

# Changes in Pastoral Production Systems in High-Altitude Village-Rangeland Interfaces in Nepal

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*Livestock farming is an important part of livelihoods in rural Nepal. Transhumant ruminant production is practised in the higher altitude areas, whereas extensive ruminant production prevails in the lower altitudes of the mid-hills. The low productivity of livestock in the high hills is mainly due to the low availability of feed. Rangeland is an important source of forage, but as a result of poor management only 37% of forage is accessible to livestock. A study conducted in the rangeland area of Kalinchowk village development committee (VDC) of Dolakha District indicated that climate change had resulted in a negative impact on traditional livestock farming practices. However, local people are exploring coping strategies for improving and securing their livelihoods. Information obtained from focus group discussions and a district level consultation meeting indicated an urgent need to prepare a rangeland policy implementation plan, to carry out rangeland action research, and to implement climate change adaptation and risk management programmes in consultation with and through mobilization of local communities to ensure sustainable utilization of the rangelands in Nepal.*

**Keywords:** climate change; livelihood; livestock; Nepal, rangelands

## Introduction

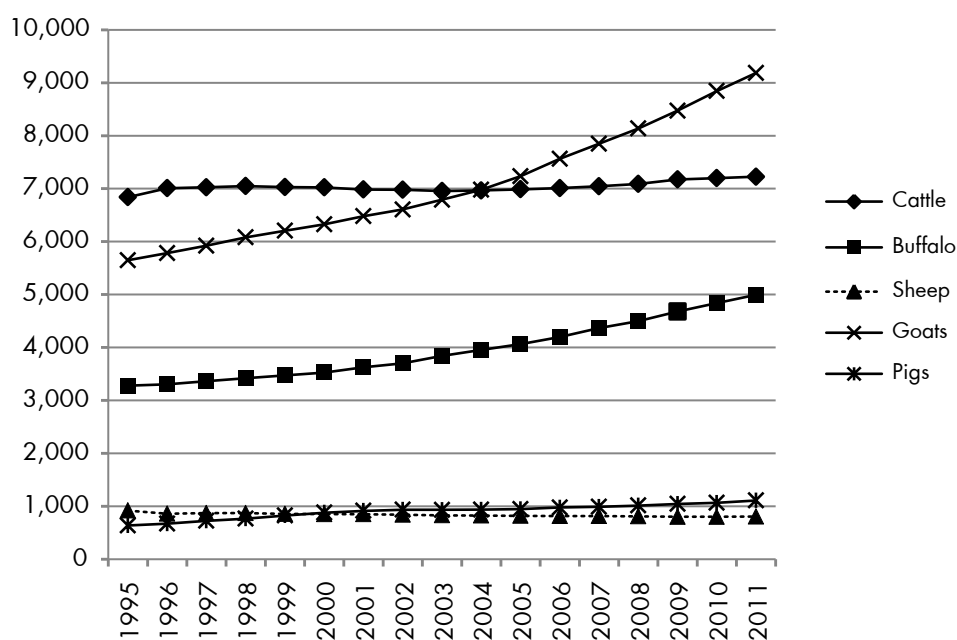
Nepal is an agricultural country. About 66% of the population depends on agropastoral practices. Livestock forms an integral part of the overall farming system; it is not only an important source of protein in the form of milk, milk products, eggs, and meat, but is also a source of draft power for cultivation and of organic manure to increase soil fertility (Sherchand 2001). In the Terai, bullocks and buffalo bulls are used to pull carts and plough the fields, but in the hills, mules, donkeys, yaks, and even sheep and goats are used to transport goods (Subedi and Jaisy 2000). A large population is involved in the production, processing, and trade of livestock and livestock products for their livelihoods. The agricultural sector provides about 26% of the national GDP, with the share of the livestock sector about 12%. Dairy, meat, and eggs contribute 63%, 32%, and 5% to livestock GDP, respectively. The Agricultural Perspective Plan (APP) has identified livestock as an important sector with a potential increase

in growth rate from 2.1% in the base year (1995/96) to 6.1% at the end of the plan period (2014/2015) (APP 1995).

Nepal's livestock statistics show that over 80% of the country's rural households own livestock and about 20% of household income comes from livestock (CLDP 2009). Livestock is an important sub-sector that ensures the supply of cash from urban to rural areas. Figure 5 shows the change in livestock numbers from 1995 to 2011. According to the most recent livestock census, Nepal has 7.2 million cattle, 4.8 million buffaloes, 0.8 million sheep, 9.2 million goats, 1.0 million pigs, 25.7 million chickens, and 0.4 million ducks (AICC 2012). The country produces about 1.6 million tonnes of milk, 0.277 million tonnes of meat, 0.586 tonnes of wool, and 700 million eggs annually. More than half of the cattle, buffaloes, goats, and sheep are reared in the hills, and one-third in the Terai. Transhumant pastoral production is practised in the temperate, sub-alpine, and alpine regions, whereas much of the livestock production in the Terai and lower-middle hills (<1,000 m) is sedentary, utilizing available forage in and around the villages.

The per unit productivity of livestock in Nepal is very low in comparison with that in other South Asian countries (Gurung et al. 2011a). This is the result of poor genetic make-up, poor health care, poor feeding, and inefficient livestock management. Nepal's livestock suffer from a 34% feed deficit calculated on a dry matter basis (Pariyar 1994), which clearly indicates the

Figure 5: Livestock statistics for Nepal from 1995 to 2011



Source: AICC 1996–2012

limitation for higher production (NASA 2004). Thus the state of the rangelands and their scientific management is a pertinent issue in Nepal.

Rangeland comprises grasslands, pastures, shrubland, and forests (MoPE 1998) and occupies 22.6% of the total area of the country. About 70% of Nepal's rangelands lie in the Western and Mid-Western Development Regions, with the major part in the mountain region. (50.5%, 29.0%, 16.7%, 1.2%, and 2.8% in the high mountains, high hills, middle hills, Siwaliks, and Terai, respectively). Forest, agricultural land, grassland, shrubland, water, uncultivated land, and others occupy 29.0%, 21.0%, 12.0%, 10.6%, 2.6%, 7.0%, and 17.8% of the rangeland area, respectively (TLDP 2002).

Notwithstanding the importance for people's livelihoods, only limited interventions have been made towards sustainable management and judicious and environmentally friendly utilization of Nepal's rangelands. A case study was carried out on the rangelands in Dolakha District in the Central Development Region of Nepal with the following objectives:

- to assess the impacts of climate change on major aspects of animal husbandry practices;
- to explore adapting/coping mechanisms practised by local communities to improve and secure their livelihoods; and
- to suggest recommendations for adaptation and coping strategies in similar agro-climatic situations.

## Study Area and Methodology

Dolakha District in the Central Development Region was selected because of its high vulnerability index (MoE 2010), vulnerability to glacial lake outburst floods (GLOFs), and the high level of drought prevailing in the district. The district has a wide altitudinal range from 732 to 7,148 masl and contains a famous glacial lake, Chho Rolpa. The greater part of the area (59.3%) is forested, which includes pasture land (DLSO 2011). Only 27.4% of the area is agricultural land, and 11.4% is snow covered. More than 90% of the population depends on agriculture, and livestock is a mainstay of farming.

The Kuri area of Kalinchowk Village Development Committee (VDC), Ward Number 9, in Dolakha was selected for a field survey and focus group discussion. A district level consultation meeting was carried out with key resource persons at the district headquarters to verify the information obtained from the focus group discussion. Kalinchowk VDC lies between 27.76 and 27.82°N latitude and 86.10 and 86.02°E longitude, and has an altitudinal range of 1,700 to 3,810 masl with three distinct climatic zones: subtropical in the lower belts; temperate in the middle regions; and sub-alpine to alpine around Kalinchowk peak. The study was carried out from February to April 2011. The information collected was tabulated and interpreted using validation from the focus group discussion and district level consultation meeting.

## Results and Discussion

The case study provided some valuable information on rangeland management and pastoral production systems in high-altitude village-rangeland interfaces. The results are summarized below.

### Herders' perception

The yak herders have witnessed several man-made and climatic changes in their surroundings during recent years. They reported rapid deforestation around their villages coupled with frequent forest fires after 1992. Villagers recall that 1992 was a particularly severe year in which they witnessed a severe forest fire, followed by a prolonged drought and terror of common leopards around the villages. The villagers felt that there had been a reduction in snowfall over the previous 7-8 years accompanied by rapid melting of snow, so that the total duration of snow cover was less. According to the villagers, the intensity of rainfall has increased and unseasonal rainfall is common. Both the quantity and duration of snowfall affected water resources and biomass production of the rangeland. The changes led to reduced availability of drinking water for herders and their chauri (hybrid bern yak and cattle), and faster drying of the land with reduced forage production resulting in a fodder deficit for the livestock. Thorny and invasive plants had also increased. Farmers in these areas graze their livestock on government-owned rangeland during summer, which is limited in extent, and in community forests during winter. Stall feeding is only practised for lactating animals. Recently, farmers started to grow white clover on private land as improved forage. Farmers do not give priority to raising male calves. It is important to note that a mountain perspective framework (MPF) is needed to explore information from the hill and mountain regions of Nepal. The MPF defines the uniqueness of mountain situations as a basis for designing and implementing integrated rangeland management for sustainable livelihoods and the environment (ICIMOD 2006). Focus group discussion was chosen as an effective tool for obtaining information about the unique characteristics in remote areas. In this study, the participants in the focus group discussion were mainly chosen from the yak and chauri keeping farmers' groups. Lohani (2007) noted that climate change is responsible for erratic weather patterns that may destroy crops and livestock in Nepal.

### General trends at district level

The consultation meeting with key informants held at the Dolakha District headquarters revealed that there were fewer large ruminants in the farming system than ten years before and the breeding season of animals had changed. Bacterial diseases had been frequent and the efficiency of veterinary drugs had gone down. Gynaecological problems such as abortion and repeat breeding were thought to have increased. Pine forest and bush canopy, which have a negative impact on pasture species and water resources, had increased and farmers were therefore giving priority to timber production. The district has experienced the start of the semi-commercialization of livestock farming. The sheep population had declined drastically

**Table 3: Rangeland carrying capacity and stocking density in Nepal**

Rangeland type	Carrying capacity (LU/ha)	Stocking density (LU/ha)	Stocking density divided by carrying capacity
Mid-hills	0.31	4.08	13.2
Steppe grassland	0.01	0.19	19.0
Open grassland	0.54	7.07	13.1
Alpine meadow	1.42	0.64	(0.5)

Source: Pariyar (1994)

and there was less interest in yak and chauri farming, while broiler chicken farming was increasing as a new opportunity. All these changes were reported and attributed by the informants.

Rangelands have a tremendous potential in terms of natural vegetation, forage supply, non-timber forest products (NTFPs), niche products like *Ophiocordyceps sinensis* (yarshagumba), the rich floral and faunal biodiversity, the rich indigenous culture (Sherpas, Limbus, and others), the unique lifestyle of pastoralists, as destinations for tourists, as water reservoirs, and as a basis for mountain farming. However, this potential has been shrinking in recent years. The carrying capacity of the rangelands is decreasing and the high stocking density has led to degradation. Pariyar (1994) noted that the stocking density was much higher than the actual carrying capacity in all range types except alpine meadows (Table 3).

## Management issues

According to the Livestock Master Plan (1993) and Pariyar (1998) only 37% of the rangeland forage is accessible to livestock in Nepal. The production and productivity of forage are also very low and fodder is scarce, especially in winter. Under these circumstances, the often-quoted 'livestock revolution' might remain a dream in Nepal if proper strategies are not adopted in time (Paudel 2006).

Uncontrolled grazing due to overstocking, unsustainable harvesting of rangeland resources, and loss of indigenous vegetation including legumes, is leading to degradation of the rangelands. Rangeland management is perceived by most of the stakeholders as 'Everybody's land while using and no man's land when it comes to the issue of management.' Deforestation, soil erosion, forest fires, and other issues are becoming common. As a result, the sustainability of the livestock production system is severely threatened, and conflicts between different groups of herders about the use of rangeland even affect social relations (ETH 2009). Despite the clear objectives and strategies for rangeland management contained in the Rangeland Policy, 2012, management is still a low priority for the government. It is further hindered by the weak intersectoral coordination among the stakeholders and public service networks, the limited research interventions, and poor adaptation to climate change.

## Noticeable achievements in rangeland management

The national Rangeland Policy, 2012, which was approved by the government after a series of regional and national level consultations, workshops, and discussions with experts and stakeholders, is a remarkable achievement for rangeland management in Nepal. The Rangeland Policy clearly recognizes the Department of Livestock Services as the lead agency for rangeland management. The policy highlights the importance of rangelands and the major issues; analyses the holistic management of rangelands from the viewpoint of different stakeholders; and considers rangelands as under constant and serious threats, which require urgent attention. A draft for the rangeland policy implementation framework has also been prepared recently by the Directorate of Livestock Production, Department of Livestock Services.

## Conclusion and Recommendations

Poorer people are the most dependent on agriculture and adjacent rangelands in the dryland areas of Nepal. Therefore, they are hit hardest by climate change, desertification, and drought (Winslow et al. 2004). However, most of the rangelands are rapidly degrading because of the limited attention paid to sustainable management and issues related to climate change. Although the Rangeland Policy, 2012, is in the process of implementation, there is an urgent need for a rangeland policy implementation plan (RPIP) which pays due attention to programmes and budget as well as the formation of implementing bodies at all levels. In addition, effective programmes are needed on climate change adaptation and risk management as well as participatory action research on rangeland management for the promotion of high-value mountain commodities for supporting pastoral livelihoods. Cross-border coordination, cooperation, and collaboration with neighbouring countries would go a long way in effective and scientific management of high-altitude rangelands. Mobilization of communities at the local level, and regular expert consultation workshops at national and international levels, are needed to support the sustainable management and utilization of the rangelands in Nepal.

## References

- AICC (2012) *Agriculture Information Communication Center*. Ministry of Agricultural Development, Kathmandu, Nepal
- APP (1995) *Nepal agriculture perspective plan. Final report. Summary document*. Agriculture projects service centre, Kathmandu and John Mellor Associates, Inc., Washington, D.C
- CLDP (2009) *Proceedings of the national workshop on Nepalese dairy strategy*. Department of Livestock Services, Harihar Bhawan, Lalitpur, Nepal
- DLSO (2011) *Annual progress and technical booklet*. District livestock services office, Dolakha, Nepal
- ETH (2009) *North-South centre, research for development*. Swiss Federal Institute of Technology, Zurich, Switzerland. pp85
- Gurung, TB; Pokhrel, PK; Wright, I (2011a) *Climate change: Livestock and vulnerability in Nepal. Proceeding of consultative workshop*. Kathmandu, Nepal
- Gurung, TB; Pokhrel, PK; Upreti, CR; Joshi, BR; Pradhan, SM; Wagle, SK (eds) (2011b) *Proceedings of the 8th National Workshop on Livestock & Fisheries Research*. Nepal Agricultural Research Council (NARC), Nepal.

- ICIMOD (2006) *Achievements, challenges, and lessons learned*. Kathmandu: ICIMOD
- LMP (1993) *Livestock Master Plan*. Ministry of Agriculture and Cooperatives. Kathmandu, Nepal
- Lohani, SN (2007) 'Climatic change in Nepal-Shall we wait until bitter consequences'? *The journal of agriculture and environment*. Government of Nepal, ministry of agriculture and cooperatives, Kathmandu, Nepal
- MoE (2010) *Ministry of Environment. National adaptation program of action (NAPA) to climate change*. Singhdurbar Kathmandu, Nepal
- MoPE (1998) *Ministry of Population and Environment*. Kathmandu, Nepal
- NASA (2004) *Proceedings of the 5th National animal science convention*. Nepal animal science association. Lalitpur, Nepal
- Paudel L (2006) 'Livestock revolution: Is this a debatable issue in relation to environmental conservation? In Deserts and desertification: Don't desert drylands'. *The journal of agriculture and environment*. Government of Nepal, ministry of agriculture and cooperatives, Kathmandu, Nepal
- Pariyar, D (1994) 'Existing feed situation in different regions of Nepal and strategies developed to increase feed production'. In Bo, L (ed) *Proceeding of the International symposium of Grassland Resources*. August 15-20, 1993. Hohhot, the People's Republic of China, China Sciencetech Press
- Pariyar, D (1998) *Rangeland resource biodiversity and some options for their improvements*. National Biodiversity Action Plan. Kathmandu.
- Sherchand, L (2001) 'Herd composition of cattle, buffalo, goat and sheep in Nepal'. In Singh, SB; Aryal, IK; Rai, AK (eds) *Proceedings of the 4th national animal science convention, Livestock for enhancing livelihood in the millennium 2000*. Nepal Animal Science Association, Nepal. pp161–166
- Subedi, TB; Jaisy, SN (2000) *Agriculture and environment, Millennium issue*. Ministry of agriculture and co-operatives, Singh Durbar, Kathmandu, Nepal
- TLDP (2002) *Forage seed production area mapping. Third Livestock Development Project*. Department of Livestock Services, Harihar Bhawan, Lalitpur, Nepal
- Winslow, M; Shapiro, BI; Thomas, R; Shetty, SVR (2004) *Dessertification, drought, poverty and agriculture: research lessons and opportunities*. International center for agricultural research in the dry areas (ICARDA), the international crops research institute for the semi-arid tropics (ICRISAT), and the UNCCD global mechanism (GM). pp52