for animal fodder (feed); they also cut timber, and animals graze on understory plants. District Forest Office (DFO) rangers and villagers were concerned about degrading forest conditions and, together, implemented Community forestry (CF) beginning in 1990. Community forestry allows villagers to manage forest lands as a common pool resource, based on management plans they develop with the help of DFO rangers. CF projects often improve forest conditions, and the democratic, locally based structure of the user-groups is consistent with the government's decentralization goals.

The success of community forestry programs has been inconsistent across Nepal. Several different factors help explain these variable results including: the extent to which international donors provide technical and organizational support to the user-group, the length of time the user-group has been functioning, and the power dynamics within the group. Furthermore, based on issues raised within the political ecology, feminist, post-colonial, and agrarian change literatures, I argue that meanings attached to forests and beliefs about ecological processes (nature) articulate with social and power relations to influence which management strategies are adopted by the group. In addition to these cultural and political elements, changing ecological conditions either reinforce or challenge existing beliefs about nature and social power relations, causing a re-negotiation of them. I contend, therefore, that ecological conditions articulate with both power relations and cultural practices to drive forest management in Nepal.

For this work I developed a "trialectical" framework from which I could examine community forestry in an integrated perspective. I understand the three analytical domains as mutually constitutive and fluctuating over time, space and scale (cf. (Harvey 1996; Soja 1996). Social and power relations include but are not exclusive to: caste, class, race and gender relations, and in the Nepali case, political party membership. These categories do not operate independently, but rather, different elements of peoples' identities combine in complex and subtle ways to influence their degree of social and political power. Cultural practices is an analytical category that I broadly define to encompass beliefs about nature, meanings attached to land and the institutions formed to manage land. These cultural elements shape the range of land management decisions people will consider, as well as influencing power relations, and therefore are critical to understanding how environmental transformations occur. Ecological conditions vary with the specific issue, but human land use often has a huge impact on which species of plants and animals are dominant in a particular place. These conditions, in turn, shape the beliefs and practices that arise in relation to particular landscapes. In addition, poor ecological conditions tend to impact marginalized members of the community most dramatically, and inversely, control over resources is often a potent source of social and political power.

While several excellent political ecology studies address gender relations as a significant factor in resource management, few studies have sought to understand how categories of difference, including gender, caste, class and other social relations, are constituted through contexts like community forestry. Categories of difference, in part, structure the extent to which individuals have access to social and political power, but as feminist researchers have demonstrated, the process of contesting and reproducing these categories is a critical way in which these relations become significant in specific geographical and historical contexts (Haraway 1991; Massey 1994; Radcliffe 1994). Community forestry programs seek the participation of women and low-caste members, but the extent to which their participation translates into influence in the management process is closely related to power relations as they operate through caste, class, and gender, and has demonstrable ecological consequences (Nightingale 1996).

A number of important issues are highlighted by the trialectical analysis I have outlined. Most significantly, ecological conditions and processes are taken to be active agents in the process of shaping human land use. It is not adequate to only understand the environment as a background for an analysis of resource use. Rather, the kinds of resources available, their rates of regeneration, the kinds of disturbances that either increase or decrease the abundance these resources, and their overall trajectory of change over time contribute to the formation of particular kinds of social and power relations and cultural practices; all of these then combine to drive land management. Similarly, the beliefs about nature, meanings attached to land, and the institutions formed to manage land (cultural practices), influence the kinds of land management options people will consider, which they believe will be most effective, and who should implement them. Concurrently, social and power relations are often contested and reproduced within the context of resource management in response to questions such as, who controls certain organizations, who is expected to implement what kinds of work, and, ultimately, who controls which kinds of resources. When I place the three analytical categories into mutually constitutive relationships in this way, I can demonstrate how they interact to produce specific environmental issues.

Closely linked to my theoretical framework, I chose an in-depth case study to implement my research. The questions I asked required a detailed understanding of complex social and ecological processes, and therefore, a small scale, intensive case study was most appropriate. I developed an interdisciplinary methodology that draws on a quantitative vegetation inventory, time-series aerial photo interpretation, analysis of historical land grant documents, observations of forest harvesting practices, Community Forestry meetings and other relevant social contexts, intensive open ended interviews and ecological oral histories. This methodology combines quantitative and qualitative methods as demanded by the kinds of questions each method addressed. The entire process was informed by a strong feminist ethic of research that sought to include the Nepalis in the research process and to address questions of importance to the community, in addition to those I believe are important.

The preliminary results emerging from this work are fascinating. For example, the user-group has changed its approach to forest fires with the advent of CF and a number of tensions are arising within the group as a result. Historically, villagers burned the forest understory to promote the growth of grass for animal grazing. Most species of mature trees cannot tolerate such burning, but many oaks (*Quercus leucotrichophora* and *Quercus semecarpifolia*) and the blue pine (*Pinus wallichiana*) of Western Nepal are fire adapted and most mature trees survive understory fires. In the forest understory grass is relatively prevalent, but as saplings and the canopy become thicker, the grass tends to die out and other, more shade tolerant species take over. Fires that burn relatively quickly kill seedlings and saplings and add nutrients to the soil, causing grass to grow thick and rich in the following season. The promotion of grass growth, however, declines over time if the area is burned regularly, due to depletion of nutrients in the system. The exact interval between burning needs to be determined for each specific ecosystem, but in general, a minimum of four to five years without burning is required to avoid excessive loss of organic matter from the soil and other nutrients critical to soil fertility (Dahms 1997). In addition, when periodic burning and harvesting of mature trees for timber are combined, the forest can degrade rapidly as canopy trees are not replaced due to high seedling mortality.

It is not known for how long this practice has been common in Mugu, but many of the trees have fire scars deep within their cores, indicating that forest fires have been periodic over at least the past 70 years. The slow decline in grass growth, however, had not been attributed to regular burning until the establishment of the community forest. Current DFO (and many international) understandings of forest dynamics indicate that frequent burning of understory vegetation is more harmful than beneficial and therefore DFO rangers teach the user-groups to prevent forest fires. The user-group I worked with quickly adopted this policy and worked hard to educate all users about the problems with fire. They also actively suppress fires that do start, an effort that has participation from a broad cross section of users. Some areas within the forest are thick with seedlings and saplings no more than ten years old, corresponding with the establishment of the community forest and, presumably, the elimination of understory

fires.

This example illustrates several of the issues I raised above. First, beliefs in Mugu about the importance of burning have changed relatively rapidly over the past ten years. I postulate that because the benefits derived from understory burns decline slowly over time, the people in Mugu had not fully realized the long-term harm it does to their grazing areas. They don't want to take the risk of having no grass at all and therefore set fires regularly. Many people outside the CF user-group continue to burn areas adjacent to the community forest. Once the CF was established and the DFO rangers convinced the user-group that the tree seedlings and saplings were more important than grass growth, the user-group changed their land management practices. I also believe, however, that if tree seedlings had not begun to grow vigorously, the user-group likely would not have continued to follow a policy of fire suppression. Changes in ecological conditions, connected with the beliefs and practices propounded by the DFO rangers, convinced the user-group to change their management priorities. Social and power relations are also a part of this equation. The DFO rangers have greater social and political power relative to the villagers and, therefore, are able to assert their beliefs and practices over the ideas that had accumulated in Mugu through time.

The picture is further complicated by the fact that some of the members of the user-group are not happy with the present trajectory of forest management. The Chhetris, a middle-level caste, keep flocks of goats and sheep and require grazing areas for them. The higher caste Thakuri and Brahmins kept flocks in the past, but most families have abandoned animal husbandry in favor of jobs in government offices, and keep only a few cows and buffaloes for plowing and milk production. Office jobs are not an option for most Chhetri men and women (and all of the Kami or lowest caste people) because most of them are illiterate and lack the historical connections with local political leaders who help place people in such jobs. Animal husbandry is a viable option for income generation that requires no formal education or political connections. Currently, the forest is managed for timber production and the user-group committee generates most of its income through the sale of timber permits. Within the user-group, a tension is developing between the higher-caste men who control the user-group committee, and therefore the income generated from timber sales, and the Chhetri men and women who rely more heavily on animal husbandry.

The extent to which grazing areas are disappearing from the forest is not entirely clear. Aerial photo interpretation shows that patches of open canopy have indeed become closed in the past 20 years, especially closer to the Chhetri village. I did a quantitative vegetation inventory of the forest but another inventory is necessary in five to ten years time in order to accurately calculate rates of tree growth, seedling recruitment (whether seedlings are successfully living to replace canopy trees), and changes in species composition. Species composition is a significant factor because some species of trees, notably the oaks (*Quercus leucotrichophora* and *Quercus semecarpifolia*), are used for animal fodder and, if they become more prevalent, could off-set the loss of grass in the understory. Yet, these species are long-lived and slow growing. The conditions necessary and the rate at which they regenerate require long periods of time to evaluate, making it difficult for villagers or researchers to develop a good understanding of the requirements of these species. Complex negotiations occur within the user-group over the trajectory of forest management and as the ecological results of their current practices become clearer, the user-group will have to renegotiate.

The example of fire ecology given above illustrates well how cultural practices, social and power relations and ecological conditions articulate in complex and continuous ways to drive land management. It is important to emphasize the fluidity of this process and it's multi-scalar aspects. Processes initiated at international and national scales are transformed and reinterpreted in Mugu based on the history, culture, politics and ecology of the area. These transformations, in turn, have caused a reconsideration of policies at larger scales, as the experience of community forestry in Nepal has shown. The focus of CF shifted from that of technical forestry to one of community development and institution building as implementation proceeded and little success was gained without active participation of the users. As the analysis of my research becomes more complete, my hope is that by combining these different data and methods, I will be able to give a nuanced account of the mechanisms driving forest management and why particular ecological conditions and social processes are dominant at this period of time in western Nepal.

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