
Chapter 20

Gene Pools of Crop Land Races in Nepal and Threats

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Nepal possesses a rich diversity of fauna and flora. The fauna of the country includes 175 species of mammal, 850 species of bird, 180 species of fish, 640 species of butterfly, 143 species of moth, and 180 species of dragonfly. Similarly, the diversity in flora is represented by 35 different types of forest, 6,500 flowering plants, 1,500 species of fungi, and 350 species of lichen. The native diversity is further shown by the occurrence of 370 endemic species and 700 species with medicinal properties (Anonymous 1993). The information on lower plants, such as liverworts, algae, fungi, and lichens, is still inadequate. Although the country represents only 0.03 per cent of the total land in the world, it contains approximately two per cent of the world's biodiversity in flowering plants (Ryman 1992).

The conditions of diverse agroclimatic environments with complex and varied farming systems, a broad mixture of ethnicity and races, varied socioeconomic settings, big differences in altitude, and complex topography have created an array of micro-niches in the country in which several food and agricultural crop species have evolved and maintained a high level of diversity. There are estimated to be more than 500 edible species, of which 200 species are cultivated (Regmi 1994). Among the food grains, rice, finger millet, rice beans, barley, and minor crops have a greater Genetic Diversity. Diversity is also found in fruit and vegetable crops. About 120 species of wild relatives of cultivated crops are also found, adding an additional dimension to the variability.

Biological Wealth

Foods:	Rice, maize, wheat, finger millet, pigeon peas, chickpeas, lentils, soybeans, rice beans, rape and mustard, potatoes, tomatoes, cowpeas, cauliflowers, cabbages, squashes, onions, yams, taro, bananas, oranges, mangos, sugarcane
Fodder Plants:	Desmodium, Medicago, Melilotus, Trifolium, Echinochloa, Ficus, Bauhinia
Ornamental Plants:	Anthrocephalus, Ficus, Nyctanthes, Jasminum, Erythrina, Delonix
Medicinal Plants:	Azadirachta, Rauwolfia, Ocimum, Atropa, Swertia, Nardostachys, Centella
Fibre Plants:	Eulaliopsis, Diospyros, Corchorus, Gossypium, Crotalaria, Phyllanthus
Timber Plants:	Shorea, Pterocarpus, Artocarpus, Adina
Pesticides:	Azadirachta, Artemisia, Vitex, Annona, Blumea
Dyes and Tannins:	Acacia, Butea, Erythrina, Mallotus, Symploca, Terminalia.

Threats to Plant Genetic Resources

The threat to biodiversity has been realised by His Majesty's Government and, as a result, all orchids and medicinal plants, 27 mammals, nine birds and three reptiles have been declared protected species. The depletion of genetic resources in food and agricultural crop species is clearly visible in the Terai and mid-hills where improved agricultural technologies are popular among farmers. A gradual disappearance of land races/plant species can be observed in all the following.

- Land races of crops such as rice, maize, wheat, cabbage, cauliflower, cowpea, and potato
- *Native cultivated species* such as *Paspalum scorbuculatum*, *Vigna angularis*, *Lathyrus sativus*, *Setaria italica*, and *Panicum miliare*
- Related wild species of cultivated crops

- Medicinal plants such as Cinamonum, Cordiceps, Dactylorhiza, Nardostachys, Rauwolfia, and Valeriana
- Forest trees such as Shorea, Cedrela, Elaeocarpus, Larix, Magnolia, and Rhododendron

Issues Related to Plant Genetic Resources (PGR)

PGR are considered to be the common heritage of mankind, although the Convention on Biological Diversity in 1992 affirms that states possess sovereign rights to the valuable resources; i.e., these are a part of the national heritage of a country. The change in status of genetic resources has raised several issues at national and international levels. The general issues of interest for Nepal are listed below.

- National legislation for access to genetic resources/exchange of germplasm for environmental use
- Management of an international fund for PGR (capacity building)
- Sharing of benefits (local communities/national level)
- Recognition of intellectual property rights/plant breeders' rights/farmers' rights (related to public vs. private sector investment)
- National PGR system (wildlife protected areas vs. PGR conservation, in situ vs. ex situ conservation, and conservation vs. utilisation)
- Breeding is a responsibility for conservation (government, non-governmental organizations, international agricultural research centres, and farmers)

Nepalese Scenario for Plant Genetic Resource/Conservation

- A Plant Genetic Resource Unit (PGRU) was established for food crops in 1984 at the Agricultural Botany Division of the Nepal Agricultural Research Council (NARC), Khumaltar. Collection and evaluation of vegetables commenced in 1972 before the establishment of the Plant Genetic Resources' Unit (PGRU) with the establishment of a Vegetable Development Division. Fruit germplasm has been maintained at 19 agricultural research centres and farms under the NARC and Department of Agriculture (DOA) since the 1960s.

- A Department of Plant Resources (formerly known as the Department of Medicinal Plants, Department of Forestry and Plant Resources) was

institutionalised within the Ministry of Forest and Soil Conservation. It is responsible for the countrywide survey and documentation of Nepalese flora at the National Herbarium, Godawari. Medicinal plant species are conserved *in situ* in ten National Parks and Wildlife Reserves in the country.

- To date, a total of 11 systematic plant exploration missions have been undertaken in Nepal in collaboration with international institutes. The first exploration was carried out in 1938, the most recent one was carried out in 1993.
- A total of 9,124 accessions of cereals, grain legumes, oil seeds, vegetables, and industrial and spice crops are preserved *ex situ* (Gupta et al. 1996). A total of 6,123 accessions of different crop species from Nepal are conserved at International Agricultural Research Centres, the National Institute of Agrobiological Resources, Japan, and the United States Department of Agriculture, U.S.A.
- Seven hundred and thirteen finger-millet, 680 rice, 322 barley, 216 soybean, 184 buckwheat, 146 lentil, and 35 faba bean species have been characterised.
- One rice, 11 vegetable, five grain legume and two finger millet land races have been released. Commodities' programmes with access to germplasm held at the Consultative Group on International Agricultural Research (CGIAR) have only used land races on a limited scale. Only rice, maize, and wheat breeding programmes have used land races as a parent. The potential of land races has yet to be fully exploited.
- Forest resources are protected by legal arrangements in the Nationalisation of Forests' Act (1956). Decentralization of forest resources was introduced in 1978 by transferring ownership to communities. About 14 per cent of the country's total area is protected by the National Parks and Wildlife Conservation Project.
- There is a rich diversity of medicinal and aromatic plants, and this is particularly high in the mountains of the Far-Western Development Region of Nepal. Twenty species are well-known in trade and another 20 species to a lesser extent. Seven species are listed as endangered species as a result of over-exploitation by farmer traders. The Jatamasi (*Nardostachys grandiflora*) is on the verge of extinction.
- Nepal has adopted Agenda 21 of the United Nations Conference on Environment and Development.

- A biodiversity profile project has been initiated to assess the state of forest biodiversity.
- Two workshops related to the Convention on Biological Diversity were organized by NARC: Conservation, Use and Management of PGR (November 1994) and Appropriate Policy in PGR (April 1995).
- A biodiversity action plan and PGR conservation projects are being developed.
- Nepal is a new member of the FAO Commission on PGR established to discuss issues related to PGR conservation, use, and management in an international forum.

General Considerations

Safeguarding crop germplasm must receive high priority. The management, use, and conservation of these valuable resources require a commitment at policy and scientific levels to ensure their safety and maintenance in order to meet both current needs and the expectations of future generations. Nepal needs to:

- develop a PGR system to suit the needs of the country;
- evolve national legislation on the exchange and accessibility of germplasm to restrict uncontrolled movement of germplasm;
- harmonise Intellectual Property Rights (IPR), Plant Breeders' Rights (PBR), and farmers' rights to improve cooperation with developed and friendly countries to attract investment for strengthening on-farm conservation of crop genetic resources through *in situ* and *ex situ* approaches;
- encourage farmers and non-government organizations to play a role as well as introducing and supporting participatory approaches in the mainstream of PGR conservation; and
- increase participation in international efforts by such bodies as IPGRI, IARC, IUCN, WWF, and the FAO Commission on PGR.

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