ROYAL GOVERNMENT OF BHUTAN

“Biodiversity Conservation and Management Initiatives in Bhutan”

by

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Executive Summary

A small country with a total area of 38,394 square kilometers, the eastern Himalayan kingdom of Bhutan is physically characterized by mountain ecosystems and high level of biological diversity both "on-farm" and at ecosystem levels. The Kingdom sits on two bio-geographical realms viz: the Palearctic realm characterized by temperate and alpine ecosystems in the central and northern parts of the country; the Indo-Malayan realm characterized by tropical and sub-tropical ecosystems in the lowlands of the southern parts of the country. The rich biodiversity of Bhutan is attributed to its biophysical features, socio-political environment, Buddhist ethic that respects nature and conservation, population size of less than one million and national development policies and legislation. Over the centuries, Bhutanese farmers have grown and bred numerous varieties of crops and vegetables best adaptable to the socio-economic and natural environment. Every aspect of Bhutanese life is dependent on biodiversity: be it religion, culture, food, medicines or timber.

The demands placed on environment and agriculture will significantly increase due to ever increasing population pressure and climate change. Major challenges faced by the world today are extreme poverty, hunger and malnutrition as well as increasing habitat destruction and environmental degradation, and so can Bhutan face such challenges one day or other. The erosion of genetic resources and hence the diversity continues at an alarming rate. The global rate of extinction is in the order of 1-5% per decade or expected be 28% from now onwards to the year 2015. FAO estimate indicate 1.4 billion farmers and 150 species of plants that provide diet to the majority of population with the progressive genetic erosion of 10,000 plant species that used to feed the planet in the past.

Conservation is one of the four pillars of Gross National Happiness; the concept propounded by His Majesty the 4th King of Bhutan. The country adopts "Middle Path" in conservation and sustainable utilization of natural resources to assure the needs of the present generation without compromising that of the future generations. In 1974, His Majesty the 4th King declared a landmark policy of maintaining at least 60% forest cover at all times to come, and this farsighted policy has made Bhutan proud of being one of the 10 global hot-spots in biological diversity.

Bhutan has passed several national biodiversity laws and regulations and has ratified the Convention on Biological Diversity (1995) and International Treaty on Plant genetic Resources for Food and Agriculture (2003) to ensure effective conservation of natural resources of national and global importance. Within the framework of the CBD and the Treaty, the strategies for conservation and utilization of biological resources is formulated and revised through the Biodiversity Action Plan for Bhutan document. To oversee the implementation of the biodiversity activities guided by the action plan document, the National Biodiversity Centre of Ministry of Agriculture of Bhutan was institutionalized in 1999. In line with the above developments, this paper presents an overview of some aspects of biological diversity, conservation and management initiatives undertaken by the Royal Kingdom of Bhutan.

1.0) Biological Diversity in Bhutan

Biodiversity conservation is one of the guiding principles of Bhutan's development philosophy. It is intricately woven as one of the founding pillars of Gross National Happiness; the concept propounded by His Majesty the King Jigme Singay Wangchuck, defining the concept more important than Gross National Product or materialism. Bhutan's existing biodiversity wealth is illustrated with highest species density in the world, with highest proportion of land in protected areas and with largest area under forest cover in Asia. The abundant biological diversity in Bhutan is manifested at the ecosystem, species and genetic levels that indicates a highly significant global importance.

At the terrestrial ecosystems level, 72.5 % of the land is under forest cover while 26.23 percent of Bhutan is under the Protected Area Management System. The protected areas are connected by 9 % of land declared as Biological Corridors, with a wide and contiguous spectrum of all major ecosystems found in the country. Inventories of diversity at the species level have indicated that there are more than 7000 species of vascular plants, about 770 species of avifauna and more than 165 species of mammals, with many endemic species and thus Bhutan being their only home and natural habitat. Such estimate on rich species diversity also parallels genetic diversity. The diverse flora includes many economically important plants such as medicinal herbs. In fact, Bhutan is also known as **"Menjong Yul"** (*the land of medicinal herbs*).

The domesticated biodiversity in Bhutan is inclusive of species that are either native or introduced (for enhancing food productivity). The native species are fairly intact. Over the last many centuries, the indigenous species have developed unique genetic, morphological and ecological characteristics adaptable to the changing environment. The micro-climatic conditions and altitude have offered, Bhutanese from different ethnic backgrounds, with large variety of crops, vegetables and different breeds of livestock animals. A long process of natural and human selection of a wide array of crops has undergone over the last many years. The native crops and animals of Bhutan posses significant genetic diversity and are ecologically well adapted to the specific requirements of the local environment, characterized by harsh terrain, steep slopes, gullies and very cold weather conditions.

The diversity in crop and livestock species is concentrated beyond the proportions of Bhutan's small size. Traditionally, the farming system in Bhutan integrates the crop, livestock and forestry production. It is often stated that only 30 crop species feed the world. In this context, Bhutan has the diverse genetic potential that could play significant role in posterity and food security given its broad genetic diversity of field crops.

Bhutan's natural and primary forest and the integrated farming systems remain largely intact and traditional. Apart from a large diversity of plant genetic resources, Bhutan has a large number of endemic species of cultivated and wild species.

2.0) Traditional values of Biodiversity Conservation

Buddhism has been predominantly practiced in Bhutan over the last many centuries. In Buddhism mountains, rivers, streams, rocks and soils are strongly believed to be the domain of spirits. Natural habitat destruction, pollution or any form of disturbances of the domain of those spirits are belied to be the cause of death and diseases (National Environmental Strategy for Bhutan, 1998). The religion teaches respect for all forms of living beings which has led to the development and adoption of ecologically friendly strategies. Through such traditional beliefs and respect for all life forms, Bhutanese have been living in harmony with nature over the past many centuries.

The importance of agro-biodiversity and cultivated species is deeply rooted in Bhutanese culture. The seeds of the "nine essential seeds" of crops ***(DUNA GU)*** including rice, wheat, barley, buckwheat, millet, amaranthus, maize, mustard and pulse are used in many religious offerings. About 79% of Bhutanese people are dependent on agriculture and livestock for their livelihood. Agro-biodiversity is thus the backbone of our economy.

3.0) Conservation approaches

In this age of consumerism and materialism, most of the countries may adopt development policies for high economic gains complacently compromising with the aftermath of unsustainable approach to biodiversity use and environmental damage. The socio-political environment of Bhutan has been favorable for the conservation of biodiversity. The strong commitment to conservation of biodiversity is reflected in various national policies and legislations and through undertaking international agreements and conventions. Bhutan's development policy is to forgo short-term economic gain and adopt a sustainable path to development.

With the global concern and exigencies for conserving biodiversity, Bhutan has taken rather proactive role global efforts in the conservation of biological diversity. Effective conservation management and use of biodiversity resources will be a key to sustainable livelihood and food security, eco-tourism, hydro-power and many other potential benefits. Bhutan has opted for a bold conservation policy of maintaining 60% of its land with forest covers at all times, a strong political will committed in 1974 by His Majesty the 4th King of Bhutan.

3.1) In-situ Conservation Efforts

The government policy is to adopt a policy of protecting representative samples of the pristine environment of the Himalayas for the conservation of biodiversity and genetic resources. This policy has been implemented with the establishment of 9 protected areas: 4 wildlife sanctuaries, 4 national parks and one strict nature reserve in 1993. The protected areas cover 10,878.33 square KM which is 26.23% of the total land area. To enable the movement of the

wildlife between the protected areas, about 9% percent of the land of about 3804 square km has been declared as the biological corridor, linking the protected areas. These biological corridors have been declared as "gift to the earth from the people of Bhutan" by Her Majesty the Queen Ashi Dorji Wangmo Wangchuck in 1999.

Establishment of protected areas include management activities such as research and biodiversity inventory, establishment of buffer and enclave zones, awareness and education programs for the local communities. Unlike the protected areas in other countries, the local communities live in some of the protected areas instituting a direct relationship between the park and people in the effected management of the protected areas. Strategically, the national parks have designated enclaves and buffer zones in order to reduce pressure on the biodiversity, whilst ensuring the sustainable livelihood of the local communities. Integrated Conservation and Development Programs are implemented in such areas in order to avoid pressure on the core areas of biodiversity in the protected areas. The ICDP includes integration of conservation with sustainable development activities, integrating biodiversity conservation into forestry, grazing and agricultural activities, research, and various other types of management of human-wildlife interactions.

In addition to the protected areas management systems, maintenance and conservation activities outside the Protected Areas will be of immense importance. As there is a limited capacity of the government to effectively manage such areas, the non-governmental organizations could play an important role in conservation outside the Protected Areas. The activities outside the protected areas include enforcement of Forestry and Nature and Forest Conservation Rules, anti-poaching and felling and any unauthorized use of forest produce, species conservation such as Tiger Conservation program, biodiversity assessment, promotion of social forestry in various schools, promotion of community and private forestry, nursery management etc.

The traditional farming systems grow traditional varieties of crops and rear indigenous livestock breeds. Such traditional practices are prevalent in difficult management conditions as the indigenous varieties are well-adapted to such environment. Conservation of such crop varieties and native livestock animals breeds are supported by the government through improved techniques and subsidies.

3.2) Ex-situ Conservation Efforts

The ex-situ conservation efforts in wild diversity include the establishment of National herbarium, publication of 8 books on Flora of Bhutan with approximately 70% of information on Flora of Bhutan; establishment of Royal Botanical Garden and parks. There is a plan and policy to establish Zoological Park.

To assure food security and sustainability in crop and livestock production for the present and future Bhutanese generations, and in an effort to maintain

gene pool for posterity, the indigenous crop varieties and livestock breeds are preserved in gene banks. Maintenance of broad genetic base of crop and livestock species in gene banks is perceived to be of paramount importance under the compelling environmental adversities like natural habitat destruction and climate change. Further, introduced crop varieties and livestock breeds are potentially very susceptible to diseases, parasites and weather conditions and thus require very good management conditions. It is well received by Bhutanese that conservation of broad genetic base of crops and livestock is a strategic insurance against risk of natural calamities and thus ensuring food security and sustainable livelihood. However, most of the Bhutanese farmers choose to cultivate new cultivars mainly because of better productivity levels. This trend has led to displacement of local genetic materials in some case posing a risk of genetic erosion of the wild relatives of crops and livestock species.

4.0) Institutional Framework for biodiversity management

4.1) Biodiversity Management Board

The Board consists of members with broad representations from various government organizations as the biodiversity conservation activities are cross-cutting that warrant shared responsibilities and partnership in biodiversity conservation and utilization. The Chairman of the Board is the Minister for Agriculture as the National Biodiversity Centre is institutionalized under the auspice of the Ministry of Agriculture. The Head of the National Biodiversity Centre has a portfolio of Member Secretary of the Board. All the biodiversity programs and activities and the corresponding financial proposals are prepared by the Member Secretary of the Board to be endorsed by the Board. The Biodiversity Action Plan provides guidelines for the preparation of annual biodiversity programs and activities.

Mandates of the Board

- To oversee the Biodiversity Action Plan
- Develop national policy framework that foster the sustainable use of biological resources and the maintenance of biodiversity.
- Strengthen capacity for sustainable conservation and utilization of biodiversity
- Mediate conservation actions through national planning and international co-operation.
- Create conditions and incentives for effective biodiversity conservation

4.2) National Biodiversity Centre

With the ratification of the Conservation on Biological Diversity by the National Assembly of Bhutan in 1995, the Biodiversity Action Plan of Bhutan was put in place in 1998 to provide the framework of biodiversity programs and activities in the country. The diverse conservation initiatives implemented by various organizations in the country suffered from lack of coordinated planning and

management. This problem was further compounded by the lack of resources and lack of institutional interaction and linkages among the biodiversity stakeholders. Under such scenario, the national biodiversity related activities was organized under a single management structure to establish a focal institute dealing with local, regional and global efforts in biodiversity conservation and sustainable uses of the biological uses. Thus, the National Biodiversity Centre, Serbithang was instituted in 1998 as a non-departmental agency under the Ministry of Agriculture as the focal institute of biodiversity activities.

a) Vision of NBC

"Effective conservation, sustainable utilization and equitable sharing of benefits arising from the use of the biological resources".

b) Mandates of NBC

- To co-ordinate Bhutan's biodiversity related activities and serve as a national focal institute.
- To ensure that the national biodiversity programs and activities are implemented in line with the Biodiversity Action Plan and that the Action Plan remains a living and dynamic document.
- To facilitate national decision-making on biodiversity concerns, cutting across sectors, divisions and institutions.
- To balance between conservation and sustainable utilization of biological resources in general, and between in-situ and ex-situ conservation in particular.
- To mobilize a participatory approach to building national consensus on biodiversity around complex issues and resolving conflicting situations,
- To establish regional and international cooperation in biodiversity conservation and use, and
- To formulate sound legal framework related with biodiversity conservation effectively in place
- To facilitate continuity of biodiversity related activities over time.

c) Objectives of NBC

- To establishing essential elements of an integrated national biodiversity program with a well reputed intuitional status in biodiversity conservation.
- To improve policies and institutional framework including mechanisms for coordinated planning and action.
- To ensure adequate national capacity to participate in global efforts to conserve and use biodiversity resources for food, agriculture, industry and environment.
- To identify and meet national needs through rational, sustainable and equitable approaches in conservation and use of biological resources and sustain environmental well-being.

d) Strategies of NBC

- Institutionalize and establish interdisciplinary programs and legal framework in biodiversity conservation and use, in line with the national and international policies.
- Enhance capacity of human resources through education training to enhance institutional capacity and efficiency.
- Integration of conservation, research and development by overcoming constraints and identifying sustainable economic opportunities.
- Establish gene banks, botanical gardens, herbarium and zoological parks for ex-situ collections to facilitate the conservation and sustainable utilization of the biological resources for equitable sharing of benefits.
- Develop institutional linkages and partnerships with relevant institutes and organizations that share NBC's vision and goals to strengthen technical capacity and source funds for the implementation of biodiversity related activities.
- Survey, inventory, characterization and documentation of genetic resources for publication and education.

4.3) Biodiversity Programs of NBC

a) Royal Bhutan Crop Gene Bank

The main objective of the gene bank is to conserve all the native species and varieties of crops through collection of seeds and tissues for sustainable use and food security of the present and future generations. The seeds and tissues will be used for research purposes and farmers field for developing improved varieties and farmers seed exchange system. Established in year 2005 as the first gene bank of the Royal Government of Bhutan through the financial support of the Royal Government of the Netherlands and Sustainable Development Secretariat of Bhutan, the gene bank is in the process of inventory, characterization, documentation and collection of seeds from various agro-ecological zones of Bhutan. The gene has institutional linkages with the National Bureau of Plant Genetic Resources, New Delhi in India, National Institute of Agro-biological Sciences, Tsukuba in Japan; Centre of Genetic Resources, Wageningen in the Netherlands and Plant Genetic Resources Centre, Sri Lanka and Nordic Gene Bank, Sweden. The gene bank will be publishing the "Status of Crop Genetic Resources of Bhutan" in 2008.

b) National Herbarium

The first National Herbarium was established in 2005 through the support of Danish Development Agency (DANIDA) with the main objective to provide information on the flora of Bhutan. The DANIDA grant supported National Herbarium and Flora project which constructed herbarium building, provided training and education, biological sciences library, laboratories and equipment.

Through the project, 5 books on Flora of Bhutan have been published. In total, 9 publications on the Flora of Bhutan are available, 4 of which were published prior to the implementation of the above project. Currently, the National herbarium holds about 14,000 herbarium samples providing passport information on the wild flora of Bhutan. In addition to the wild flora samples at the Herbarium, herbarium samples of domesticated crop specimens, ornamental flowers, medicinal plants and other plants of significance will be collected. The National herbarium has institutional linkage with the Royal Botanic Garden Edinburgh of Scotland, Kew Botanical gardens in London and National Science Museum in Tsukuba of Japan.

c) Biodiversity Use and Conservation Asia Program (BUCAP)

This program is complementary to the Royal Bhutan Crop Gene Bank in terms of in-situ conservation of crop genetic resources at the farmers' field. The South East Asia Regional Initiative for Community Empowerment (SEARICE) in Manila and the Development Fund of Norway (NORAD) has been providing technical and financial resources to this program since 2000 which will continue till 2008. The project focuses on "Participatory Plant Breeding and Participatory Variety Selection" techniques through "Farmers Field School" approaches. The participating team comprises of researchers, extension agents, farmers and managers. The main purpose of this participatory approach is to educate farmers in required skills and techniques of in-situ conservation and food security measures and empower them in decision-making process at the grass roots. The BUCAP is simultaneously implemented in Philippines, Thailand, Bhutan, Laos and Vietnam with the objective of facilitating interaction and exchange visits of the farmers and project staff among these countries.

d) Serbithang Botanic Garden

Located at an attitude of 2300 meters above sea level at Serbithang within the National Biodiversity Centre complex, the 58 acres of botanical garden is 15 kms far from Thimphu, the capital city of Bhutan. The main objectives of the garden are to have a living collection of native flora of Bhutan for research, education and recreational purposes. The development work of the botanical garden started on 2 June 1999 to commemorate the 25 years of golden reign of His Majesty the King Jigme Singye Wangchuck, the 4th King of Bhutan. The initial development work was supported by the Bhutan Trust Fund for Environmental Conservation. The Serbithang botanical garden has institutional linkages with Tsukuba Botanical Garden in Japan, Royal Botanical Garden Scotland and Kew Gardens in UK. The garden comprises of various thematic areas such as orchidarium, bamboos, rock garden, hedge plantations, oak garden, deciduous plants, fern garden, etc. Future plans are also to maintain living collections of plants of economic significance useful for food, fiber, medicine, cosmetics and the endangered species of plants. Currently about 1500 species of living collection of plants exist at the garden.

e) Royal Bhutan Animal Gene Bank

The animal genetic resources of Bhutan are very unique and will remain central to livelihood in many parts of the country. By and large, the native livestock and poultry breeds are robust and adaptable to the difficult mountainous terrains and gullies and provide farm yard manure and draught power to the traditional agricultural farming systems. The introduced animal breeds often face difficulties in harsh production environment and do not prove much success to the farmers. In order to conserve the genetic pool of the native animal breeds, the Royal Bhutan Animal Gene Bank has been established in 1995 with the basic required equipment in collaboration with the Centre of Genetic Resources of the Netherlands. The semen and tissues of the native animals conserved in Liquid Nitrogen will be used for development of new breeds that will be used for enhancing food productivity levels in the Bhutanese production environment. Characterization studies of production parameters and other useful economic traits will be studied through DNA mapping and selective breeding in the near future.

f) Bhutan Integrated Biodiversity Information System (BIBIS)

Biodiversity information generated by different organizations will be pooled and integrated into one web-based system and the information will be accessible to all the biodiversity stakeholders and users. This information system is very useful to the researchers, policy makers, planners, managers, non-governmental organizations and international organizations; the development partners in conservation and sustainable utilization of biodiversity. Gaining access to the scientific information base will also stimulate potential for economic opportunities in eco-tourism, education and bio-prospecting activities. The National Biodiversity Centre would be the focal institute for biodiversity information services in the country. The system is yet to be operationalised though it has been conceptualized during the multi-stakeholder workshop in 2002.

h) Legal framework for Biodiversity Conservation and Use

Bhutan ratified many international conventions of which very notable are the Convention on Biological Diversity (CBD), 1995, and the International Treaty on Plant Genetic Resources for Food and Agriculture in 2003. The National Biodiversity Centre is the national focal institute of CBD and the International Treaty on Plant genetic Resources for Food and Agriculture. In accordance with the provision of CBD, Bhutan has developed a national legal framework of Biodiversity: Biodiversity Act adopted by the National Assembly of Bhutan in 2003. The Act has legal instruments and provisions for national legislation for access to genetic resources, plant variety protection (suigeneri system), protection of traditional knowledge and offences and penalties. Given the rich biological wealth of Bhutan, many international companies have been prompted for access and benefit sharing collaborative ventures with Bhutan. It is

envisaged that a pilot bioprospecting program be initiated in the near future in collaboration with the international research institutes and pharmaceutical companies under benefit sharing conditions and legal framework. Bioprospecting is basically a search for new genes with potential for pharmaceutical and agrochemical products and commercial applications. The economic returns of such initiatives could be invested to strengthen conservation activities.

Currently, the Rules and Regulations of the Biodiversity Act is being drafted with the technical assistance of the World Foundation for Environment & Development (WFED), Washington DC; ICIMOD in Nepal and South East Asia Regional Initiative for community Empowerment of the Philippines.

5.0) Challenges and Opportunities

Bhutan has emerged into the 21st century with a huge natural resource base after many years of self-imposed isolation and the political environment has been very favorable for conservation of biodiversity.
With the change in political system after 2008, though conservation policy of 60% forest cover is emphasized in the Constitution, effective conservation of biodiversity can be challenging. Expansion of population size, infrastructure development activities, and increasing need for agriculture lands and natural resources for growing population will be inevitable in the coming decades. These challenges caution the government to reinforce and strengthen our conservation efforts.

Over the past many centuries Bhutanese farmers have cultivated and bred many varieties of crops and the native agro-biodiversity including the livestock diversity is still intact. Thus biotechnology using the genetic materials could deliver potential increase in productions systems.

There is increasing erosion of biodiversity in the neighboring countries due to ever expanding population and conversion of forest to agriculture land. This will mean that the value of Bhutan's biodiversity and natural ecosystem will increase and gain relative importance. Bhutan is however destined to such similar situation of the neighboring countries from one point of time onwards. Given these considerations, we need to pursue with more investment on strengthening our scientific capacity and management, particularly on developing a sound scientific knowledge base of our rich biological diversity. A sustainable use of an effectively managed protected area system with good scientific knowledge base could balance conservation needs and the economic benefits. There could be immense opportunities for eco-tourism, bioprospecting and transfer of technology, utilization of non-wood forest products, carbon trading and ecosystem services.

Acknowledgement: I want to express my sincere appreciation for the kind guidance and generous support of Dr Michael Tobias, President, and Mrs Jane Morrison, Vice-President, of the Dancing Star Foundation, California, LA.

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