

## Indigenous Livestock Grazing and Management Impacts in Upper-Slope Forests of Nepal

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### Abstract

The central Himalayan 'upper-slopes' are defined as an area lying between 2,300 and 4,000 masl, which possess a rich wealth of forest, shrub and grassland resources. The upper-slope area is capable of sustaining sizeable populations of livestock as well as other forms of resource utilisation such as extraction of bamboo and timber, collection of *Daphne* spp bark for making Nepali paper and collection of various medicinal plants. Herding livestock is an important means of livelihood among the people living in and near upper-slope areas. This paper on indigenous knowledge is based on research carried out to examine traditional use of upper-slope mountain resources with special attention given to intense forest use by livestock grazers in the east-central districts of Sindhupalchok and Kabhrepalanchok in Nepal.

Three styles of livestock management have been identified in the study area: 1) full transhumance, 2) semi-transhumance, and 3) stall-fed livestock management (non-transhumance). These indigenous systems have recently been influenced by several factors like the construction of new roads into formerly remote locales; the opening of new markets for agricultural, livestock and forest products, and employment; greater access to schooling and health facilities and supplies of clean water; and, new opportunities for migrant labour and small business investment in and outside of Nepal. In response to some of these impacts, use of forest resources on high upper-slopes is changing. Yet, despite the various social and political constraints, traditional livestock systems are still prevalent in some areas, though local authorities have begun to rationalise the use of resources by means of extra-legal restrictive measures under community or communal pasture management systems.

In this study, we examine the traditional and contemporary adaptation of users of upper-slope resources, especially livestock herders, and their impact on high-altitude forest resources.

### Introduction

Herding livestock is an important means of livelihood among the people living in north central Nepal, on the Himalayan 'upper-slopes'. About 43% of Nepal's landmass is classified as 'high Himal' and 'high mountainous'. Grassland, shrubland, and forested land account for 53% of the land area in these physiographic zones. Thus, the upper-slopes possess a rich wealth of forest and grassland resources, capable of sustaining sizeable populations of livestock as well as other forms of resource use such as extraction of bamboo (*ningaalo*, *baans*) and timber (*kaath*), making of paper from *Daphne* spp bark (*lokta*), and collection of medicinal plants (*jaributi*). Nepal's livestock production system

alone contributes significantly to the national economy, accounting for about 25% of total agricultural GDP (MPFS 1989); the upper-slopes are among the main areas of the country used for livestock grazing.

The forest environment of the upper-slopes is regarded as a distinct and fragile ecosystem. This is the result of a combination of climatic and topographical conditions, rich biodiversity, and a variety of human influences (Schmidt-Vogt 1988, Jackson *et al.* 1993, BPP 1995b). However, the overall value of natural resources in the forests of the upper-slopes of the Himalayas has been little explored by scientists and developers, except in the recently protected areas of Annapurna, Solokhumbu, and Makalu-Barun. Until now, His Majesty's Government of Nepal (HMG/N) has focused its management efforts on areas of the *Terai* (lowlands) and the mid-hills. Research on the upper-slopes, while not entirely neglected, has received considerably less attention. There is an urgent need to collect information related to issues and knowledge that can be used to develop approaches to the sustainable management and conservation of resources from the upper-slopes.

This paper explores the knowledge and practices of communities occupying the upper-slopes in terms of indigenous livestock management and knowledge and use of forest resources. It deals specifically with the demographic, socioeconomic, and biophysical settings of the upper-slopes, the impact of livestock herding, and emerging strategies of livestock management in response to the changing demographic, socioeconomic, and biophysical setting of the upper-slopes. It raises questions about how upper-slope forest resources can be managed sustainably in future and, in particular, the role of community-based management initiatives over traditional private management schemes.

### Methodology

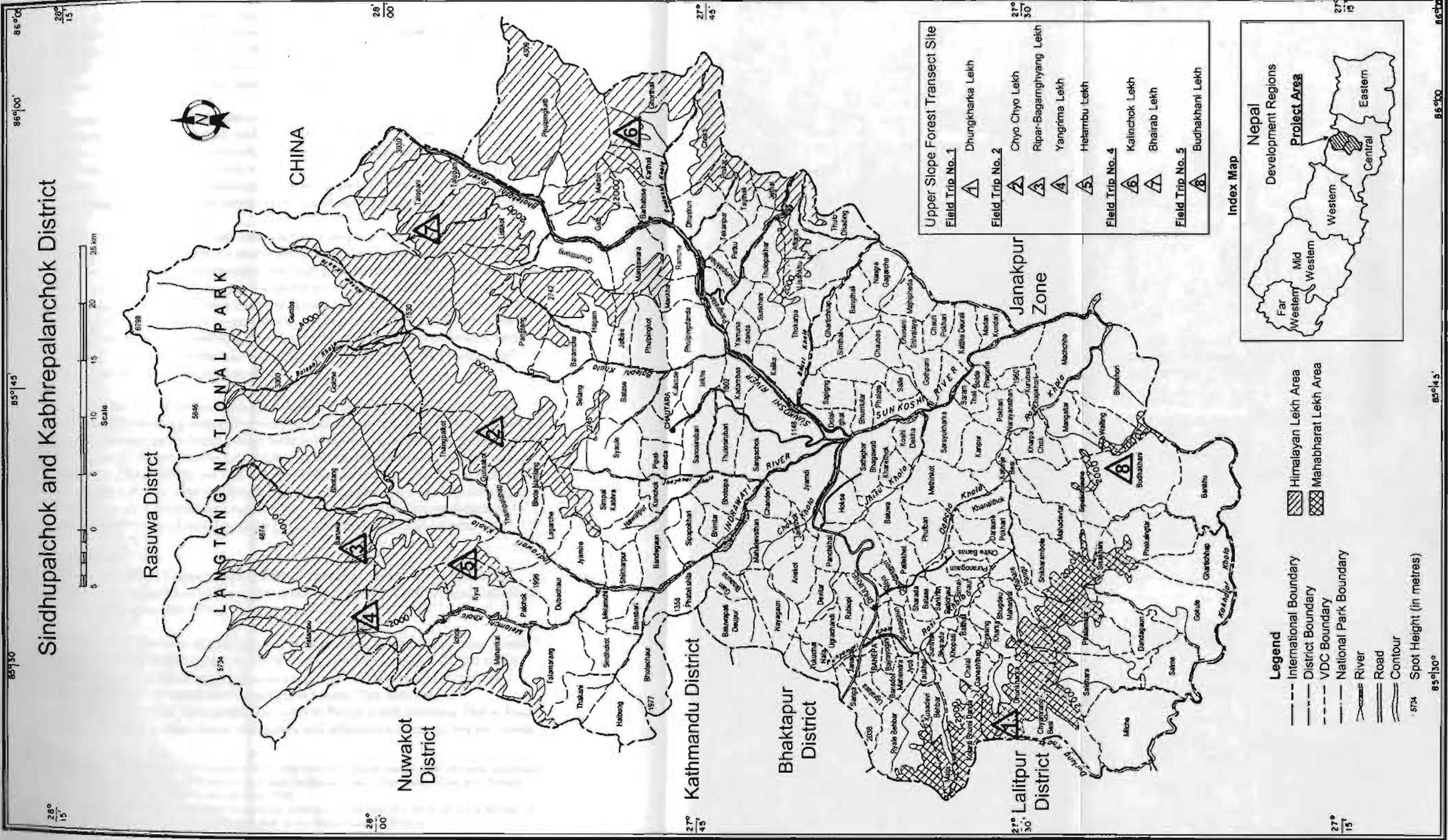
The study was conducted over a four-month period, January–May 1996, by a multi-disciplinary team of researchers on behalf of the Nepal Australia Community Forestry Project (NACFP) in the two central districts of Sindhupalchok and Kabhrepalanchok.<sup>1</sup> The team identified and analysed the status of, and issues related to, resource management and conservation of the upper-slope forests. The authors' experiences in other upper-slope areas of the Himalayas are also incorporated in this paper.

A series of investigative field trips was undertaken into the high altitude areas of Sindhupalchok and Kabhrepalanchok districts to survey the condition of the forest and grassland resources. For basic data collection, a methodology for a

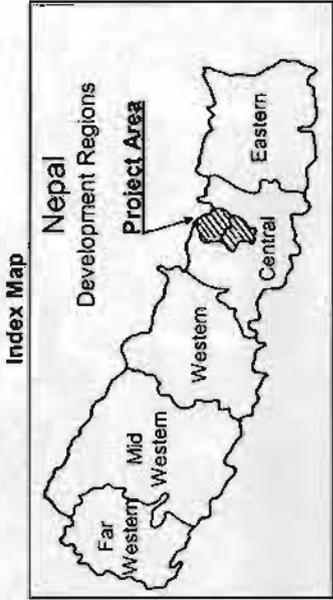
<sup>1</sup> The study on the upper-slopes was supported by the Australian Agency for International Development (AusAID) as part of planning for the proposed Nepal Australia Community Resource Management and Conservation Project (NACRMCP), implemented from 1996–2001.

The research was carried out from January to May 1996 by a team led by Don Messerschmidt (Anthropologist, Social Forester), with Santosh Rayamajhi (Forester, Protected Area Specialist), Tulsi B. Prajapati (Social Forester), R.M. Tamrakar (Land Use Specialist), and Anita Manandhar (Gender Specialist). In addition, Bill Jackson, Ram B. Chhetri, and Sameer Karki, all of the Nepal-Australia Community Forestry Project, also participated in parts of the fieldwork and in the subsequent workshop and data analysis (Messerschmidt and Rayamajhi 1996). The authors thank all involved for their participation.

# Sindhupalchok and Kabhrepalanchok District



- Upper Slope Forest Transect Site**
- Field Trip No. 1 Dhungharka Lekh
  - Field Trip No. 2 Chyo Chyo Lekh
  - Field Trip No. 3 Ripar-Bagamhyang Lekh
  - Field Trip No. 4 Yangima Lekh
  - Field Trip No. 5 Helambu Lekh
  - Field Trip No. 6 Kalinchok Lekh
  - Field Trip No. 7 Bhairab Lekh
  - Field Trip No. 8 Budhakhani Lekh



- Legend**
- International Boundary
  - District Boundary
  - VDC Boundary
  - National Park Boundary
  - River
  - Road
  - Contour
  - Himalayan Lekh Area
  - Mahabharat Lekh Area

5734 Spot Height (in metres)

28° 15' 28°

85° 13' 85°

28° 15' 86°

27° 00' 28°

27° 00' 28°

27° 45' 27°

27° 45' 27°

27° 30' 27°

27° 30' 27°

27° 15' 27°

27° 15' 27°

85° 13' 85°

86° 30' 86°

'Forest Profile by Rapid Assessment' developed for the Nepal-Australia project by Jackson and Ingles (1996)<sup>2</sup> was used and both key informant interviews and focus group discussions with villagers and forest resource users were used following standard Rapid Appraisal tools and methods (Messerschmidt 1995, Grandstaff and Messerschmidt 1995, Jackson and Ingles 1996). These and other rapid appraisal field methods were used to investigate land-use change, gender issues, and environmental management issues.<sup>3</sup>

A series of interviews were also conducted with specialists in forestry and protected area development; and these include officers of HMG/N and professional staff from community forestry and protected area development projects. The team also carried out an extensive literature review, held a series of briefings, and held a workshop on upper-slope forest management issues involving participants from many government agencies and projects in Nepal.

During the field work, 71 high-altitude forest profile surveys were undertaken. In addition, we held discussions and interviews with key informants (especially with resource users encountered in the high pastures and forests) and made first-hand observations. Perhaps most important of all, sources of information from among the local people were the local guides who were engaged by the team to travel with us through the upper-slopes – which are locally called '*lekh*'. These guides were highly knowledgeable informants, able to discuss in detail a wide range of seasonal activities and lore (the basis of indigenous knowledge and practices) about natural resources.

Because the use of the upper-slope forests and pastures is seasonal, meeting people while actually engaged in some seasonal activities was difficult. Livestock grazing on the upper-slopes occurs later in the year from April into the summer monsoon. Cutting of fuelwood and timber also tend to be done after the snow has gone. Nonetheless, we encountered and interviewed some individuals and family groups who were herding cattle and yak, collecting *lokta* and *jaributi*, and cutting wood in several high forest areas. Our individual, prior professional experience on use of resources from the upper-slopes was also helpful.

### Study Area

The study area is located in the middle and high mountain zones of central Nepal; i.e., in the Mahabharat *Lekh* of Kabhrepalanchok District and Himalayan *Lekh* of Sindhupalchok District (Figure 1).

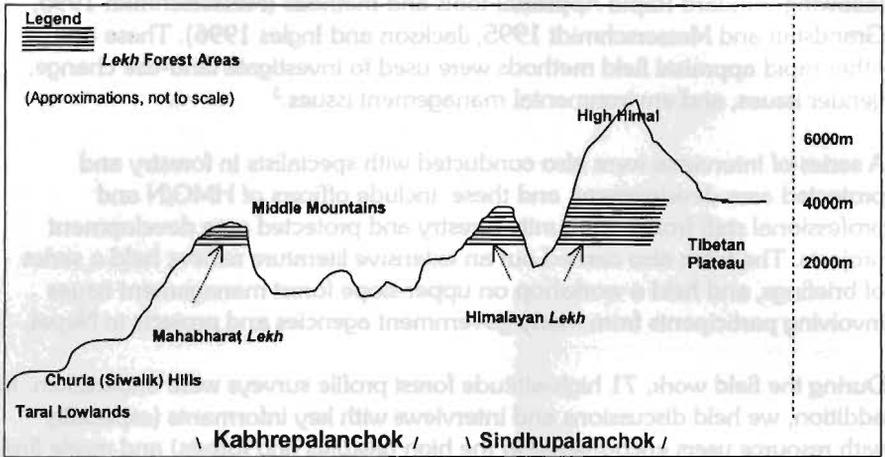
The NACFP has been operating since 1978 in these districts, in an area which together covers 3,886 sq.km, or 2.6% of Nepal's total area of 147,181 sq.km. The *lekh* area of Sindhupalchok rises to the high altitude pastures and even extends into Tibet across the Nepal/China border. The *lekh* area of Kabhrepalanchok is the culmination point in Nepal's mid-montane Mahabharat range. There are some major similarities and differences between the two areas

<sup>2</sup> A revised and expanded version of the *Forest Profile by Rapid Assessment* has been developed for the Third Forestry Development Project in Bhutan. See Nurse 2000; Nurse and Wangdi 2000; Nurse and Messerschmidt *et al.* 1998.

<sup>3</sup> Our work on these topics was not entirely unique, but was part of a set of on-going studies on these topics being conducted by the staff of the Nepal-Australia Project.

Figure 1. **Profile of Nepal Showing the Approximate Vertical location of Lekh Areas**

(adapted with modifications from Jackson 1999:7, Figure 1-2)



Note that lekh occur on the smaller peaks of the Middle Hills and the mid-levels of the High Mountains

in terms of the people, their culture, forest and pasture resources, and patterns of resource use.<sup>4</sup>

The upper-slopes are distinctive; they are located far from urban centres and they are difficult to reach. They differ in many ways from the mid-hills as they not only have large and contiguous forest areas and rich biodiversity, but also show differences in a variety of socioeconomic, demographic, and institutional aspects.

## Discussion of Findings

### The environment of upper-slope forests

#### Definition of 'upper-slopes' (or 'lekh')

For the purposes of the study the upper-slopes of the central Himalayas are defined as the area lying between 2,300 and 4,000masl.<sup>5</sup> This definition is based on local perceptions of differences between the *lekh* and Nepal's mid-hills (*pahad*, *besi*) and lowlands (*Terai*). Local people living within or near the *lekh* usually specify the upper-slopes according to a variety of distinctive circumstances and conditions, in which the land-use patterns change from predominantly agricultural to predominantly forest/grassland livestock husbandry, largely above 2,300m. Note that the Nepali term '*lekh*' and the English 'upper-slopes' are synonymous.<sup>6</sup>

<sup>4</sup> See the full report for greater details; Messerschmidt and Rayamajhi 1996

<sup>5</sup> In our earlier report, we set the lower limit of the upper-slopes at 2,000m, but have revised it upwards to conform more closely with local perceptions as well as with other environmental factors noted. Hereafter, the upper-slopes are defined as lying between 2,300 and 4,000m. Note that some of our research was carried out below the lower limit of this definition, as described in the text.

<sup>6</sup> The correct spelling of the Nepali term for the upper-slopes (transcribed to English from Devanagiri script) is *lek*. We have opted, however, to use the more common and popular (mis)spelling: '*lekh*'. We are indebted to Ram B. Chhetri for pointing out this orthographic discrepancy.

The definition of 'upper-slopes' is exemplified by the opinions of various experts and from brief remarks in the literature (LRMP 1986; Metz 1991, 1994; BZST 1993a,b; Jackson *et al.* 1993; BPP 1995b; Panday 1995; Jackson 1999). In general, the upper-slope forests and their environs are characterised as being more remote and isolated, with more severe climatic conditions, less accessible infrastructural advantages, more limited institutional attention, and greater difficulties in achieving subsistence livelihood than other areas.<sup>7</sup> These are broad generalities and are based on comparison with the mid hills; hence, they are not necessarily universally applicable and can be refined through more intensive scrutiny.

Because livestock grazing on the upper-slopes involves important resource management strategies, it is important to note the general context of environmental and socioeconomic characteristics under which livestock grazing operates. Thus, in brief, the *lekh* is defined as a place combining some or all of the following characteristics.<sup>8</sup>

- **Inaccessibility.** Most *lekh* forests are relatively inaccessible, compared with mid-hill forests. This results from:
  - the generally long distance from downslope settlements;
  - seasonal conditions (especially winter weather, deep snow, monsoon rainfall);
  - aspect (e.g., northern aspects are colder, with more snow); and
  - terrain (often quite steep and rugged).
- **A distinctive set of high altitude resources.** *Lekh* forests represent distinct species, associations, and forest types, in distinct high altitude combinations. They are generally dominated by:
  - broadleaved tree species (e.g., oak, rhododendron), conifers (fir, hemlock, juniper), mixed forest and associated trees and shrubs, many of which are not found at lower elevations;
  - large tracts of dense high forest and vast, open alpine pasture lands;
  - a generally wide range of wildlife species in greater numbers than in the densely populated mid hills; and
  - a lower population (overall and per village).
- **Traditional patterns of use.** Most *lekh* areas are defined with three basic criteria of use in mind:
  - being at or above the upper limit of agriculture (agriculture is absent for the most part, livestock husbandry is more prevalent) and having generally, little integration with mid-hill farming;
  - focused on single-purpose and single product activities (less diversity of use than in the mid-hills), and
  - based largely on seasonal accountability and seasonal availability of resources.

<sup>7</sup> As Jackson has noted elsewhere, "Nepali villagers generally use the term *lekh* to refer to upland areas that seasonally receive snowfall, but do not have permanent snow and ice." Furthermore, "The *lekh* areas can be considered as social and ecological 'cross-roads' between the lower and elevation temperate Middle Hills and the higher elevation alpine areas of the Himalayan range and the Tibetan Plateau" (1999:5).

<sup>8</sup> These characteristics may be compared with the 'mountain specificities' identified and discussed by Jodha (1998).

In areas of the upper-slopes *lokta* bark (used in paper-making) and *nigaalo* (bamboo used for wicker crafts) are harvested in winter. Fuelwood (*daura*) is usually cut by late winter or early spring. Transhumant livestock grazing (*ghumti charan*) climaxes in the high pastures during the summer monsoon, starting with a spring ascent through the highlands and ending with an autumn descent back to the lower slopes.<sup>9</sup>

### The Socioeconomics of Upper-slope Forests

#### *Primary and secondary users*

The ethnic identities of the people who live in or in close proximity to upper-slope forests vary by locale (especially by altitude), sometimes by season and specifically by *lekh* and district. The Tamang and Sherpa are the majority populations living in or near and using the resources on the upper-slopes of the Himalayas in Sindhupalchok district. The highest permanent settlements include Sherpa and Tamang villages at approximately 2,500m altitude on Helambu *Lekh* and 2,700m on Kalinchok *Lekh*, respectively, both in upper Sindhupalchok.

The Tamang and the Sherpa are also among the primary users of highland resources, in fact they predominate. The Tamang have the highest numbers (33% of the total population of the two districts). Sherpas rank fifth (only 4%). Secondary resource users, ranking between Tamang and Sherpa, include the typical mid-hill caste and ethnic groups such as Brahmin, Chhetri, Kami (Blacksmiths) and Newar. They are most directly involved in managing upper-slope resources and most directly affected by changes in policy or in the socio-economic situation, particularly as they relate to livestock husbandry, community forestry, and buffer zone activities (e.g., adjacent to Langtang National Park in Sindhupalchok).

Note that some primary users of resources of Himalayan *lekh* reside at lower altitudes, sometimes far below the *lekh* in altitude. Similarly, the secondary and tertiary users of the *lekh* typically come long distances (or their representatives; e.g., local herders entrusted with the management of cattle owned by valley dwellers). They tend to use upper-slope resources more on a strictly seasonal basis, often coming with permits issued by district government authorities, especially to gather *jaributi* (medicinal plants). The primary users, on the other hand, living closer to the *lekh*, tend to use them more or less in all seasons. The presence of seasonal lower slope 'outsiders' is one of the distinguishing features of use of upper-slope forest.

#### *Land use and forests*

There are three main land-use types in *lekh* areas: agricultural, forest and shrubs, and non-agricultural including grasslands. In both the *lekh* areas studied, forest and shrubs are the dominant vegetation group. Livestock grazers use a mixed resource base, consisting of all three land use categories in various combinations. Livestock grazing occurs in each – spring, summer, and fall in the

<sup>9</sup> Terminology in italics designates common Nepali usage.

high forest/shrub and grassland pastures and during winter in the fallow agricultural fields at lower elevations. Of these, high forest/shrubland grazing is of equal, if not greater, importance than grazing the open alpine pastures, since they are used during both the upward and downward transhumant cycle, while the highest grasslands are used for a relatively brief period only during the snow-free summer months. It is important, then, to note the specific characteristics of *lekh* forests and shrublands.

The high forests and shrublands have four broad vegetation types: coniferous forest, broadleaved forest, mixed forest, and shrubs. The distribution of vegetation types mainly reflects climate, topography, altitude, and aspect. The distribution of some vegetation types is also affected by human impact.<sup>10</sup>

Coniferous forests at the lower altitudes of the *lekh* are dominated by *Pinus wallichiana* (*gobre salla*; Blue Pine) and *Tsuga dumosa* (*thingre salla*; Hemlock); and, at higher altitudes by *T. dumosa*, *Abies spectabilis* (*talis patra*) and *Juniperus* spp (*dhupi*, *dhupi salla*; Junipers). The broadleaved forests are dominated by various *Rhododendron* spp (*gurans*), *Quercus* spp (*kharsu*, *bangsi*; Oaks), *Symplocos* spp (*kaalikath*), and *Myrsine capitellata* (*setikath*) in all zones. The mixed forests consisted of both broadleaved and conifers. In general, the shrublands are degraded forms of forests and often show the greatest impacts of open grazing.

In our study area in the Mahabharat *Lekh* of Kabhrepalanchok, the area covered by forest (excluding forest plantations) declined from 42% in 1978 to 35% in 1992.<sup>11</sup> Conversely, the area under grassland has increased by the same proportion, while the area of shrubland has remained virtually unchanged (Tamrakar 1995, Jackson *et al.* 1998).

By comparison, in the area sampled in the Himalayan *lekh* of Sindhupalchok, the area covered by forest has declined from 86% in 1978 to 65% in 1992, a loss of forest from 19% of the total land area over the 14-year period. Of this amount approximately two-thirds was replaced by shrubland and one third by grassland (Tamrakar 1996, Jackson *et al.* 1998).

As noted below, decreasing forests and concomitant increasing shrublands and grasslands are not characteristics of *all* areas in these two districts, but the fact that this phenomenon occurs here on the upper-slopes begs the question *why?* To answer, we now examine conditions in the two *lekh* areas in light of cultural adaptations, local lifestyles, and local management systems, especially as they are related to livestock management in response to resource scarcity. Following that, in the last section of the paper, we discuss recent and current management decisions and responses.

<sup>10</sup> Schmidt-Vogt (1988) has made similar observations, especially regarding the effects of human impact on land-use patterns. See also Jackson (1999).

<sup>11</sup> These figures are based on the total area of 12 local administrative units called VDCs (Village Development Committees; previously *Panchayats*), and include some forests below 2,300m, the lower limit of the upper-slopes.

### **Human and livestock impacts**

The forests of the upper-slopes contain a vast wealth of biological biodiversity, much of which is important for local subsistence economies in the region. These biological resources are also important for the part they play in soil and water conservation. They are used in a variety of ways by many people. The livelihoods of local people depend to a great extent on resource quality and condition, access, and their sustained use as both raw materials and their value-added products.<sup>12</sup>

The upper-slope forests and their environs in both districts have been impacted heavily by human and livestock use. There were strong indications that, based on a variety of land-use changes and changes in forest resource conditions and qualities, some species and forest-types are threatened with degradation, to the point of extinction in some localities. For example, there has been a profound impact on selected fodder and timber tree species and on eco-types in both *lekh* areas (most seriously between 2,500 and 3,000m) as a result of excessive grazing, lopping, and harvesting of timber. This has led to changes in forest type,<sup>13</sup> and it raises questions of how more sustainable management can be effected.

The total area of upper-slope forests had declined in both districts of the study area, and forest area had been replaced by shrub and grasslands. There had also been a decline in the total area of agricultural land within the lower *lekh*. Loss of marginal agricultural lands and degradation of grasslands are accompanied by an increase in other categories of land use such as landslides, water bodies, and settlements.

In contrast, Jackson *et al* (1998) have shown that, between 1978 and 1992, in three lower-slope village development units (VDCs) of Sindhupalchok and in five of Kabhrepalanchok, there was a net increase in forest and agricultural land with a concomitant decrease in shrublands and grasslands. Other studies in four lower catchment areas of Sindhupalchok and Kabhrepalanchok, by the same authors, show a net increase in forest land with a decrease in shrub and agricultural lands.

It is also interesting to note a report of forest area changes in three hill districts in eastern Nepal in an area somewhat comparable to the study area. The forest area was found to be decreasing in Sankhuwasabha and Terhathum districts and increasing slightly in neighbouring Dhankuta district. All three districts showed a net decrease in the area of shrublands and grasslands and an increase in the area of agricultural land (Shrestha 1994).

<sup>12</sup> Throughout this study we hold to the distinction between 'forest resources' and 'forest products'. Forest resources are defined as the raw materials from a forest. They remain as resources until well after harvesting when they become, after some work or processing, value-added products for home use or market. See Messerschmidt *et al.* (in press), after Messerschmidt and Hammett (1998, 1994). Forest resources and their products are important in both the subsistence and commercial economies of the Himalayas.

<sup>13</sup> This findings for Nepal are supported by recent research in the mid- to high mountain areas of the eastern Himalayas of Bhutan (Davidson 2000).

Our transect surveys indicate that the less accessible, more remote, higher altitude forests were more dense and mature than those closer to human settlements, as expected. Livestock pressure plays an important role in the overall decrease in density and increase in immaturity of forests in remote areas that are inaccessible from village settlements. Vast areas of shrubland were encountered at lower elevations, a result of extensive pressure and removal of the forest cover for both subsistence and commercial needs.

A medium soil cover (ground cover) was found along the transects surveyed between 2,000 and 2,500m and above 3,000m. Sites between 2,500 and 3,000m generally had less lower soil cover than sites lower down. These forests are used intensively throughout the year, especially the forest pastures which are subjected to concentrated livestock grazing and trampling at the cross-over point where the lowest winter yak-*chauri*<sup>14</sup> pastures and the highest summer water buffalo/common cattle pastures overlap. Where livestock pressure is highest, the forests are found to be seriously damaged, thus creating 'hot spots' needing management attention. Thus, relatively severe forest degradation is evident at the highest and lowest elevations of the upper-slopes.

We found human impacts to be pervasive at all altitudinal ranges, a finding supported by other researchers (Alirol 1979; Schmidt-Vogt 1988). There was some difference at lower altitudes, however, where both protected forests and high density shrublands are found in several areas.

In most of the lower altitude forests (from 2,000 to 2,500m), extreme pressure is being exerted as a result of the collection of fuelwood and fodder for subsistence purposes by the people from nearby settlements. In most of the areas surveyed, formerly high canopy forests have been or are currently being converted into very sparse forests and shrublands. In some of the higher *lekh* forests, important fodder trees, especially *Q. semecarpifolia*, are so heavily lopped that they are virtually branchless and produce no seeds at all. The threat to forest regeneration is clear; on the lower *lekh*, for example, one species of Oak (*Q. lamellosa*) has been virtually eliminated in this way.

The number of shepherds' camps (*goth*) in an area varies greatly across the Himalayan *lekh* of Sindhupalchok district, according to the locale. For example, the average number of yak-*chauri* herds using an area of two to three kilometres in radius for grazing ranged from 30 to 125 in the Kalinchok and Bhairab *Lekh*, but was only 0 to 6 over the same radius in the Cho-Cho and Yangrima *Lekhs*. The total number of yaks and *chauris* per *goth* ranged from 10 to 40.

The expansion of herds and pastures tends to affect the forest in two ways. One is the effect of herders cutting poles and immature trees to make temporary sheds and fences. Another is the effect of livestock browsing on the young regenerating seedlings, thus destroying them and reducing the regenerative capacity of the vegetation.

<sup>14</sup> *Chauri* is a general term for the offspring of common cattle and yak.

It is important to note that, contrary to general assumptions, the condition of the forest does not always improve with increasing distance from settlements. For example, change is clearly evident even at relatively great distances from settlements in the troubling transition zone between seasonal yak-*chauri* and water buffalo-cattle herding. Forests are always altered, though perhaps not irreversibly, where seasonal or permanent shepherd camps are been established. The serious changes associated with pressure on forest resources around shepherd camps are also accelerated by forest fire. Extensive damage, caused by a forest fire which occurred around 1970, can be seen at elevations between approximately 2,900 and 3,800m in the Kalinchok and Bhairab *Lekhs* of north-east Sindhupalchok. These areas suffer from soil erosion and land degradation on the upper-slopes.

### **The Livestock Management System**

In Nepal, 90% of the population is dependent on agriculture for their livelihood. Agriculture is a complex subsistence system in which livestock are an integral part of agricultural production. Herding of livestock and agro-pastoral management systems in the hills and mountains of Nepal are the result of a long tradition. However, a number of changes has taken place in livestock management in the study area in recent years (within the present generation) in response to the changing demographic and socioeconomic circumstances and biophysical conditions of the upper and lower slopes. These changes reflect a response of traditional herders. The main types of livestock management systems and the changes that have taken place are summarised in Tables 1 and 2 and Figure 2. We now describe them in more detail.

### ***Upper-slope lifestyles and cultures***

Nepal's highland people have developed a variety of lifestyles and cultures over many centuries of adaptation. In the modernising national economy of Nepal, however, they are in danger of losing their distinct identities as a result of two processes: change in the quality and condition of the upper-slope forest resources on which they depend and a more pervasive process of cultural homogenisation.

The people of Sindhupalchok who live in or near to the *lekh* have two main lifestyles:

- upland livestock herding, and
- upland dry-field (rain-fed) farming.

The herder's lifestyle is closely attached to mobile herds in camps and pastures. The farmer's lifestyle is tied to the land and village. Nonetheless, they are interlinked in the following ways.

- Both lifestyles are rich in tradition, in the sense of containing a vast amount of indigenous knowledge about the *lekh* and long-standing traditions about how to live, adapt, and survive there.
- Both lifestyles are closely interconnected—sometimes both are practised in the same family, or by individuals who move with relative ease back and forth between them over time, in the same or succeeding generations.

**Table 1. Upland Livestock Management, Type of Range, and Sociocultural and Economic Conditions in Sindhupalchok (the high Himalayan lekha) and Kabhrepalanchok (the high Mahabharat lekha) Districts**

| Type of herd – range, altitude, seasonality   | Lifestyle – social, cultural, economic  | Forest Resources – processing, use & products  |
|---|---|--|
| <p><b>a. Long distance, year round full transhumance (highest altitude: 4,500 m +)</b></p> <p><b>Mixed yak-chaury herds (only in Sindhupalchok District)</b></p> <ul style="list-style-type: none"> <li>• Fall–Winter: descent to as low as 2,800m (northern aspect) or 3,000m (southern aspect); at lowest kharkas in December–January</li> <li>• Spring–Summer: ascent to 4,500m +; at highest kharkas July–August</li> </ul> | <ul style="list-style-type: none"> <li>• Tamang, Sherpa<sup>§</sup></li> <li>• herder and family live in a semi-permanent movable camp (<i>goth</i>)</li> <li>• gender-based division of labour; e.g., women and girls collect leaves, grass, and lokta-bark, and prepare milk by-products; men cut poles, bamboo, and do other heavy work</li> <li>• little access to schools</li> </ul> | <ul style="list-style-type: none"> <li>• <u>Primary resource use</u>: grazing of forest and pasture, tree fodder livestock bedding, poles for sheds and fencing, fuelwood, bamboo</li> <li>• <u>Secondary resource use</u>: non-timber forest products (e.g., lokta, medicinal plants), bamboo</li> <li>• <u>Primary products</u>: cheese,<sup>‡</sup> ghee, dried meat, calves, hides, yak tail whisks</li> <li>• <u>Secondary products</u>: bamboo crafts (mats, baskets), guard dog pups</li> </ul> |
| <p><b>Sheep-goat herds (only in Sindhupalchok District)</b></p> <ul style="list-style-type: none"> <li>• Autumn–Winter: descent to valleys as low as 1,500m; encamped on fallow fields December–January</li> <li>• Spring–Summer: ascent as high as 4,000m; July– August</li> </ul>   | <ul style="list-style-type: none"> <li>• Tamang and other</li> <li>• other conditions as above</li> </ul>   | <ul style="list-style-type: none"> <li>• <u>Primary resource use</u>: grazing of forest and pasture, poles for sheds and fencing, fuelwood, bamboo</li> <li>• <u>Secondary resource use</u>: non-timber forest products (e.g., lokta, medicinal plants), bamboo</li> <li>• <u>Primary products</u>: wool, meat, livestock for sale, animals for rituals</li> <li>• <u>Secondary products</u>: chickens (raised in the camps), dog pups</li> </ul>  |

**Notes:** Sometimes a few goats are kept with yak-chaury herds in the highlands; see also goat-keeping under 'Stall-fed Livestock Management', below.

\* Primary resource use directly supports herding; secondary use indirectly supports the overall subsistence enterprise by value-added processing and sale, trade or home consumption. Primary products are animals or their by-products; secondary products indirectly support the enterprise. The resources and products may not, of course, all be used by the same individuals; they are generalisations.

§ Schmidt-Vogt (1988; pp209-214) describes transhumant yak-chaury husbandry as the exclusive domain of Sherpas; that of mixed herds of water buffalo, common cattle, sheep, and goats to be the exclusive domain of Tamangs; and all other husbandry types to be open to anyone regardless of caste or ethnic identity. In very general terms, Schmidt-Vogt may be correct. There is a problem in Sindhupalchok; however, in identifying (or differentiating) some Sherpas from Tamangs. We often heard references to *sakkali* (genuine) and *nakkali* (fake) Sherpas, implying that some are socially upward-aspiring Tamangs. We observed both Tamangs and Sherpas tending yak-chaury herds. ‡ Three kinds of cheese are produced as the cash crop products of livestock herding: a) home-made *churpi* (dried cheese sticks) common in yak-chaury *goth*s; b) *khuusa* (sweet condensed cottage cheese) common in areas, whereas buffalo milk is produced; and c) factory-made cheese in commercial rounds from both yak-chaury and buffalo milk.

| <b>b. Short distance, short period semi-transhumance (highest altitude: &lt; 3,000 m). Two variants — (i) Himalayan lekhs and (ii) Mahabharat lekhs</b>   |  |   |
|---|--|---|
| <p><b>i. Water buffalo and common cattle herds, on the Himalayan Lekhs of Sindhupalchok District</b></p> <ul style="list-style-type: none"> <li>• Winter: low valley bottoms, down to 1,200m</li> <li>• Summer: high pastures to 2,800m (northern aspect) or 3,000m (southern aspect)</li> </ul>  | <ul style="list-style-type: none"> <li>• Tamang, Sherpa, Chhetri, and others</li> <li>• Usually adult male herders, often accompanied by older male children. Some herders hired by livestock owners</li> <li>• Usually female family members stay at home as subsistence farmers</li> <li>• Access to schools and other facilities</li> </ul> | <ul style="list-style-type: none"> <li>• Primary resource use: grazing in forest and pasture, tree fodder leaf litter for bedding, poles for sheds and fencing, fuelwood, bamboo for mats and crafts</li> <li>• Secondary resource use: non-timber forest products (e.g., lokta-bark, medicinal plants), bamboo</li> <li>• Primary products: milk, ghee, cheese, fertiliser, meat, hides</li> </ul>   |
| <p><b>ii. Water buffalo and common cattle herds on the Mahabharat lekhs of Kabhrepalanchok District</b></p> <ul style="list-style-type: none"> <li>• Winter: stalled at or near settlements (seldom over 2,200m), occasionally grazed on fallow fields or in nearby forest and shrublands</li> <li>• Summer: ascent to pastures up to 2,900m</li> </ul> | <ul style="list-style-type: none"> <li>• Tamang, Chhetri, Newar, and others</li> <li>• Usually adult male herders, often accompanied by older male children-some herders hired by livestock owners</li> <li>• Usually female family members stay at home as subsistence farmers</li> <li>• Access to schools and other facilities</li> </ul>   | <ul style="list-style-type: none"> <li>• Primary resource use: a) <i>traditional</i> — grazing of forest and meadows, tree fodder, leaf litter for bedding, poles for sheds and fencing, fuelwood, bamboo for mats and crafts</li> <li>b) <i>for modern stall-feeding</i> — tree fodder, cutting grass, a few poles for stalls and fencing, conversion of agricultural products/waste into milk</li> <li>• Secondary resource use: fuelwood, timber</li> <li>• Primary products: milk, ghee, cheese, fertiliser, meat, hides</li> </ul> |

Note: Traditional semi-transhumance herding has been totally abandoned in Kabhrepalanchok's lekhs within the present generation, replaced by stall-fed livestock management.

| c. Stall-fed livestock management (permanently at the family homestead in the village) An adaptation primarily for increased milk production.   |   |  |
|---|---|--|
| <p><b>Water buffalo and common cattle management in both study areas</b></p> <ul style="list-style-type: none"> <li>• Year round: stall-fed livestock with some brief grazing near the <i>lekh</i></li> <li>• Improved buffalo breeds, with good milk-producing capacities; also cattle for traction</li> </ul> | <ul style="list-style-type: none"> <li>• Any caste or ethnic groups (low castes sometimes discouraged by higher castes for ritual 'purity' reasons)</li> <li>• Conducive to male out-migration for labour or business opportunities</li> <li>• Women and girls manage livestock enterprise</li> <li>• Access to schools and other facilities</li> </ul> | <ul style="list-style-type: none"> <li>• Primary resource use: intense use of fodder trees lopping in nearest low <i>lekh</i> forests, cutting grass, major fuelwood consumption for cheese-making (especially sweet condensed <i>khuwa</i>), a few poles for stalls and fences, leaf litter for bedding</li> <li>• Primary products: milk, cheese, ghee, meat, hides, fertiliser</li> </ul> |
| <p><b>Goat-keeping, in both study areas</b></p> <ul style="list-style-type: none"> <li>• Year round: kept in stall and grazed daily on village shrublands and forests</li> </ul>  | <ul style="list-style-type: none"> <li>• All castes and ethnic groups</li> <li>• Mostly women's enterprise with help from girls and boys who graze the animals and cut fodder and grass near the village</li> <li>• Overall, similar to the stall-fed management conditions described above</li> </ul>  | <ul style="list-style-type: none"> <li>• Primary resource use: tree and grass fodder (a selective browser), poles for stalls, leaf litter for bedding</li> <li>• Primary products: milk, meat for ritual-religious purposes, fertiliser, animals for sale (cash income)</li> </ul>   |

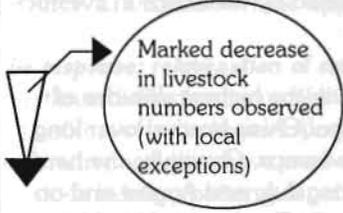
**Table 2. Change in Transhumant Livestock Herding Lifestyles on the Upper Slope (*Lekh*) Areas Visited**

| Change  | Name of <i>lekha</i>   | Description of Lifestyle Change*   |
|---|--|--|
| <b>Himalayan <i>lekha</i>, Sindhupalchok District</b>   |  |  |
| <b>Increase</b> ↑   | <ul style="list-style-type: none"> <li>• Bhairab</li> <li>• Kalinchok</li> </ul>                       | <ul style="list-style-type: none"> <li>- Increased number of yak-<i>chauri</i> livestock units, registered herds and pastures in use</li> <li>- Transition zone between yak and buffalo herds under heavy pressure</li> <li>- High competition in livestock herding overall</li> <li>- Good market for milk by-products (esp. <i>churpi</i> cheese) and sales of animal (calves).</li> </ul> |
| <b>Same</b>   | <ul style="list-style-type: none"> <li>• Cho-Cho</li> </ul>  | <ul style="list-style-type: none"> <li>- No significant change seen or noted on transects, nor heard from local informants</li> </ul>  |
| <b>Decrease</b>   | <ul style="list-style-type: none"> <li>• Yangrima-Helambu</li> <li>• Ripar-Bagamghyang</li> </ul>      | <ul style="list-style-type: none"> <li>- Some decrease in usage and improved condition of fodder sources noted</li> <li>- Informants say that because of heavy competition and resource pressure, the number of herds and livestock units has decreased within this generation.</li> </ul>   |
| <b>Mahabharat <i>Lekha</i>, Kabhrepalanchok District</b>  |  |  |
| <b>Abandoned</b> ↓  | <ul style="list-style-type: none"> <li>• Walting-Buddhakhani-Sipaali</li> <li>• Dhungkharka</li> </ul> | <ul style="list-style-type: none"> <li>- Changing economic opportunities and out-migration during present generation</li> <li>- Conversion to stall-fed livestock management for milk/cheese production</li> <li>- Increased pressure on nearby oak forests for cutting fodder, easy access to markets</li> </ul>  |
| <p>* See Figure 2 for concomitant changes in the condition of the natural resource base (pastures, forests and fodder trees).</p> |  |  |

- Both lifestyles are dependent in complex ways on the variety of resources of the upper-slope forests, without which they would be seriously threatened—they both require access to fodder for livestock, wood for fuel and timber for construction purposes, and herders especially need access to good pastures (*kharka*). Thus, sustainability of these resources is a paramount concern.

The upland dry-field farmers transfer considerable biomass energy between forests and fields in the form of forest fodder and livestock bedding materials (broadleaf litter and conifer needles), directly by lopping or indirectly through the conversion of fodder to animal manure. There is often a symbiotic association between upland farmers and herders, whereby animals are allowed

Figure 2. Projected and observed changes in upper slope livestock grazing patterns, 1968 to present (based in part on Alirol 1979)

| Changing livestock numbers by years   | Alpine/subalpine grass lands   | Forest   | Fodder trees   |
|---|--|--|--|
| <b>Consultants' observations across all Lekhs visited</b>   |  |  |  |
| <b>1996 Observations</b> <ul style="list-style-type: none"> <li>• decline in livestock numbers and herds in some areas; increase in others</li> </ul> | <ul style="list-style-type: none"> <li>• over-grazed</li> <li>• degraded</li> <li>• loss of local interest in herding in some areas due to heavy competition on poor pastures</li> </ul> | <ul style="list-style-type: none"> <li>• severely degraded</li> <li>• poor regeneration of some valued species</li> <li>• less valued species predominating</li> <li>• composition of forest changing</li> <li>• some forest types threatened</li> <li>• loss of local interest in forest herding and switch to stall-fed practices</li> </ul> | <ul style="list-style-type: none"> <li>• insufficient to meet annual demand</li> <li>• some species exterminated and forest types threatened</li> <li>• less desirable species collected</li> <li>• more fodder trees on private land</li> <li>• stall-fed practices increasing</li> <li>• fodder substitutes being used (e.g., oil cake, stalks, and branches)</li> </ul> |
|   |  |  |  |
| <b>Alirol's projections for Kalinchok lekha</b>   |  |  |  |
| 1988  | <ul style="list-style-type: none"> <li>• over grazing (risk of severe degradation)</li> </ul>  | <ul style="list-style-type: none"> <li>• forest degradation (no regeneration)</li> </ul>   | <ul style="list-style-type: none"> <li>• totally insufficient to meet demand for winter feeding</li> </ul>   |
| 1978  | <ul style="list-style-type: none"> <li>• entirely used</li> </ul>  | <ul style="list-style-type: none"> <li>• substantially used</li> </ul>   | <ul style="list-style-type: none"> <li>• over used (winter loss of weight)</li> </ul>  |
| 1968  | <ul style="list-style-type: none"> <li>• under used</li> </ul>   | <ul style="list-style-type: none"> <li>• partially used</li> </ul>   | <ul style="list-style-type: none"> <li>• entirely used</li> </ul>  |

Alirol (1979) correctly pre-dicted increase in livestock numbers in Kalinchok

**NOTE:** This figure is an adaptation and expansion of Alirol's 'Foreseeable development of the grazing pattern in the Kalingchowk region' of NE Sindhupalchowk *lekh* (1979: 177, Table 21). Alirol's projections for Kalinchok *lekh* were good, both Kalinchok and neighbouring Bhairab *lekh* have indeed seen an increase in livestock numbers and herds in the 18 years since his study. Present observations indicate that the increase of livestock pressure in some locations has contributed to an overall decline in fodder resources and pasture quality.

to graze in the agricultural fields during winter in return for provide manure. We observed a number of winter shepherds' camps (*goth*) established in farmers' fields and being moved between fields in the lower *lekh* (where preparations for the spring upward movement were underway). Great energy is exchanged in this way between herd and farm.

Upland herding is closely adapted to forest conditions on the upper-slopes, but places intense pressure on the resource base. Much of our attention was drawn to this lifestyle, both because of the nature and outcomes of its associated forest resource-use patterns and because of certain other aspects, which are important to understand when considering future upper-slope, forest resource management initiatives.

### ***Upland livestock management systems***

Transhumance herding in Nepal is a cultural system characterised by mobile camps (*goths*) and seasonal movement between pastures (*kharkas*), ascending during spring to the summer pastures and descending during autumn to the winter pastures.

There were three styles of livestock management in the study area – full transhumance, semi-transhumance, and stall-fed livestock management (non-transhumance) (Table 1). Two of these are based on the seasonal transhumance movement of herds on the *lekhs* and are distinguished by variations in livestock type, altitudinal range, seasonality, and ethnicity.

- **Full transhumance pastoralism** is practised in the highest altitudes of Nepal and neighbouring Tibet (crossing the Nepal/China border) over long distances with year-round movement of mobile camps. Generally, the herds and shepherds stay on the highest pastures during July and August and on the lowest pastures during December and January. Two kinds of herd are involved in full transhumance: yak-*chauri* and sheep-goat (see Palmieri 1976, Alirol 1979, Brower 1987, Stevens 1993).
- **Semi-transhumance pastoralism** is conducted over short distances for fewer months of the year, with the same spring-autumn, up-down movement but maintaining a base camp at or near a settlement in which the herds are sometimes kept for up to half a year (over winter). Mixed or separate herds of water buffalo and common cattle follow this pattern.
- **Stall-fed livestock management** (non-transhumance) has virtually none of the distinguishing features of the transhumance systems noted above. Instead, it is based on a stall-feeding regime at the farmer's home base. Water buffalo (often of improved varieties), cattle, and goats are typically kept in this manner. They may be taken into nearby fields, shrubland or forests to graze but are kept in stalls at night or even most of the day, depending on the type of livestock (Table 1).

The causes and effects of the recent changes in livestock management styles include a complex array of new opportunities brought on, in part, by the construction of new roads into formerly remote locales; the opening of new markets for agricultural, livestock, and forest products; greater access to schooling and health facilities, including the supply of clean water; and new or expanding opportunities for migrant labour and small business investment in and out of Nepal. The result has been an overall pattern of sometimes dramatic social and economic change.

For example, out-migration in search of labour or business opportunities elsewhere (to Kathmandu, and to India and other countries) has modified and,

in some instances, irreversibly changed highland lifestyles of both herding and farming. Furthermore, local social and cultural expectations have altered, based on the cumulative effects of access, principally to education and better health facilities. Such social changes are not necessarily bad, but many of them are not easily reversed and they all have an impact on resource use and cultural adaptations.

One result has been a demographic shift of population away from the vicinity of the upper-slopes – the 1991 national census reported declines in population of up to 50% in selected VDCs adjoining the *lekhs* in both of the study areas (e.g., near Dhungharkha and Buddhakhani *Lekhs* of Kabhrepalanchok and Helambu, Bhotang and others of northern Sindhupalchok) (HMG/N 1991). This has effected village life as well as the ecological conditions of the forest resources of the upper-slopes (see Tables 1 and 2 and Figure 2).

Overall, our findings indicated that the demographic, socioeconomic, and biophysical situation on the upper-slopes is dynamic, complex, and changing.

### ***The response: rejuvenation of community-based management***

The three distinct patterns of livestock management described above are clear indications of a strategic response of herders to resource scarcity. New income-generating activities have evolved concomitantly with the change in the livestock herding pattern, especially the harvesting of *lokta* (*Daphne*) bark to make Nepali paper, *nigaalo* (bamboo) for wicker crafts, and various *jaributi* (medicinal herbs) for trading. To some extent, these changes lessen the pressure on some resources and increase it on others. To a great extent, they substitute for income foregone by less intensive livestock herding. The traditional and indigenous transhumance system is gradually being replaced by a more sedentary, stall-fed livestock system. Over time, further change in the condition of forest resources should be expected, though it is arguable if the changes will reduce grazing pressure.

Despite various socioeconomic changes and political constraints, traditional livestock grazing systems are still prevalent in some upper-slope locales. The individuals involved, however, recognise the pressures that exist on the resource and have begun to rationalise their use of forest and pasture resources by extra-legal restrictive measures under community or communal pasture management systems. Initiatives include artificial seeding of pastures, breed improvement, and reducing the size of herds.

Several factors need to be understood before the full picture of the local response becomes clear. While pastures are regarded by some as relatively open access, common properties, the imposition of controls in several places by those more involved and concerned has changed people's views of them in important ways. These include the role of the local administrative units (the VDCs) and ward committees, in association with traditional livestock herder associations (*gothaalo samiti*), in controlling access to some upland pastures through strictly managed permit systems. This is a good sign for the development of pasture and forest management and rejuvenation of forest resources and sustainability. In part, these actions reflect how national policy can affect or influence local practice.

The Pasture Nationalisation Act of 1974 has had an important effect on perceptions of pasture tenure, how pastures are treated, how access to them is controlled, and how they are managed overall. Private ownership (previously quite common) of pastures is no longer allowed; all pastures are now under the control and management of the local VDCs. The Act was promulgated prior to the introduction of community forestry and prior to the development of the user group approach to natural resource management, both of which began with the Decentralisation Act of 1983. It is our observation that, whereas some *kharka* management is both *de facto*<sup>15</sup> and *de jure*<sup>16</sup> under the control of the VDCs and wards, there is a potential for relatively non-political user group management and it is encouraged and enabled by more modern policy, for example, the government's progressive community forestry and buffer zone laws and regulations (HMG/N 1973, 1993a, 1995, 1996).

Sustainable management of upper-slope forest resources depends on a series of interactions between the resource use and management practices of communities on the upper and lower slopes. The user group, community management approach may, however, need to be adapted and modified to fit some of the special circumstances of the upper-slope forests and the buffer zone surrounding the Langtang National Park in upper Sindhupalchok District. Our findings suggest that the long-standing knowledge and experience of user group development, based on the community forestry approach, can be adapted to integrate forest and pasture land into the management of the overall landscape and ecosystem of the upper-slopes.

### Conclusion

The livestock herders of Nepal have a lot of indigenous knowledge about the upper-slopes, their forests, and grassland resource base. The adaptive strategies they have adopted in response to the changing biophysical, socioeconomic, and political situation are remarkable. These observations suggest that there is a very complex set of livestock management systems and variables related to the effect on resources that need further study. Government legislation alone will not solve the problem; if livestock management systems are to survive and prosper there must be commitment and integration of local community (indigenous) initiatives. For example, the community- and user group-based approach to resource management now found in widespread uses in lower slope communities should be adapted and extended to include integrated management of forests and pasturelands of the upper-slopes. Increased technical support and strengthening of participatory management options, particularly among existing resource user groups and interest groups, may result in more effective and sustainable management of the forests and pastures of the upper-slopes, thus reducing pressure on those resources.

<sup>15</sup> *de jure* = legal, formal officially recognised management decreed by the administration, law, etc.

<sup>16</sup> *de facto* = the actual system - the informal system in actual practice

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### Forest Profile by Rapid Assessment

(complete one form for each block of forest, shrubland or grassland)

|                                      |  |
|--------------------------------------|--|
| Name of Forest                       |  |
| District                             |  |
| Village Development Committee        |  |
| Ward Number                          |  |
| Range Post                           |  |
| Information collected by (your name) |  |
| Date information was collected       |  |

#### Main Vegetation Type (circle one)

|           |           |                |                  |              |
|-----------|-----------|----------------|------------------|--------------|
| Grassland | Shrubland | Conifer Forest | Broadleaf Forest | Mixed Forest |
|-----------|-----------|----------------|------------------|--------------|

#### Write the names of the three most dominant species

|  |  |  |
|--|--|--|
|  |  |  |
|--|--|--|

|  |                              |  |  |
|--|------------------------------|--|--|
| Estimated Area (ha)                        |                              | Measured Area (ha)                                 |  |
| Altitude                                   | Yes / No                     | Aspect   |  |
| Local Management?<br>(circle)              | Yes / No                     | Planted? (circle)                                  | Yes / No                               |
| Forest Change in Last 5<br>Years (circle)  | Now Worse /<br>Same / Better | Year (s) of Planting (if<br>planted)               |  |
| Forest Handed-over as<br>CF? (circle)      | Yes / No                     | Current Stocking (if<br>planted, seedlings per ha) |  |
| Forest User Group Code<br>(if handed over) |                              | Stocking Class (if planted,<br>circle one)         | Understocked<br>Stocked<br>Overstocked |

**Forest Condition Characteristic 1**

For forest or shrubland complete the following four forest condition characteristics (refer to Forest Condition Characteristics' Table) then use these characteristics to determine Forest Condition Class (see Forest Condition Class Table). Grasslands are automatically classified as 'Very Degraded Forest'. Definitions of Grassland, Shrubland and Forest can be found in the Definitions' Table.

| SOIL COVER?                            | SOIL COVER CLASS?<br>(circle one soil cover class only) |
|--|---|
| more than 50% of the soils are covered | High  |
| 25% to 50% of the soils are covered    | Moderate  |
| less than 25% of the soils are covered | Low   |

**Forest Condition Characteristic 2**

| CROWN COVER<br>(use for shrubland or forest only) | DOMINANT CROWN COVER CLASS?<br>(circle one crown cover class only) |
|---|--|
| more than 70%                                     | Dense  |
| 40% - 70%   | Moderate   |
| 20% - 40%   | Sparse   |
| less than 20%                                     | Very Sparse  |

**Forest Condition Characteristic 3**

| DENSITY OF REGENERATION                     | REGENERATION CLASS?<br>(circle one regeneration class only) |
|---|---|
| more than 5,000 trees or shrubs per hectare | Dense   |
| 1,500 - 5,000 trees or shrubs per hectare   | Moderate  |
| 500 - 1,499 trees or shrubs per hectare     | Sparse  |
| less than 500 trees or shrubs per hectare   | Very Sparse   |

**Write the names of the three most dominant species in the regeneration.**

|  |  |  |
|--|--|--|
|  |  |  |
|--|--|--|

**Forest Condition Characteristic 4**

| DENSITY OF SEED TREES<br>(use for shrubland only) | SEED TREE CLASS?<br>(circle one seed tree class only) |
|---|---|
| more than 50 seed trees per hectare               | High  |
| 10 - 50 seed trees per hectare                    | Moderate  |
| less than 10 seed trees per hectare               | Low   |

## Annex 1, continued

page 3 of 5

**Forest Condition Class**

Use the four forest condition characteristics recorded above to determine a forest condition class for this block (see the Forest Condition Definitions sheet).

|                                  |                      |          |        |      |
|----------------------------------|----------------------|----------|--------|------|
| Condition Class?<br>(circle one) | VERY<br>DEGRA<br>DED | DEGRADED | MEDIUM | GOOD |
|----------------------------------|----------------------|----------|--------|------|

**Other Information**

|  |          |
|--|----------|
| Participatory Map, Sketch Map, VDC Map or other map exists? (circle one) | Yes / No |
| Reference number of this forest block on map (if map exists)             |          |
| Does a plant species' list for the forest block exist? (circle)          | Yes / No |

**Comments**

|  |
|--|
|  |
|  |
|  |
|  |
|  |

**DEFINITIONS**

| Main vegetation type | Definition |
|----------------------|------------|
|----------------------|------------|

|                  |  |
|------------------|--|
| Grassland        | Vegetation dominated by grass species and where the area covered by tree or shrub crowns is less than 10%.   |
| Shrubland        | Vegetation dominated by woody plants that are multi-stemmed near the ground or, if single stemmed, are less than 2 metres' tall. An upper stratum of emergent trees may be present and comprise up to 5% of the total crown cover. |
| Forest           | Vegetation dominated by woody plants more than 2 metres' tall, with a single stem or branches well above the base. The area covered by tree crowns must exceed 10%.  |
| Conifer Forest   | 75% or more of the tree species present are coniferous.  |
| Broadleaf Forest | 75% or more of the tree species present are hardwoods.   |
| Mixed Forest     | All other combinations of tree species present.  |

## FOREST CONDITION CHARACTERISTICS

| Forest Condition Characteristic | Definition  |
|---------------------------------|---|
| Soil Cover                      | The percentage of the area assessed that has the mineral soil surface totally covered by either live vegetation or a layer of other plant material.                                 |
| Crown Cover (Forest)            | The percentage of the area assessed that is within the vertical projection of the periphery of tree crowns, where tree crowns are treated as opaque.                                |
| Crown Cover (Shrubland)         | The percentage of the area assessed that is within the vertical projection of the periphery of shrub crowns, where shrub crowns are treated as opaque.                              |
| Regeneration (Forest)           | Seedlings, saplings and coppice regrowth of naturally occurring tree species that are less than 2 metres' tall.   |
| Regeneration (Shrubland)        | Seedlings, saplings and other regrowth that do not originate from a stump above ground level and which are of naturally occurring shrub species and are less than 0.5 metres' tall. |
| Seed Trees                      | Trees greater than 2 metres' tall which have healthy, intact crowns capable of producing flowers and seed within one growing season.  |

| VEGETATION CLASS |  |
|------------------|--|
| Grassland        | Vegetation dominated by grasses and other herbaceous plants. The area covered by tall or short grasses is less than 50%. |
| Shrubland        | Vegetation dominated by woody plants less than 2 metres tall. The area covered by tall or short shrubs is less than 50%. |
| Forest           | Vegetation dominated by woody plants more than 2 metres tall. The area covered by tall or short trees is less than 50%.  |
| Conifer Forest   | 75% or more of the tree species present are conifers.  |
| Broadleaf Forest | 75% or more of the tree species present are broadleaves.   |
| Mixed Forest     | All other combinations of tree species present.  |

## FOREST PROFILE BY RAPID ASSESSMENT

## FOREST CONDITION CLASS

| Soil Cover Class | Dominant Crown Cover Class | Regeneration Class | Seed Tree Class  | Condition Class |
|------------------|----------------------------|--------------------|------------------|-----------------|
| Low or Moderate  | very sparse or             | very sparse or     | low              | VERY DEGRADED   |
|                  |                            | sparse             | moderate or high | VERY DEGRADED   |
|                  | sparse                     | moderate or        | low              | VERY DEGRADED   |
|                  |                            | dense              | moderate or high | DEGRADED        |
|                  | moderate or dense          | very sparse or     | low              | DEGRADED        |
|                  |                            | sparse             | moderate or high | MEDIUM          |
|                  |                            | moderate or        | low              | MEDIUM          |
|                  |                            | dense              | moderate or high | MEDIUM          |
| high             | very sparse or             | very sparse or     | low              | VERY DEGRADED   |
|                  |                            | sparse             | moderate or high | DEGRADED        |
|                  | sparse                     | moderate or        | low              | DEGRADED        |
|                  |                            | dense              | moderate or high | MEDIUM          |
|                  | moderate or dense          | very sparse or     | low              | DEGRADED        |
|                  |                            | sparse             | moderate or high | GOOD            |
|                  |                            | moderate or        | low              | MEDIUM          |
|                  |                            | dense              | moderate or high | GOOD            |