

The human dimensions of land change in Lamjung district of Nepal^{§§§§}

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Introduction: 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’ with 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 – the 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 this approach. One, these modification activities are subtle and dynamic to be detected with the existing remote sensing and ecological models (Liverman et al. 1998; Turner et al. 2003). Two, there is no sufficient knowledge on 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 LUCC is even greater for mountains. Mountains have one of the most understudied fragile ecosystems, and agricultural practices in mountains are relatively complex due to heavy dependence on forests, livestock, pastures and cultural-ecological adaptations (Netting 1981; Rhoades 1997). Rindfuss et al. (2004) argue that land change science should build upon a clear understanding of contextual history of human-environmental relationships, particularly by studying the way such relationships evolve, spatially and temporally, in a study area.

Lamjung as a case study: Similar to other Himalayan areas, Lamjung is believed to have witnessed rapid changes in population growth, disruption of customary rules, and penetration of market economy (Gurung 2004). The impacts of these factors are reported to include deforestation, declining pasture coverage, overgrazing, changing forest structures and species composition, and landslides (ICIMOD 1996). These

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reported impacts represent the dominant view on Nepal's deforestation discourse, which was dramatized as the 'Theory of Himalayan Environmental Degradation' (HED) between the years of 1970s and 1990s (see Ives and Messerli 1989; Blaikie and Brookfield 1987; Jodha 1995). It was perceived that massive deforestation in Nepal was mainly caused by an ever-increasing population of small landholders and their 'irrational' agricultural practices, causing a disastrous impact on the Himalayan environment and its long-term sustainability.

Over the years, many key assumptions of 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. It is being 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). The debate around HED points to the need of a more careful and contextualized analysis to match the highly diverse and dynamic mountain ecosystems (Forsyth 1998; Price and Thompson 1997). One of the major problems with the HED is that it focused too much on deforestation and ignored or over-generalized other important types of LUCC. For mountain communities with complex smallholding agriculture, the historical and contextual analyses of different types of LUCC are important to capture the real essence of 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, along with the thematic accuracy assessment, has provided an in-depth analysis of the land-cover change trajectories. The trajectories illustrate the dynamic transitions between forest, agricultural land, and shrubland. They suggest that there is no linearity in land-cover change, as is generally assumed. One significant change is the loss of shrubland coverage to agriculture and forest over the years. Shrubland coverage decreased from 22.33 percent of total area in 1976 to 9.86 percent in 2003. The forest coverage steadily decreased from 44.2 percent in 1976 to 38.02 percent in 1990, but this decrease cannot be called a "massive deforestation," as is generally claimed in the HED debate. Forest coverage in fact increased in subsequent observation years to reach 42.22 percent in 2003. Agricultural land also expanded from 18.1 percent to 24.8 percent between 1976 and 2003.

Human dimensions: Most literature emphasize the demographic change, affluence (or poverty), and technological change as the driving forces of environmental change (Turner et al. 2003; Rindfus et al. 2004;

Moran 2005), and the HED literature were no exception. In this study, I explored and studied, along with demographic and social drivers, how the changes in institutional arrangements were linked to the transformation of smallholdings in Lamjung. The changes were categorized into (1) changing institutional arrangements with significant impact on landscapes and Gurung culture, in particular their labor network and social ties, (2) the growing influence of cash economy that followed with building of roads and with development of markets in Lamjung, (3) the outmigration and thus shortage of labor that resulted in changes in the pattern of use of agriculture and forest resources, and (4) the shifting of crop and food preferences as the result of downward movement of settlements and the adoption of new agricultural systems. Together, these changes mediated the effects of population pressure and poverty and influenced the land-use decisions of smallholders. To make the dynamics even more complicated, a relatively recent Maoist insurgency further impacted the social relations, labor availability, and the use of agricultural and forest resources — the most notable being the growing sense of insecurity that pushed the farmers to abandon distant farm lands and to focus on home gardens and prime paddy fields.

Institutional arrangements: The changes in institutional arrangements had profound effect on historically significant land-use strategies and Gurung culture. Effects include the disappearance of transhumance or migratory sheep herding practices, the abolition of *khoriya* (slash-and-burn) system, and the break-down of agriculture-forest-livestock interdependence. These traditional practices and institutions provided a social organization of much needed labor allocation for farming; but, the new rules of resource allocations brought about by the government, such as the abolition of customary rights of forest and pasture management and the initiation of community forestry programs (CFP) and other forest conservation programs abolished these traditional practices, as those were viewed as ‘backward’ and ‘destructive’ to the environment. In the changing context of smallholding, the focus of the new rules was to stop migratory herding practice, to ‘enclose’ livestock, and to encourage sedentary agriculture, so that they could be ‘governed’ (or levied taxes) properly. There is no doubt that forest coverage has increased due to outmigration during the early 1970s and due to the initiation of CFP and other forestry conservation initiatives; but, the new rules that have completely dislocated and replaced the traditional networks have been inadequate in providing the same level of safety cushion as was provided by traditional networks for years during the times of stresses and needs. Hence, smallholders had to seek alternatives and accept inferior options of

decreasing livestock number, keeping stall-feed animals and small ruminants, and engaging in agro-forestry in *baari* and *paakho*.

Household conditions and community contexts as the social drivers: Indeed, the impact of demographic factors – population pressure on forest resources and agricultural intensification and the outmigration – had been pervasive at the household and community level during the pre- and post-1970 periods; but, the recent trend has been the disintensification of agriculture, mainly because of lack of interest in agriculture among young population and a growing attraction toward non-farm jobs in the cities and overseas. Once non-farm employment started to draw labor away from agriculture, it created labor shortage and a drastic decline in transhumance, with its chain effect on declining manure availability, decreasing crop productivity, and increasing abandonment of distant cultivated land. This trend has resulted into a positive feedback to forests – a lower level of extraction, less imposition on forests, and even natural reforestation. This trend of abandoning cultivation of land has been exacerbated by the Maoist insurgency, a new phenomenon with a huge impact on agriculture land-use and farmers' livelihood.

The growth of cash economy has played an important role in monetizing goods and services, which further diminished the legitimacy of customary rules and authority structures. Only in the *Besi* areas there are some indications of increasing land-stress, because the competitions for 'prime lands' are raising levels of agricultural intensification. Those who can afford labor and other inputs have maximized the productivity of rice-based intensification.

The impact of changing economic and social relations is that smallholders are now faced with increasing demand for cash incomes and that their economic activities center mainly on markets and gateway towns. This is another reason for seeking non-farm employment, preferably wage earning in the cities and abroad to purchase commodities, to acquire production services, or to access basic services like education, health care and other contingencies. Besides breaking down or eroding customary rules and traditional support networks, the recent changes have pervasively influenced the choices and preferences of crops and land-use types. While millet, potato and corn still constitute the major diet source, rice is the most preferred staple. Similarly, the increasing accessibility has also influenced the mobility of people.

Conclusions: Changing institutional arrangements and growing influence of cash economy are the key driving forces of LUCC trajectories

in Lamjung, even though the impact of outmigration, under the population pressure and poverty, had been 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 land-cover changes are non-continuous in space, leading to complex landscape mosaics and overlapped patchworks. These results 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. Complex and 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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