BHUTAN

SUMMARY

The paper, Water for Food and Rural Development: Under Bhutan's Resource Base consist of two parts. The first part gives the background information on the status of the resource base used for food production. Under the Bhutanese food production system, forest resources play an important role besides water and land. The existing conditions of these resources with their potential and constraints are described, culminating to proposals for formulation of interventions to manage the resource base.

The second part describes some of the policies, long term as well as short term, that are felt necessary to sustain food production without eroding the resource base. The long term interventions are proposed based on the existing policies and to fill the gaps in them.

The second part also describes some of the strengths of our existing policies that will deliver us into the first quarter of the next century.

1. BACKGROUND

1.1 PHYSICAL FEATURES AND CLIMATE

Bhutan is a landlocked country which lies in the Eastern Himalayas sandwiched between China and India. The country stretches from the foothills (below 150 m) in the south to the towering heights of the Himalayas (more than 7500 m) in the north. Physiographically, the country is divided into three regions, in ascending altitudes- the southern foothills, the central river valleys and the northern snow covered alpine regions. The corresponding climates are characterized by

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wet subtropical foothills, wet to dry temperate central river valleys and cold alpine conditions of the high mountains. Due to the mountainous setting, micro climates varying from the general conditions can occur (Jamtsho, 1996).

1.2 RAINFALL PATTERN

Bhutan has predominantly a unipolar rainfall pattern brought by the South- West monsoon. The monsoon reaches its peak by late June to early July and recedes by end of September. More than 70% of the precipitation is concentrated between June to October. The North-East monsoon comes in December-January. It is limited to a few rainfall events in the lower regions while the higher reaches get snows which replenish the glacier fields. The glacier fields feed and sustain the perennial streams that form the major rivers that drain the country.

The southern foothills get the maximum rainfall of 4000-5000 mm per annum. The rain shadow areas of some of the central river valleys get as low as 500 mm per annum. There is a steady increase in rainfall as the elevation rises from 1000 m to 2500 m followed by decrease in precipitation after 3500 m (Jamtsho, 1996).

1.3 WATER RESOURCES

Fair spatial distribution of good annual precipitation has promoted rich natural vegetation cover. With its geographical location in the Himalayas, Bhutan is endowed by nature with abundant water resources. The four major rivers, all flowing in the North-South direction drain the country. They are Dangmechhu (Manas), Punatsangchhu (Sankosh) Wangchhu (Raidak) and Amochhu. There are numerous tributaries which drains into the four river systems and constitute the water resources potential of the country. The estimated theoretical hydropower potential of the country is estimated at 20,000 megawatt (Power Master Plan, 1992). More than 50% of the potential is from the four rivers and their main tributaries. As of 1996 only 2% of the total estimated potential had been harnessed which accounted for one-third of Bhutan's foreign revenue. The hydropower generation is a clean source of energy, and on top of earning foreign revenue will reduce the pressure on the forest for fuelwood. But hydropower generation is subject to proper management of the watersheds to arrest degradation because of logging, agricultural and rangeland encroachment and human settlements.

Water demand for agriculture is met from secondary and tertiary level tributaries in small watersheds. The main rivers are not used for agriculture except in few flat areas. This is because of the need for pumping due to elevation difference between the river level and the terraced fields. The water resources in small watersheds are seasonal and highly vulnerable to changes in land use and climate. Under such a scenario, water scarcity and equitable distribution are the major issues of concern. The traditional water rights and rigid sharing systems that have evolved over a long period of time make interventions difficult. The conflicts between upstream versus the downstream and first versus the last users impedes the efficient use of the resource.

The drinking water is taped from small streams and springs within the watersheds. The demand for urban water supply is also met from such watersheds. The competitive demand for water from different sectors are increasing and will increase in the future.

Inspite of the so many constraints faced by water resources, a well defined watershed management strategy is absent in the national policies. The need for watershed management is felt by all the sectors but how it will be done is still vague.

The sustained and efficient use of water resources can only be achieved through a concerted and complementary efforts from all sectors supported by meaningful research interventions.

1.4 LAND USE

Bhutan is fortunate to enter the next millennium with a pristine environment. Our natural resource base is largely intact with 72.5% (LUPP[1], 1997) forest cover. With the strong government policy on conservation, Bhutan is the only country in the world where forest area has increased in the last few decades. The Forest and Nature Conservation Act of Bhutan stipulates that all forest harvesting or logging operations should be strictly based on approved management plans and sound ecological considerations to ensure sustainability. The forest policy states that revenue generation is secondary to conservation and protection.

Arable land at 7.8% (LUPP, 1997) of the total area has limited scope for expansion. The pressure on land is mounting due to increased food demand brought by population growth. With change towards market economy, cash crops are competing for agricultural land. The area under horticulture is expanding. Apples predominate in high altitude areas while citrus and cardamom are the main cash crops in low altitude regions.

Land under natural pasture is 3.9%. Since livestock rearing is an important activity, pasture is another land use category. Pasture is mostly located in high altitude areas where rearing of yaks is the sole occupation of the pastoral farmers.

The remaining land area of 15.7% is under snow/glaciers, rock outcrops, landslips/erosion and waterspreads.

1.5 IRRIGATION DEVELOPMENT

Indigenous irrigation system has been practised in Bhutan from time immemorial. Farmers have constructed small irrigation schemes with the use of local materials, mainly stones, earth and timber. Government assistance in irrigation development started in the seventies. Irrigation schemes were constructed based on demand and not seriously considering the real need and the economic feasibility. This approach made the users more dependent on the government assistance and eroded their sense of communal ownership of the schemes. The operation and maintenance of the schemes suffered and more frequent scheme failures occurred. As a result, investment from the government increased without bringing the corresponding benefits to the beneficiaries. This led to the realignment of the development approach which resulted in adoption of the National Irrigation Policy (NIP) in 1992.

The NIP covers the whole process of irrigation development and is founded on three basic principles: encouraging effective farmers' participation, multi- disciplinary feasibility study and institutional support to water users' groups. Now government assistance is provided in the form of technical support and construction materials. Farmers are involved in all stages of scheme development light from appraisal to commissioning and subsequent operation and maintenance. Free labor for the construction work is provided by the beneficiaries. The beneficiaries' share in terms of free labor account for 20- 55% of the total cost of scheme development. Irrigation sector provides institutional support to the Water Users' Associations by providing training on operation and maintenance of irrigation schemes. The emphasis on the three basic principles is bringing improvement in the management of irrigation schemes.

The main problems related to irrigation development are the small command areas, the steep and fragile mountain topography and a monsoonal climate. The small irrigation schemes with water brought from long distances through contour canals require high investment per unit area of command area. The canals are susceptible to failures during the monsoon. Command areas under rainfed secondary and tertiary level sources face water shortage during transplanting season of rice. It is due to the phase difference between the rainfall pattern and the transplanting season. Peak rainfall season lags behind peak transplanting season by a month. The rigid

mountain climate does not favour delayed transplanting. The mismatch between the rainfall pattern and the cropping calendar reduces the potential yield of rice.

Traditionally, crops other than rice are not irrigated. Promoting irrigation of other crops by providing technical information through research and dissemination by extension is required. The benefits of irrigation to other crops, especially horticultural crops has to be demonstrated to the farmers. As reflected by crop water requirement determined from climatic data, irrigation of horticultural crops will lead to better quality produce, more efficient use of water and generate cash income.

Water management research is integrated into the national research system to address the need for a sustained effort to study the impacts and benefits of water and soil management practises on crop production. Its objectives are to raise the productivity of the existing rice-based irrigated agriculture through durable improvements in water delivery, to increase rural incomes by diversifying the range of irrigated crops on wetland as well as on dry land and to rationalise the irrigation assistance program with a view to increase the role of water users. Within these objectives, the mandates are to assess the performance of alternative irrigation systems and water management practises for a range of food and horticultural crops to broaden the production base to increase the returns to land and labor in harmony with the environment.

The ongoing research focuses on generating time series data of soil moisture balance for major horticultural crops, improving water use efficiency of rice irrigation and exploring suitable water harvesting technologies.

1.6 AGRICULTURE

Agriculture is characterized by an integrated production system with forest as the resource base. Most farmers produce cereals and dairy products for household consumption with the use of forest resources. The nutrient for crop production is largely organic based with leaf lifter as the major component of the farm yard manure. The forest is the source for fodder, fuel, timber and non-forest products. Forest is also used for free range grazing system by livestock.

Arable agriculture is mainly confined to the southern foothills and the central river valleys. Irrigated rice cultivation is done on terraced sloping hills and valley bottoms. In the southern belt with assured irrigation, two crops of rice is grown while in the higher altitudes one crop of monsoon rice is followed by wheat, mustard or vegetables.

Cultivation of horticultural crops is gaining prominence. It is being promoted due to As comparative advantages as well as to broaden the production base. The produce earns cash income which strengthens the household economy and the export earnings pay for food import. In the past, irrigation infrastructures were developed for rice irrigation. Diversifying irrigation programs to cover horticultural crops is a policy objective of the 8 Five Year Plan (1997-2002). Drip and sprinkler irrigation systems for orchards are under trial in demonstration farms.

In higher altitude areas, above 3000 m, reading of yaks is the sole occupation of the pastoral farmers. The farmers depend on the animal products for sustenance. In the past the animal products were bartered for food items with the people in the lower regions. Now with the monetised economy, the dairy products are sold in local markets and basic necessities are purchased from the cash generated.

The current level of food self-sufficiency is about 65% (NES^2, 1998). The government policy objective is to achieve 70% food self-sufficiency by the end of the 8th Five Year Plan (1997-2002). Therefore, increase in food production to achieve the self-sufficiency goal has to come largely from intensification of the cropping systems. The intensification of the cropping systems has impacts on the forest, soil and water.

Agriculture is the single largest contributor to the GDP. Although the agriculture sector grew by only 3.1 percent in 1997 its contribution to the GDP remained the highest at 36.4 percent (Kuensel, May 15, 1999, p-4). More than 80 percent of the population depend on agriculture directly for their livelihood

2. CREATION OF ENABLING ENVIRONMENT

Sustainable food production and rural development are dependent on efficient use of the natural resources. The natural resources have established interdependence relationship among themselves. In the Bhutanese context, the interdependence is even stronger and much more well defined due to our mixed production system. The status of water and soil resources are determined by the forest cover and its quality. The forest cover and its quality are in turn depends on the level of exploitation of the resources by the farming communities for food production. The resource use dynamics is strongly influenced by the population growth and their activities. The institutions that are involved in regulating and managing the resources have the responsibility to create the enabling environment for better management of the resources. Creating the enabling environment is a process that requires interaction and consultations at various levels among all the stakeholders.

The need for fresh policy formulation and strengthening the existing policy are highlighted in view of the high population growth rate (3.1%), the food self- sufficiency objective and the policy on forest conservation.

2.1 NATIONAL WATER POLICY

Bhutan is yet to formulate a comprehensive national policy on water resources and its utilisation. A policy on water which will rank the water use by national priority will reduce the competition for water from different sectors. A broad national level water policy supported by legal frameworks on sharing water at national, regional and watershed or local levels will result in equitable and efficient use of water. Such a policy is required in view of the expanding water demand from other sectors as well as the increase in agricultural water demand due to intensification. Intensification of agriculture has to take place to feed the growing population.

2.2 WATERSHED MANAGEMENT

Located in the Eastern Himalayas, on the highest and most active mountain ranges, the topography is characterized by steep slopes that descend to narrow river valleys. With relatively heavy monsoon rains generating high runoff rates, the land is vulnerable to soil erosion. Judging by the sediment carried by the rivers during the monsoon, soil erosion is substantial. Soil erosion if not controlled has great implication on the sustainable agriculture production and hydropower generation.

Watershed management is not done at the national level in terms of coverage. Attempts are made to manage the watershed in some regions, like the Wang Watershed Project covering the Wangchu basin. Irrigation Sector is initiating protection of critical watersheds in collaboration with Forestry Services Division. Community-based Natural Resources Management Research is being conducted in Lingmuteychhu Watershed by the Renewable Natural Resources Research Centre, Bajothang where all issues and constraints raised by the communities revolve on water. Soil and water conservation activities are reflected in the annual work plans of the districts, but nothing much in terms of tangible outputs are forthcoming.

Hydropower development is one of the three avenues of sustainable development identified by the government. The other two are agricultural and industrial development. Hydropower development will have great influence on the development of the other two avenues. This reflects how important watershed management is to the national objectives. And hydropower generation depends on sustained yield of silt-free water which is the outcome of proper watershed

management. Hydropower development is possible only if the present integrity of Bhutan's watersheds can be maintained , which means maintaining the integrity of the country's forests (NES, 1998). Therefore, a coordinated national program on watershed management is definitely the need of the hour and this need will be felt much more in the future. An immediate start should be made with critical and small watersheds where water for agriculture is scarce and unstable. As a starting point, all the sectors that use water should begin mutually reinforcing watershed conservation programs decided through consultations.

Bhutan has been institutionalising decentralised decision making for development activities from the early eighties. This process of encouraging active participation from the users' groups in the management of the local resources is a good foundation to build on in the future. Active community participation and Organisation in managing the resources leads to vibrant and responsive institutions at the grassroots level. Water Users' Associations for operation and maintenance of irrigation schemes is being strengthened with institutional support from Irrigation Sector. Rural Water Supply Schemes are also promoting the users' groups for the same function. Management of community forests on degraded state lands is turned over to the communities on pilot basis.

2.3 RESEARCH

Organised agricultural research system was started from the early eighties. After its establishment much has been achieved within this short time and much needs to be done. The research was crop-fc>cused, mainly looking at crop husbandry aspects and varietal improvement. Research on issues related to soil and water for crop production is integrated into the national research system since 1997. It is getting assimilated into the system with some activities under implementation. Strengthening the integrated research system will ensure generation of valuable information required to fill the information gap.

A coordinated national research agenda needs to be set up to address issues related to water. It should be well focused and responsive to the needs of the farming communities. Research agendas must fit the needs of the local people, and findings must be disseminated quickly and applied effectively (NES, 1998).

Networking of research institutes both from inside and outside the country will lead to flow of information. Networking has the potential of benefiting the research communities in many ways. As a small country with only the foundations of its own academic and informal groups in place, it should not hesitate to draw upon the information resources of its regional neighbors and the international community (NES, 1998)

2.4 EMERGING BHUTAN: ITS STRENGTHS

By virtue of its self-imposed isolation, Bhutan is entering the next millennium with extensive forest cover and largely intact natural resource base. This has also afforded us the privilege of hindsight, learning from the mistakes of other developing countries. Lessons learnt have cautioned us and strengthened our national policies. Bhutan has adopted the 'middle path" as its development strategy whereby a balanced approach to development will be pursued. Bhutan will tread the development path of raising the socioeconomic conditions of its people without compromising its resource base. The key is to find a development path that will allow the country to meet the pressing needs of the people, particularly in terms of food, health care and education, without undermining the resource base of the economy (NES, 1998).

Forest is the main resource base. The three avenues of development entirely rests on the success of protecting the forest from a range of development activities, including agricultural extensification, rangeland encroachment and logging operations. To that end, the government has committed itself to maintaining a national forest cover of atleast 60% (NFP^3, 1974). Adhering to this commitment, the government has banned export of timber from January, 1999.

High population growth rate is a serious concern to the government. With the current growth rate of 3.1%, our population will double in twenty years. The growth will put even greater pressure on the country's resource base and the fragile mountain ecosystems. Recognising the threat from unabated high population growth rate, the government has formulated several demographic objectives for the Eighth Five Year Plan. The government aims to reduce the growth rate from 3.1% in 1996 to 2.48% in 2002 (NHS[4], 1996). The long term goal is to settle for a stable population with each couple having a family of two children. A multi-pronged population control program is underway.

The government has adopted the decentralisation policy since early eighties. Dzongkhag Yargay Tshogchungs (DYT), or district development committees were established in 1981 to encourage people's participation in national planning and decision-making processes. Geog Yargay Tshogchungs (GYT), or block development committees were established in 1991 to take the processes further down to the grassroots level. The government has realised the importance and need for people's participation in natural resource management.

Even the best of policies do not work unless the highest authorities in the land are committed to the cause of national development. Policies remain on paper short of being materilaised into effective programs to raise the living standard of the people. Government is strongly committed to the welfare of its people. This commitment is amply reflected in the policies and developmental activities currently being pursued. The one prerequisite upon which any truly effective development strategy depends - political will - is clearly there (NES, 1998).