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The Human Dimensions of Land Change in Lamjung District, Nepal[1]

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Abstract

This paper presents a brief overview of an anthropological study conducted in Lamjung, Nepal. Using a multi-scalar approach that integrates household and community data with remote sensing and geographic information system applications, this study investigated the relationships between agricultural land-use strategies and the district level land-cover change patterns for the period between 1976 through 2004. The main focus of this paper, however, is on the human dimensions part, which examines the household conditions and community contexts under which smallholders changed their land-use strategies. In doing so, it looks beyond the conventional view that tends to over-emphasize demographic and poverty factors.

Key words: land-use and land-cover change, Lamjung, Nepal, smallholders, agriculture, anthropology, household conditions, institutional arrangements

Among land change scientists, there is a growing recognition of the need for an integrative, multilevel approach to study the relationships of agricultural 'modification activities' and global land-use and land-cover change (LUCC) (Moran 2005; Walsh et al. 2004). This new development comes as a crucial step to move beyond the primary area of change (i.e., conversion of forests) to study the changes in agricultural areas, mainly the land-use strategies resulting in different agricultural intensification levels (Lambin et al. 2000; Laney 2004). There are, however, two challenges associated with it: (1) these modification activities are also subtle and dynamic to be detected with the existing remote sensing and ecological models (Liverman et al. 1998; Turner et al. 2003), and (2) we lack sufficient knowledge of the extent to which agricultural land-use strategies contribute to LUCC and vice versa (Lambin et al. 2000). The need for understanding the human dimensions of land change—involving both land-use and land-cover change—is even greater for the mountains, which is one of the most understudied fragile ecosystems and where agricultural practices are relatively complex due to their heavy dependence on forests, livestock, pastures and cultural-ecological adaptations (Netting 1981; Rhoades 1997). Rindfuss et al. (2004) argues that land change science should build upon a clear understanding of contextual histories of human-environmental relationships, particularly by studying the way such relationships evolve, spatially and temporally, in the study area.

Lamjung as a case study

Similar to other Himalayan areas, Lamjung is also believed to have witnessed in the last five decades rapid changes in terms of population growth, disruption of customary rules and penetration of market economy (Gurung 2004). The reported impact of these include

deforestation, declining pasture coverage, overgrazing, changing forest structures and species composition and landslides (ICIMOD 1996). These reports represent the dominant view on the Nepal's deforestation discourse, which was dramatized as 'Theory of Himalayan Environmental Degradation' (HED) between the 1970s and 1990s (see Ives and Messerli 1989; Blaikie and Brookfield 1987; Jodha 1995 for discussions). It was perceived that massive deforestation was taking place in Nepal, mainly caused by an ever-increasing population of smallholders and their 'irrational' agricultural practices, and it was causing a disastrous impact on the Himalayan environment and its long-term sustainability.

Over the years, many key assumptions of the HED turned out to be more complicated, if not dubious (Ives and Messerli 1989; Thompson et al. 1986; Guthman 1997). Interestingly, the HED debate has resurfaced in recent years and it is claimed that while the HED was over-generalized and to some extent exaggerated, it is anything but a 'myth', since there is adequate evidence of environmental change (Ives 2005). This means, more careful and contextualized analyses are necessary to match the highly diverse and dynamic mountain ecosystems (Forsyth 1998; Price and Thompson 1997). One of the major problems with the HED or other environmental reports on Nepal, I argue, is that they focused too much on deforestation alone while ignoring or over-generalizing all other important types of LUCC. For mountain communities like Lamjung, which depend mainly on very complex smallholding agriculture, historical and contextual analyses of different types of LUCC, mainly agricultural land-use strategies, are important, since these capture the real essence of the environmental changes taking place in Nepal.

Land-cover change patterns

A change detection method based on Landsat series data of 1976, 1984, 1990, 1994, 1999 and 2003 (Table 1 and Figure 3), along with the thematic accuracy assessment, provided an in-depth analysis of the land-cover change trajectories (see Figure 4). This analysis illustrates dynamic transitions between forest, agricultural land and shrubland and suggests that there is no linearity in land-cover change as is generally assumed. As shown on Table 2, one significant change in land-cover pattern, however, is the loss of shrubland coverage to agriculture and forest over the years, decreasing from 37,825 ha (22.33% of the total area) in 1976 to 16,717ha (9.86%) in 2003. Although forest coverage steadily decreased from 75,582ha (44.2%) in 1976 to 64,453ha (38.02%) in 1990, it was no "massive deforestation" as claimed in the "Himalayan Environmental Degradation" debate. Forest in fact gained in areas in subsequent observation years to reach 71,582ha (42.22%) in 2003. Agricultural land also expanded from 30,3360ha (18.1%) to 42,048ha (24.8%) between 1976 and 2003.

The human dimensions

> If you ask me whether the population has increased, I have contradictory answers. If I say yes, then I know that more people are abandoning their lands. If I say no, then I see the same number of *khaane mukh* (literally meaning mouths to be fed) as before. This is tricky, you see… the difference I think is the problem caused by the young people leaving the village for jobs in the Gulf countries. When a son (mature labor) leaves the village, it affects not just his family, his neighbors who are dependent on his labor exchange during cultivation seasons are also affected… Nowadays, all other family members don't do much. They just look up to him to send money for food, medicines and expenses. This is what is making the difference…
>
> (67 years old male respondent from Maling village)

Most literature on the environmental change tend to emphasize the demographic, affluence (or poverty), and technological change (otherwise known popularly as the I=PAT formula) factors as

the driving forces (see Turner et al. 2003; Rindfus et al. 2004; Moran 2005 for more) and the HED literature were no exception. In this study, I explored and studied, along with demographic and other social drivers, how the changes in institutional arrangements are linked to the transformation in some key areas affecting smallholding in Lamjung, which can be categorized as the proximate causes: (1) changing institutional arrangements with the significant impact on landscapes as well as on Gurung culture in general and their labor network and social ties in particular, (2) the growing influence of the cash economy following road building and market development; (3) outmigration and labor shortage resulting in changes in agriculture and forest resource use; and (4) shifting crop and food preferences as the result of the downward movement of settlements and the adoption of new agricultural systems (Table 3). Combined, these changes mediated the effects of population pressure and poverty and influenced smallholders' land-use decisions. To make the dynamics even more complicated, relatively recent Maoist Insurgency has also changed social relations, labor availability and in the use of agricultural and forest resources—the most notable is the growing sense of insecurity that is pushing the farmers to abandon distant farm land and focus mostly on home gardens and prime paddy fields.

Institutional arrangements

The changes in institutional arrangements have had profound and direct implications on historically significant land-use strategies, particularly to Gurung culture. These include the disappearance of transhumance or migratory sheep herding practices, the abolition of the *khoriya* (slash-and-burn) system and the break-down of the agriculture-forest-livestock interdependence. These institutions used to provide social organization, including much needed labor allocation for farming. All the new rules of resource allocations brought about by the governments, such as

abolition of the customary rights of forest and pasture management, the initiation of community forestry programs (CFP) and other forest conservation programs, directly targeted those land-use strategies as 'traditional practices' and abolished them, as those were viewed as 'backward' and 'destructive' to the environment. In the changing context of smallholding, the new focus and priority was to cease migratory herding practice, 'enclose' the livestock and encourage sedentary agriculture, so that they could be 'governed' (or levied taxes) properly.

There is no doubt that forest coverage has increased due to the outmigration of the early 1970s and the initiation of CFP and other forestry conservation initiatives, but the downside is that these 'new' rules have dislocated and replaced traditional networks completely, while these new rules of resource allocation are still inadequate to provide the safety cushion provided by the 'traditional institutions' for years during the time of stresses and the needs. Hence, smallholders had no choice but to seek alternatives or accept the inferior options (e.g., decrease livestock number, keep stall-feed animals, small ruminants, agro-forestry in *baari* and *paakho*).

Household conditions and community contexts as the social drivers

The impact of demographic factors at the household and community level has undoubtedly been pervasive; be it the effect of population pressure on forest resources or on agricultural intensification in the pre-1970 period or the beginning of the outmigration in the post-1970 period. The recent trend, however, has been the disintensification of agriculture, mainly because of the lack of interest in agriculture among the young population and a growing attraction toward non-farm jobs in the cities and over-seas. Once increasing non-farm employment started to draw labor away from agriculture, it created labor shortage, which in turn, has led to a drastic decline

in transhumance and started the chain effect of declining manure availability, decreasing crop productivity and increasing abandonment of distant cultivated land.

The shortage of labor caused by permanent outmigration and the young people seeking non-agricultural employment outside of the district has conversely resulted into a positive feedback to forests. Under the condition of the lower population pressure, there have been lower level of extraction and less imposition on forests, in some cases even natural reforestation. The trend toward abandoning of cultivated land has been exacerbated by the Maoist insurgency, which despite being a new phenomenon has had a devastating impact on agriculture land-use and the farmers' livelihood in general.

The impact of the cash economy is felt in every aspect of smallholders and it has played an important role in monetizing goods and services, which also pushed the declining legitimacy of customary rules and authority structures. Only in the *Besi* area, where the competitions for 'prime lands' are higher agricultural intensification is taking place, with some indications of increasing land-stress. Those who can afford the labor and inputs have maximized the productivity of rice-based intensification. Cheaper transport of goods such as, food grains, salt and kerosene and their instant availability in local markets have made them attractive alternatives.

The impact of the changing economic and social relations is that smallholders are now faced with increasing demand for cash incomes in the recent years and that their economic activities now center mainly around markets and gateway towns. This is another reason for seeking non-farm employment, preferably wage earning in the cities and abroad to meet the increasing cash needs to purchase these commodities, to acquire services (e.g., labor for rice plantation, livestock care) or to be able to access basic services (e.g., education, health service

and other contingencies). Also, besides the break down or slow erosion of customary rules and traditional support networks, the recent changes have pervasive influence on the choices and preferences of crops and land-use types. While the millet, potato and corn, for instance, still constitute the major diet source, virtually anyone would tell rice is their most preferred staple. Similarly, the increasing accessibility has also influenced the mobility of people. These changes have influenced the meaning of the way we understand how people choose certain land-use over others and why they do the way they do.

Conclusions

Overall, it is clear that the changing institutional arrangements and the growing influence of the cash economy are the key driving forces of LUCC trajectories in Lamjung, even though the impact of outmigration, under the population pressure and poverty, is more visible at the household and community levels in the recent decades. With the development of the Dumre-Besishahar road and other secondary roads inside the district, accessibility increased so fast that the effect of the cash economy is felt virtually in every aspect of smallholder households. Their synergistic effect resulted in the dynamic transitions or trade-off between forest, agricultural land and shrubland.

The trajectories of land-cover change—analyzed from multi-temporal Landsat data of 1976, 1984, 1990, 1994, 1999 and 2003—illustrate the dynamic transitions or trade-off between forest, agricultural land and shrubland in the last four decades. This analysis also suggests that there is no linearity of land-cover change as is generally assumed (i.e., irreversible conversions of forest and shrublands to agricultural land). These land-cover changes are in fact non-continuous in space, leading to complex landscape mosaics and overlapped patchworks in the district. These

results also support the basic premise of this study that we must look beyond the popular notion that conceives land-cover change as simple and irreversible conversions from one cover type to another. The land-cover change patterns identified in Lamjung can be explained in terms of the expanding human modification activities (i.e., agricultural land-use strategies), which are mainly characterized by the shifting crop and food preferences, the changes in labor allocation, and the growing pressure of the cash economy. In other words, such complex, dynamic patterns of land-cover change cannot be fully addressed by remote sensing applications and ecological modeling alone; narrative details of historical facts and farmers' ecological knowledge of land-use are needed to fully understand the modification activities that give rise to a highly dispersed pattern of land-cover change.

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Figure 1. Lamjung District

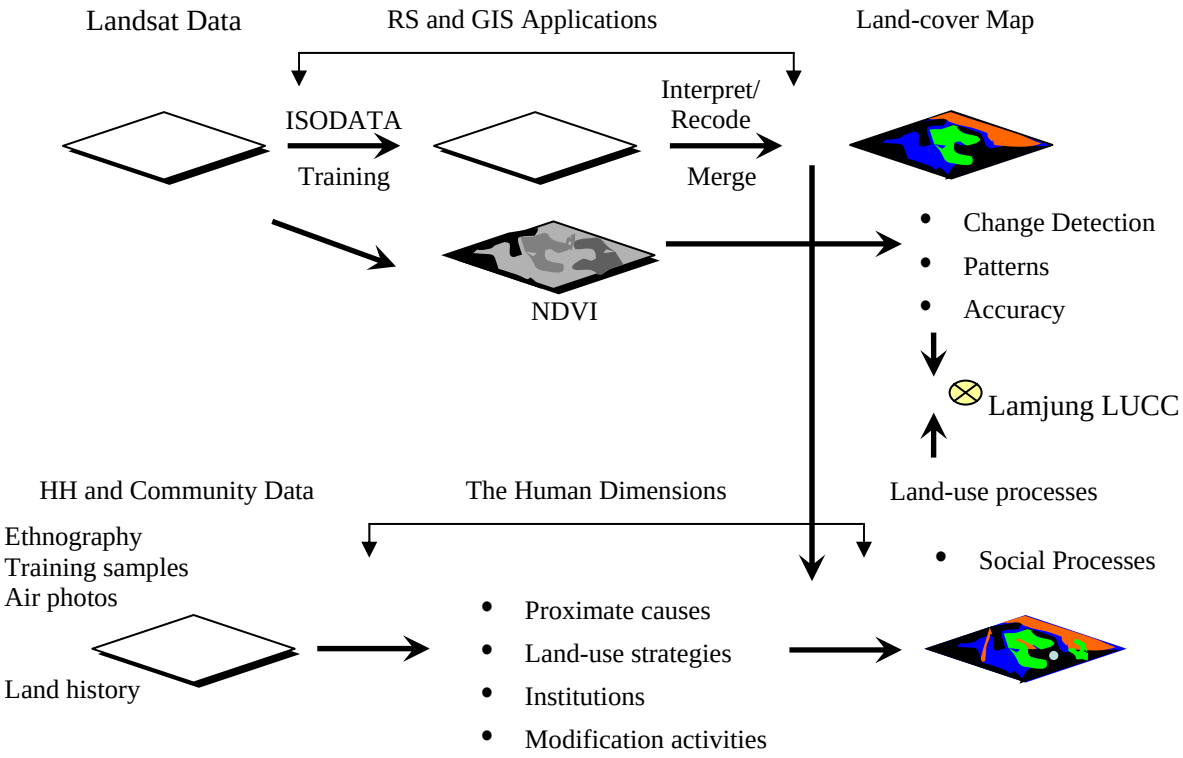

Figure 2. Schematic diagram of the research method employed in the study

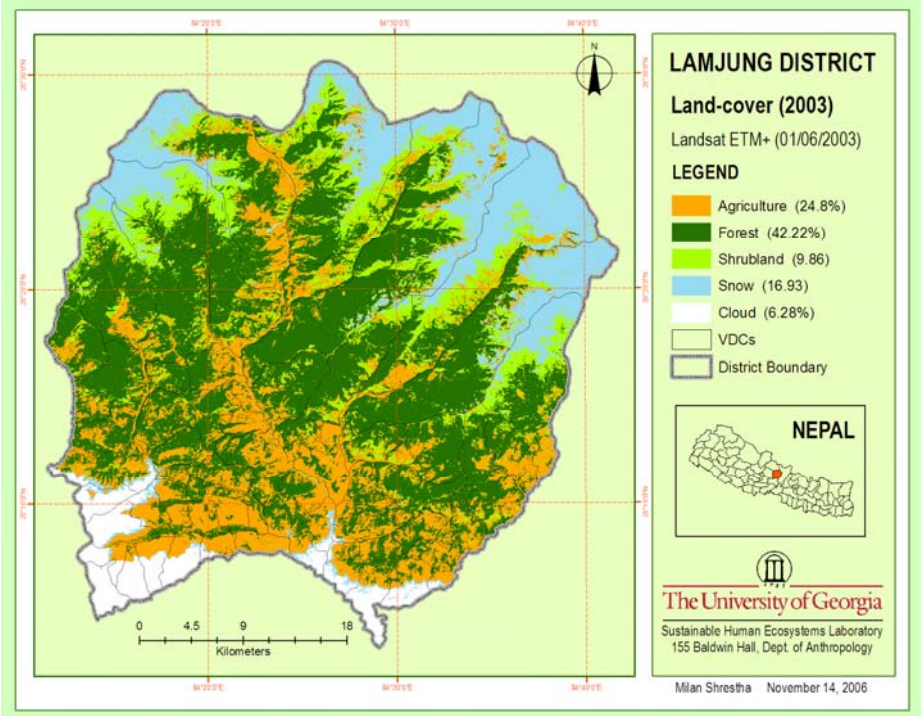

Figure 3. A sample map of land-cover created from Landsat data (2003)

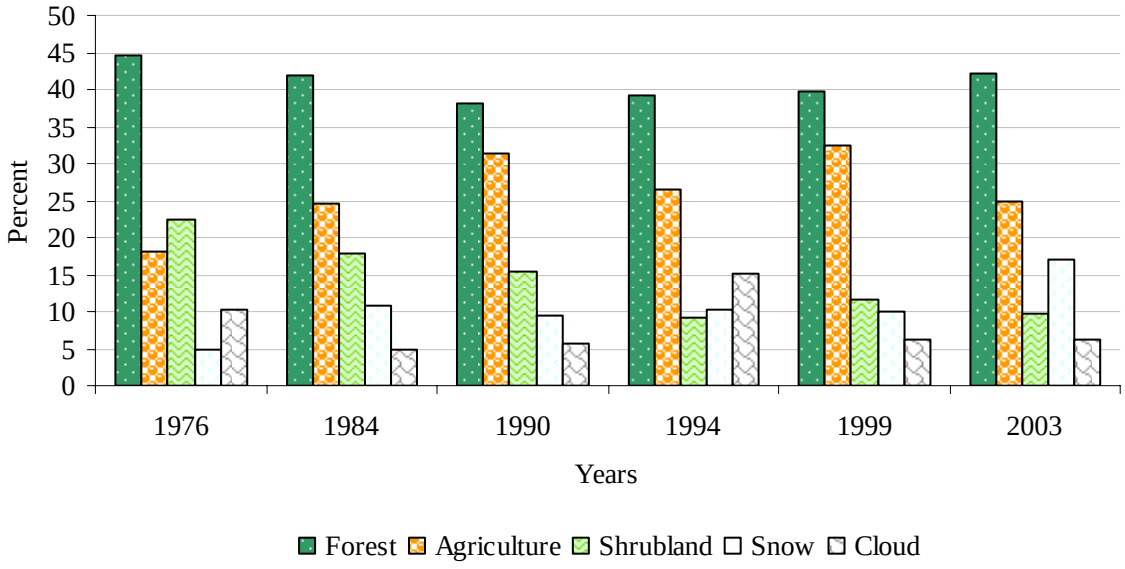

Figure 4. Land-cover changes (1976-2003) in Lamjung district

Table 1. Characteristics of the Landsat data

Date	Landsat Mission	Sensor	Spatial Resolution (m)	Path/row
3 December 1976	1	MSS	79	152/040
3 February 1984	4	MSS	79	142/040
10 November 1990	5	TM	30	142/040
13 May 1994	5	TM	30	142/040
13 December 1999	7	ETM+	30	142/040
6 January 2003	7	ETM+	30	142/044

Table 2. Land-cover change matrix (1976 to 2003)

		2003					
		Forest	Agriculture	Shrubland	Snow	Cloud	Area Lost
1976	Forest (ha)	48454.81	8125.26	6789.04	4090.25	2874.97	70334.33
	(%)	28.59	4.79	4.01	2.41	1.70	41.50
	Agriculture	10451.17	17938.22	3021.23	5122.55	3835.60	40368.77
	(%)	6.17	10.58	1.78	3.02	2.26	23.81
	Shrubland	6040.53	4901.71	9437.54	6847.35	180.71	27407.83
	(%)	3.56	2.89	5.57	4.04	0.11	16.17
	Snow	1075.49	1066.95	333.09	4928.12	764.23	8167.88
	(%)	0.63	0.63	0.20	2.91	0.45	4.82
	Cloud	5553.48	6281.12	2860.90	7688.60	803.55	23187.66
	(%)	3.28	3.71	1.69	4.54	0.47	13.69
	Area Gain	71575.48	38313.26	22441.80	28676.87	8459.07	169466.47
	(%)	42.23	22.60	14.03	16.92	4.99	

Table 3. Major historical and institutional factors of land-use in Lamjung

Historical period (in AD)	Events/episodes	The impact on land-use
Pre 1548	Ghale Raja ruled	• Hunting • Exclusive use of *Lekh* and *Pahad* for Agropastoralism
1500	Arrival of *Khas* groups and Hindu ideology	Introduction of • irrigation techniques • agricultural terracing system • rice, corn
1548 to 1950	The *Khas* group as the Shah King's allies	Land tenure and landownership • land grants and preferential treatment
1800-1970	Gurungs moving toward the valley	• Toward sedentary agriculture • competition for 'prime lands'
1957-73	Abolition of customary rights over forest and pastures	Abolition of customary rights and the state failed to implement the Acts • 'Open access' • Deforestation • *Khoria* outlawed, intensification
1990s	The Dumre-Besishahar Road	• Improved access and market
	Community forestry program (CFP)	• Restrictions on roaming/grazing • Low incentives in agropastoralism • Forest are gain
2000 -	The Maoist insurgency and political turmoil	• Labor shortage • land abandonment