Chapter VI
Summary and Conclusions

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Chapter 6

Summary and conclusions

6.1 Introduction

Pastoralists of Jammu and Kashmir make a significant contribution to state economy in terms of food security (milk), provision of draft animal power, organic manures as well as foreign exchange earnings (meat, fibre e.g. *pashmina* wool). Such herding groups produce practically all the goat-meat in the state. Contrary to their reputation, pastoralists have traditional practices for conserving vegetation by rotational grazing. Since pastoralists do not own land, the produce is generated by dependence on communally and state owned grazing land. Currently, the trend towards globalization of the market, with pastoral lands increasingly being commercialized has created ecological problems. Thus, (chapter 1) describes all the problems related to the transhumance and has been framed in a conceptual frame work.

As a result of this practice, the Himalayan mountains are on the verge of a major ecological crisis threatening the collapse of the very life support systems. The impact of unscientific and irrational resource development processes and the resultant deteriorating environmental conditions are not confined to the region itself but also adversely affect the environment and economy of the hilly people. Thus, it becomes necessary to represent an area which best desires the impacts of transhumance on the Himalayan environs. Liddar Valley, which forms the southeastern part of the Kashmir valley and forms the part of middle Himalaya has been selected as a geographically representative area. The Valley gradually rises in elevation from south (1600 mts to North 5400 mts) and is girdled by lofty ridges. The interior of the northern part of the Liddar valley has concentration of high mountain ridges making its actual area more than the apparent area and this anomaly gives rise to the alpine and sub alpine grazing grounds. These vast biotopes are seasonally used by transhumant graziers to exploit the fodder
resources of the area (Chapter 2). The study describes the Patterns of movement and social classification of transhumant tribes with the other resources for transhumance. The impacts of the focal phenomenon is summarized under following paragraphs.

6.2 Impact on soil properties

Continuous free grazing by numberless transhumant flocks cause change in soil physico-chemical parameters like compaction, degradation of structure, increase in coarseness and increase of bulk density Coupled with uneven nutrient enrichment. Thus, the observed differences are attributable to long term excessive grazing and trampling. The different grazing and trampling intensity as well as the uneven return of cattle excreta in grazed pastures results in spatial heterogeneity, leading to distinct compaction, nutrient accumulation in top soil coupled with bare patch formation and weed infestation.

The long-term effect of this redistribution of nutrients within a paddock is that, areas for day grazing become depleted of nutrients, while areas especially near the camping sites and migration routes accumulate high amounts of nutrients in top soil, primarily those that are returned in a high degree due to cattle excreta. Similarly, long term grazing tended to accumulate the nutrients in top soil especially Sulphur and phosphorus because of their lower tendency to be leached as compared to Carbon, Nitrogen and Potassium. The enrichment of Sulphur, Phosphorus and their compounds has resulted the invasion of characteristic annual weedy species.

On the basis of above findings, there is a need to develop sustainable grassland management and exclusion practices to combat the ongoing pastureland degradation and improve the soil quality in the region. As application of grazing exclusion is advised to be viable method for the restoration of such ecosystems.

6.3 Change in plant community structure and biomass

Plant communities of the grassland investigated in the present study are an assembly of annual and perennial herbs, small shrubs, cushion-forming species, forbs and few grasses. Such an assemblage has been shaped by the fact that the
area has a long history of livestock grazing, although there are no historical records for it. In the grasslands of Kashmir, overgrazing has been found to affect the species richness and increase the occurrence of poisonous grass species in addition to increasing the coverage of weeds.

These facts are evident along the migration routes, which are available for grazing at the earliest time and some shepherds camp in and around this zone with their animals. Under such conditions, plants with buds high above the ground surface are depressed and give way to plants like Sibbaldia cuneata, which have their buds close to the ground and can withstand trampling. Many of the species produce underground rhizomes and buds and spread clonally, which has replaced less trampling-tolerant tussock grasses and decreased species richness in this zone. This is a main cause for the decline of biomass along the migration routes and infestation of unpalatable and poisonous weeds, which cause a serious damage to livestock wealth of the state. However, tall perennials and annual species are present in protected sites and are found to be rich in the edible biomass.

It is in this concern that uncontrolled grazing by transhumant livestock has been a potential threat to the regional ecology and its further implications may be on the water bodies of the area, which supply the pristine waters downstream to a huge population.

6.4 Regional changes through Remote sensing

The present transhumant utilization and management practices regarding their herd grazing are unsustainable. They do not accommodate the requirements of future development, are a major cause for the change in regional land use and land cover. The underlying causes for the forest cover change are diverse, including encroachment, illegal logging, grazing, forest fire, intense population pressure, invasion of exotic species etc. In majority of Himalayan forests, apart from deforestation, forests experience thinning, which makes forests fragmented and are separated into smaller patches due to anthropogenic activities. There has been tremendous increase in the population pressure and number of settlements due to improving connectivity, which is leading to increased fire occurrences and other related anthropogenic disturbances like grazing.
The forests in the study area experience a severe pressure because it has a long history of deforestation mainly for the extraction of torchwood, fuel wood and timber for the constructions of temporary huts. These changes in land use and land cover have important consequences for natural resources through their impacts on soil, water quality, biodiversity and regional climatic change. This study has provided important insight into the dynamics of forest ecosystems that occurred in forested area and other major land uses of the study area from 1992 to 2010.

Forest department of Jammu and Kashmir has developed various nurseries within the region to restore the degraded forests and to develop the panoramic sceneries around the area to maintain the natural ecology for the benefit to local people in terms of tourism and forest produces.

From the findings of the study, it becomes evident that the ecosystems of the study have a high resilience because the decrease in the area of degraded patches during the period of 1992 to 2000 has shown a decline. Furthermore, the physical topography of the area makes it feasible for the grazing.

6.5 Suggestions

Prior to undertaking any actual work for the improvement of these grazing areas, it will be relevant to conduct a detailed survey of these grass lands to know their present condition, trend and future potential. The prior grading of the areas should be thus done and every site be given the best scientific treatment it warrants. The overall conclusion is that the grazing ranges badly need a rest from the intensive grazing for excessively long periods of the year to which they have been subjected for centuries, and probably at an accelerated rate in recent times.

1. The rest can be provided by holding nomadic and migratory flocks and herds for, say, one month longer in the cultivated lands (to which they go at regular intervals in many parts of the area), and bringing them back from these lands one month earlier. The effect of closing the area alone will be tremendous. This has been observed practically That *Dactylis glomerata*, one of the prized grass species, grows to a height of about 2 meters, naturally. Besides, some of the rare species like *Briza media* are also seen growing there in an alpine pasture of Liddar valley. The area was closed for
wildlife protection purposes. A sample survey of the area has revealed that a yield of 200 Qtls. of green matter could be achieved per hectare without any import of seed material for the purpose.

2. Establish a capital value system for grassland, because the possession of the grasslands belongs to the government and the access rights to the grassland are not clearly established. Grassland has no perceived value in the state. This is one cause of the grassland degradation. We should treat the grassland as an important asset, and get reimbursement and investment from its utilization and for its use, restoration and protection. It is urgent to establish a capital value system for grasslands, and to implement a series of policies to determine the accessibility of grasslands.

3. The current government investment in the grassland and husbandry industries is small. Therefore, the mismanagement and overutilisation of grasslands are continuing. State and Central government should constitute policies to attract capital investment to grassland farming and industry, which would be conductive to sustainable development of economy and environment.

4. The management of grasslands has to comply with the strict legislation to protect the areas under the effect of grazing from unsustainable utilizations like denudation, over harvesting, and excessive grazing, and enforce punishment for illegal activities. In mountainous regions with large contiguous grasslands, national parks or natural reserves should be developed to meet the needs of biodiversity conservation, ecological traveling, and scientific research.

5. What must be analyzed is the potential to approach as nearly as possible long-term equilibrium for the sustainability the number of animals and the amount of fodder needed in the individual pastures again accounting for the constraints of climatic hazards. Further, long-term analyses must be undertaken to record the changes in the areas of woodland and the spread of settlements and arable land. The satellite imagery interpretation used here is a relatively simple, but nevertheless adequately accurate method of conducting a broad-area analysis of the state of a pastoral land use system.
6. Any effort aimed at the development of these pastures cannot meet enough success unless the graziers too are involved in the task. The problem should be tackled on the socioeconomic grounds. The semi nomadic and nomadic graziers should be trained in the field and made to practice by providing job opportunities to them on priority basis. Facilities in the form of shelter-sheds, farm ponds, bridle-paths should be provided on different routes of their migration.

7. The public opinion should be mobilized by propaganda so that the useless and scrub cattle are castrated. Heavy grazing taxes, if imposed, would discourage the practice of keeping large but uneconomic herds.

6.6 Limitations

The present study has intended to find the long-term impacts of transhumance on a highly remote area of central Himalaya. Obviously, limitations faced during the study have been mainly associated with isolated and difficult nature of the terrain.

1. The area being situated in a very mountainous area makes a researcher to make a huge arrangement for the preservation of samples to be studied. However, the study area was visited at least once in each season.

2. The background values for the concentration of soil nutrients were not available from the previous literature. Therefore, the study has to be based on some observation from lightly grazed, moderately grazed and heavily grazed areas etc. to understand the impact of grazing.

3. Census data for the transhumant population and their livestock are not available in the government planning departments, which makes the study short of predicting the future scenarios.

4. The study is mainly based on the data related to a small region. However, the conclusions based on the local data may be applied to the other regions facing similar problems.
6.7 Scope for further research

The present study with its limitations offer a scope for further studies as mentioned below:

I. It encourages to undertake the studies related to vulnerability assessment of different ecosystems in relation to natural and anthropogenic factors.

II. Studies on regeneration status in highly fragmented and disturbance areas for sustainability of forests.

III. Model of pastoral production as a variable of ecological animal husbandry.

IV. Study of development and planning strategy of regional land use for the benefit of pastoralists.

V. The studies aiming at conflict management based on the present work.