

## Chapter 8

# Management of Natural Resources in Bhutan

Walter Roder  
c/o Helvetas, P.O. Box 157  
Thimphu, Bhutan

### INTRODUCTION

Bhutan is located in the eastern part of the Hindu Kush-Himalayan region. The country shares many of the vegetation, climatic, and socioeconomic characteristics of its immediate neighbours, especially the south-eastern Tibetan region of China and the Sikkim and Arunachal regions of India.

Geographic isolation, low population density, delayed modernisation, stable and far-sighted leadership, and the Buddhist worldview of nature have all contributed towards preserving a rich and diverse environment. In spite of its small size Bhutan has embarked on a development process which has many unique characteristics unusual for the region. The achievements made over the last few decades are generally seen as very positive, and Bhutan is often cited as a model for proactive conservation initiatives and for innovative approaches to natural resource management (NRM).

The Bhutanese take pride in the fact that their country has proportionally one of the world's highest forest covers and widest biodiversity in flora and fauna. They spare no effort in trying to maintain and protect this treasure. Yet, the current health of the environment—and the policies, strategies, and achievements in preservation and natural resource management—must be seen in the context of the historical, geographical, and social conditions of the country. This is especially important when making comparisons with the development of other countries or in attempts to use models from Bhutan in other countries or regions.

**"...we can draw much satisfaction in our success in the preservation of our natural environment which has become an outstanding example for the rest of the world". (His Majesty the King of Bhutan, in an address summarising the achievements of the past 25 years, Kuensel, June 1999).**

This paper gives an overview of NRM in Bhutan. It is divided into 4 parts:

- background information on history, geography, and socioeconomic aspects,
- current status of NRM,
- potentials, opportunities, and problems, and
- experiences in the regional context, historical peculiarities, and what can be learned.

All aspects of NRM are included, but more importance is given to agriculture, livestock, and forestry resources.

## **BACKGROUND**

### **Topography**

Bhutan is a country consisting only of mountainous terrain. The elevation ranges from about 200m in the south to almost 8000m in the north (Figure 1).



**Figure 1: Topography of Bhutan**

### **Climate**

The climate is dominated by the monsoon, with a dry winter season and high precipitation from June-September. Influenced by topography, elevation, and rainfall pattern, Bhutan has a wide variety of climatic conditions and consequently a wide diversity in vegetation and farming systems.

## History

Isolated by natural and self-imposed barriers, Bhutan experienced little outside influence until the second half of the last century. The isolation demanded that the country was self-sufficient in food, clothing, and shelter to the highest degree possible. By virtue of their resourcefulness and adaptability, Bhutanese households were almost completely self-sufficient. The traditional subsistence economy was based on a feudal system up to the 1950s. Until 1959 the country had no roads, its education system was entirely entrusted to Buddhist monasteries, and trade with the outside world was limited. Despite the isolation, several new world crops—chilli, maize, and potato—spread relatively fast throughout the country and became a very important part of the Bhutanese diet.

The management of natural resources and the resulting socioeconomic conditions were strongly influenced by the pre-Buddhist and Buddhist beliefs and practices. This resulted in a strong respect for nature and conservation. This veneration of nature was common in other countries of Asia, but was sometimes seen as backward or a discouraging impediment to the empire of man over inferior creatures (Aris 1988, Roder 1998). Ancient Tibetan block prints make frequent references to Bhutan's rich environment by calling it 'Realm of Healing Herbs', 'Paradise of the South', and 'Lotus Garden of the Gods—rich in forests of sandalwood and sweet scented herbs'. The influence of past beliefs and values on today's condition of nature was eloquently summarised by a recent statement by His Majesty the King.

"Throughout the centuries the Bhutanese have treasured their natural environment and have looked upon it as the source of all life. This traditional reverence for nature has delivered us into the twentieth century with our environment still richly intact. We wish to continue living in harmony with nature and to pass on this rich heritage to our future generations" (MOA 2002).

## Socioeconomic conditions

Bhutan has an area of about 46,500 sq.km and a population of 700,000 (CSO 2001). The population is still growing rapidly, at a rate of 2.5% per year. More than 79% of the population live in rural areas and depend on agriculture (CSO 2001). Agriculture is the main economic activity, contributing 32.5% to the GNP (Table 1). Buddhism is the state religion.

The country had no urban centre until the 1960s. In the absence of urban centres there was limited scope for the development of specialised trade. The growth of small industries and manufacturing enterprises is seriously hampered because of that.

**Table 1: GDP of Bhutan in 2000**

Sectors	Value (US \$ million)	Proportion (%)	Growth (%)
Agriculture	29.30	32.5	2.4
Construction	9.85	10.9	19.7
Electricity	9.55	10.6	8
Transport, communication	9.52	10.6	11.8
Community, services	9.09	10.1	3
Manufacturing	8.44	9.4	4
Financing, insurance	7.60	8.4	2.4
Wholesale and retail	5.38	6	4.5
Mining	1.30	1.4	6.4

In the traditional subsistence economy the availability of water to irrigate rice and other crops was the main factor leading to the prosperity of farming households. Besides the influence of Buddhism, it is probably the tremendous economic importance of forest cover that enhanced the evolution of social institutions and beliefs that helped to protect forest cover and the watersheds.

The comprehensive system of laws established by the saint Ngawang Namgyal (1594-1651), the founder and unifier of Bhutan, in the 17th century, also included detailed rules on land ownership and formed the basis for establishing a land registration system. The clear ownership situation (in the form of land documents) was very important for farmers, who risked high labour investments for terracing, making irrigation systems, and protecting the forests.

**CURRENT STATUS OF NATURAL RESOURCE MANAGEMENT**

Bhutan’s farsighted, cautious, and conservation-oriented leadership has succeeded in further enhancing the traditional respect for nature and conservation. Policies and legislation, as well as awareness building through the media and the education system, have raised the level of awareness and appreciation for an intact environment. Matching the limited resources available with the needs of the tremendously variable production systems and climates has and will always be a challenge. Rigorous priority setting and judicious planning are given due importance.

**Agriculture (including livestock)**

Due to the mountainous topography, only a very small percentage of the land is suitable for agriculture. Crops, in order of importance, are maize,

rice, millet, wheat, buckwheat, potato, mustard, and barley (Table 2). Rice is cultivated on small terraces made on slopes with gradients of up to 80%. Topography and market accessibility favour livestock production, especially in regions with elevations above 2000m. Livestock production is traditionally an integrated part of the Bhutanese farming system.

**Table 2: Land-use and livestock statistics**

<b>Land use</b>	<b>Area in '000 ha</b>
Forest	2904.5
Lowland rice	38.8
Upland agriculture (maize, wheat, barley, buckwheat)	181.7
Shifting cultivation (Tsheri and Pangshing)	88.3
Horticultural plantations (apple, orange, cardamom)	5.8
Natural pastures	155.3
Improved pastures	1.1
<b>Livestock</b>	<b>Number '000</b>
Cattle	305.0
Buffalo	1.0
Yak	30.2
Equine (horse, mules, donkeys)	25.8
Goat	16.0
Sheep	31.3

Source: MOA 1997

### Soil fertility management

Soil fertility is a major constraint in any mountain environment. High rainfall, steep slopes, and poor parent material are characteristics of the agricultural soils of Bhutan. In spite of these fertility constraints, Bhutanese farmers produce reasonably good crop yields with minimal inputs of inorganic fertilisers. The average input of inorganic fertilisers for 2001 was 3.3, 0.7, and 0.5 kg N, P, and K, respectively, per ha of cultivable land. Obtaining good crop yields with insignificant fertiliser inputs is only possible due to the continuous flow of plant nutrients from the forest to other parts of the production system. To facilitate the flow of nutrients, farmers have devised a range of techniques. The most important of these methods include: (i) use of animals as agents for collection of nutrients and for the acceleration of nutrient flow; (ii) collection of leaves, needles, and decomposed litter from the forest; and (iii) collection of fuel from the forest to be used in a system that enhances nutrient availability through the burning of soil organic matter in a unique grass-fallow system. The use of these systems was only possible because of the high ratio of forest cover to cultivated land.

The methods used are often lauded as ingenious adaptations to the given resources or as excellent examples of organic agriculture. Conversely, critics of these traditional practices see forest grazing and forest litter collection as harmful to the forest ecosystem and the grass fallow system as a waste of labour, land resources, and soil organic matter. Perhaps these practices were the only options available for food production given the mountainous environment and the geographic isolation.

## **Permanent grassland**

Bhutan has over 400,000 ha of registered grazing land. These areas are known as 'tsadrog'. The area of 'tsadrog' available for large ruminants (cattle and yak) is about 1.6 ha per animal. The natural grassland area estimated from aerial photographs is considerably lower than the area of 'tsadrog'. The most extensive areas of natural grassland are found above the tree line at altitudes of between 4000 and 5000m in the northern districts of Ha, Paro, Thimphu, Gasa, Wangdue, and Bumthang.

Based on the few available estimates, the dry matter yields range from 0.7–3.0 t/ha-1 for temperate grasslands at elevations < 3000m and 0.3–2.5 t/ha-1 for alpine grasslands at elevations > 3000m. A ban on the use of fire for grassland improvement introduced in the Forest Act (Ministry of Trade and Industry 1969) decreased the area and quality of the traditional grassland used by herders. Yet, a substantial increase in dry matter production is possible. Combined effects of white clover introduction and P-application resulted in dry matter yield increases of 813, 317 and 64% for elevations of 2700, 3300, and 4020m respectively. Efforts to increase the availability of winter fodder in both quantity and quality are given priority. Overgrazing is frequently mentioned as the main cause of low and deteriorating grassland and as a threat to the environment. This, however, has yet to be substantiated.

Grassland resources support a wide range of wild animals, of which the takin (*Budorcus taxicolor*), the blue sheep (*Pseudovis nayaur*), the sambar (*Cervus unicolor*), and the musk deer (*Moschus chrysogaster*) are the most important. In recent years some of these species, especially the blue sheep, have increased, supposedly due to a decline in the population of their predators. Another wildlife species which has substantially increased its population is the wild boar.

## **Forestry**

Covering over 70% of the country, forest is the most important ecosystem supporting much of the wide species' diversity of 160 mammals, 770 birds, and 5,400 vascular plant species. Eight major forest types have

been identified in Bhutan. With increasing altitude the vegetation changes from subtropical forest to warm broad-leaved forest, chir pine, cool broad-leaved, evergreen oak, blue pine, spruce, hemlock, fir, juniper/rhododendron, and dry alpine scrub. The tree limit is usually found at an elevation of from 4000–4500m. Rainfall and exposure are additional factors determining a particular ecosystem. A substantial proportion of the forest area is believed to be of primary forests, thus unique for the region and the world.

The first modern legislation enacted by Bhutan was the 1969 Forest Act, specifically aimed at protecting the forests. It is believed that this act has resulted in an increase in forest cover and forest quality. The recent policies of decentralising executive power to the lowest level possible together with the Social Forestry Act (1996) will make rural households responsible for the management and conservation of forest resources.

Timber is used widely for construction and has been an important commodity exported to India ever since Bhutan became accessible by vehicular road. Harvesting and processing of timber is expected to provide substantial employment opportunities in the near future.

## **Parks**

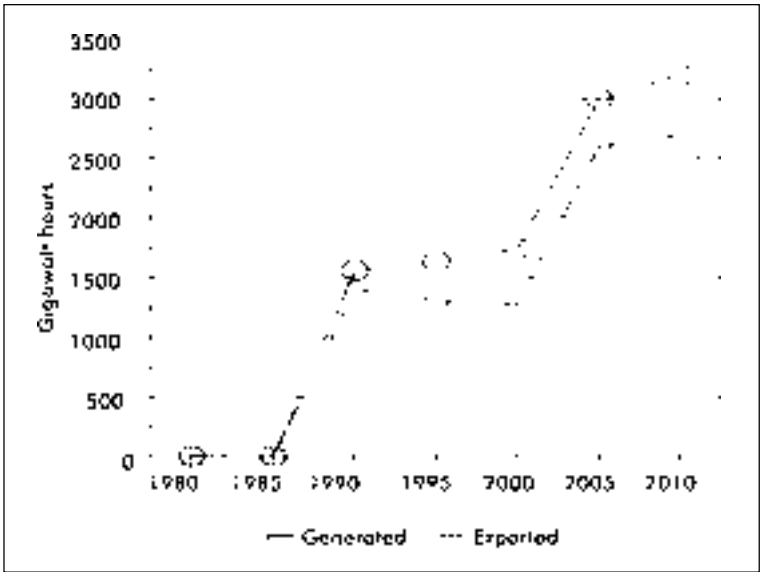
Recognising the importance of conservation, Bhutan started to establish a system of protected areas in 1966, when the Royal Manas wildlife sanctuary was established. Currently the protected area covers 26.2% of the country, consisting of a natural reserve, four national parks, and four wildlife sanctuaries. The responsibility for this rests with the Forest Department, though the management is strongly dependent on and influenced by outside donors, especially the World Wildlife Fund (WWF).

## **Hydropower**

With roughly 45% of the country above 3000m, the potential for hydropower is enormous. It was estimated that Bhutan has the potential to generate 30,000 MW, which would be sufficient to cover over half of India's present requirement of power.

Today only a little over 1% of the estimated potential (about 400 MW) is harnessed. Yet, even with this small proportion used, the hydroelectricity power sector is already the singlemost important revenue earner for Bhutan. Most of the current power is produced by the Chukha hydropower station, generating 380 MW. Only 80 MW are required in the country, and the remainder is exported to India. Electricity from Bhutan makes an important contribution to the power requirement of India, reaching to places as far

as Ranchi and New Delhi. Revenue from the sale of electricity gave Bhutan a trade surplus of Nu\* 448.7 million with India for the first time in 1996. In 2000, the Chhukha Hydro Power Corporation alone contributed US \$40.8 million to the national exchequer (Kuensel). Today, the power sector contributes about 45% to the gross revenue generation in the country and accounts for about 11% of the GDP, currently generating a direct income of about US \$40 million, or \$60 per inhabitant. It is expected that electricity generation will contribute more towards the GDP than agriculture when the Tala hydropower station goes into production in the year 2007. By then, Bhutan would be exporting about 6,400 million units of power annually. Figure 2 shows the existing and projected capacity of hydropower and its export between 1985 and 2010. The revenue from hydropower projects, along with earnings from the other traditional revenue sources, could reach about Nu. 15 billion annually (\$500 per capita). Most of the hydropower plants are based on the run-of-the-river system, which takes advantage of the natural drop of the rivers, and the silt load of the water used is a major concern.



**Figure 2: Capacity of hydropower generation and export between 1985-2010**

\* One US dollar equal to 46 Nu in 2003



All of the large hydropower projects except one have been financed through grants or loans from India and constructed either by India or with Indian technical assistance. India's co-operation in developing Bhutan's hydropower is well beyond the scope of development co-operation, as India desperately needs the energy generated.

## **Mineral resources**

Mineral exploration began only in the early 1960s and information on the mineral resources of Bhutan is still incomplete. So far surveys have shown that there are deposits of coal, limestone, dolomite, talc, marble, gypsum, slate, lead, zinc, copper, tungsten, graphite, iron, mica, phosphate, pyrite, asbestos, and gold. According to an estimate by the United Nations (1991), reserves of dolomite and limestone were about 13.4 billion tonnes and 121.2 million tonnes, respectively.

Currently mineral production includes coal, dolomite, gypsum, limestone, marble, quartzite, sand and gravel, slate, and talc. For exports, some of the minerals are processed into value-added mineral products, such as calcium carbide, cement, and ferrosilicon. Most dolomite, gypsum, and limestone are mined for the manufacture of calcium carbide and cement. Quartzite is mined for production of ferrosilicon and microsilica. Most of the calcium carbide and cement production is exported, mainly to India, and most of the ferrosilicon production is exported, mainly to India and Japan. Most industrial mining of minerals is carried out by privately-owned companies operating in the southern part of the country.

Coal is mined on a small scale in Bhangtar in the eastern district of Samdrup Jongkhar, and exported to neighbouring tea estates of India as well as Bangladesh. A total reserve of 89,000 tonnes of coal has been estimated within 50 metres of the surface.

## **Institutions, policies, and legislation**

Amendments and additions made over the last 5 decades to the intricate and comprehensive system of law codified by Shabdrung Ngawang Namgyal in the 17th century strongly enhanced the legal backing for conservation. Similarly, the conservation-oriented leadership has succeeded in further enhancing the traditional respect for nature and conservation. Policies and legislation, as well as awareness building through the media and the education system, have raised the level of awareness and appreciation for an intact environment.

Today the Ministry of Agriculture is the main government agency responsible for all aspects of development and interventions relating to agriculture,

livestock, and forestry. This ministry is also responsible for management of the parks and protected areas and the generation of an enabling environment for optimal use and conservation of natural resources. Other agencies involved are the National Environment Commission, the Department of Education, the Department of Mining and Industries, and the Department of Power (the latter two under the Ministry of Trade and Industry). The list of rules and regulations developed for forest-related management illustrates the strong commitment of the Government of Bhutan to creating an appropriate environment for the sustainable use and protection of available resources.

Legislation on forest use and management enacted since 1969

- Bhutan Forest Act, 1969
- National Forest Policy, 1974
- Land Act, 1978
- Livestock Act and Bye-laws, 1980
- Forest and Nature Conservation Act, 1995
- Social Forestry Rules, 1996

The Ministry of Agriculture has listed the following policies as the main guiding principles for the 9th FYP:

- to pursue a people-centred development path that would lead to the realisation of their aspirations for a better life through active public participation in the development process,
- to pursue economic development that has prospects for long-term sustainability based on the country's resource situation, comparative advantages, and community-based self-help institutions,
- to pursue balanced and equitable development of the country's renewable natural resources and distribution of benefits accruing from them across society and regions,
- to adopt development strategies that are environmentally friendly and ensure the integrity of the country's fragile ecosystem, and
- to be sensitive and responsive to the rich cultural heritage of the country and ensure its preservation.

## **UNIQUENESS, POTENTIALS, OPPORTUNITIES, AND PROBLEMS**

Bhutan's society is still in the transition from a subsistence, largely agriculture-based economy to a market-driven economy. The achievements made in some areas, especially education, health care, nation building, and nature conservation, are remarkable. Entering the development process

later than all its neighbours, Bhutan could avoid some of the problems and accelerate certain processes, but, in many areas, the country may not be spared the pains that others have experienced.

One of the main limitations posed by the mountainous characteristics is the limited agricultural potential in a situation where almost the entire population depends on agriculture. At the same time the mountainous conditions offer specific potentials in terms of niche production, tourism, and hydropower. It is very important to realise the limitations for general agriculture and to make best use of the potentials in other fields.

## **Uniqueness, opportunities, potentials**

### ***Truly mountainous country***

Bhutan is perhaps the only country in Asia that is exclusively mountainous. Therefore, the entire population consists of mountain people. Bhutan therefore cannot speak of mountain regions that have been neglected in comparison to non-mountainous areas. Any commitment to work with the rural population, with farmers or herders, therefore directly translates into working with the mountain population. Bhutan has a low population density with a high population growth rate, high forest cover, low urban population (the largest city has only 30,000 inhabitants), and extremely high aid per capita. As a result of low population density, the landholdings in Bhutan's temperate belt are generally larger than in other Asian countries. There is a high proportion of foreign labour in construction projects and industries. The proportion of foreign labour in the non-agricultural workforce is estimated (by the author) to be higher than 60%.

### ***Healthy environment, biodiversity***

Bhutan stands out in the region because of its rich biodiversity and healthy environment. A large percentage of households do not use any inorganic fertiliser or plant protection chemicals. There are many opportunities for marketing speciality products, as organic products or products from a very unique environment. The biodiversity, coupled with the healthy environment, is also a major attraction for donors as well as for tourists.

### ***Niche products***

The higher elevations of Bhutan offer opportunities for growing specialised products for the markets in tropical India and Bangladesh. This opportunity has been exploited ever since the country became accessible by road. Apples and potatoes growing at elevations above 2000m generally get very good prices and provide high income to the producers. There are other opportunities in the fields of mandarin, cardamom, off-season fruits

and vegetables, and seed production for vegetables. Being relieved from the necessity of high self-sufficiency, Bhutanese farmers can concentrate more on products that are adapted to the environment.

### ***Rapid transformation***

Over the last decade the country has gone through very rapid changes. The time required to go through the same changes has taken Asian or European countries hundreds of years. Very high per capita income is obtained from hydropower export. However, the environment is almost intact and cultural sentiment restricts culling of livestock. The government is small and easy to manage because the size of the population is very small.

### **Problems**

#### ***Low population density, scattered settlements, and poor infrastructure***

Low population density, poor road communication, and scattered settlements limit the potential for many agricultural commodities. The cost of providing social services is also high, and the access of households to the services available is limited.

#### ***Wide range of environments***

It is impossible to generate and offer technologies for all existing environments in Bhutan. Similarly, it will not be possible for any single extension person to develop expertise for all conditions and situations.

#### ***High production cost in agriculture***

The mountainous topography limits the yield potential and increases the labour requirement when compared to more favourable environments. The transition from subsistence agriculture to a market-oriented system is very difficult under conditions where agricultural production is not competitive in the regional or international market and where almost the entire population depends on agriculture. Table 3 clearly indicates that the retail price of goods coming from lowland areas is less than the price of the goods produced locally. In this context future agriculture and livestock production will therefore be largely for consumption within the country. Bhutanese producers will have a competitive advantage for products with a short shelf life or products that cannot be transported over long distances. These would be mostly fresh milk, other dairy products, vegetables, and fruit.

**Table 3: Prices of selected products in India and Bhutan**

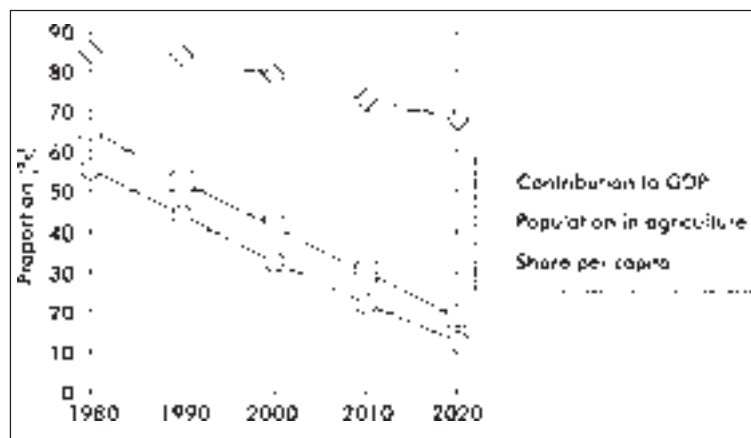
Product	Retail price <sup>1</sup>			Farmers' price	
	Bhutan		India	Bhutan	India
	Bhutan produced	Indian produce			
Milk (kg)	25.0	25.0	12.5	16.0	9.0
Egg (piece)	4.0	2.5	2.0	3.5	1.0
Rice (kg)	18-25	10-20	5.0	15-22	6-15
Wheat (kg)	12.0	11.0	6.0	11.0	4.0

<sup>1</sup> Based on Thimphu prices

### ***Economic realities***

Agricultural production in mountainous areas throughout the world has serious economic constraints. Because of the limited possibilities of increasing agricultural production and productivity, there are limited opportunities to improve economic benefits. The disparity between farm incomes and incomes of urban families is increasing fast. Based on the available statistics, in 1980 a family working in agriculture had an income representing 60% of the average family GDP. In 2000 the income was only 40% of the average GDP, and for the year 2020 the income may drop to less than 20% of the average GDP (Figure 3).

Rising expectations can no longer be fulfilled through the very labour-intensive production system. It is therefore not surprising that the new generation has limited interest in agriculture and that rural-to-urban migration has accelerated. Various labour obligations further disadvantage the rural population and are further accelerating this trend. About 60% of



**Figure 3: Relative contribution of agriculture to GDP and relative share of the population in agriculture**

the male population of Zhemgang district in the 20–45 age group has migrated to other areas (Kuensel 12-10-96). Emerging socioeconomic realities are putting pressure on the farmer to engage in environmentally risky production systems (switching from fallow rotation to permanent cropping systems, using chemicals or fossil fuel energy to replace labour, cultivating marginal land prone to erosion, etc.) or to migrate to urban areas.

### **Donor culture**

Bhutan currently receives yearly assistance to the amount of US \$60 per capita, far higher than any other country in Asia. Research, development, and conservation in the natural resource sector are strongly influenced by a variety of different donors. Outside expertise and resources may make an important contribution to agricultural development, but expatriate advisors often lack sufficient insight into local realities (cultural, biological, and economic), and their advice is strongly influenced by problems and priorities in their own countries.

### **Parks and wildlife**

Largely influenced by outside interest, Bhutan has introduced regulations protecting wildlife. This may have resulted in population changes and certainly has affected the extent of wildlife problems experienced by farmers. In many regions farmers cite wildlife damage as the single most important constraint to agricultural production. The most important species are wild boar, bears, and monkeys. The exponential growth of the area under national parks has further aggravated the problem.

## **LESSONS FROM BHUTAN'S EXPERIENCES**

### **Bhutan as a model for environmental conservation**

Perhaps the most important statement to be made is that Bhutan is not a Shangri-La of conservation and development. As mentioned earlier, today's conditions are largely the result of the past. A combination of historical factors "delivered us into the twentieth century with our environment still richly intact. We wish to continue living in harmony with nature and to pass on this rich heritage to our future generations". Bhutan clearly has no secret recipe. If we want to learn from Bhutan we may therefore need to learn mostly from its past approach to NRM.

When comparing development in Bhutan with other countries in the region, it is important to be aware of factors unique to Bhutan. These have been elaborated upon earlier as low population density, high forest cover, larger landholdings in the temperate belt, relatively late initiation of development

activities (20th century), almost intact environment, relatively high income per capita, high proportion of foreign labour in construction projects and industries, and relatively rapid changes in the country during the last four decades.

## **Lessons learned which may be of regional interest**

### ***Mountains as a source of strength***

Bhutan's unique culture and its independent nationhood were only possible thanks to the mountains. Bhutan's existence and its relatively good economic performance, therefore, is a strong testimony that mountains give economic and cultural strength. During this workshop we may be talking at length of the marginality of mountain environments. Bhutan's recent economic development contradicts such theories. Being fully mountainous, Bhutan had a higher GDP growth than most other South Asian countries, although some of them have rather insignificant proportions of mountainous terrain (Table 4). If we look at agriculture only, then we may talk of a marginal system. If, however, we take a holistic view of the mountain environment (as the country of Bhutan may represent), then we may get a very different picture. Poverty in some mountain regions may be due to the non-mountain population of a country getting the main benefits from the mountain regions (benefits from tourism, hydropower, mining, timber, etc.). In Bhutan we do have similar examples of the urban middle class benefiting more from tourism than the rural population.

**Table 4: Some socioeconomic indicators of development in selected countries (figures for 2000)**

	<b>Bhutan</b>	<b>Nepal</b>	<b>China</b>	<b>India</b>	<b>Switzer- land</b>
Forest %	64.2	26.5	16.7	19.4	29.0
GNI per capita (US \$)	590	240	840	450	38140
GDP growth (%)	7.0	6.5	7.9	3.9	3.0
GDP agriculture (%)	33.2	40.3	15.9	24.9	1.7
Population density (person/km2)	17	156	135	303	174
Population growth (%)	2.9	2.4	0.9	1.8	0.6
Urban population (%)	7.1	11.8	35.8	27.7	67.4
Aid per capita (US \$)	66.2	16.9	1.4	1.7	-
Telephones (per 1000)	19.6	11.9	177.6	35.5	1370
Internet (per 1000)	1.9	2.2	16.9	5.0	291.7
Cereal yield (t/ha, FAO)	1.84	2.09	4.74	2.34	6.40
Bovine species used (no)	5	4	4	5	1

Source: World Bank 2002

## ***The mountain population is not backward***

Consider that in 1960 Bhutan was a feudal society without any schools or health system. The advances made over the last four decades in health, education, and governance are faster than in most other Asian countries. Again this shows that mountain people can adopt and adapt to changes very fast and can advance as much as any other population.

## ***Importance of agriculture***

Although the relative contribution of agriculture to the total GDP is declining fast, agriculture will remain the most important source of employment for several decades. The government has recognised this reality and gives high importance to agriculture. This is largely done in an approach where all the needs of the rural population are addressed. In the future it may be necessary to find practical systems by which the wealth generated from the mountain environment through hydropower and tourism can be shared with the rural population.

## ***Growing disparity***

The disparity between the urban and rural populations is growing fast. Every effort has to be made to address this problem, otherwise it does not serve any purpose to continue discussing problems which are inherent to mountain environments, especially the marginality for agriculture and difficult communications. But there are many issues that can be addressed. Examples for Bhutan include access to quality education and health care, labour obligations by the rural population, centralised bureaucracy (for a farmer many bureaucratic steps (obtaining trade licenses, renewing drivers' licenses, processing a bank loan, etc.) are unnecessarily complicated and time consuming.

## ***Conservation***

The efforts of previous generations to preserve natural resources are paying high dividends.

## ***Integrated approach by the Ministry of Agriculture***

The Ministry of Agriculture was completely reorganised from 1993–96. Research and extension activities previously carried out under separate livestock, agriculture, and forestry departments were integrated into one department. Sharing facilities and working in integrated teams appeared to offer tremendous advantages. After using the new model for seven years, enthusiasm has faded, but the majority of people involved still consider it a good system, especially considering the complex production systems in the mountains. While the system may not be suitable for national



application in a larger country, it could still be an interesting model for mountainous regions with autonomous administrative units.

### **Control over resources**

In the initial phase of development the control and management of forest and grassland resources were centralised, but it was soon realised that sustained conservation and optimal use was only possible if the control, management, and the economic benefits were given back to the rural population.

### **BIBLIOGRAPHY**

- Aris, M. (1988) 'Man and Nature in the Buddhist Himalayas', In Rustomji, N.K. and Ramble C. (eds) *Himalayan Environment and Culture*, pp 85-101, Rastrapati Nivas, Simla: Indian Institute of Advanced Study
- CSO (2001) *National Accounts Statistics Report 1980–99*. Thimphu: Planning Commission, Government of Bhutan
- Kuensel. References are from articles appearing in Bhutan's National English Newspaper
- Ministry of Trade and Industry (1969) *The Bhutan Forest Act [Dzongkha]*. Thimphu: Government of Bhutan
- Ministry of Trade and Industry (1996) *The Social Forestry Act*. Thimphu: Government of Bhutan, Ministry of Trade and Industry
- MOA (Ministry of Agriculture) (2002) *Biodiversity Action Plan for Bhutan, 2002*. Thimphu: Ministry of Agriculture, Government of Bhutan
- MOA (Ministry of Agriculture) (1997) *Atlas of Bhutan*. Thimphu: Land Use Planning Project, Ministry of Agriculture
- Roder, W. (1998) 'Sustainable Agriculture—Is It a New Concept for Bhutan?' Paper Presented at the National Workshop on Sustainable Agricultural Development Strategies in Bhutan, Paro, December 19-20
- UNDP (1991) Natural Resources Bhutan: [www.saarcnet.org/news/saarcnet/countryprofile/bhutan/bhutanprofile4.htm](http://www.saarcnet.org/news/saarcnet/countryprofile/bhutan/bhutanprofile4.htm)
- World Bank (2002) *Country Profiles*. Washington D.C.:The World Bank Group

