Conservation of Biodiversity and Forest Resources in Nepal
-Degradation and Threats-

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ABSTRACT

Nepal is rich country in terms of its vast array of biological diversity. The relationship between local communities and the biological diversity in Nepal is a very entangle one, whereby two-thirds of our population are heavily dependent upon the biodiversity for their survival. The destruction of biodiversity signifies the destruction of people's livelihoods and survival. Biodiversity and genetic resources conservation has been a most significant part of the Nepalese society due to its socio-economic and cultural importance and provides the human race trees for timber, fuel, food, industrial raw materials, pharmaceuticals, beverages and environmental stabilization. Threats to biodiversity at global level is of greater concern, specially, human activities are the greatest factor currently affecting biodiversity, through the use of natural resources by industry, agriculture, hunting, and energy generation.

Keywords: Biodiversity, genetic resources, degradation, conservation, environment.

INTRODUCTION

Biodiversity is a resource for sustainable use. It plays an important economic, social, and cultural role in the lives of many people. Nepal has high levels of both natural and agricultural biodiversity (Gorkali 1991; Sthapit 1998; Belbase 1999; Shrestha 1999). It has a number of floristic regions and large variations in climate and physiographic conditions, which have resulted in a rich flora (Olsen 1998). Forests are the main source of biodiversity in Nepal, and provide habitat for thousands of indigenous and rare species of fauna and flora. The country is home for over 7000 species of plants which comprise of trees, shrubs, herbs, climbers. It has 5400 vascular plants, including over 254 species of endemic plants and 700 species of medicinal plants. In addition, over 175 species of mammals, 850 species of birds, 600 species of butterflies, 50 species of moths, 180 species of dragonflies, 170 species of fish, and other animals inhabit this country. The country represents 0.01% of the total land area of the world, however, holds nearly 2.5% of the world's biodiversity in flowering plants. Forests are the single most important assets that provide a basic necessities and the second major source of the country's income after agriculture in Nepal. However,

over the last few decades, these important contributions of the forestry sector are being degraded by various factors such as habitat loss, forest degradation and destruction. Habitat loss, forest destruction and degradation are taking place by clearing of the forest. For the terrestrial species, the declines in the habitat quality and quantity arise from conversion of forest and grassland to agriculture, natural forest to monoculture plantation, and from grazing and woodcutting pressure. Within a period of 15 years (1964-1979) about 400,000 ha of forest was cleared and converted into agricultural land and scrub-land for livestock grazing (Chaudhary 2000). In addition to this, high population has put increasing pressure on forest resources, thus leading to an increase in the demands for firewood and timber, the maintenance of a large number of livestock, and the scarcity of agricultural land (Chaudhary 2000). Therefore, alleviation of poverty in rural areas thus becomes vital not only for economic reasons, but also for preserving the environment and biodiversity (Hagen 1996). The challenges for the future in the area of plant genetic resources conservation are technical and scientific, socio-economical, legal and political, including public awareness (Esquinas-Alcazar 2005). Therefore, for the success of biodiversity and genetic resources conservation, role of public awareness and participation plays important role, more sustainable and cost effective. The main objectives of this report are to provide information on environmental problems related to the degradation and threats to the biodiversity and genetic resources of Nepal.

Table 1. Distribution of plant genetic resources and its share in Nepal

Group	Families	Nepal			World Species Species	Nepal share (%)
		Genera	Species	Endemic sp.		
Algae	50	150	687	13	40.000	1.72
Fungi	80	552	1.822	150	70.000	2.38
Lichen	30	79	471	48	17.000	2.77
Bryophytes	78	180	853	37	14.000	6.09
Petidophytes	31	103	383	-	12.000	3.19
Flowering plants	213	1.496	5.833	246	250.000	2.07

Source: Government of Nepal, 1997.

Table 2. Distribution of animal genetic resources and its share in Nepal

Groups	Biological Species World	Nepal	Nepal's share (%)	Endemic species
Arthropods/Insects	1.000.000	5.052	0.44	4
Butterfly		645		29
Moth		6.000		
Other than insects	190.000	144		108
Fresh water fishes	85.000	185	0.21	8
Herpetofauna				
Amphibians	4.000	43	1.07	9
Reptiles	6.500	100	1.53	2
Birds	9.881	847	8.57	2
Mammals	4.327	185	4.27	1

Source: Government of Nepal, 1997.

CAUSES OF DEGRADATION

Loss of natural resources is seriously affecting the life of rural people. Local people depend in biological species for meeting their basic needs. Major factors responsible for the degradation of biodiversity can be outlined as below.

Habitat alteration

Alteration of habitat represents the greatest threat to biodiversity in Nepal, since almost all human activities cause alterations to the natural environment due to growing pressure of urbanization, industrialization, resettlement and conversion of wetlands into agriculture lands. According to recent study, increasing urbanization with migration rates from the countryside to urban areas in Nepal is estimated at about 8%. Habitat fragmentation not only affects species, but also affects the processes that drive biodiversity. Habitat fragmentation causes large populations to be broken into smaller populations which may be isolated from one another. These fragmented populations may be too small to be viable or lost potential for repopulation.

Table 3. Number of wetland sites in Nepal

Development region	Number of sites (%)		
	Terai	Hills and Mountains	Hills and Mountains
Eastern	18 (7.4)	24 (9.9)	42 (17.4)
Central	37 (15.3)	15 (6.2)	52 (21.5)
Western	34 (14.4)	16 (6.6)	50 (20.7)
Mid-western	12 (5.0)	22 (9.1)	34 (14.0)
Far-western	62 (25.6)	2 (0.8)	64 (26.4)
Total	163 (67.4)	79 (32.6)	242 (100.0)

Source: International Union for Conservation of Nature (IUCN)-Nepal (1996)

Over harvesting/Overexploitation

Overexploitation of species affects the loss of genetic diversity. In some cases, over exploitation lead to exhaustion, particularly by excessive hunting, fishing, cutting of trees. The most notable targets for over harvesting are freshwater and forest ecosystems. Intensive and indiscriminate cutting of trees in forest ecosystem and fishing in freshwater systems, has demonstrate catastrophic impacts on biodiversity. This over-exploitation of genetic resource can be explained by the increase of human population and its demand in the market.

Table 4. Forest area decline and population growth in Nepal during the last two decade

	Year		
	1979	1986	1998
Forest area	43%	37.4%	29%
Population	13.7 million	15 million	21.8 million

Limited public awareness

The current level of ecological awareness in the general population is very low, due to limited publication and inadequate information on conservation and utilization of biodiversity and genetic resources. The lack of integrated information and management systems undermines biodiversity conservation activities. The mass media have enormous potential in creating a change in public awareness on biodiversity conservation through environmental education and motivating the people involved in conservation by recognizing their efforts and sharing necessary information with them.

Inadequate national policy

Lack of adequate policy, inadequate legislative and institutional frameworks, lack of research and management works are currently a major hurdle in achieving effective biodiversity conservation. According to recent policy, Forest user groups (FUGs) is required to share 40% of its income generated from the sell of surplus forest products for commercial use with the national, and local governments (i.e. the Village Development Committee and District Development Committee) (Gautam 2004). Earlier (September 2000), the Forest Department issued a Circular prohibiting the extraction of any forest product from a community forest, even for meeting subsistence needs, unless a forest resource inventory and assessment of annual increment has been made (Gautam 2004). The biodiversity of protected areas is typically managed under inadequate national policy frameworks that give preference to short-term solutions for long-term problems. Government need to improve development policies and to give priority to biodiversity issues, and need to play a key role in harnessing the wealth that is available from the region's biodiversity for present and future generations.

Genetic erosion

When the changeable agroecosystem has been greatly altering its process of evolution, genetic erosion occurs. The combination of new conditions, including rapid population growth, new agricultural technology and swift economic & cultural changes, produce a new environment. Diffusion of plant species between continents. modern agricultural technology and the widespread adoption of high yielding rice varieties (HYVs) over local varieties have caused erosion in gene pool of local land races. There is a need to make appropriate measures and policies to conserve local races while introducing new cultivars and advance technologies.

Inadequate rapport

The lack of good rapport between the officials managers, academics, delegation of authority and the local people causes difficulties in the implementation of program related to conservation of biodiversity. Hence, priority must be given to the active participation, motivation under the eco-development strategy with the aim to bring awareness in the proper utilization and conservation of genetic resources.
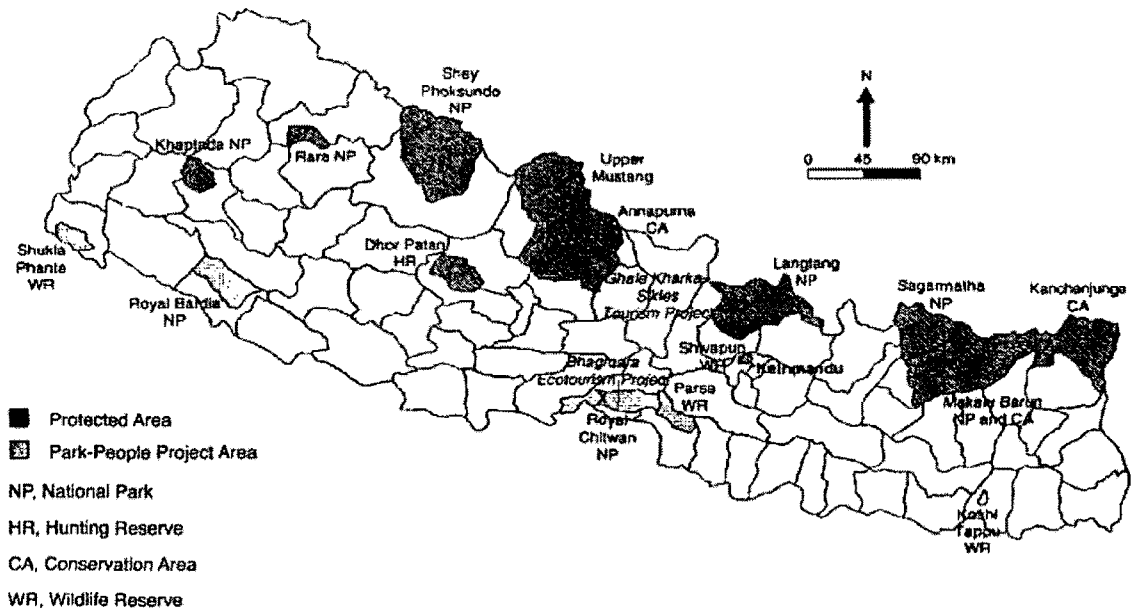
Fig.1. Protected and conservated area of Nepal.

RECOMMENDATION

Biodiversity is a resource for sustainable use. Hence its importance of biological diversity in the national economy, their conservation and utilization is felt necessary for the sustainable development of the country. Some of the important method of conserving biodiversity and genetic resources can be outlined as below.

Habitat management

Ensure the preservation of wild genetic resources including rare and endangered Species, especially through the maintenance of their habitats. Practicing guided land use, ecozoning and core buffer zoning should be adopted for effective protection of biodiversity. Explicitly integrate conservation and the sustainable use of biological and landscape diversity into national sector policies such as agriculture, forestry, tourism, transport and energy and industry.

Public awareness

Promote awareness raising, knowledge and understanding of key roles, environmental services, functional groups and impacts of diverse soil management practices, importance of genetic resources and its conservation to the indigenous and local communities through posters, pamphlets, audio and TV programs, magazines and journals etc.

Exchange of information

Promote the exchange of experiences, news, views and data among national and international communities and create an adequate rapport between the scientist, journalist, administrator with local communities in order to develop national strategies for sustainable agriculture and biodiversity conservation.

Protection against overexploitation

Adopting measures such as fixing date of harvesting, encouraging cultivation, organizing environmental education programs as well as research on regeneration and quantitative estimation for optimal harvesting (Chaudhary and Singh 1998) and by harvesting only after maturation/shedding of seeds by retaining some portion on nature and by practicing scientific methods of storage (Lecup 1990).

Adequate rapport

Establishment of mechanisms for interaction and dialogue between civil society and public administration at local, regional and national levels. Creation of mechanisms for broad public participation in the decision-making process.

Tourism programs

Joint development of more sensitive tourism programs based on the preservation of the natural resources and well managed protected areas. Implement programs that will enable local populations to derive economic benefit from traditional and sustainable land-use and tourism practices that protect the high biological diversity.

Enforcement of plans and programs

By adopting new laws, reinterpreting existing laws, fine tuning management practices are some effective ways for the restoration of biodiversity.

Assess all new or revised policies and programs for their impact on biodiversity and apply the precautionary principle.

Use the new agri-environment program and other mechanisms to promote agricultural practices which encourage minimal use of fertilizers and chemicals and reduce pollution.

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Adopt stronger measures, including in the enforcement of anti-pollution legislation, to minimize the entry of effluent and solid wastes into water-courses.

Encourage all relevant sectors to engage in the management of conservation sites.

Identify surviving plant cultivars and domestic livestock breeds of historic importance, and review the current arrangements for their conservation, and implement conservation action plans where appropriate.

CONCLUSIONS

Any meaningful success in tropical conservation will need active participation by the civil society, biologists, social scientists, lawyers, funding agencies, national and multinational corporations, governments and non-governmental organizations. In addition to educating the populace and politicians about the plight of biodiversity, conservationists need to work with various stakeholders (e.g. village chiefs, traditional authorities (Sodhi 2008). Social issues such as poverty alleviation should be better integrated into policy to achieve tangible and perhaps lasting conservation effectiveness (Adams et al. 2004).

REFERENCES

Adams, W. M., R. Aveling, D. Brockington, B. Dickson, J. Elliott, and J. Hutton. 2004. Biodiversity conservation and the eradication of poverty. Science, 306: 1146–1149.

Belbase, N. 1999. National Implementation of the Convention on Biological Diversity: Policy and Legislative Requirements. International Union for Conservation of Nature (IUCN), Kathmandu.

Chaudhary, R. P. 1998. Biodiversity in Nepal: Status and conservation. Majupuria, T.C. (Ed.). S. Devi, India. & Tecpress Books, Thailand. pp.324.

Chaudhary, R. P. 2000. Forest conservation and environmental management in Nepal: a review. Biodiversity and Conservation 9: 1235-1260.

Esquinas-Alcazar, J. 2005. Protecting crop genetic diversity for food security: Political, ethical and technical challenges. Nat. Rev. Genet. 6: 946–953.

Gautam, A. P., G. P. Shivakoti and E. L. Webb. 2004. A review of forest policies, institutions, and changes in the resource condition in Nepal, International Forestry Review 6(2).

Gorkali, C. P. 1991. Biological diversity. In International Union for Conservation of Nature (IUCN) (ed), Background Papers to the National Strategy for Nepal, Volume II, pp. 445-475, International Union for Conservation of Nature (IUCN), Kathmandu.

Hagen, T. 1996. Environment and biodiversity seen with the eyes of the farmers. In: Jha PK, Ghimire GPS, Karmacharya SB, Baral SR and Lacoul P (eds) Environment and Biodiversity, pp 1–11.

Lecup, I. and J. Lecup. 1990. Medicinal Plants. The United Nations Children's Fund (UNICEF). 139p.

Olsen, C. S. 1998. The trade in medicinal and aromatic plants from central Nepal to northern India. Economic Botany. 52(3): 279-292.

Shrestha, T. B. 1999. Nepal Country Report on Biological Diversity. International Union for Conservation of Nature (IUCN).

Sodhi, N. S. 2008. Tropical biodiversity loss and people – A brief review Basic and Applied Ecology 9: 93–99.

Sodhi, N. S., G. Acciaioli, E. Maribeth and A. K. J. Tan. 2008. Biodiversity and human livelihoods in protected areas: Case studies from the Malay Archipelago. Cambridge: Cambridge University Press.

Sthapit, B. R., K. D. Joshi, R. B. Rana and A. Subedi. 1998. Spread of Varieties from Participatory Plant Breeding in High Altitude Villages of Nepal. LI-BIRD technical paper no.1, LI-BIRD, Pokhara..