

LIVESTOCK AND RANGELANDS IN SELECTED HIGH ALTITUDE DISTRICTS OF NEPAL: A REVIEW

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Abstract

Range/pasture is one of the natural resources where the livelihood of the mountain peoples relies on, whose main occupation is livestock farming. However, this cheaply available resource is depleting annually and thereby sustainability of the rangelands has been questioned. The situation is further worsened by other factors such as continuous grazing, high stocking rate, climatic uncertainty and so on. On the other hand, livestock population is increasing in alarming rate per year. The imbalance of the resource use and livestock demand will not only produce the ecological problems but ultimately will be the greater threats to the sustainability of mountain livelihood. In this paper, various modalities of rangeland management within the Hindu Kush Himalayan region has been review with relevance to the range/ pasture and livestock production in high lands of Nepal.

1. Background

Nepalese economy is agricultural dependent where about 67% of the population is engaged in agriculture; which is a typical combination of crops, livestock and forests under integrated mixed farming system. Actually, crops and livestock are important components of Nepalese farming system. Among these components, livestock contributes about 31% to the total GDP of the country among which the largest amount is derived from the hills (53%) followed by terai (38%) and the least from the mountains (9%) (APP,1995). This is one of the reasons for need of focusing livestock based development opportunities to the mountain people where livestock is strong means of livelihood support.

It is estimated that about 70% of the total draft power comes from animals. Likewise, livestock is the source of soil fertility, energy (bio-gas) as well as source of income and food. Draft power used in Nepal is around 1.37 million kilowatts (Oli,1984), and are used for 62 days per annum in the hills and 130 days per annum in the terai (Oli,1985). However, in the higher Himalayan regions, yaks, chauries and even Zebu animals are used, not only for agricultural practices, but also as pack animals. The in-situ manuring system, practiced by hill farmers in Nepal (especially migratory sheep flocks) has been shown to increase subsequent crop production by 28.7% compared to the manual distribution of an equal amount of compost (Dhital et al, 1990).

Livestock is a means of livelihood of Nepalese farmers that is accompanied by the mixed nature of farming crop, livestock and forests. Economy of hills and mountains of Nepal is dependent on the livestock. The

dominating ruminants in Nepal are cattle, buffalo, sheep, goat and chauries. Raising livestock is also characterized by the socio-religious aspects. On the other hand, some of the products, such as wool are region specific in terms of generating household income (Tiwari and Shrestha, 2004) which are means of livelihood support.

This chapter broadly covers livestock situation in relation to its contribution to the household economy and livelihood system across the five Himalayan districts of Mid and Far Western Nepal, where pastoral/range based livestock rearing system commonly prevails.

Table 1: Livestock situation of high altitude regions

Districts	Livestock category				
	Cattle	Buffalo	Sheep	Goats	Pig
Darchula	69890	36800	29664	28642	256
Humla	32140	2389	26113	29743	22
Mugu	31303	7117	44898	21948	60
Jumla	64350	3470	42770	38745	115
Bajhang	98984	33150	25727	34665	467

Source: HMG/MOAC, 2005.

The above table shows that livestock population in the selected districts varies. For example, number of cattle was highest in Bajhang followed by Darchula. Likewise, Number of buffaloes was highest in Darchula district followed by Bajhang. On the other hand, number of sheep was highest in Mugu and Jumla whereas, number of goats was highest in Jumla followed by Bajhang. In general, small ruminants are given equal importance in these districts, whilst declining trend of migratory small ruminants has been reported, for example in the Humla district (Tiwari and Shrestha, 2004).

In context of the high altitude Himalayan districts, small ruminants are managed under 100% migratory system, for example in Jumla and Mugu. But in Humla, small ruminants are reared up to 51% (Tiwari and Shrestha, 2004). The hills of Nepal are reported to have the highest concentration of livestock per unit area of cultivated land anywhere in the world (Chitrakar, 1990); with 10 livestock units per family in the mid-hills and 15 in the high hills.

Feed scarcity is the main problem of livestock rearing in the high altitude districts. The critical feed scarce period in Mugu and Jumla districts starts from December to April (Tiwari and Shrestha, 2004), and for Humla district, the situation persists in between December and May.

Similarly, highest mortality of small ruminants are found in Humla followed by Kalikot and Mugu in Karnali zone. In Humla, highest mortality rates often found correlated to the feed scarcity and disease problems.

2. Range/pasture and its role in livestock production

In Nepal good pasture lands in the high Himalayan regions are available in monsoon months, while pastures completely lack in winter months. In winter, livestock are fed with roughage including straws, hay, maize, or millet pillages. According to Joshi and Pandey (1991), high mountain region (2000-3000m) is

good grazing land for sheep, yak and other animals. The authors described about the traditional practices of allowing livestock to graze the farm land. In the hills and mountain regions of Nepal animals graze the natural pastures or scrubby forests. Free grazing livestock during monsoon also cause environmental problems in Nepal (EPC, 1993). They consume fodder plants excessively and insufficient time is permitted for fodder plant regeneration. The poor farmers, however, have no other place than communal land to graze their livestock. Crop residues and forests contribute together about 87% of livestock feed in Nepal and the rest is supplied from non cultivated inclusions and shrub and grazing (MPFS, 1988).

According to Shreshtha (1995), livestock herds in the Trans-Himalayan range and High mountain range are taken to higher altitudes in summer and lower altitudes in winter. Animals graze the perennial pastures and weeds. In the mid mountain region, stall feeding and taking the animals out to graze in the day time and keeping in sheds at night are practiced together. Animals are allowed to graze on high meadows, shrubs, communal grazing land, waste, and a limited amount of crop by products. It is reported that on the private level, only 1.2% of the land holding area is under meadows and pastures. Moreover majority of the meadows and pasture are kept by farmers of hills, especially in the western region of the country (CBS, 1993).

2.1 Rangeland inventory

Rangelands of Nepal comprise grasslands, pastures, shrub-lands, and other grazing areas which is about 12% of total land. Mostly, these areas are spread vertically on the Himalayan mountain systems' and are very diverse (Yonzan, 1998). About 70% of the rangelands are situated in the Western and mid-western regions, and it is estimated that only 37% of the rangelands forage is actually available for livestock (LMP, 1998). Accordingly, tropical and subtropical ranges occupy only about 4% of the grazing land (Range).

Table 2: Distributions of rangelands in Nepal

Physiographic regions	Total land area (Km ²)	Rangeland		
		Area (km ²)	% of total land	% Grazing land
Terai (Tropical)	21220 (14.39)	496.6	0.34	2.92
Siwalik (Subtropical)	18790(12.74)	205.5	0.14	1.21
Mid-Hills (Temperate)	43530 (25.50)	2927.8	1.98	17.20
High mountains(Sub-alpine)	29002 (19.66)	5071.3	3.44	29.80
High Himal (Alpine)	34970 (23.71)	8315.4	5.64	48.87
Total	147485	17016.6	11.54	100.00

Note: Values in parentheses indicated percentage.

The above table (2) shows significance of range in terms of area and grazing land. However, it is growing concern that most of such rangelands are degrading day by day mainly due to high stocking density, and poor management. It has been estimated that the dry matter productivity of rangelands in general is only 2.5 t/ha/year, which is unmatched in terms of carrying capacity and need of animal's requirements associated with high stocking rates (Archer, 1990b). This emphasizes need to introduce sound and sustainable range management system in the region.

Major constraints of range: There are important constraints at high elevations range/pasture which is worthy to recognize while addressing such issues into developmental efforts. The principal constraints are:

Physical: Climate and short-growing season; hence low plant growth rates and limited potential prevails for improved production.

Edaphic: Infertile soil, often shallow, acidic, with low P-availability, and often degraded.

Ecological: Fragile ecosystems, loss of forest cover, and ingress of weeds.

Social: Traditional systems with a transhumance element; pastoralists and farmers are conservative and averse to change; risk, communal grazing.

The physical and ecological/edaphic constraints are very critical in the high Himalayan ranges. Climate can not be taken into control, other than perhaps the development of irrigation where possible. Soils can be improved somewhat by the correction of deficiencies, e.g. P, where legumes are to be grown, but only if there is likely to be an economic return from any given input. Otherwise, the only ways of dealing with these constraints are: (a) Introduction of an appropriate management practices, if these can be defined, for specific conditions, and (b) use of appropriate pasture/range species with high rates of adaptation.

2.2 Rangeland biodiversity

Shrestha (1998) reported that among 5160 flowering plants, some 246 species are known to occur in sub-alpine and alpine rangelands. Accordingly, 41 species of medicinal plants out of 700 species were recorded in Nepal. About 14 (34%) medicinal plants are found in rangelands, which are basically used for *Ayurvedic* purposes and for the Allopathic purposes.

None mammalian orders out of 12 in Nepalese rangelands have been reported survived, of which eight are major wildlife species. For example: leopard, Grey wolf, Tibetan Argali, Lynx, Brown bear, Musk deer, Red Panda, and Tibetan Antelope are commonly found in the region. Similarly around 413 bird species are reported to occur above 3000 m altitude, whilst 19 species are known to breed in these high grounds (Inskipp, 1989; Shreshtha, 1998).

The above facts and figure clearly suggests that range in the Alpine regions of Nepal is enriched with different plant and animal species, making it one of the spectacularly diversified in nature. Perhaps this is one reason for existence of range in spite of poor management and weed invasion, whereas carrying capacity and grazing are often neglected while following transhumance system

2.3 Sustainable Rangeland Management

The indigenous range/pasture management systems have been structured primarily from local knowledge and experiences. Many pastoral systems involve moving livestock herds following seasonal pattern for forage or water resources (Yonzan,1998). Moreover, rangelands provide 36% of the total feed requirements for livestock in the country. The estimated forage production of high altitude grazing is comparatively higher including their carrying capacity (Miller,1989; Rajbhandari and Shah,1981). The following table provides excerpts on range situation with respect to the carrying capacity and sustainability in terms of use and management of range.

Table3: Rangeland carrying capacity

Rangeland	Area (km ²)	Productivity (TDN, t/ha)	Carrying capacity	Stocking rate (LU/ha)
Subtropical and temperate	6293	0.58	0.54	7.07
Alpine	10141	1.54	1.42	0.64
Steppe	1875	0.06	0.09	1.19

Source: Miller (1989); Rajbhandari and Shah (1981).

2.4 Rangeland environment and development issues

Ruminant animals are a vital link in agricultural production system of Nepal (LMP,1990). In spite of their importance, livestock also have a major impact on the environment. The direct and indirect effects of livestock on environment can be discussed as follows:

Direct impacts:

Grazing and browsing: Selective feeders as well as the uncontrolled over grazing results in the suppression and loss of the preferred species, creating a less productive vegetative composition which then is covered by the unwanted species, such as *Eupatorium adenophorum* and *Lantana camara*. Forest browsing may eventually inhibit the tree growth resulting ageing and thinning.

Trampling: Trampling due to livestock results compaction of soil and degradation in soil structure. It also affects to the water infiltration and thus increased in runoff. Similarly, hill cattle trails also concentrate run off water and greatly increase the hazard of sheet and gully erosion.

Indirect Impacts:

The following points summarize some of the key indirect impact that livestock grazing can rendered in the given eco-system:

- Forage collection, litter collection, fire and destruction of predators may be the consequence of grazing
- Grazing might lower absolute numbers of animals.
- Species substitution might be occurs due to change in prevalence forages. For example, there could be increased in buffalo numbers at the expense of cattle
- The situation might result in change from large ruminants to small ruminants

- Changes in grazing pattern might reduce the number of animals, for example for draft purpose

2.5 Development issues in relation to highlands ranges/pastures of Nepal

There could be some of the important issues, taken as guidelines for rangeland development in the Highland ranges of Nepal. For example the following development issues for rangelands could be considered (LMP, 1990):

- Development of institutions aiming to regulate the grazing in the alpine pastures (3000- 5000 m) for sustainable livestock development could help to initiate sustainable range management practices into action.
- Transhumant/nomadic flock grazing management needs to be scientifically studied in order to generate appropriate management practices to reduce overgrazing in the lower pasture areas.
- There is an urgent need of Institutionalization of the land tenure system.
- It is necessary to link the rangelands to the market.
- Conservation of forages and development of appropriate technology in this line is necessary.
- It is important to start range inventory preparations work, and action to protect emergency areas where environmental and pasture deterioration is severe is.

2.6 Problems of rangeland management in Nepal

Major issues concerning, and priority for fodder/pasture development considered in Nepal (Pande, 1997) are as follows:

Major Issues	Priority action
▪ Shortage of feed/fodder during winter	Establish improved forages and hay crops
▪ Lack of fertilizer to establish legume forages	Develop appropriate technologies for forage development
▪ Lack of land for forage cultivation and pasture establishment	Use fallow and marginal land
▪ Lack of dedicated extension staff	Establish hay meadow
▪ Lack of appropriate technology (variety, methods, production system)	Improve profitability of rearing vis-à-vis crops.
▪ Lack of forage seeds	Support seed production of forages
▪ Lack of a sustainable technology and related support system	Establish food-forage crop system; promote hay, silage technology
▪ Poor communications among herders/farmers	Test winter period forage species
▪ Lack of methods for hay making and other ways of forage conservation	Organize training on forage conservation
▪ Lack of identification and promotion of native species	Emphasis year round fodder production
▪ Lack of forage distribution in remote pastoral areas	Promote stall feeding
▪ Poor genetic characteristics of livestock	Identification of high altitude pasture species
▪ Limited market for livestock produced	

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