

**Kailash Sacred Landscape Conservation and
Development Initiative – Phase II
(India Component)**

on

**Status of low and high altitude grazingland and Issues of
Livestock (migratory pastoralism) in Kailash Sacred
Landscape - India**

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Content

Introduction	1
Kailash Sacred Landscape (KSL)	2
Pindari – Namik – Khalia Alpine Corridor	
Khaliya – Humdhura Corridor	
Riverine Corridors along with Gori and Ramganga	
Riverine Areas of Sarayu-Ramganga- Sharada Regions	
Pastoralism in KSL - India	7
Migratory routes of livestock owners in KSL-India	10
Issues of Livestock (migratory pastoralism) in low and high grazinglands of KSL-India	12
Disruption of trade: Sealing of Indo-China border in 1962 onwards	14
Declining agricultural production and changes in cropping pattern	14
Increased illegal collection of medicinal plants and aromatic (MAPs)	15
Unregulated grazing leads to extraction of natural resources and Fragmentation of grazinglands	16
Changes in socio-economic status of migratory pastoral community	17
Conservation Areas and their Management	18
Improving management, resilience, and adaptive capacity of forests and grazinglands	18
Agriculture, Farming Systems, and Livestock	19
Acknowledgment	
References	

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Introduction

Pastoralism is a type of animal husbandry where livestock grazes in rangelands by nomadic people who move across space and periodical time. Pastoralism is practiced throughout the world across different geographies including Africa, the Tibetan Plateau, the Eurasian steppes, the Andes, Patagonia, the Pampas, Australia, the Himalaya, and many other places. Pastoralism predominantly maintains herds of ungulates, which can include cattle, yak, sheep, goats, horses, donkeys, reindeer, camels, llama as well as non-ungulate species. Pastoralism is practiced in more than 75% of countries by between 200 and 500 million people including nomadic communities, transhumant herders, and agro-pastoralists (World Bank 2008).

Pastoralism is of three different kinds; Sedentary pastoralism, Mobile pastoralism, and Silvopastoralism. Grazing of livestock in limited grazing zones or ranches due to strict political borders leads to sedentary pastoralism. This form of pastoralism is becoming more common with the changing geo-political dynamics across the world. Sedentary pastoralists also raise crops with livestock in the form of mixed farming to diversify productivity. Mobile pastoralism includes moving herds of livestock in search of fresh forage and water, from shorter to longer distances. Transhumance is the form of mobile pastoralism where animals are routinely moved between different seasonal pastures across regions and under nomadism pastoralists their families move with the animals in search of available grazing grounds to supplement their natural resource needs. Grazing in woodlands and forests may be referred to as silvopastoral in which the livestock is periodically grazed inside the forest areas.

Pastoralist communities directly interact with the environment and help to shape ecosystems in different ways; Grazing and browsing at an appropriate level often can help in maintaining the biodiversity of the region in check. Rangeland ecosystems are grazing dependent and balanced pastoralism maintains soil fertility, soil carbon, water regulation, pest and disease regulation, and fire management. Grazinglands cover 5 billion hectares worldwide and sequester between 200-500 kg of carbon per hectare per year, playing a leading role in climate change mitigation. When assessments are adjusted using standard life-cycle methodologies to account for pastoralism's positive environmental externalities the system has lower emissions per unit of production compared to more intensive feed-lot production systems (McGahey et al 2014).

For millennia, the alpine pastures of the Himalayan region have been used for livestock grazing by a large number of agro-pastoral communities (Tucker, 1986). In the Himalayan region, customary institutions have provided the framework for sustainable

use of rangeland resources by pastoralist communities for countless generations (Miller 1998; Banjade and Paudel 2008; Negi 2010).

All along the Himalaya, many groups were previously involved in a complex cross-border network of social, cultural, and economic relations with residents of the Tibetan Plateau that led to the evolution of mutually dependent agriculturalist–trader–pastoralist economies (Van Spengen 2010; Bauer 2004). Migratory pastoralism was thus intricately intermeshed with other livelihood activities like trade and agriculture and was sustained by mobility and enabling customary systems along the migratory routes and rangelands, both within and beyond modern national boundaries.

Observed impacts in pastoral systems reported in the literature include decreasing rangelands, decreasing mobility, decreasing livestock numbers, poor animal health, overgrazing, land degradation, decreasing productivity, decreasing access to water and feed, and increasing conflicts for the access to pasture land (high confidence) (López-Gelats et al. 2016; Batima et al. 2008; Njiru 2012; Fjelde and von Uexkull 2012; Raleigh and Kniveton 2012; Egeru 2016).

Kailash Sacred Landscape (KSL)

The Kailash Sacred Landscape (KSL) transcends geographical boundaries and covers the region of China, India, and Nepal with an area of about 31,000 sq km which includes the southwestern portion of China’s Tibet Autonomous Region (TAR), a northeastern region of Uttarakhand, and districts of the western region in Nepal. The KSL is biologically and culturally diverse and also environmentally fragile. Due to its rugged terrain and remoteness, the region is considered difficult to survive and is mainly civilized by local mountain communities.

The Kailash Sacred Landscape is characterized by numerous sacred sites, including high-altitude wetlands, snow peaks, and a network of religious sites. The religiously famous Mount Kailash and the adjacent Lake Mansarovar are considered extremely sacred by four major religions of the world and are important pilgrimage sites for Hindus, Buddhists, Jains, Sikhs, and Bon. The region is also the source of Asia’s four major rivers: the Indus, the Sutlej, the Brahmaputra, and the Karnali. KSL includes several protected areas coming under different administrative boundaries thereby providing an opportunity for regional cooperation to ensure long-term sustainable development in this one of the important ecosystems.

The KSL varies geographically and culturally covering four physiographic zones (Lesser Himalayan zone, Greater Himalayan Zone, the Trans-Himalayan Zone, and the Tibetan Plateau which is least inhabited). The bioclimatic zones vary in altitude (369-7678 m asl) and topography, and its landscapes include the hot and semi-arid region in the south-west, lush green and humid valleys in the mid-hills, extensive mountain forests, moist alpine meadows, remote and arid trans-Himalayan valleys and high altitude grasslands and steppes along with extensive areas of permanent snow and

ice. The region provides rich biodiversity to the world of both regional and global significance.

The rangelands provide essential watershed functions and support globally significant species of flora and fauna, including many medicinal plants growing in the high altitudes. The flora also provides fodder and other biomass resources for various kinds of migratory pastoralism which are considered the most important livelihood strategy in the landscape (Rawat et al. 2013).

The livestock population within the KSL is quite numerous with local cow and goat varieties being predominant at lower elevations, and yaks, goats, and sheep at higher elevations. Permanent grazing areas and other pasture lands comprise over 27% of the total KSL area, with transhumance, nomadic herding, and on-farm livestock production being important livelihood activities for much of the region. A large percentage of the KSL area is occupied by alpine meadows and alpine tundra, and more than 15% of the entire KSL area is covered by snow and glaciers in high-altitude areas. Grasslands (>27%) are an important and predominant land cover type and land-use, reflecting the important role of herding and livestock activities.

KSL provides global and regional significance and its Transboundary presence provides cross-border cooperation among countries that share the fragile landscape. About 20% of the KSL area is estimated to be under some form of forest cover and an additional 18% is bare or uncultivated fallow. In the southern part of the landscape, which is dominated by human habitation, forest patches appear to be in smaller and more fragmented form than in the northern parts. It is estimated that less than 10% of KSL is agricultural land which is also a major and important source of livelihood for the local mountain communities. The people of this landscape share a cultural heritage and have been linked by historical trade and pilgrimage routes for centuries. They have developed local specific patterns of natural resource use for food, medicine, fiber, and in earlier times, for barter. These 'heritage routes' and remnants of this once-flourishing trade add to the beauty and rich cultural history of the region. However, at present, these communities are vulnerable as they suffer from the impact of remoteness which includes limited infrastructure, transportation, and poor educational & health facilities.

The limited livelihood options together with modern changes in lifestyle due to globalization, accelerating development, environmental degradation, and the erratic weather patterns due to climate change, put these indigenous and local communities, the landscape, and its biodiversity at risk and threaten their long-term sustainability (FAR, 2011, Rawal et al., 2012).

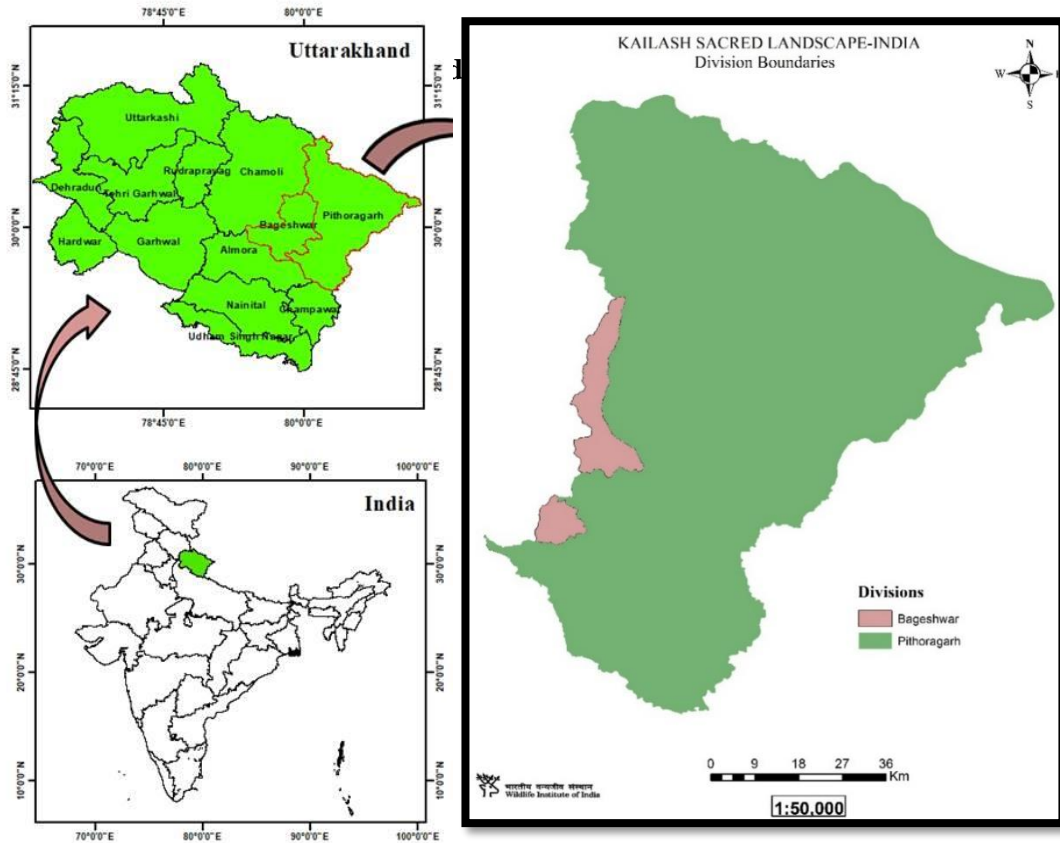


Figure 1. Location map of KSL-India

Kailash Sacred Landscape (KSL) - India is situated in the north-eastern region of Uttarakhand state comprising the district of Pithoragarh (6,826 sq km) and Bageshwar (294 sq km) sharing borders with Nepal and Tibet Autonomous Region (TAR) of China (Fig. 1). The Indian portion of the KSL target landscape is comprised of four major hydrological units, i.e., Panar-Saryu (350 sq km), Saryu-Ramganga (1,500 sq km), Gori-Kali (2,750 sq km), and Dhauli-Kali (2,650 sq km) watersheds, with a total area of approximately 7,120 sq km. Elevation gradient which is a characteristic of bioclimatic zonation ranges from less than 500 m to almost 7,000 m. The total population of the region is more than 460,000. The main languages include Kumaoni (different dialects), Beyanse, Bhotia, Hunia (a Tibetan mixed dialect), Hindi, and Nepali. Indigenous ethnic groups in this area include Van Rawats and Bhotiya. Literacy rates for men are quite high (90%), but not quite as high for women (63%). Approximately 50% of the area is forest land, with an agricultural area (22%) and significant portions of uncultivated area (10%). Permanent grazing areas and other pasture lands comprise 13% of the area. Dominant cropping systems center around paddy, jhangora, mandua, pulses, and potatoes in the Kharif season (October to May), and wheat, barley, masur, ginger, and pepper in the Rabi season (May-November). Vegetables, for example, potatoes, onions, radishes are grown during different times

of the year. The livestock population is quite numerous with local cow varieties being predominant.

The landholdings in the KSL part of India are marginal and fragmented, even then, rich crop diversity has been reported from this area (Kumar et al, 2010; Negi 2010, Plate I). 211 different local varieties of food crops have been identified as grown in this landscape of which 105 have been classified as cereals, 21 pulse crops, and 10 oil-yielding crops. The cropping system includes Paddy (*Oryza sativa*) as the dominant crop with 10 species having 41 varieties, 20 varieties of Wheat (*Triticum aestivum*) and Barley (*Hordeum vulgare*), and 14 varieties of Mandua (finger millet- *Eleusine coracana*) apart from 5 other millets from the *Panicum* and *Pennisetum* species. The rest of the area is under millets including koni, jhangora, jowar, bajara, maize, and oilseeds. Different varieties of fruits and vegetables are also grown in the region. Especially in the higher reaches of Dharchula and Munsyari, several known crops such as Buckwheat (Ogal - *Fagopyrum esculentum* and Phaphar - *Fagopyrum tataricum*), Uwa (*Hordeum Himalayans*), Potato (*Solanum tuberosum*), etc are grown. Two main pulses cultivated in the landscape are Lentil (Masur - *Lens culinaris*) and Black Gram (Moong - *Vigna mungo*). Other varieties of pulses are also grown, such as different kinds of Beans (Kidney Beans, Scarlet Beans, Lima Beans, Soya Beans, etc.) are widely intercropped.

The KSL-India comprises protected Areas i.e. Askot Wildlife Sanctuary (AWLS) and Nanda Devi Biosphere Reserve (NDBR) on its northwest thereby providing an additional benefit of forming a contiguous landform with high conservation and socio-economic value. AWLS covers an area of about 600 sq km. It comprises the reserve forest of Askot Range (289 sq km), 225 sq km of civil and Van panchayat areas, and 85 sq km of Agricultural land (BCRLIP, 2008).



Plate I: A village setup in KSL-India

KSL has a rich diversity of plants, distributed along a gradient categorized into four main bioclimatic eco-zones ranging from subtropical (300-1,800 m asl), temperate (1,500-2,800 m asl), sub-alpine (2,800-3,800 m asl) to alpine (3,500-5,000 m asl). According to Champion & Seth's classification with the recent addition of 6 new forest types, the area represents 8 major groups, 15 subgroups, and 40 forest types (Champion & Seth, 1968; Sinha & Chandran, 2012). It is reported that the KSL-India landscape harbors biodiverse elements ranging from lower groups to the higher ones which include about 3170 species, 288 families, and 1347 genera (Rawal et al 2012). The area is dominated by forest types such as Chir pine (*Pinus roxburghii*) and oaks (*Quercus* species) and this is the westernmost limits of the *Tsuga* and *Macaranga* communities. There are 234 near-endemic and 24 endemic species (together constituting 21% of the flora). 10 species are listed in the Red Data Book, and 11 species have a small population in a narrow geographic range and are under pressure of high demand. Over 172 species are used by local communities with a significant amount of indigenous knowledge based on their traditional knowledge. The area is very rich in terms of the diversity of medicinal and aromatic plants (MAPs). Several well-known botanical hotspots exist in the area, particularly in the alpine zone (above 3,500 m asl) (FAR, 2011; Rawal et al; 2012; Sinha & Chandran, 2012).

Faunal diversity of KSL-Indian Landscape includes 90 fish species, 19 reptiles, 9 amphibians, 193 birds, and 38 mammals. The IUCN threatened list for this area includes 3 critically endangered, 7 as endangered, 7 as vulnerable, and 18 as near-threatened.

This area is particularly rich in cultural diversity with rich heritage sites, regarded as sacred, religious, or otherwise culturally significant. Many pilgrimage routes and associated sacred temples are present in this landscape. There are at least 6 sacred lakes namely Parvati Sarovar, Anchari Tal, Jolingkong Lake, Chhiplakot Lake, Maheshwari Kund, and Thamri Kund apart from having a large number of sacred groves.

This area is particularly rich in cultural diversity having a proud history and many cultural traditions. Different sacredness values within the landscape have contributed to the conservation of biodiversity in this area. In addition to the main pilgrimage routes and associated cultural heritage sites, there are many sites regarded as sacred, religious, or otherwise culturally significant. For example, there are at least six sacred lakes namely Parvati Sarovar, Anchari Tal, Jolingkong Lake, Chhiplakot Lake, Maheshwari Kund, and Thamri Kund apart from having a large number of sacred groves. In addition, there are many festivals and fairs held in this area throughout the year (Negi, 2010).

Following are the important corridors under KSL-India for the exchange of both natural and cultural heritage;

• **Pindari – Namik – Khalia Alpine Corridor:** The tract between upper reaches of Pindari (Bageshwar District) and Namik – Khalia Ridge (Pithoragarh District) is

linked through a narrow alpine belt. This stretch is home to several western Himalayan mammals and avifauna. The contiguity of this landscape is extremely critical for the genetic exchange of various Himalayan fauna.

• **Khaliya – Humdhura Corridor:** The Humdhura ridge is one of the most prominent ridges that run in a north-south direction linking the lower parts of Didihat Block with that of Munsiaiy. This ridge serves as an important corridor for the avifauna and many lower animals. Barjikan - Burphu Dhura - Rajrambha: The Barjikan - Bhurphudhura ridge between Johar and Ralam Valleys forms one of the most important corridors for the migration of flora and fauna between the two valleys. The area is also prime habitat for blue sheep and snow leopard, and be critical for the maintenance of genetic continuity between Johar and Ralam. Likewise, the Rajrambha and Naginidhura form an important corridor between Barjikan and Panchchuli basin for the genetic continuity of flora and fauna.

• **Riverine Corridors along with Gori and Ramganga:** Both Gori and Ramganga Rivers support rich riverine vegetation on either bank. These forests serve as important corridors for migratory birds as well as dispersal routes for a variety of orchids. Hence, the extant riverine stretches are of utmost conservation significance.

• **Riverine Areas of Sarayu-Ramganga- Sharada Regions:** At the lower reaches of the landscape, the riverine areas of Sarayu - Ramgang - Sharada Corridors help maintain travel and dispersal routes for flora and fauna. Detailed studies on the use of important species of avifauna especially kalij and red jungle fowl along these corridors could reveal important facts about their biogeography.

Pastoralism in KSL - India

Pastoralism in KSL-India is prominent since the age millennia, mostly towards the upper reaches of the Himalaya. The pastoral communities of the Pithoragarh district are majorly engaged in mobile pastoralism by rearing their livestock in herds while moving and settling with their families. Migratory pastoralism was sustained by mobility and exchange of traditions along the migratory routes and rangelands, both within and beyond national boundaries. This form of pastoralism in the KSL-India part was also supplemented with other livelihood activities like trade and agriculture.

The seasonal transhumance system adopted by a smaller number of Anwals (shepherds) who live a completely nomadic life by conducting upward migration (from mid-April to May) to summer habitations in need to sow crops while harvesting is done by the end of September, this is also the period for harvesting medicinal plants, mainly kutki (*Picrorrhiza kurroa*), kira-jari (*Ophiocordyceps sinensis*), atis (*Aconitum heterophyllum*) before returning to winter homes in the first half of October.

In KSL - India, the nature of access to rangelands and the volume of migratory pastoralism had already begun to be significantly shaped by the policies of the colonial government starting in the first half of the nineteenth century (Bergmann et al. 2012).

Before the mid-20th century, the geopolitical and institutional conditions in KSL India, China, and Nepal allowed for rangelands and migratory pastoralism to be governed primarily by local level arrangements, which were nested within broader networks of governance. In KSL India, after the British colonialism around the nineteenth century, the administrative dynamics changed and the Britishers decided to cash upon this opportunity. Right from the beginning, the British administration was aware that involvement in the trans-Himalayan trade was crucial for advancing colonial ambitions and expanding their influence to market and resources of Tibet and Central Asia (Moorcroft and Trebeck 1837).

With the developments such as restrictive colonial forestry policies, settling up of reserved forests from the late nineteenth century onward till Indian Independence in 1947 restricted the pastoralist communities to graze their livestock freely in the rangelands. Further replacement of Tibetan wool by imports from Europe and Australia and Tibetan salt by cheaper substitutes from coastal India began to slowly dry up both Indo-Tibetan trade and seasonal transhumance (Guha et al 1989, Roy et al 2003).

A large proportion of the area in KSL-India is rangelands or grazing area (nearly 13%, Plate II). There are five major high altitude pasture areas, situated in the Byans Valley, Darma Valley, Pancha Chuli Valley, Ralam Valley, and Johar Valley. They collectively occupy 1,520 sq. km. In KSL-India, rangelands support more than 40,500 sheep and goats and 1400 cattle and horses. Livestock density in KSL-India rangelands is 27.6 LSU. In KSL-India, traditional mixed crop and livestock farming is widely practiced. The indigenous communities maintain livestock for various agricultural and other uses. Livestock includes cow, ox, buffalo, yak and cross-breeds, sheep and Tibetan sheep, goat and Tibetan goat, horse, mule, and hen. Likewise, livestock husbandry is one of the major occupations of communities in KSL-Nepal. Cattle, buffalo, sheep, goats, yaks, are cross-bred and form major livestock species. Livestock provides numerous functions, including being widely used for transport, but they also are a source of cash from their sale. At higher elevations, communities practice an indigenous system of cross-breeding yaks with cattle for various purposes. High elevation ethnic groups cross-breed yaks to produce female offsprings (jumo, talbuni or garmu) for milk and male offsprings (jhupu, talbu or garu) that are used for draught and as pack animals. Transhumance pastoralism is common among high elevation communities in Nepal and India, along with nomadic herding on the rangelands and high pastures of the Tibetan Plateau in KSL-China.

For livestock production and diversity, the landscape shows the following trends of degradation: (i) growing number of less productive livestock; (ii) increasing demand of fodder and consequent shortage of green fodder during winter and summer season, (iii) declining number of landrace/breeds and unscientific introduction of exotic breeds, and (iv) decrease in available grazing lands. In KSL-India, over-grazing, the rapid growth of productivity, and population have resulted in grassland degradation and desertification, which in turn have triggered a variety of environmental problems,

such as soil erosion, water loss, loss of arable lands to landslides and soil movement, and the loss of biodiversity. Additionally, there is an increasing trend in goat-rearing for cashmere production. Goat-rearing is a severe threat to the alpine ecosystem especially for the steppe and sparse meadows.

The practice of migratory pastoralism depended on well-defined customary institutions, However, with the changes in political scenarios across the borders which underwent significant transformations, first as the result of Indo-China in 1962 war leading to changes in governance structure and had a profound effect on the Himalayan pastoralists, and second through the independence of Uttarakhand state; the trend shifted towards increasing decentralization that saw local communities becoming involved in the management of local natural resources with the new framework of polycentric governance.



Plate II: High altitude grazingland in Byan valley, KSL-India

In the Himalayan region, customary institutions have provided the framework for sustainable use of rangeland resources by pastoralist communities for countless generations (Miller 1998; Banjade and Paudel 2008; Negi 2010). There is much evidence that pastoralism is best managed communally (Herrera, Davies, and Baena 2014) and that forage resources in the Himalaya were historically governed by local communities as common property resources (CPRs) under customary frameworks (Oli et al. 2013).

The pastoral communities in the KSL-India are Bhotiyas, Anwals (Shepherds), and Van Gujjars migrating along the Himalaya at three major grazing zones. The High altitude grazing zone falls under alpine and sub-alpine regions above 2900 m which are covered by the pastoral community during summer months (June-October), Migratory grazing zone under sub-temperate and temperate climatic zone from 800-

2900 m covered during Autumn and spring (October-December and April-May) and the foothill grazing zone in sub-tropical region from 360-1100 m covered by the pastoral communities during winter months (Dec-March). The narrow belt of the outer Himalaya (Bhabar) arises out of the northern parts of the Gangetic Plains (Terai) up to an altitude of approximately 1,000 m sub-humid tropical Sal forests (*Shorea robusta*) are found.

Migratory routes of livestock owners in KSL-India

The Bhotiyas and Anwals migratory patterns span over different ecological zones in the KSL-India each with specific environmental potentials, forest and pasture use. The altitudinal distribution of pastoral grazing zones in the region varies from 360m to 5000 m. Grazinglands across this altitudinal gradient are spread over three distinct geo-climatic zones with different pasture types viz; i. Sub-tropical grazing land of the lower foothills (winter-grazing zone); ii. Sub-temperate- temperate pastures of the middle hills (the migratory route with major *Padavs* or basecamps) and iii. Sub-alpine and alpine pastures of the high altitudes (summer grazing zone). The narrow belt of the Outer Himalaya (*Bhabar*) arises out of the northern parts of the Gangetic Plains (*Terai*). Up to an altitude of approximately 1,000 m, sub-humid tropical Sal forests (*Shorea robusta*) are found. The Lesser Himalaya follows as a 70-100 km broad belt in a northerly direction and covers an altitude between 1,500 and 3,000 m. In lower parts, this zone is extensively covered by *Pinus roxburghii* forests, which often exhibit a herbaceous understorey sustained by intentional burnings. The zone of the High Himalaya is about 30–50 km wide. Glaciated mountain peaks, of which some exceed an altitude of 7,000 m, dominate the scenery. Its narrow transversal valleys give rise to montane forests where evergreen oaks (*Quercus semecarpifolia*, *Q. floribunda*, and *Q. leucotrichophora*) alternate with areas dominated by conifers (*Abies pindrow*, *Cupressus torulosa*) or deciduous trees (*Alnus nepalensis*, *Aesculus indica*, and *Acer* spp.). The high-altitude grasslands are found above 3600 m, which extends into the Trans-Himalaya and forms the northernmost part of Kumaon. With relatively wide and shallow valley bottoms, these localities are covered with meadows and dwarf shrubs, which are widely used as summer pastures (*bugyals*). High passes leading onto the Tibetan Plateau had facilitated a flourishing cross-border trade until the war between India and China created a new periphery in 1962.

The upward and downward migration patterns depend on the seasons of the year which eventually leads to the establishment of the upland and highlands habitation sites in the KSL-India. In this region, the migratory pastoralists move without their families by conducting upward migration in summer habitations during the April-May months in the need of forage, medicinal plants, etc. They climb down to their winter habitations to avoid the harsh climate of the alpine region and camp in their winter sites during the first half of October. Upward migration route begins in the bhabar region of the Himalaya in the Chorgaliya, Kunwarpur of Nainital district located in the western part of the route and Purnagiri area of Champawat district makes the eastern part of the route are their sub-tropical winter grazing camps and from here they migrate

towards the highland sites for their summer habitations. The following are the *Padavs* (officially sanctioned grazing lands) on their way to the highland sites; Kathgodam, Haidakhan, Mornaula, Almora, Bagewshar, Sama, Kwiti, and Munsiyari for the western part of the route, while Tanakpur, Shukhi-dhang, Lohaghat, Ancholi and Bin in Pithoragargh the eastern part. From here the routes divide into two directions, the prior one keeps on going northerly with Kanalichhaina and Dharchula as last major *Padavs* in between in the sub-temperate and temperate grazinglands finally reaching to the highland sites of the migration pastoralist at Chaudhans, Byans and Darma valley in the alpine region. The other direction of the route diverts towards the eastern part with Didihat and Munsiyari as other *Padavs* and merges with the eastern part of the migration pattern originating from the Nainital district reaching Tolu, Burfu, Matoli, and Milam summer migration sites in the alpine region of the KSL-India region (Fig. 2). In this way, almost every segment of mountains of the region contributes to forming the large pastoral landscape. Pastoralists and their livestock have evolved with the forests and their wildlife and are highly adapted to the large altitudinal as well as spatial variation that affects the topography, climate, and natural forage.

The pastoral communities in the KSL-India region have a predefined system to run their migration pattern throughout the grazing seasons. Each shepherd does not stay permanently for the whole grazing season; instead two or three shepherds take turns to rear the animals, while the others go back to their families. Sometimes, they also bring the livestock belonging to richer people who are not involved in livestock grazing and would often give these shepherds their animals to be taken up to the alpine meadows during summer, in return for money. The migratory villagers have two permanent settlements zones: one upper altitude summer settlement region at Milam, Martoli, Burfu, Tola, Darma, Byan, and Chaundans valley. The settled villagers in the upper altitude of KSL-India belong to the Bhotiya tribe. These villagers are traditionally involved in activities such as cleaning and spinning of wool and weaving woolen items like shawls, carpets, pankhi (blanket) along with small-scale agriculture. The transhumant herders (Anwals) are generally people who belong to the lower elevations of the Himalaya, whose main occupations are to rear livestock and involve in small-scale agriculture. Each migratory shepherd group has 3-5 persons, all males along with three to four horses/mules and their three to four dogs. They bring their herds to higher alpine meadows during summers for grazing. All the pastoral groups visiting the area have to furnish personal details about their herd composition, their duration of stay and pay tax fees to the concerned authority every year. The average tax fee is Rs 6 per sheep/ goat and Rs 50 per horse/mule for the whole season. The total number of livestock in the group is in the ratio of 65% is sheep and 35% are goats. The sheep are reared for wool as well as meat, while goats are an important source of meat and wool as well for their making rope and handicrafts. Horses and mules from 1% and 0.2% of the migratory livestock population, respectively and are used primarily for carrying burdens. Each herder group keeps three to four dogs for the safety of livestock, protection from wild animals such as common leopard, wolf, and jackal in the lower regions, snow leopard, and feral dogs in the alpine regions.

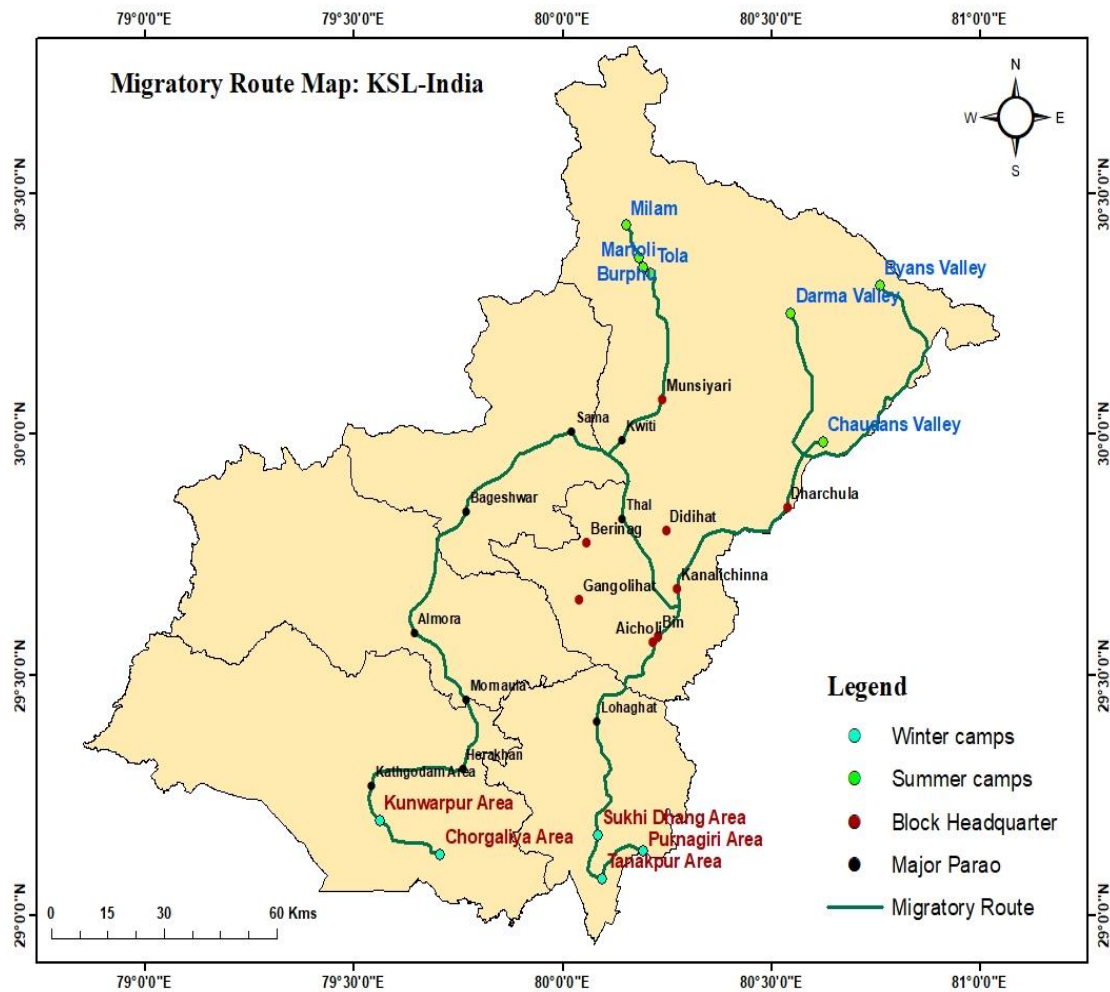


Figure 2: Migratory route map of pastoral communities in the KSL-India

During their stay in the valley, the shepherds use the available natural resources of the area at a nominal price. The pastoralist communities of the KSL-India migrate through different forest types of the Himalaya and depend on natural resources for their forage and habitations need. The dependence of the community on natural resources is so intricate that the balance if not kept would result in unsustainable extraction of resources in the ecosystem.

Issues of Livestock (migratory pastoralism) in low and high grazinglands of KSL-India

Migratory pastoralism practiced in the KSL-India region had a self-sufficient system running since the millennia by keeping sustainability in its backbone. The livestock owners in the Himalaya region were grazing their cattle along the migratory routes with the changing seasons and also conducting trade across the transboundary region. The changes in various geopolitical dynamics, of which the sealing of the Indo-Tibetan border in 1962 is the only most viable example, had one profound effect on Himalayan

pastoralists, particularly through the loss of additional income sources in the trade as well as the massive expansion of infrastructural and administrative structures for military purposes. The increase in the alternate market outside the KSL region and their readymade products changed the market dynamics as well leading to the suffering of the pastoral communities dependent on natural resources (wool, medicinal plants, produced meat, etc.) from the transboundary region. Livestock grazing has been constrained in many forests due to new forest policies with the advent of the independence of Uttarakhand state and the National Forest Policy of India. Accelerated growth due to urbanization and commercial energy generation in mountains has resulted in increasing diversion of forest land and grazing pastures. The natural rangelands used by the pastoralists also support large biodiversity. However, the sustainability of both wildlife and pastoralism has consistently been threatened by the growing anthropogenic activities. Changes in pastoral ownership due to diversification of occupation, reduction in traditional trade and less natural resource extraction have also taken place during the last decades. Very few Bhotiyas and Anwals are now engaged in pastoralism. These phenomena are the indicators of decreasing trend of pastoralism in the region.

The total number of persons currently involved in annual migration and the number of livestock that are taken along with them are not monitored or recorded by any department. This data needs to be generated at least from now on. In Kailash Sacred Landscape-India about 87% of the population resides in rural areas, comprising 1672 villages. The urban area is only 0.38%, which contributes 13% of the total population. About 75.8% population is spread in 23.74% area of the landscape. In general, agriculture and livestock rearing are the main occupations of >70% of inhabitants. However, several studies have observed a marked decline in the traditional practices and migration patterns of pastoralism, as well as its socio-economic viability, in the Himalaya in recent years (e.g. Wu and Richard, 1999; Goodall 2004; Negi 2007; Namgay et al. 2014; Sharma et al. 2014; Wu et al.2014).

The major issues identified of migratory pastoralism in the lowland and highland sites of the KSL-India region are pointing towards the environmental and socio-economic aspects of their lives. Pastoral life depends on both 'natural' and 'socio-cultural' resources, which together drive a given production system and also shape the power relations inscribed therein. Their traditional dependence on natural resources and trade exchange with different within and across the national boundaries have resulted in one efficient system which on changes has disrupted the balance. Following are the major issues discussed on livestock in the KSL-India region:

Disruption of trade: Sealing of Indo-China border in 1962 onwards

The Bhotiyas traders guarded the trade routes and maintained a monopoly over the trans-Himalayan trade with Tibet (the Autonomous Region of China). As sheep and goats transported merchandise, large flocks and herds are needed for the woollen, handloom small cottage industries. Following the Indo-China war in 1962, the Indo-Tibetan border was closed, which led to the instant termination of this flourishing commerce, abandoning two-thirds of the population, who lived almost exclusively on income from trade. As a result of that, the transhumant lifestyle of raising sheep and goats as pack animals and family movement from winter village to summer village, determined trade relations, also dwindled with time. The disruption of trade also hurt several other professions intricately linked to trade; cultivation of crops, sheep rearing (the wool industry), and occupations that helped maintain the community at a subsistence level. The bhotiyas used to produce a variety of woollen products mostly for sale, as long as Tibetan wool was imported, in addition to the wool locally available from one's flock of sheep. After the closure of the border, traditional handicrafts suffered and the community was forced to seek alternate livelihoods. The total sheep population has dwindled from 15,949 in 1987 to a mere 2813 at present, a decline of 82% (Negi et al 2007).

The highland sites (Darma, Chaudans, Byans, and Milam valleys) are drastically affected by the disruption of trade ties between India and China from 1962 onwards. The handloom and small cottage industries situated in neighboring towns who were getting their raw materials (wool and meat) from transboundary had to completely change their dependence from Tibet to other sources within no time. This change in market dynamics affected the migratory pastoral community in the lowland regions of the KSL-India landscape which lead to the reduction in sheep and goat rearing population.

Declining agricultural production and changes in cropping pattern

The termination of trade ties with Tibet after Indo-China 1962 resulted in the loss of crop diversity. Cereals and pulses species are almost absent in the KSL-India region, a single cereal species, *Fagopyrum esculentum* is being grown (Negi et al 2007). Before 1962, durum wheat was produced on a mass scale for trade with the Tibetans. With these changed scenarios, chives (*Allium stracheyi*), which sell for 150-200 Rs/kg, and caraway (*Carum carvi*) which sells for 250 Rs/Kg are the principal remunerative crops grown (Negi et al 2007). Subsistence farming has taken the place of commercial farming in the KSL-India region with its sole purpose being to feed the family.

Food requirement has been grown with a growing population which resulted in the conversion of natural forests and uncultivable lands into farms. In many parts of the KSL-India region, this has led to declination in traditional grazing practices. Rising numbers of fruit orchards mainly of apples on different migratory routes create a

barrier for the herds. Land under miscellaneous tree crop farming has been increased from 4.45% in 2002-03 to 6.08% in 2013-14 (Govt. of Uttarakhand 2014). With the increase in the alternate source of income the agriculture system has also declined in the region.

Increased illegal collection of medicinal plants and aromatic (MAPs)

The upper alpine region of the KSL-India has been cited in the literature as a place where much cultivation of MAPs is taking place. The primary sales MAPs are Yar tsa gumba (caterpillar mushroom or Kira jari) or *Cordyceps sinensis*, found at sub-alpine and alpine pastures in the altitudinal range of 3000 to 5000 m whose current market price hovers at about Rs 50,000-Rs 8, 00,000/ Kg. Caterpillar mushroom is referred to the final form as the fruiting body of the fungus arising out of the dead body of a caterpillar (Devkota, 2006). Various reports are indicating the number of Cordyceps species so far identified; ranging from 200 to more than 400 species. However, about 48 species of Cordyceps have been reported from the Tibetan plateau and Himalayan region (Bhattarai, 2010, Negi, 2010).

Cordyceps sinensis is the most discussed and prioritized species and has been reported from four countries namely Bhutan, China, Nepal, and India distributed along the Himalaya and Tibetan plateau. This income from wild MAPs amounts to more than half of the total earnings from agriculture, livestock, and cultivation of spices and MAPs combined. Overexploitation of MAPs is leading to increased pressure on the alpine grounds. There are many reasons for this overexploitation: both collectors and contractors are primarily interested in higher, short-term income and give less emphasis on the sustainability part of it. The harvest season is from April-June wherein collectors from the migratory pastoral and village communities gather around their restricted regions to harvest the produce. The collection of Kira jari also results in damaging the vegetation growth as the collection practice tends to disturb the topsoil of alpine meadows.

In the KSL-India part, *C. sinensis* (caterpillar fungus/Kira jari) is found in the sub-alpine and alpine grasslands of Dharchula and Munsiyari Blocks. According to the literature on the trade of *C. sinensis* done by Rawat (2005), Negi (2006), it occurs at places like Chiplakot in the confluence of Darma and Chaudans valleys, Sundym. Philam, Bon. Baling, Dugtu and Panchachuli base, Johar valley and Namik in Dharchula Munsiyari region of Pithoragarh district.

Other MAPs grown in the region are *Aconitum heterophyllum* (atis), *Picrorhiza Scrophulariflora* (kutki), *Angelica glauca* (chippi), *Podophyllum hexandrum* (ban kakri), *Saussurea costus* (kuth) and *Rheum australe* (dolu). There has been low interest in the cultivation of MAPs at present due to factors like; high risk involved in the cultivation of medicinal plants, low growing period and lesser yield, lack of financial and technological support, and lack of institutional support to protect from wildlife, poachers, etc. Another issue related to migratory pastoralism and MAPs is the absence

of pastoralists during the winter migration thereby risking the cultivated MAPs land to poachers leading to exploitation of the crop. The highland alpine grasslands of the KSL-India were majorly affected by MAPs extraction which in turn affected the crucial summer habitations of the migratory pastoral communities.

Unregulated grazing leads to extraction of natural resources and Fragmentation of grazinglands

Land use practices have been changed radically across the newly formed Uttarakhand and resulted in a massive increase in land use for non-forest and non-agricultural uses. Since the passing of the Forest Conservation Act 1980, the forest-dependent communities including migratory pastoralists are highly neglected by the fact that the act does not require any social or environmental impact assessment for forest diversion. Livestock grazing dependent on the forests and meadows has been losing grazing pastures and has become fragmented.

In KSL-India the pastoral community's migratory routes are spread throughout the different Eastern parts of Uttarakhand state in the districts of Pithoragarh and Bageshwar covering different climatic zones. The migratory route is sometimes more than 300 km. During the long seasonal migration, pastoralists camp at traditionally fixed camping places (*Padavs*) on the way near the grazing lands. These places are either the village commons or reserved forests. The intensification of agriculture, hydropower infrastructure development projects widening or new construction of roads, etc have wiped out many of these camping points that were preferred for the availability of a source of drinking water and forage. Increased influx of tourists round the year in the region, even in the outermost areas of the state has not only invited the number of newly constructed hotels and resorts but has also increased the resource dependency.

Expansion of roads on the hill slopes augmented the fragmentation process which in turn reduces the availability of fresh fodder. Regular construction of roads leads to blasting the hills which are serious causes of environmental degradation. Migratory herds moving alongside the roads through forests face the problem of noise, pollution, and mobility. The lowland sites of the KSL-India in the bhabar region (Sub-tropical climatic zone) are densely populated towns and they very much face the ill-effects of anthropogenic activities like unregulated human interference in the forests, infrastructure development (road construction, mining, etc) on the way of migration. The livestock also faces issues of diseases and a lack of veterinary services in both the lowland and highland sites.



Plate III. High altitude garzinglands in Chaudas valley in a part of KSL-India

There are various environmental issues linked with grazing, fodder, and firewood collection from the forests. With the increasing risk of habitat fragmentation and destruction by humans and resource competition, there is an increasing danger of human-wildlife conflict as the forests in the alpine meadows provide habitat to many wild mountain ungulates and carnivores including leopard (*Panthera pardus*), snow leopard (*Unica unica*), bharal (*Pseudois nayaur*), Himalayan tahr (*Hemitragus jemlahicus*). With the incidence of Human-wildlife conflict in the migratory routes and camps, the pastoral community had no other option than to lose their livestock to the wild animals. With the habitat fragmentation, and lesser grazinglands along the route the encounter with wild animals is becoming more frequent in both the lowland and highland region of the KSL-India.

Changes in socio-economic status of migratory pastoral community

Pastoral communities showed transformation towards their social and economic fabric with the “Schedule Tribe” status in 1967 and subsequent reservation granted to the Bhotiya community in government institutions, Universities, government services, and legislature which had improved the education and awareness in the community. This resulted in the transformation in the traditional Bhotiya transhumant community to an agro-pastoral-based economy to other service sectors. Furthermore, the Indian government promoted land reforms, the building of schools, and the implementation of a decentralized administrative structure (Natutiyal et al 2003). These policies helped the population of Munsiyari and Dahrchula block, the densely populated centers of the valley to advance in other sectors. In this way, other non-agricultural employment became increasingly important, and the Bhotiya migratory group shifted to set up their steps on the growing market in and around the new developing infrastructure.

All this resulted in the decrease of the sheep and goat population and an increase in the number of cattle (KBPF 1947; GoU 2003), which became the preferred animals for all-year agriculture in the middle sections of the valleys. It led to the sharp reduction in livestock population in the KSL-India region which in turn affected the tradition of migratory pastoralism. Changes in socio-economic structure led to the changes in the dependence on alternate livelihood opportunities.

The lowland sites of migratory pastoral communities are regularly in contact with the changing infrastructure and land use. With the increasing native pahadi community settlement in the suitable sub-tropical climate of the bhabar region, the land is gradually shrinking and the grazinglands are facing immense pressure also pushing the migratory community to adopt different service sectors leaving traditional pastoralism.

Conservation Areas and their Management

Land-use changes with the increasing human population are the major driver of the environmental degradation in the Himalayan region. Change in land use leads to changes in pastoral practices as they both share an intrinsic relationship. Pastoralists community have their efficient means of utilizing natural resources as pastoral grazing has been an integral part of the ecosystem dynamics in the Himalaya. Conservation does not mean the exclusion of the dynamics that are symbiotic in relation but active maintenance of those factors (Meffe and Carroll 1994). In KSL-India, the target landscape includes one legally defined Protected Area (i.e., Askot Wildlife Sanctuary) and Nanda Devi Biosphere Reserve (NDBR), a globally recognized mountain Biosphere Reserve on its upper north-west extremes. The contiguity of the landscape with NDBR provides it an additional benefit of forming a contiguous landform with exceptionally high conservation and socio-economic value.

Improving management, resilience, and adaptive capacity of forests and grazinglands

Forests/rangelands and Indigenous communities share an intricate relationship acting both symbiotically. While these ecosystems ensure environmental security, the indiscriminate loss of forests and rangeland degradation as a result of various factors is a cause of great concern. Therefore, increasing forest resilience to different kinds of disturbances (human and natural) is a major priority. Planning and effective program implementation to increase diversity, appropriate changes in silvicultural/rangeland management practices, and incorporating effective soil and water management practices are essential. Carrying capacity assessment, economic valuation, and sustainable harvesting strategies for goods and services from forests and rangelands would help reduce pressure on natural ecosystems and improve the quality of life for local communities. The development of a culture of continuous training and capacity building, experience sharing, and effective use of modern tools and techniques for increased participation of skilled human resources is important. Encouraging landscape-level forest and rangeland restoration programs would contribute to

maintaining natural ecosystem processes and biodiversity values. Deforested areas, degraded rangelands, and drained wetlands are evident throughout the KSL and represent ecosystems in immediate need of improved management and restoration. Strategies include addressing threats to ecosystem degradation, revising and upgrading protected area plans, preparing species-specific conservation plans, and declaring and protecting Biologically Important Areas or Conservation Areas within the landscape. Quantitative survey and mapping of important forest products like medicinal plants, lichens, minor surface minerals, yar-tsa-gumbu, and other products need to be achieved. *Taxus contorta* (Himalayan yew) and *Tsuga dumosa* (Himalayan hemlock) are two rare tree species of the landscape whose quantification is of immediate necessity for evaluation of their threat status. Inadequate development and conservation of community forests have resulted in inefficient habitat management and biodiversity conservation in some parts of the region. Among the reasons are inadequate coordination among forest offices, communities, relevant agencies, and user groups and committees. Forest areas are being converted for rural development activities, as well as for large-scale infrastructure development. Core forest areas that will not be converted to such activities must be delineated even in cases when alternate non-forest land is not available. Development activities should incorporate programs that restore ecosystems that have been damaged as a result. Environment and Social Impact Assessments should be done meticulously for every project and clearances should not be conditional, but rather specific for each case. Over-grazing is a major issue in the alpine and Tibetan Plateau ecoregions of the KSL. Local communities consider free grazing beneficial to both animals, as well as grasslands because 70 livestock manure helps maintain soil fertility. However, increasing rangeland degradation, decreasing precipitation, and increasing livestock/wildlife conflicts highlight the need for ecosystem management approaches. The total numbers of persons currently involved in transhumance and their livestock are not monitored in the landscape. This data must be generated for a better understanding of the carrying capacity and management of grazing lands. Grazing routes of different herders should also be mapped. The carrying capacity of grazinglands needs to be evaluated before developing any grazing policy or strategy.

Agriculture, Farming Systems, and Livestock

Agriculture and agricultural land, although reported at just 5% of the total landscape area in the remote sensing analysis, is a major and important source of livelihood for mountain communities within the KSL. Within KSL-India, mountain agriculture comprises a significant area (>20%), as it likely does in Nepal (although land use data is inadequate), while on the Tibetan Plateau within KSL-China, harsh conditions constrain agricultural production to just 10 square km in the southern portion of the lower Peacock (Karnali) River Valley. Agriculture is mostly practiced in the lower, more tropical to mid-temperate zones, but crops such as barley and potatoes are found growing at higher elevations and on the Tibetan Plateau. Agriculture is generally rain-fed hill agriculture, but valley irrigation is also practiced, particularly in the trans-

Himalayan areas and KSL-China where precipitation is very low. At higher elevations, only one crop (generally highland barley) is grown annually, but at lower elevations, a variety of crops including cereals, pulses, millet, maize, beans, and potato are grown.

In KSL-India, mainly traditional hill agriculture is practiced. The area forms an integral part of India's potential Agricultural Biodiversity Heritage Site (i.e. the Western Himalayan Region). Farming in KSL-India is done on small, fragmented, terraced fields carved out from hill slopes. Almost 98% of the population has small landholdings (less than 2.0 ha) that collectively account for 87% of the total cultivated area. Farmland is predominantly rainfed and less than 10% of agricultural land is irrigated. Generally, three crops are grown every two years in rainfed hill agricultural land, while irrigated valley farmlands produce two crops per year. Farming systems can be broadly categorized into: i. mixed crop-livestock which accounts for 47% of total cultivated land and 32% of total livestock; ii. mixed livestock-crop accounting for 26% of cultivated land and 34% of total livestock, and iii. livestock-crop farming accounting for 27% of total cultivated land and 34% of total livestock.

Rangeland Management Plan

Literature on the vascular flora of the KSL-India (Sahni and Raizada 1957, Rawat 1984, Samant and Pangtey 1993, Dhar et al. 1997) confirms that the area is floristically underexplored. However, at least 25 species are recommended for the highest priority in situ conservation. These include Brahmakamal (*Saussurea obvallata*), the state flower of Uttarakhand; *Terminalia chebula*, a high-value medicinal tree in the subtropical belt; *Turpinia nepalensis*, one of the rarest trees of Uttarakhand and confined to Ghandhura region; *Sinarundinaria anceps*, a hill bamboo endemic to KSL-India and forming important habitat for endangered Himalayan musk deer, serow, and several other birds. In most of its range, there is acute livestock grazing pressure on this species and, as a result, it is rapidly declining. This species is recommended for long-term monitoring. A more detailed list of flora to be considered for highest priority for in-situ conservation and population studies is provided as follows; • *Psilotum nudum* (Linn.) P. Beauv. (Psilotaceae) • *Cyathea spinulosa* Wall. ex Hook. (Cyatheaceae) • *Juniperus semiglobosa* Regel (Cupressaceae) • *Berberis osmastonii* Dunn. (Berberidaceae) • *Berberis lamberti* Parker (Berberidaceae) • *Cleyera japonica* Thunb. (Theaceae) • *Pinguicula alpina* Linn. (Lentibulariaceae) • *Onosma pyramidale* Hook .f. (Boraginaceae) • *Trachycarpus takil* Becc. (Arecaceae): Vern. Thakal. • *Lilium wallichianum* Schultes (Liliaceae) • *Dendrobium normale* Falc. (Orchidaceae) • *Flickingeria hesperis* Seidenf. and Arora. (Orchidaceae). • *Herminium kumaunensis* Deva and Naithani (Orchidaceae) • *Ponerorchis renzii* Deva and Naithani (Orchidaceae) The incidence of sensitivity is higher for lower plants. Six species of lichens from the landscape are known to be endemic to the area as they are identified only from their type locality and are designated as 'rare elements': (i) *Lobaria himalayensis* Upreti and Divakar; (ii) *Myelochroa macrogalbinica* Divakar, Upreti and Elix; (iii) *Myelochroa upretii* Divakar and Elix; (iv) *Lithothelium himalayensis*

Upreti and Aptroot; (v) *Caloplaca abuensis* Y. Joshi and Upreti; (vi) *Caloplaca himalayana* Y. Joshi and Upreti

The following high priority action points have been identified for the better management of biodiversity and wildlife in the landscape:

- Livestock grazing is a major management issue that needs to be addressed at the landscape level. Policy guidelines for sustainable livestock grazing should be developed and adopted for this landscape after appropriate consultation with the local communities.
- Over-grazing is a major issue in the alpine and Trans-Himalayan regions of KSL-India. Local communities consider free grazing beneficial to both animals, as well as grasslands because 70 livestock manure helps maintain soil fertility. However, increasing rangeland degradation, decreasing precipitation, and increasing livestock/wildlife conflicts highlight the need for ecosystem management approaches. The total numbers of persons currently involved in transhumance and their livestock are not monitored in the landscape. This data must be generated for a better understanding of the carrying capacity and management of grazing lands. Grazing routes of different herders should also be mapped. The carrying capacity of grazinglands needs to be evaluated before developing any grazing policy or strategy.
- Development of Livestock Information Base (LIB) to evaluate the impact of livestock on the environment there is a need to establish a structural platform to acquire information on the health and movement pattern of livestock. This information is required to support the development of science-based policies, such as to plan a relevant substitution and compensation system.

Environmental conditions entail certain potentials and limitations for pastoral land use, such as the duration of snow cover or the onset of the vegetation periods (MAPs, etc) in different altitudinal belts. The dependence of pastoral communities on the environment is necessary for their survival. Their exclusion from the environment would disrupt the sustainable system they have maintained over a long period. Pasture and pastoral practices in the KSL region thus unfold within a multidimensional continuum that includes regulated extraction of natural resources, ritualized movement practices, and realized subsistence strategies. Pastoral life depends on both 'natural' and 'socio-cultural' resources, which together drive production and an essential system and also shape the national, state, and regional power. A positive interplay of state policy and regional performance (Van panchayat; a decentralized form of governance in India) in the formation of considerable pastoral utilization strategies could enhance the policymaking process and would also help in facilitating more assistance to that section of the community who dwell on difficult high altitudes for making a living out of the migratory pastoralism.

There is a need for a collective and interdisciplinary approach to link conservation practices with the sustainable management of natural resources to ensure that the

nature-based livelihood of the forest dwellers in the Himalayan pastoralism can sustain.

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