Chapter 38

The Shifting Perspectives of Biodiversity/Agrobiodiversity Related to Land Use in the Himalayas and Its Implications

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Mountain Biodiversity

Mountains make up one-fifth of the world's landscape and are home to at least one-tenth of the world's people. In addition, two billion people depend on mountains for much of their food, hydroelectricity, timber, and mineral resources. Mountain areas in general, and the Himalayas in particular, are considered to be a storehouse with a wealth of economically important and endangered species. Now that the lowlands have been hugely altered by agriculture, industry, and urban settlement, the last stronghold of nature is in the mountains (Denninston 1995).

The Himalayas have not received sufficient attention in the context of global biodiversity compared to the tropical rain forests. This lack of attention may be because species' diversity generally declines with increasing elevation, and there are far more species per unit area and in total in the tropics than in temperate mountain regions. The Himalayan region, however, has considerable biodiversity and agrobiodiversity, particularly at levels of biological organization higher than species, i.e., genera, families, phyla, habitats, and ecosystems and agroecosystems. Perhaps no other life zone contains so great a variation in habitats and ecosystems (beta diversity) as the mountains. Mountains also rank high in another indicator of biodiversity - endemism, the occurrence of species only within narrow ranges, typically after a century or more of isolation. The eastern ranges of the Himalayas are richer in both species and endemism than the western ranges, although similar habitats are rich in some taxa and poor in others. The Himalayas, which are about 3,000 kilometres in length and only 80-200 kilometres in width, have a

striking vertical zonation in natural vegetation. Furthermore, the changes in plant and animal communities are very abrupt, and smaller areas may contain a variety of habitat types as a result of changes in aspect, slope, and altitude. The micro variations in climate, soil, and vegetation over very short distances lead to the occurrence of species within narrow ranges. The ecological changes in the Himalayas occur along three principal axes.

- A vertical axis, with variations in temperature and moisture determined by the increasing altitude

- A transverse axis cutting across the main ranges, with a decrease in annual precipitation and extreme temperature fluctuations between the front and interior ranges along the axis resulting from the topography

- A longitudinal axis parallel to the ranges, with a decrease in monsoonal precipitation and winter snowfall along the axis from southeast to northwest.

Since the interaction of these three axes determines the climate and biodiversity-agrobiodiversity at any place in the Himalayas, our perception of biodiversity in the area has to go beyond the conventional measures of biodiversity based on species' diversity and species' abundance, since the absolute number of species is generally smaller than in lowland and tropical forests (Gaston 1981). The Himalayan region is also characterised by diverse ethnic groups. These have developed their own cultural practices based on the available natural resources, giving rise to a high level of cultural diversity on par with that of the biodiversity found in the region. The interaction of mountain people with the natural ecosystem has helped people to maintain the richness of species, communities, and genetic material, both in farming systems and in the wildlife of the mountain environment (Gurung 1994). This has led to a depth and diversity of indigenous knowledge about the management of biodiversity and agrobiodiversity, examplified by the diverse farming systems, use of minor forest products, and richness of cultivars and land races of mountain crops.

Monitoring of Agrobiodiversity

Post independence land-use changes have not remained limited to forests, grazing lands, and minor settlements, but have also involved large-scale use of land for mining, horticulture, road building, hydroelectric projects, construction, urbanisation, commercial tourism, and industry resulting in water pollution, severe landslides, pressure on forests, and shrinkage of wildlife habitats. The front ranges and low altitude areas of the mountains are more prone to these environmental disturbances, though the interior areas experience a seasonal burden in summer.

Summing up the chronological events of land-use changes in Himachal Pradesh, it seems that the period from early 1800 to 1870 was a phase of harnessing unused forests. from 1870 to 1900 saw the exclusion of locals from forest use and management. From 1900 to 1947 was the so-called 'conventional conservation phase' with changes to stricter regulations further restricting the use of forest land and resources by people, and increasing conflicts over land use with local farmers. Post 1950 saw moves changing forest composition for commercial requirements, and the development of chir pine plantations in the mid hill grasslands and rangelands. The conservation phase started only in the 1980s. The degradation in biodiversity had already started in the early 1800s, in the form of deforestation and hunting. The history of land-use changes provides a chronology of processes relating to structural changes in the dimensions of biodiversity.

Thus, during the past century and a half there have been considerable losses in the area of habitats for natural biodiversity, but equal gains in the area of agrobiodiversity habitats. Has this increased agrobiodiversity? The addition of cash crops may be a gain, but the loss of native land races and farming cultures are a net loss for which we do not have actual accounts. The moves towards commercial forestry for timber and resin, and to restricting the use and management of forests by people, have added to the risk of loss of several wild species. The biological degradation of grassland ecosystems through chir pine plantations and lantana invasion represents an added threat to the diversity of animals and plants associated with these systems. The now endangered pheasant species is one example of this. Government policies and institutions are at the helm of the factors directing change, particularly the forestry department. The other key influence is the increase in the population working to sustain their livelihoods.

Monitoring of Agrobiodiversity

Agrobiodiversity and human needs have been in a state of continuous adjustment since historical times. There is much talk today of environmental degradation in the Himalayas, but most of this is literary and sentimental, asserting the impression that the Himalayas are facing destruction by people, and unable to distinguish between natural changes and changes caused by anthropogenic activities and improper institutional interventions.

The pace and characteristics of change within mountain zones over the past 50 to 100 years need to be evaluated. But data on the natural rates of regeneration may not be available, so that it might be difficult to compare the human-induced rates of degradation with natural changes. Loss and gain accounting for biodiversity and agrobiodiversity might help.

We need sound monitoring and management of environmental changes, along a network of on-farm sites to detect the range of changes, particularly those resulting from continual anthropogenic changes in land-use patterns and the use of natural resources and human influences. Biological monitoring programmes can evaluate trends in the status of species, communities, and ecological systems over time. The conservation of biodiversity could be enhanced by monitoring programmes, providing a feedback loop that signals to managers and policy-makers the need to make appropriate changes.

Monitoring programmes should be on a scale relevant to the ecological processes being monitored and the conservation and management questions being asked. Surveys and monitoring should be aimed at identification of areas with rich diversity; of trends in species and habitat loss; of loss in agrobiodiversity resulting from factors such as population, resources, consumption, and trading systems; and conservation measures needed, including such things as monitoring species to audit the changes in diversity, custodial management, and buffer zone eco-development.

There are some simple and cost-effective biodiversity monitoring methods aimed at identifying trends in species and habitat loss. Some of these are listed below.

Comparative Historical Data

Historical data related to natural history observations have been collected for a century or so and are available in museums and libraries for comparison with recent records. Local changes in diversity should be analysed in the historical setting.

Revisiting of Sites

Sites for which historical accounts are available should be revisited to enable a fresh assessment of changes in species and habitats. This could form a basis for evaluating the status of agrobiodiversity components and also for future prediction of the processes. Spatial data on the distribution and abundance of people-crop-livestock-forest species are of great value in assessing diversity.

Biodiversity can also be monitored using such tools as photographs and maps, repeat photography, ethnosciences, and wildlife studies.

Agrobiodiversity conservation will also require assessment of the economic, social, and ecological effects of land-use policies. The socioeconomic data at household level needed for this may be acquired from various sources.

The Options and Imperatives

The dichotomy of conservation and development policies needs to be addressed through a holistic approach to agrobiodiversity in the mountains. This would require an institutional change, as the present institutional mechanisms are oriented towards sectoral approaches at both policy and field levels. A variety of approaches and strategies has to be worked out for this purpose. These would include incentives and disincentives to agencies directly or indirectly affecting the conservation of agrobiodiversity in the Himalayas.

Participatory Monitoring Protocol

Simple and participatory methods need to be developed for the assessment of agrobiodiversity. Our perception of the full dimension of mountain agrobiodiversity remains very vague, but we may expect species' estimates to be made with increasing confidence and precision. Standard sampling methods and protocols that allow reliable comparison between sites without a complete inventory being taken need to be developed.

Study of both formal documented records and non-formal indigenous knowledge can provide vital information about indigenous resource management systems and present day agricultural management methods.

Outstanding Individuals and Communities

The process of change always results in the emergence of a set of individuals or communities who are outstanding in terms of local innovation and set the trend among the people in how to deal with changed circumstances. Recognition should be given to innovative farmers, indigenous communities, and institutions who have a stake in conservation of biodiversity for their own survival.

Benefit Sharing Mechanisms

An effective conservation policy based on the better understanding of biological resources and the human uses of agrobiodiversity would require new mechanisms of cooperation among local communities, government agencies, and non-government organizations. Economic values need to be assigned to each component of agrobiodiversity, in particular, those elements that have been considered as the free gifts of nature. New benefit sharing mechanisms need to be evolved so that resource use is minimised.

Policy Awareness

An informed public is the most effective custodian of agrobiodiversity. This would require the publication and dissemination through modern and traditional methods of field guides and educational materials on components and values of agrobiodiversity. To make the conservation of agrobiodiversity a goal, we need a fundamental shift in our policies. Agrobiodiversity conservation should be looked at from all levels, from subsistence farmlands with a 100 old varieties, to rapidly developing modern agriculture.

References

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