

Strategies to ameliorate pasture production for livestock in high altitude regions

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Introduction

The high altitude regions in India exhibit a diverse climate, topography, vegetation, ecology and land use pattern. The annual average rainfall varies from 80 mm in Ladakh to over 200 cm in some parts of Himachal Pradesh and Uttar Pradesh. The vegetation varies from the scrub in the lower hills to arctic in the Greater Himalaya (GJK 2004). In this region, Ladakh is a unique land form encompassing distinct physical features, ecology, environment, ethnicity, agricultural systems and livestock rearing practices. This region experiences a very hostile climate and winter temperature may go as low as -30°C . Summer temperature rarely exceeds 27°C . (Uniyal *et al.*, 2005).

Livestock farming is a major source of economic activity in the high altitude regions of India. The livestock rearing is practiced both under sedentary and migratory system. Crop residues, alfalfa (*Medicago* spp.), *Melilotus*, *Hyphophae* and several species of grasses/pastures are the major forage resources. Tree leaf fodder of willow is also used as forage. However, excepting alfalfa which is still cultivated in area over 4000 ha, resource base of other forage resources has deteriorated and a huge imbalance in demand and supply scenario has occurred. In order to economically exploit potential of livestock products for better livelihood option to the local population, sustainable fodder production strategies will be required.

The paper is an attempt to describe and suggest suitable options for sustainable fodder production in the high altitude regions of the country.

Materials and Methods

The literature and reports on fodder resources in this region and its utilization patterns in high altitude regions of India were scanned and compiled. Based on these compilations, the current fodder situation is analysed and some future thrust areas are suggested.

Results and Discussion

In hilly regions, cultivation of fodders is restricted to the lower hills. At higher elevations, the available cultivable land that is about 10 percent of the total geographical area is used for the cultivation of cereals, pulses and oil seeds etc. and very little fodder. Rangelands and forests, comprising 50 to 70 per cent of the total geographical area are the major sources of forage for sheep, goats, rabbits, cattle and other animals (GJK, 2004). Nomadic graziers (*Khadwals*, *Gaddis*, *Gujjars*, *Khas*) use sub-alpine and alpine pastures for rearing their livestock. Due to ever-increasing demand of animal products, the livestock population has increased putting increased grazing pressure on these pastures. This has resulted in the deterioration of the grass cover as well as valuable forest species. As a result of this a significant area of this natural resource has been covered by noxious plant species like *Aconitum*, *Anemone*, *Adonis*, *Aquilegia*, *Cincifuga*, *Clematis*, *Lepidium*, *Artemisia*, *Ranunculus*, *Stipa*, *Sorbinia* and *Sambucus* (Misri, 1988). All these factors have led to the decrease in carrying capacity of these pastures.

However, high altitude regions, including Ladakh have traditionally been surviving on the land base resources. The traditional agriculture is indeed a blend of excellent crop management and conservation of natural resources and environment. After independence, there has been a decline on dependence on land resources. The reasons include like opening of Ladakh for tourism etc. (LAHDC, 2005).

The research work done by various organizations on this aspect in the region suggest that degraded pastures (2-3 t green forage yield) in the entire Ladakh, especially in the Changthan region may be rehabilitated (60-70 t green forage yield) with managed pasture systems with proper institutional supports. Alfalfa, the mainstay for the livestock in the region, is now a mix of *Medicago falcata* and *Medicago sativa*. There is a need to exploit the great variability encountered in this species and identify suitable plant types that are able to provide maximum fodder and nutrition, in stressed environments

as well. Apart from alfalfa, there are ample opportunities to introduce seasonal fodder like oat, cowpea, corn, perennial grasses/legumes/shrubs/trees in the existing farming systems practiced by the farmers. Field bunds may be an ideal niche for this purpose. Adopting the available improved fodder varieties in some such crops will enhance fodder production per unit area. Several other technologies like silage making, enrichment of crop residues and leaf meal etc. may be introduced in the region for optimum utilization of the available bio-resources.

Pasture improvement is indeed a very tough task in a tough terrain like Ladakh. However, a well-planned, long term, inter-disciplinary approach can accomplish the task. The populations of palatable species like *Eurotia*, *Euphorbia*, *Stipa* etc. have dwindled considerably so rehabilitation of these species along with other suitable pasture species is of prime importance in this region.

There is no fertilizer use in the natural grasslands in any form, except dung and urine addition by the grazing animals. This has led to continuous depletion of plant nutrients. Significantly higher herbage yields may be achieved with the application of nitrogen (60 kg/ha) and phosphorus (30 kg kg P₂O₅/ha) (Singh, 1995).

Generally, uncontrolled and continuous grazing is prevalent in most of the grasslands throughout the hilly regions. Rotational system of grazing is better but not easy to adopt. The most desirable system of grazing would be that of periodic or deferred grazing by limiting the number of livestock on the basis of carrying capacity of grasslands (Koranne and Singh, 1989).

Detailed studies on phenology and reproductive biology on important pasture species found in the region is required. The growth pattern, seed dispersal mechanisms, seed bank of soil and related studies on these species can determine the method and time for their sowing. All the studies have to assure the active participation of farmers and other stake holders who can later assure the better management of the improved pastures.

As far as river bed and valley basin pastures are concerned, the vegetation cover and species composition is almost adequate but all these pastures lack in nutrient management. Detailed studies need to be initiated on integrated nutrient management of pastures so that a package of practices is formulated and disseminated to the farmers and other stake holders.

Conclusion

The high altitude regions are undoubtedly a tough terrain having very harsh climate and a dwindling natural resources base. Nevertheless the local population still survives on the natural resources and there is an urgent need for various research and development interventions which could bring about a balance in demand and supply position. Forage resources are no exception. The situation may be alarming but may be taken care with appropriate measures. Research organizations based in this region may play an important role in working with local organizations in this region for enhanced fodder availability for livestock.

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