Rangeland and Livestock Management in Bhutan

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Introduction

The bio-diversity of Bhutan is best illustrated by the diversity of rangelands and livestock of the country. The rangelands of Bhutan comprise alpine grasslands, temperate shrublands and sub-tropical forests. In the Bhutanese context, rangelands must include lands which are also used as grazing lands during fallow period. Each of these categories contains within them a wide diversity of livestock ranging from water buffaloes in the southern foothills to yaks in the alpine meadows. Several species of cattle, sheep and equine are distributed throughout the different agro-ecological zones. These livestock play a vital role in the agrarian economy of the country by not only providing milk, meat and fibre but also by supporting agriculture through draught power and manure supply.

There is a general conception in Bhutan as is elsewhere in the Himalayas (Miller 1993), that rangelands are overgrazed and that modern techniques of rangeland improvement and management need to be introduced to improve the conditions of the rangelands. A number of studies have recommended pasture improvement through seeding and fertilization, improved grazing systems such as deferred and rotational grazing and adjustment of livestock numbers to the carrying capacity of the rangeland. These prescriptions often ignore the complexity and ecological and economic efficiencies of the traditional pasture systems. Detailed assessments of rangeland resources including their potential have not yet been made and there is a lack of quantitative data to support widespread claims of overgrazing and rangeland degradation. There is also a dearth of knowledge on the socio-economic and institutional arrangements in rangelands and livestock management that are in vogue in different parts of the country and their impact on the environment.

Extent, characteristics and scope of rangeland area

In Bhutan, the rangelands basically refer to sub-alpine and alpine zones of the country although definitons vary from author to author. The alpine and sub-alpine rangelands iie roughly between 3,000 m and 5,000 m altitudes. This area extends from north of Waa in the west to north-east of Trashigang in the east, i.e., the whole northern belt of the country. According to a survey conducted by renewable natural resources sector of Royal Government for the 7th Plan, this area is home to 9,182 nomadic and semi-nomadic households deriving a livelihood from an area of 62,000 hectares registered rangeland which supports some 37,000 heads of yaks and 32,000 sheep (Livestock census 1994). In monetary terms, this area contributes an estimated Nu. 110 million to the GNP as the value of milk and milk products, manure, draught and wool (MoA/ ISNAR, 1991).

The major production constraints in these area are poor productivity of rangelands due to overgrazing by both domestic animals and wild ungulates, poor management practices, inbreeding of yaks, difficult transport, communication and marketing, poor literacy rate and poor entrepreneur skills of the herders. The transhumant migratory system which is dictated by climatic limitations and socio-economic needs, further compound the problem. While all the above constraints have hardly been addressed, the solution to the constraints detected by the agronomic and management practices could go a long way towards enhancing the productivity of the system.

From the limited experience obtained, it can be seen that by improving winter pastures alone and using them as standing hay fields, the calving interval of female yaks can be reduced from 2-3 years to 1 year, and milk yield can be increased from 300 ml a day to 1 litre a day (Gyamtsho 1992). This would mean that there would be an increase in milk production on two fronts:

- increased number of female yaks in milk production, and
- increase in milk yield per animal.

Although, no study has been conducted on the production and consumption of yak meat, it is widely considered a delicacy and there is a big demand in the market for it. Unlike cattle, it is an accepted practice to slaughter yaks for meat among certain communities in the country. Members of these communities already operate in buying and slaughtering yaks for meat and sale. Thus there is no potential risk of drastic decrease in yak numbers as better nutrition and reproduction ability could substantially compromise.

Yak hair is widely used by the herders to make bags, rugs, ropes and tents for their own use as well as for bartering with food grains from the agrarian communities in the lower areas. Yak wool growing on its belly is used to produce blankets, garments and hats. The hair and wool are sheared annually and on an average, an adult yak produces 0.5 kg of hair and 0.3 kg of wool. There is a good export potential and local market for some of these yak hair and wool products.

In the rugged and harsh climatic conditions of the alpine areas, yaks are the only means of transport and are used for riding as well as carrying goods. They are used for transporting the yak produces like milk, butter, cheese, meat, skin, tails, bags,'rugs and ropes to the lower areas and on their return they carry food grains, clothing and other consumable from these areas. During winter, they are the only animals who could negotiate the highest snowy passes between habitations.

Though last but not the least is the importance of manure supply by yaks to the alpine pastures and grazing lands. This helps to maintain the grasslands essential for both domestic and wildlife. Manure production in this eco-system was estimated to be around 11,200 t valued at Nu. 46 million (MoA/RGOB/ISNAR).

Review of literature

Dunbar (1979) reported the following main genera in alpine pasture of Laya and also estimated the ground cover on a south-east facing slope at 41% plant cover, 13% litter and 46% bare soil:

Family	*Genera*
Grasses	*Agropyron, Agrostis, Arundinacia, Bromus, Calamagrostis, Danthonia, Deyeuxia, Deschampsia, Eragrostis, Festuca, Koeleria, Poa, Stipa, Trisetum* etc.
Forbs	*Carex, Primula, Iris, Potentilla, Artemisia, Fragaria, Delphinium, Euphorbia, Rumex, Geranium, Gnaphalium, Veronica* etc.
Shrubs	*Cotoneaster, Rhododendron, Berberis, Juniperus* etc.

Miller (1987) classified the grasslands according to their types, site characteristics and altitude (table 1). This survey showed that some species of *Agrostis, Bromus* and *Festuca* are widely distributed from 2,000 m to 4,500 m altitude.

Table 1. *Classification of rangeland types found in Merak-Sakten region*

Type	Site characteristics	Altitude (m)	Main species	Production (tlha DM)
Schizachyrium delavayi	Drier south facing slopes	2500-3000	*S. delavayi* *A. hookeri* *H. virescens* *B. ramosus*	2.0-3.0
Forest meadow	Located in & around oak-rhododendron forest	2900-3300	*E nigra* *A. hookeri* *Agrostis spp.* *Sedges* *G. elatum*	0.8-1.0
Danthonia cumminsii	Drier south facing slopes	3000-3800	*D. cumminsii*	1.0-1.5
High Elevat-ion forest meadow	Associated with fir forest	3600-900	*P. alpinum* *T. spicatum* *Agrostis spp.* *Festuca spp.* *Poa spp.* & Sedges	1.0
Bamboo Grassland	Moist sites	32003600	*Bambusa spp.* *D. glomerata* *H. virescens* *Agrostis spp.* *Bromus ramosus* *B. sylvaticum*	2.0-3.0

Source: Miller (November 1987)

Note: S - *Schizachyrium*; A - *Arundinella*; H- *Helictotrichon*; G - *Geum*; D = *Danthonia*; P = *Phleum*; T= *Trisetum*; D - *Dactylis*; B - *Brachypodium*; E- *Eragrostis*

Screening work done with improved species

Gibson *et al* (1992) screened some winter hardy varieties of lucerne (Medicago saliva), alsike clover (Trifolium hybridium) and cocksfoot (Dactylic glomerata) at 3,900 m altitude in north-west Bhutan (Soiyaksa). They were found to be very persistent and productive as hay meadows under village conditions. After the screening work, the following conclusions were derived:

- promote hay meadows based on winter hardy varieties of lucerne and cocksfoot in alpine areas for winter and spring feeding of livestock
- test all soils for pH before meadow establishment
- lucerne should only be sown on soils of pH 6.0 or higher
- alsike clover can be sown on soils of pH lower than 6.0 where lucerne is not adapted cocksfoot is adapted to a wide range of soils
- lucerne and other forage can be established without chemical fertilizer in alpine areas if sufficient yak and sheep dung is used
- standard temperate pasture mixture of Ladino clover, Italian ryegrass and tall fescue are not suitable for alpine environments

Gyamtsho (1994) carried out extensive research studies on the rangelands of north-west Bhutan (Laya & Lunana under Gasa Dzongkhag). The preliminary findings were:

- overgrazing by domestic animals and wildlife particularly blue sheep (*Pseudois nayaur*) is rampant and particularly severe in community pastures around the villages
- recent growth herder numbers have led to breakdown of traditional institutions of rangeland management such as user groups control over grazing time and duration
- indiscriminate banning of rangeland burning has led to invasion by inedible shrubs of rhododendrons and junipers aggravating the grazing pressure on open meadows and also indirectly reducing flora big-diversity due to competition and shading by these aggressive shrubs
- the fertility status of soils particularly from the pastures around the villages is low due to improper nutrient management - yak dung is normally collected for use in barley fields - thus breaking the soil-plant-animal-soil nutrient cycle which is further compounded by the presence of shrubs which prevents nutrients from being released to the nutrient cycle

- white clover can establish successfully under both cultivated and uncultivated conditions provided fertilizer P and protection from grazing during the first year can be provided

- several other species including *Lotus pedunculatus* (CV Maku), red clover, alsike clover, perennial ryegrass, cocksfoot and tall fescue can be grown if soil is cultivated and applied with P

- contrary to past prescriptions, the experiments at 4020 m altitude proved that low soil fertility rather than low temperature and moisture status was the limiting factor

- for pasture growth during summer

References

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