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Grasslands in India: Problems and perspectives for sustaining livestock and rural livelihoods

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Abstract

In India, grazing-based livestock husbandry plays an important role in the rural economy as around 50% of animals depend on grazing. Pasturelands over an area of 12 Mha constitute the main grazing resources that are available. Temperate/alpine pastures are spread across elevations higher than 2000 m in the Eastern and Western Himalayas including the Jammu & Kashmir, Himachal Pradesh, Uttarakhand, West Bengal, Arunachal Pradesh and Sikkim states. Nearly 30 pastoral communities in hilly or arid/semi-arid regions in northern and western parts of India, as well as 20 in temperate/hilly regions, depend on grazing-based livestock production. Due to overgrazing coupled with poor management and care, these grazing lands have deteriorated to a large extent and need amelioration or rehabilitation. Appropriate technologies have been developed, refined and tested in various research and academic institutions. These technologies need to be implemented on a large scale in different parts of the country for augmenting forage resources, enhancing livestock production and sustaining livelihood options in an eco-friendly manner.

Resumen

En la India, la ganadería basada en pastizales juega un importante papel en la economía rural, ya que el 50% de los animales depende del pastoreo. Las áreas de pastoreo abarcan 12 Mha y constituyen el principal recurso para la ganadería. Los pastizales de zonas templadas/alpinas se encuentran a alturas >2000 m.s.n.m. en las regiones este y oeste del Himalaya, incluyendo los Estados de Jammu & Kashmir, Himachal Pradesh, Uttarakhand, West Bengal, Arunachal Pradesh y Sikkim. Aproximadamente 30 comunidades de pastores en regiones de ladera o zonas áridas/semi-áridas en el norte y oeste de India, y 20 en zonas templadas y/o topografía pendiente dependen de la ganadería basada en pastoreo. Debido al sobrepastoreo acompañado de mal manejo, los pastizales se han degradado y requieren prácticas de rehabilitación. En varias instituciones de investigación se han desarrollado y probado tecnologías apropiadas que deben ser implementadas a gran escala en varias regiones del país, con el objeto de aumentar, en forma amigable con el medio ambiente, los recursos forrajeros para mayor producción pecuaria y mejor calidad de vida de las comunidades rurales.

Introduction

In India, agriculture is characterized by the traditional predominance of a mixed farming system, a well-knit combination of crop production and livestock rearing. Livestock rearing is a major source of income providing employment and livelihoods for rural families. Livestock production is the backbone of Indian agriculture, contributing 4% to national GDP and providing a source of employment and the ultimate livelihood for 70% of the population in rural areas.

India's livestock sector is one of the largest in the world, with a livestock population around 623 M, which is expected to grow at a rate of 0.55% in the coming years. India has 56.7% of the world's buffaloes, 12.5% of the cattle, 20.4% of the small ruminants, 2.4% of the camels, 1.4% of the equines, 1.5% of the pigs and 3.1% of the poultry. The livestock population, over the years, has shown a steady growth on 2 broad fronts, namely: (i) in the number of stall-fed bovine livestock, including buffaloes and crossbred cows, owned mainly by people with arable land and resources to grow or procure green fodder; and (ii) in the number of small ruminants like goats and sheep, surviving mainly by free grazing the available pasture lands and tree foliage (Anon. 2011).

This latter category is the topic of this paper. Uncontrolled grazing is the basis of grazing systems of resource-

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poor households, landless pastoralists, nomadic and semi-nomadic tribes and marginal farmers. Between 84 and 100% of poor households gather food, fuel, fodder and fiber items from the 'common property grazing resources' (CPRs). These landless farmers graze their animals on, as well as collect fodder from, the CPRs. In this paper we describe work to: survey and update the distribution of the main grassland types of India; define the current grazing methods; summarize the overall state of the grassland-livestock systems; and propose action to rehabilitate grassland areas.

Methods

A reconnaissance survey of the grasslands of India was conducted from 1954 to 1962, revealing 5 major ecosystems based on vegetation composition and distribution, primarily governed by climatic factors, latitude, elevation, topography and seasonal patterns of soil moisture (Dabadghao and Shankaranarayan 1973). The 5 types were: *Sehima - Dichanthium* grasslands; *Dichanthium - Cenchrus - Lasiurus* grasslands; *Phragmites - Saccharum - Imperata* grasslands; *Themeda - Arundinella* grasslands; and temperate/alpine grasslands.

Several previous studies and reports **(**Shankarnarayan and Shankar 1984; Singh et al. 1997; Pandeya 2000; Tambe and Rawat 2009) were used to draw conclusions for this paper. In recent studies **(**Singh et al. 2009; 2011**),** the monitoring and mapping of grasslands of the Himalayan region (Himachal Pradesh, Sikkim, Jammu and Kashmir states) during 2007−12 with modern tools and techniques, viz. GIS, RS, GPS and FSGT, were used in conjunction with ground-truthing to assess the extent of grasslands and their productivity.

Grassland areas

Hill region

In Himachal Pradesh (IRSP6L3 2008[1]), grasslands occur on 16.5% of the total area, occupying 15.3, 21.6, 18.0 and 15.3% of geo-climatic zones 1 (Low hill subtropical), 2 (Mid-hill subhumid), 3 (Mid-hill temperate wet) and 4 (High hill temperate), respectively. Forage production from high hills was recorded as 4.0 t/ha/yr (fresh weight) and 1.1 t/ha/yr (dry matter), with an average crude protein concentration of 11.3% (Singh et al. 2009).

In Jammu and Kashmir (IRSP6L3 2009 and 2010 data), 4.3% of the total geographical area was under productive grasslands, whereas the area of other grazing lands, including scrub and other unpalatable swards, was 9.8% of the total. The areas under productive grasslands in Jammu, Kashmir and Ladakh were 3.5, 13.2 and 5.8%, respectively.

In Sikkim, the area under alpine pastures in the High hill zone was 7.4% of total geographical area, whereas it was 6.8% in the Mid-hill zone. About 36.5% of the total pasturelands (14.1% of the total area) were in various stages of degradation. About 44.6% of pasturelands at different elevations and slopes in the Mid-hill zone were susceptible to soil erosion/depletion and/or landslides.

Temperate/alpine and subalpine meadows

The Indian Himalaya system comprises various mountain ranges which run parallel to each other, and contains a tremendous diversity in ecology, terrain, elevation, climate, resource availability, ethnicity, agricultural activities, flora and fauna. Steep topography, prolonged and severe cold winters, shallow soils and lack of irrigation etc., have limited the choice of agricultural activities, with livestock rearing being one of the most important occupations in the region. The temperate/alpine pastures are spread across elevations higher than 2000 m in the Eastern and Western Himalayas including Jammu and Kashmir, Himachal Pradesh, Uttarakhand, West Bengal, Arunachal Pradesh and Sikkim states. The alpine and subalpine meadows suffer from general degradation, with an increasing incidence of unpalatable species and erosion due to overgrazing. These grasslands and pastures, besides being a major source of forage for livestock, provide habitat for a large variety of wild animals and birds, and for endangered species of plants, many of which have an ethnobotanic value.

Tropical and subtropical grasslands

These are found mainly from high rainfall areas (Western Ghats) to arid/semi-arid areas including the Terai and Gangetic plains. These areas are subjected to heavy grazing, which has resulted in their general degradation and very low productivity. Ecologically they belong to the mid-successional/subclimax type of grasslands.

Grassland management

Nomadic pastoralism, a traditional form of human-livestock-grassland interaction, is still predominant in the drylands of western India, the Deccan Plateau, and in the mountainous reaches of the Himalayas. Nearly 200 castes are engaged in pastoral nomadism. They represent endogamous (discrete) social units, and specialize in the breeding of traditional animal sub-types, including buffaloes, sheep, goats, camels, cattle, donkeys and yaks (Tables 1 and 2).

[1]IRSP6L3 2008 = Indian Remote Sensing Satellite P6, Linear Imaging Self Scanning Band 3, Year 2008

Table 1. Some important pastoralist communities in the Himalayan region of India (Sharma et al. 2003).

Pastoral community	Area	Predominant livestock species
Bakarwal	Jammu and Kashmir	mainly goats
Bhotia	Uttarakhand, Garhwal, Kumaon − upper regions	sheep, goats and cattle
Bhutia	North Sikkim	sheep, goats and cattle
Changpa	Jammu and Kashmir, mainly in Zanskar	yaks
Gaddi	Himachal Pradesh, Jammu and Kashmir	sheep and goats
Kinnaura	Kinnaur − Himachal Pradesh	sheep and goats
Gujjar	Jammu and Kashmir, Rajasthan, Himachal Pradesh	buffaloes, some cattle
Monpa	Tawang, West Kemeng of Arunachal Pradesh	yaks and cattle
Van Gujar	Uttarakhand, Uttar Pradesh	buffaloes

Table 2. Some important pastoral communities in Western India (Sharma et al. 2003).

Pastoral community	Area	Predominant livestock species
Bharwad	Gujarat	sheep, goats and cattle
Charan	Gir forest region of Gujarat	cattle
Dhangar	Maharashtra, Karnataka and Madhya Pradesh	sheep
Gavli	Gujarat, Goa, Karnataka and Maharashtra	cattle
Gayri	southern Rajasthan (Mewar)	sheep
Ghosi	Bihar, Rajasthan and Uttar Pradesh	cattle
Golla	Andhra Pradesh and Maharashtra	cattle
Jath	Kutch region of Gujarat	cattle, occasionally camels
Mer	Saurashtra region of Gujarat	camels, some cattle
Rath	western Rajasthan (Ganganagar, Bikaner)	cattle (mainly of Rathi breed)
Rebari/Raika	Rajasthan and Gujarat	camels, cattle and goats
Sindhi Sipahi or Sindhi Musalman	Marwar and Jaisalmer	mainly camels, also cattle and sheep

These pastoral groups are concentrated in certain regions such as the semi-arid and arid Thar desert region, salty marshy lands of Kutch, and the alpine and subalpine zones in the Himalayas. In mountainous areas, nomadic grazing descends in winter to the lower slopes and in summer it progresses up the hills to get the maximum benefit from the good pastures that regenerate after the snow melts. In plateaus, plains and desert areas, the pastoralists move according to the alternation of the monsoon and dry seasons, in response to the availability of forage resources, including tree fodder. Usually in the dry season, they move to the coastal tracts, and leave when the rains come.

The grazing lands are degrading due to management neglect and have been invaded by unpalatable, alien species like *Lantana*, *Eupatorium*, *Parthenium*, *Prosopis juliflora* and others, severely affecting grassland productivity. The once robust village-level traditional institutions, that ensured the sustainable management of grasslands, have broken down and there is no responsible agency to look after the management issues (Anon. 2011). Neglect, poor maintenance and overgrazing have resulted in most of the grazing resources declining to a poor, degraded condition. In semi-arid areas, the carrying capacity is currently less than 1.0 adult cattle unit (ACU)/ha, whereas in the arid areas, it is 0.2−0.5 ACU/ha.

Many of the ecologically important, sensitive pasture lands, viz. Shola grasslands of Nilgiris; Sewan grasslands of Bikaner, Jodhpur and Jaisalmer; semi-arid grasslands of Deccan; Rollapadu grasslands in the semi-arid tracts of Andhra Pradesh; Banni grasslands of Gujarat; and Alpine grasslands of Sikkim and Western Himalaya, have already deteriorated to a large extent.

Issues for consideration to revitalize grasslands

Several factors, including the involvement of multi-stakeholders, a lack of participation of pastoral people in decision-making and in Government initiatives, overgrazing, and a lack of sufficient extension resources

have hampered the revitalization of grasslands or CPRs. Some of the following points require attention, in order to achieve the rehabilitation of grazing lands, which are a source of livelihood for a large population**:**

- A national policy, involving various stakeholders, needs to be formulated and implemented for the targeted rehabilitation and development of the country's grazing resources (natural and cultivated).
- There is need to coordinate various research, educational and extension projects on fodder and pasture development for the CPR areas.
- Ecologically sensitive grasslands need to be mapped and appropriate amelioration models/protocols developed, given priority and implemented.
- Fodder conservation strategies need to be explored and implemented to control numbers of grazing animals, meet the fodder requirement targets for use during periods of low productivity, and prevent overgrazing.
- In the arid and semi-arid zones, the adoption of silvopastoral practices could be considered.
- In specific subregions, a network of nurseries and seed banks is needed for the rejuvenation of CPRs and grasslands.
- The rejuvenation of degraded grasslands will require the best strategies for transferring technologies developed in institutes to the field situation, using participative methods that consult with and educate the pastoralists.

Conclusion

A lot of significant work has been done and technologies have been developed and tested with the active support of Government agencies and researchers. More emphasis is required in a coordinated manner involving multiple stakeholders to implement processes and activities to rehabilitate grasslands. It is hoped that this paper will help to create international awareness and development of suitable eco-friendly technologies for grassland rehabilitation and sustainable livelihoods of communities.

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