

CHAPTER 15. RENEWABLE NATURAL RESOURCES

Basic Situation

Structure of the Sector

The renewable natural resources (RNR) sector under the Ministry of Agriculture, covers forestry, livestock and agriculture, including horticulture.

Economic Activity

Although the economic importance of the RNR sector has declined in recent decades as the economy has diversified, it remains the single most important sector accounting for 40.7% of GDP in 1993 down from 56.7% of GDP in 1980. 85% of population are engaged in farming. Between 1990 and 1993 agricultural output grew by an estimated 2% p.a, livestock production by 2.3% and forestry output by 2.7% p.a. in real terms.

The monitoring of economic trends in the RNR sector is made difficult by the lack of reliable and consistent information on cropping areas, yields and production, and by the absence of time series data. However, it is estimated that arable and horticultural production together account for about 53% of sector output, with rice and maize being the principal food crops. The most recent crop production estimates are those provided by the agricultural extension service for 1992 (Table 15.1).

Livestock production is estimated to account for around 21% of sector output. Cattle predominate and are owned by 90% of households. Meat and livestock products are mostly retained for home consumption and consequently, marketed surpluses are small. Cattle have a crucial role in the farming system as providers of draught power and manure. Apart from a steady increase in the number of cross-bred cattle, no

Table 15.1 Crop Production Data, 1992

Crop	Area (ha)	Yield (Kg/ha)	Production (t)
Maize	55,473	1,358	75,332
Rice	45,086	2,392	107,845
Millet	10,319	0.887	9,153
Wheat	9,568	1,123	10,745
Buckwheat	7,290	0.883	6,437
Barley	4,406	1,100	4,487
Mustard	4,782	0.770	3,682
Potato	5,631	7,694	43,325
Vegetables	5,990	3,715	22,253
Orange	8,040	3,877	31,171
Apple	1,966	1,907	3,749
Cardamom	6,893	0.570	3,975

Source: Ministry of Agriculture

clear trends are discernible in livestock populations, reflecting problems with recent livestock census data. Although stocking densities are regarded as close to their sustainable limit, there is no consistent evidence of grazing pressure causing long-term land degradation.

Forest products account for 26% of sector output and consist of timber and firewood supplied to domestic markets and the export of sawn timber and unsawn logs to India. Exports of wood and wood products to India were valued at Nu 271 m in 1993 (including plywood and particle board exports totaling Nu 100 m). However, there has been a downward trend in recent years reflecting the RGOB's concern to place forest utilization on a sustainable basis. The recent closing down of the Gedu Wood Manufacturing Corporation is a clear indication of this sensitivity.

The RNR sector has continued to contribute a significant positive trade balance. Imports, primarily of rice, wheat, livestock products and edible oils are more than offset by exports mainly of cardamom, oranges, apples, timber and logs.

Land Use

Updated estimates for land cover, based on analysis of 1989 satellite data, show that forest accounted for over 72% of land area (64.4% forest tree cover, and 8.1% scrub forest), while cultivated areas accounted for 7.8%. In the arable areas, virtually all accessible and moderately sloped land is being utilized. Around 18% of farm households own less than 1 ha. Households with insufficient land of their own enter into tenancy contracts and sharecropping arrangements to get additional land for food production.

Production Systems

Bhutan's mountainous environment produces a wide range of agro-climatic conditions, reflecting differences in soil, rainfall, temperature, and slope. This allows a considerable variety of different crops to be grown. Crop production, livestock and forestry activities are closely interrelated and interdependent.

Agriculture derives organic material, fuel, fodder, timber, feed, bedding materials and other basic resources from the forest. Livestock provides the draught power and organic nutrients required for food production and in turn utilize feed and fodder from crops. The forests provide over 90% of domestic fuel in the rural areas as well as the timber used in rural housing and farm buildings. They are also a source of supplementary food supplies in the form of edible roots, tubers, fungi and leaves of certain plants. Lemon grass, other essential

oils and medicinal herbs provide a significant source of cash income to some rural communities.

Population growth is resulting in increased pressure on traditional production systems. With little scope for increasing agricultural land area, this is leading to resources being used more intensively. While this poses environmental threats from increased livestock numbers and reduced fallow periods, it also opens up opportunities arising from the introduction of the technologies required to intensify production and from the creation of new markets.

Opportunities and Constraints

The Scope for Increased Production

Despite Bhutan being a relatively high cost producer in both local and regional markets, there is considerable scope for increasing production and incomes from the RNR sector:

Horticulture

Bhutan has significant regional and seasonal comparative advantage in the production of horticulture crops, particularly in sub-tropical and temperate fruits and in the supply of potatoes and vegetables to off-season (summer) markets in neighbouring areas of India and Bangladesh. There are also opportunities for export of high value crops such as asparagus, strawberries, stone fruits and mushrooms. Production of non-perishable products such as essential oils, medicinal herbs, nuts and dried fruits can bring the benefits of the market to remoter areas.

Traditional Food Crops.

Recent research has shown that there is ample potential for intensifying the production of traditional food crops and this has been reflected in the uptake of new rice and maize varieties. Providing farmers with the technology to intensify production of staple crops contributes towards ensuring household subsistence requirements and food security, and also enables resources to be released for cash crop production.

Livestock.

Livestock provide draught power, manure to the farming system and milk and milk products to households. Religious sentiments against the culling of cattle limit the scope for supplying meat and livestock products for the market. Expanding demand in local markets provides opportunities for increased small-scale dairy farming, rearing of pigs and poultry.

Forests.

There is a wide scope for increasing the sustainable utilization of forest resources through improved forest management, more efficient logging techniques and improved sawmill technology. There are also opportunities for increasing revenues from national parks and protected areas through eco-tourism.

Factor Constraints

The availability of the main factors of production of land, labour and capital together with access to technology determine the range of production opportunities available to the farmer:

Land.

Population pressure has led to fragmentation of land holdings, and an increase in the number of economically marginal farms. Migration from the rural areas has helped to alleviate land pressure to some extent. Diversification and the introduction of higher value crops offer opportunities to increase production and income on small farms.

Labour.

In Bhutan labour shortages and seasonal bottlenecks are regarded as key constraints to increasing agricultural production and incomes. Employment opportunities imply that returns to labour are often higher outside of agriculture. Small field size and terrain limit the scope for mechanization. Bhutan's relatively high labour costs and less favourable growing conditions go to show that the production of traditional crops such as cereals becomes less attractive once subsistence requirements are met. Responding to perceived labour shortages therefore implies the introduction of cropping patterns with less marked seasonal labour peaks and diversification into crops for which labour returns are higher.

Capital.

Limited capital restricts the ability of many small farmers to invest in the development of horticultural production, particularly fruit and tree crops. It also constrains the development of small businesses providing input and marketing services to the RNR sector.

Technology.

Although agricultural research has achieved notable success, the advice available to farmers does not adequately reflect the range of agro-ecological conditions. Poor agronomic and post-harvest practices result in excessive crop losses reducing food security and lowering returns to cash crop production. Research and extension need to become more broad-based, less prescriptive and more responsive with the aim of providing a "menu" of technological options to farmers.

Environmental Constraints

Bhutan's mountain environment poses a number of constraints:

- Climate and topography. In the higher altitude areas of the temperate zone, low temperatures limit the growing season and the range of crops which can be produced. The very steep terrain, also limits the availability of suitable arable land so that, with increasing pressure on land resources, farmers have to take recourse to cultivating steeper slopes with shorter fallow periods than in the past. The environmental impact of such changes will be monitored and measures taken to alleviate land pressure since this could lead to long-term degradation.
- Diversity. The diversity of Bhutan's mountainous ecology, and hence of its farms considerably increases the costs of providing effective agricultural research and extension services.
- Inaccessibility. The ability of rural communities to develop beyond subsistence production depends crucially on their access to markets. Over half of the rural population live more than half a day's walk from a road head. However, the scope for expanding the road network is limited by constraints of terrain, high investment and road maintenance costs. Identifying niche market opportunities for high value/low weight rural products has an important role in providing enhanced income opportunities to remote communities.

Institutional Constraints

Government services to the agricultural sector continue to face a number of institutional constraints which adversely influence their effectiveness:

Information and Data

The lack of reliable data on farming systems and land use has hampered efforts to develop appropriate policies and programmes for the RNR sector. During the 7FYP considerable progress was made in addressing these constraints through the work of the Land Use Planning Section in MOA. However, there remains an absence of basic agricultural statistics and only limited information is available on farm-level production systems and constraints.

Trained Manpower.

Limited professional and technical capacities in the research and extension services have severely restricted the ability of the MOA to provide appropriate advice and assistance to the farming community. Alleviating these constraints through graduate and diploma level training was a major emphasis in the 7 FYP.

Management.

Capacity limitations, inadequate management structures and procedures within MOA and lack of management continuity has often reduced the effectiveness of field-based programmes.

Institutions

Ministry of Agriculture (MOA)

The MOA is responsible for the promotion of agricultural development. The MOA employs a total of 2,171 staff of whom 1,160 are in professional and technical positions. The Ministry Headquarter has two service divisions (the Administration and Finance Division and the Policy and Planning Division) as well as the Natural Resources Training Institute at Lobeyasa. The services provided by the Ministry are delivered through three operational divisions:

- The Research, Extension and Irrigation Division (REID) is responsible for promoting innovation and development at the farm level. REID operates through RNR research centres, the Dzongkhag RNR offices, 157 agricultural and 112 animal husbandry extension centres in the gewogs.

- The Crop and Livestock Services Division (CLSD) responsible for animal health, livestock breeding, mechanization and input supply services. Under CLSD are the Agricultural Machinery Centre (AMC), the Royal Veterinary Epidemiological Centre, 4 regional veterinary laboratories (RVLs), 1 satellite laboratory, a vaccine production centre, 10 livestock breeding farms and 42 artificial insemination centres.
- The Forest Services Division (FSD) responsible for the sustainable management of forest and protected areas. FSD operates through 10 territorial forest divisions and also manages the 10 national parks and protected areas. During the 7FYP a social forestry and forestry extension programme was initiated with the appointment of Forest Extension Officers to each Dzongkhag.

Public Corporations

There are four public corporations that are involved in the RNR sector:

- The Food Corporation of Bhutan (FCB) is responsible for: (i) import of foodstuffs (mainly rice and edible oils); (ii) the management of WFP assistance; and (iii) the operation of permanent and seasonal auction yards for horticultural produce.
- The Bhutan Logging Corporation (BLC) undertakes logging operations under commercial forest management concessions on behalf of the FSD.
- The Druk Seed Corporation (DSC) was established in 1995 and took over the commercial seed and plant supply operations of the former National Seed and Plant Production Programme.
- The Bhutan Development Finance Corporation (BDFC) through its network of branches in the Dzongkhags, is the main source of credit for the agricultural sector. New lending by BDFC to the RNR sector in 1995 totaled Nu 37.6 million divided between 731 seasonal and 2,097 term loans.

Private Sector Operations

It has been policy of the RGOB to promote the role of the private sector in providing services to the RNR sector. The marketing of agricultural produce is entirely in the hands of private traders, the MOA's role being to facilitate improvements

through measures such as the FCB auction yard system and the provision of information on prices and quantities traded.

Review of Past Performance

Objectives of the 7FYP

- Sustainable development of arable production to enable self-sufficiency in food production: involving concepts of household and national food security such that: (i) households in the rural areas would be able to meet their food requirements; and (ii) for the country as a whole, agricultural exports would be sufficient to meet the costs of food imports.
- Improvement in the incomes, living and nutrition standards of the rural population to be achieved through promotion of commercial horticulture and diversification in food crop production at the household level.
- Sustainable utilization of natural resources involving the management of forest and protected areas and steps to ensure that agricultural intensification was accompanied by measures to maintain soil fertility and prevent land degradation.

Strategies in the 7FYP

- Integration and strengthening of project planning and implementation. This required greater integration between planning and implementation of government interventions which had previously been fragmented along fairly rigid sub-sectoral lines.
- Institutional strengthening. Capacity within MOA was to be strengthened through recruiting additional staff and a greater emphasis on staff training. The private sector was to be encouraged to take a more active role in agricultural marketing and input supply. A greater community involvement in project planning and implementation was to be achieved.
- Strengthening of regional development. The area development projects (ADPs) were to be integrated into a regional structure to support greater decentralization of programmes to the Dzongkhag level.
- Integration of environmental sustainability into all agricultural activities. Sustainable development was

to be based on the introduction of sound conservation practices, land management and land use planning which were to be introduced into the planning of Dzongkhag programmes.

Attainment of Objectives

The lack of consistent time series information on production, rural incomes and land use, means that it is impossible to develop a full picture of the extent to which the objectives set for the 7 FYP have been achieved. However, a number of indicators suggest the direction of developments in the sector:

- The trade balance in the sector has continued to remain positive although horticultural exports have been affected by large fluctuations in the volume of citrus exports.
- Production.- Evidence from the level and distribution of FCB grain imports, nutrition studies, and the uptake of new grain varieties suggests that production of staple grains has kept pace with population growth in the rural areas. Production of horticultural crops has continued to increase and, together with plantation crops it accounts for around 13% of sector output.
- Nutrition surveys of the rural population show that calorific intakes are generally adequate, but that vitamin A deficiencies and anaemia are common. Nutritional problems in children are closely related to the incidence of diarrhoeal diseases, rather than dietary deficiencies, although there remains scope for improving the quality of diet.
- With the creation of the Land Use Planning Section in MOA, more systematic information on land use has become available. This indicates that the area of forest cover remains well in excess of the Government's long-term target of 60% of total land area, and suggests that long-term land degradation caused by agricultural activity remains limited.

Implementation Performance

Table 15.2 shows the actual and expected capital and recurrent expenditures on RNR sector (MOA and Dzongkhag) programmes for the first four years of the 7 FYP. The overall implementation percentage achieved was 103.7% of the 7 FYP target, reflecting considerably higher than anticipated expenditures on the Paro Valley Development Project (PVDP) and the Agricultural

Mechanization Centre (AMC) which together have accounted for 39% of RNR sector expenditures over the four year period.

A little over one tenth of RNR sector expenditures are currently incurred on Dzongkhag implemented programmes (funded from both Dzongkhag budgets and the ADPs). Improvements to farmer support and advisory services will require a greater share of resources being allocated to Dzongkhag programmes. However, programmes implemented at the Dzongkhag level have continued to emphasize achievement of input supply targets, rather than impact, and there is a need for a much stronger technical content in these programmes. This will require closer collaboration and support between Dzongkhag RNR offices and MOA.

Table 15.2 7 FYP Budget Performance - RNR Sector (Nu million)

MOA and Dzongkhags	7 FYP Allocation	Actual 1992/93	Actual 1993/94	Actual 1994/95	Est. 1995/96	Total 1992/93-1995/96	Implementation %age
Capital	1,275.5	283.5	458.9	516.5	529.9	1,788.8	140.2%
Recurrent	1,158.1	157.4	170.9	194.6	212.8	735.7	63.5%
TOTAL	2,433.6	440.9	629.7	711.1	742.7	2,524.5	103.7%

Project monitoring and review reports have generally indicated satisfactory implementation progress, although, for some projects, implementation has been constrained by staff shortages. There have been no excessive delays on projects involving construction work. Disbursement shortfalls have tended to reflect over-optimistic programming assumptions about the time taken to secure aid financing and for project mobilization, as well as over-budgeting of project costs on some aid funded projects. Information on project impact is not readily available and the development of an effective monitoring and evaluation capacity remains a priority for MOA.

Input supply programmes have continued to face difficulties such as commission agents' having insufficient working capital leading to delayed delivery of fertilizers and seedlings and low levels of efficiency in the livestock breeding programme. Further commercialization and privatization are seen as the eventual solution to these problems.

In recent years, around three-quarters of the RNR sector budget have been financed from aid sources, including almost one third of recurrent costs. Domestic resource constraints sometimes make it impossible for the RGOB to provide adequate recurrent financing for projects after their completion. This is a problem which will be addressed through the development of a realistic medium-term financing perspective for RNR sector programmes that takes account of both domestic and aid resources.

Institutional Developments

Human Resources Development.

The number of graduates working in the MOA increased from 90 at the end of 1991 to 142 at the end of 1995. However, only 6 out of 20 Dzongkhag RNR offices have graduate staff attached to them, and only 34% of technical (Scientific Support Cadre) positions are filled by diploma level staff. The shortage of trained staff has been addressed through two initiatives: (i) the Natural Resources Training Institute (NRTI), which began operation in 1992 and offers three-year diploma courses in agriculture, animal husbandry and forestry; and (ii) an expanded programme of professional training funded by the European Union which, on completion in 1999, will have funded 50 undergraduate and 30 postgraduate training placements.

MOA Reorganization

A major reorganization of the MOA took place in 1993 aimed at achieving better integration and efficiency in the services provided to farmers. This involved merging the agriculture, livestock and forestry research services and combining responsibilities for agriculture and livestock extension services under a single Research, Extension and Irrigation Division. Veterinary and input supply services were brought under the Crop and Livestock Services Division. The mandate of the Forest Services Division was left largely unchanged. Linked to the implementation of the reorganization was a review of research and extension policies and practices. This led to reorganization of the research system with 4RNR Research Centres (RNR-RCs) each having a regional mandate. Extension officers are being posted to the RNR-RCs to ensure closer integration between the research and extension services and to improve technical support and supervision of the Dzongkhag RNR programmes. Measures to strengthen the planning base for the sector have included the establishment of a land use planning section in the Policy and Planning Division of MOA.

Community Participation

The importance of increased community participation in RNR sector programmes has been emphasized both as a way of reducing demands on the government budget and as a means of ensuring the long-term sustainability of programmes beyond their development phase. Considerable progress has been made in transferring responsibility for irrigation schemes to Water Users' Associations (WUAs) which were introduced under the new irrigation policy adopted in 1992. By the beginning of 1996, around 100 WUAs had been established. Following the winding up of the Bhutan National Potato Programme (BNPP) in 1994, the establishment of potato farmers' groups has been encouraged to provide input supply and marketing services. A total of 10 groups were in operation at the beginning of 1996.

Commercial and Private Sector Development

Commercialization and privatization of input supply and marketing services are seen both as a means of reducing demands on the Government budget and of increasing the range of services available to farmers by providing additional opportunities for entrepreneurial activity. In the 7 FYP greater autonomy was given to FCB and BLC which now operate as fully commercial corporations. Seed supply has been brought under the Druk Seeds Corporation (DSC) which will become fully commercial by 1998. Agricultural input supply, formerly the responsibility of MOA, was transferred to private sector commission agents providing opportunities for the delivery of additional services to rural communities. Meat processing plants at Phuntsholing and Samdrup Jongkhar, milk processing plants at Phuntsholing and Bumthang and a fruit processing plant at Bumthang have been privatized.

Objectives, Strategies and Programmes for the 8 FYP

Objectives

The objectives for the RNR sector for the 8FYP are:

- National Food Security. The objective of national food security has three aspects:
 - Maintaining broad national self-sufficiency level whereby the export of crops for which Bhutan has comparative advantage provides sufficient foreign exchange to cover the costs of food imports.
 - Achieving a minimum of 70% self-sufficiency in food grain production compared with the current level of around 65%.
 - Ensuring household food security whereby the population have assured access to food at all times.The national food security policy has implications beyond the RNR sector alone and call for a much broader cross-sectoral approach, the requirements of which were addressed under the Comprehensive Food Security Programme developed during the 7 FYP.
- Conservation of Natural Resources. An over-riding objective of RGOB is to protect Bhutan's fragile mountain environment and its unique flora and fauna for future generations. This requires that natural resources are utilized in a sustainable way and involves trade-offs between short-term economic gains and sustained long-term economic development. The protection and management of forest areas and improved land husbandry practices in agriculture are essential to achieving this objective, and will be actively pursued during 8 FYP.
- Sustainable Economic Production and Enhancement of Rural Income. At the farm level, production has to be both economic and sustainable. The RGOB will therefore aim to ensure that:
 - (i) appropriate, viable, and ecologically sustainable agricultural technologies are available;
 - (ii) rural communities have access to the benefits provided by the market; and
 - (iii) an enabling regulatory framework is in place which allows economic activity to flourish while ensuring the conservation and protection of the natural resource base.
- Social and Regional Balance and Equity. The support and services provided by RGOB in the RNR sector will be available and accessible to all, while reflecting differences in local natural and economic conditions.

- Role of Government. The role of Government in the RNR sector is guided by the principle that agriculture, animal husbandry and to some extent forestry are primarily private domains in which farmers and local communities take initiative, provide their own labour and capital, and take the risks and consequences of their actions. The RGOB therefore cannot direct and manage economic activity in the sector. Instead, its role is that of facilitator, extending the range of available opportunities through constructive regulatory measures, appropriate fiscal policies, provision of infrastructure, and cost-effective research, technical support and advisory services.

Strategies for the 8 FYP

The strategies for the RNR sector for the 8 FYP focus on the broad cross-sectoral policy measures required to: (i) maintain the natural resource base in the sector, (ii) promote economic growth and development; and (iii) ensure the efficient use of scarce public sector resources.

Improving the Planning Base for the Sector

The limited statistical base, lack of key agro-climatic data and limited understanding of the principal farming systems severely constrain efforts to develop appropriate policies and programme interventions for the RNR sector and to monitor and evaluate programme implementation. Steps to be taken to improve the planning base for the sector will include (i) the strengthening of agricultural statistics collection, analysis and dissemination; (ii) the provision of consistent land use information; (iii) a more farmer-centred approach in agricultural research and extension; (iv) a greater emphasis on monitoring the impact of government policies and programmes; and (v) strengthening of professional capabilities, particularly at the regional and Dzongkhag levels.

Ensuring an Enabling Regulatory Framework

One of the most important roles of RGOB in the RNR sector is to ensure an enabling legal, economic and social environment that encourages the best possible use of the available natural, human and capital resources. Certain aspects of the present regulatory framework, particularly in the areas of land use, taxation and trade are inconsistent or place inappropriate restrictions on the rural population. Greater attention needs to be given to assessing the economic and social impact on the RNR sector of existing and proposed legislation as part of an on-going review and updating of the legislative framework for the sector.

Strengthening Natural Resources Management

The management of Bhutan's natural resources is the responsibility of both the RGOB and local communities. Ensuring the sustainable management of the state forests and protected areas, requires that the costs to the government are minimized. In the forest areas, therefore, revenues from forest utilization will be recycled to finance forest conservation and management, while the costs of managing the protected areas are increasingly being covered from the Bhutan Trust Fund. To strengthen natural resource management in the agricultural areas, greater emphasis will be placed on land husbandry practices in agricultural research and extension, and the integration of social forestry into the extension programmes. The legislation on Tseri land passed during the 7 FYP will be implemented in a way that is sensitive to its social and economic impact.

Introducing Improved Technologies

The introduction of technologies and practices that improve the viability of grain production will be pursued, so as to increase self-sufficiency. Improved agronomic and post-harvest practices will also be promoted to help Bhutan to realize its regional and seasonal comparative advantage in horticultural crops. Initiatives to increase productivity in the livestock sub-sector will focus on intensification and measures to ensure sustainability of traditional production systems. Within this context the role of the research and extension services is to provide a "menu" of technological choices to farmers. To cater for the wide range of agro-climatic zones in Bhutan, the research programme will be conducted across a broad front, emphasizing the utilization of research results from elsewhere rather than focusing on experimentation at a limited number of sites.

Promoting People's Participation

Local communities are already involved in the planning and monitoring of RNR sector programmes in their areas through the structure of GYT's and DYT's. The role of private individuals in providing input supply and marketing services and basic curative animal health services will be encouraged. Greater emphasis will also be given to promoting farmers groups to manage rural infrastructure, deliver services and market agricultural produce, building on the successful experiences from the water users' associations.

Ensuring Well-Managed, Cost-Effective and Responsive Public Services

There remains considerable scope for improving the efficiency and effectiveness of public services in the RNR sector. Critical to this will be measures to strengthen management within the MOA. This will require the elimination of unnecessary bureaucracy, allowing managers greater flexibility in the implementation of their programmes, and better technical back-stopping and supervision of field-based staff. Research, technical and advisory services will be (i) restructured to make them more farmer-responsive and cost-effective; and (ii) subjected to regular monitoring and impact assessment. The imbalance in funding of national programmes implemented by the MOA and district programmes implemented by the Dzongkhags will be addressed and measures introduced to ensure better integration between MOA and the Dzongkhag RNR offices.

Promoting Commercialization and Privatization, and Reducing Subsidies

Input supply services are most appropriately the domain of the private sector which can respond quickly to the demands of the market. During the 8FYP, the policy of commercialization and privatization will be extended to cover mechanization services and livestock breeding services. Cost recovery will be sought for technical and advisory services provided to commercial horticulture and the scope for such services being provided directly by independent organizations, such as growers' associations, will be investigated. Input subsidies distort resource allocation and impose considerable costs on government. In future, such subsidies will be retained only where there is a strong economic and social justification.

Improving Access to Markets

For many communities, the opportunity to increase incomes and living standards depends on improved access to markets. This requires continued emphasis to be given to the development of rural access roads and mule tracks. Price controls, which may distort market mechanisms and discourage local production, will be reviewed.

Promoting Human Resources Development

The human resources, most decisive for the development of the RNR sector, are those of the rural communities themselves. Primary education and literacy programmes have a crucial role in opening up capacities for innovation and development among rural communities. The benefits of education can be enhanced by making curricula more sensitive to the needs of rural life. Extension programmes in the RNR sector also help to promote knowledge and understanding among the adult population in the rural areas. The RGOB's aim is to improve the quality of education and extension services by providing an appropriately qualified teaching and extension staff, backed up by adequate resources and supervision.

Management and Utilization of External Assistance

In 1995/96 almost 75% of the RNR sector budget was funded under external assistance programmes. During 8 FYP efforts will be made to ensure that external assistance to the RNR sector reflects more closely government policy and programme priorities, supports institutional capacities and programmes in the sector, and avoids the creation of separately managed project structures which cannot be sustained. An appropriate balance will also be sought between capital financing, recurrent expenditure support and technical assistance.

Programmes for the 8 FYP

During the 8FYP, government interventions in the RNR sector will be brought within a stronger "programme framework" approach. Activities in the sector will be grouped under six principal programmes: (i) management and planning services; (ii) farm systems development; ; (iii) crop and livestock production services; (iv) forest management services; (v) export horticulture development; and (vi) human resources development. The definition of programmes in the sector reflects closely the management of government interventions in the sector. The introduction of the programme framework approach will be initiated through a series of review exercises which will determine medium-term financing requirements for each of the main programmes in the sector.

Management and Planning Services

The strong emphasis under the 7 FYP on human resources development will suggest that by the end of the 8 FYP there will be well-trained personnel in the RNR sector at both the professional and technical levels. Utilizing these manpower resources effectively will require improvements in the planning and management of programmes in the sector.

RNR Programme Management

A series of measures will be taken to strengthen the management of RNR sector programmes. The aim will be to make central programmes more responsive to demands from rural communities. The RNR research centres (RNR-RCs) and Regional Veterinary Laboratories (RVLs) will be progressively staffed and equipped to provide technical backstopping and supervision to RNR staff in the Dzongkhags. The administrative and budgetary decentralization will be further promoted.

Within MOA Headquarters, attention will be given to streamlining decision making and improving programme supervision. Work planning by the Divisions will be strengthened, while programme monitoring and reporting requirements will be reviewed to make them more relevant. Steps will also be taken to restructure the Dzongkhag RNR office and improve communications by equipping headquarters divisions, RNR-RCs and Dzongkhag RNR offices with computers, fax, E-mail and telephones.

Policy and Planning Activities

Measures to improve the planning base for the sector and establish consistent time series data will involve collaboration with the Central Statistical Organization, in strengthening the collection and analysis of agricultural statistics. Priority will also be given to building up reliable agro-climatic data to provide a better basis for research and extension planning. A stronger economic input will be brought into research and extension programmes following the posting of agricultural economists to each of the RNR-RCs.

Greater emphasis in the work of PPD will be given to analyzing the impact of regulatory and policy measures, which generally fall outside the purview of the operational divisions in MOA. An effective programme of impact monitoring and evaluation will be established, the results of which will feed back into programme review and design. The Land Use Planning Section (LUPS) will broaden its activities becoming more fully integrated into the work of PPD, its work focusing on land policy analysis, farming systems analysis and the strengthening of RNR planning capacities at the Dzongkhag level.

Budgeting and Financial Administration

In collaboration with the Ministry of Finance, necessary reforms will be made to budgeting and financial administration in MOA. These will emphasize greater delegation, along with flexibility, to field-based managers and the establishment of a medium-term budgetary framework for programmes in the sector.

Farm Systems Development

The farm systems development programme falls under the Research, Extension and Irrigation Division of MOA. Its objective is to facilitate the process of change and development within the RNR sector through agricultural research, irrigation development and the provision of extension services.

Research

The objectives of the RNR research programme are:

- to facilitate agricultural and horticultural intensification, so that national food security and the income and employment potential of small farm households is enhanced through sound conservation and economically and ecologically sustainable farming practices;
- to enhance productive and regenerative capacity of forest resources safeguarding against any degradation of forest and water resources and loss of biodiversity; and
- to contribute to (i) increasing the importance of livestock to the household economy and the nutrition of the rural and urban population; and (ii) raising farm productivity while reducing environmental pressures through improvement of livestock breeds, feed and fodder availability and maintenance of livestock health.

The research structure is based on four geographic regions and four sub-sectoral national research programmes covering field crops, horticulture, livestock and forestry. Research centres at Yusipang, Bajo, Jakar and Mongar will coordinate research activities within their regions with each centre also being responsible for coordinating one of the national research programmes. Integrated into the research system are two technical service units, the Soil and Plant Analysis Laboratory and the Plant Protection Service.

The research system has to date focused primarily on experimentation. However, the 1995 RNR research policy emphasizes its broader role in: (i) contributing policy advice; (ii) managing linkages both with those outside the research system and with the farming community; (iii) coordination with other agencies involved in research or the introduction of new technology; (iv) managing and making available information; and (v) regulating the introduction of technology to avoid inappropriate or harmful introductions. The research programme will be expanded to take on this broader role. The number of scientists working in the RNR research system is expected to increase from 27 at the end of 1995 to around 50 by 2002. This will require increased investment both in research facilities and in the financing of research programmes.

Irrigation

The objectives for the irrigation programme for the 8 FYP are: (i) to raise productivity of existing rice-based irrigation schemes through improvements in water delivery and management; (ii) to increase rural incomes by diversifying the range of irrigated crops; and (iii) to rationalize the irrigation assistance programme with a view to increasing the role of water users and the private sector and reducing recurrent government investments on irrigation schemes.

The focus of the irrigation programme will continue to be on promoting community involvement in irrigation development and management with the RGOB providing technical support (civil, irrigation and geotechnical engineering and sociology), and management support and advice to WUAs. Financial assistance, on a cost-sharing basis, will be made available to defer the costs of construction and rehabilitation of food crop-based irrigation schemes. Investment in irrigation systems for cash crop production will be fully funded by the farmers involved. It is planned to decentralize technical support, design and supervision functions of the Irrigation Section to the RNR-RCs. During the 8 FYP the Irrigation Programme Strengthening Project will support MOA with the implementation of the irrigation policy, providing assistance for field studies, testing and institutional development. Funding for irrigation development and rehabilitation will be provided through the Dzongkhag budgets with external resources being made available under the ADPs.

Extension

The objectives of the extension programme during the 8 FYP will be: (i) to support the development of self-reliance by rural households and communities; (ii) to support and promote the development and use of management strategies

by rural households for sustained utilization of natural resources; and (iii) to support the participation of rural households and communities in their own economic development.

In order to achieve these objectives, extension activities are being reorganized into eight distinct sub-programmes (input supply, crop and livestock production, post-harvest management, farm management, organizational support, farm surveys, and environmental management) aimed at addressing the totality of farm problems including post-harvest issues, farm management and organizational development which have previously been relatively neglected. This will involve considerable expansion in the range of extension activities and much greater flexibility in budgeting arrangements to allow Dzongkhags to plan and implement extension programmes in ways that are better adapted to local conditions and demands.

Implementation of the new extension system will also require much stronger links between the MOA and the Dzongkhags, and between the research and extension services. This will be facilitated by the appointment of Extension Programme Officers who will be located regionally to: (i) provide a link between the extension service and the RNR-RCs; and (ii) assist Dzongkhag staff with programme planning, monitoring and evaluation and by providing technical backstopping.

The allocation of extension resources has tended to be supply-led, based on posting of an extension agent in each discipline per gewog. Under the RNR approach agriculture and animal husbandry extension services will become integrated at the field level. The social forestry and agro-forestry programmes will also operate through this unified extension service. Implementation of this strategy will allow extension resources to be allocated on the basis of need with additional resources being made available to the more populous gewogs or where there were special considerations relating to agro-ecological potential or marketing opportunities.

Crop and Livestock Production Services

The Crop and Livestock Services Division (CLSD) is responsible for animal health services and for input supply programmes. Policy during the 8 FYP will be to commercialize and, where appropriate, privatize input supply services in order to encourage greater efficiency and reduce the cost burden on the Government.

Animal Health Services

The objectives for the animal health services for the 8 FYP are: (i) to control, prevent and eradicate the economically important livestock diseases; and (ii) to develop a strong epidemiological database for economic analysis of major livestock diseases.

With the completion of the restructuring of the animal health services and the investment in the national and regional laboratory system, the emphasis for the 8 FYP will shift to strengthening preventive animal health services. This will involve: (i) epidemiological studies and analysis; (ii) drawing up of control programmes for the major animal diseases; (iii) upgrading and updating of technical staff; (iv) decentralization of responsibility to the regional laboratories for all aspects of animal health services in their areas; (v) involvement of the extension services in training of farmers in basic animal health; (vi) introduction of a computerized disease information system; (vii) problem/field oriented research including research on traditional medicines; (viii) improved supervision of quarantine stations and slaughter houses; (ix) measures to make the animal health inputs supply system more efficient and financially sustainable; and (x) monitoring and evaluating of the animal health programme.

Livestock Breeding Services

Breeding Farms. MOA operates a network of 10 breeding farms which distribute improved breeding stock to rural communities. An evaluation of these farms carried out under the Livestock Master Plan found that unit production costs were excessive and that major restructuring and rationalization of operations were required. In response to these findings, MOA is introducing partial commercialization of the farms with non-staff operating costs to be covered from revenue. Despite these measures, the economic viability of government breeding farms remains uncertain and lower cost alternatives such as encouraging specialist breeders in the private sector will be examined.

Artificial Insemination Services

Artificial insemination services were first introduced in 1982. The objectives of the service are: (i) to improve the genetic base and productivity of dairy cattle through a scientific cross-breeding programme; (ii) to identify, characterize and conserve animal genetic resources; (iii) to promote the formation of breeders' associations to be collectively responsible for cattle genetic improvement; and (iv) to establish a gene bank. During the 7 FYP the performance of the AI service has fallen well short of targets with less than 25% of the total Plan target having been achieved during the first three years with the result that a number of AI Centres have operated at well below economic capacity. A review of the programme will be undertaken, and underutilized AI centres closed so that resources can be concentrated on developing a viable service in those areas where demand is greatest.

Agricultural Input Supplies

Progress was made in commercializing agricultural input supply services during the 7 FYP. Fertilizer supply which was previously undertaken by the extension services has been taken over by commission agents with farmers expected to pay the ex-MOA warehouse price while the costs of transport and agents' commission are met from the MOA and Dzongkhag budgets. From the start of the 8 FYP, all subsidies will be removed and farmers will pay the full cost including transport expenses and commission. RGOB's core funding to the Druk Seeds Corporation is being phased out over a four year period and by 1998 the company is required to become financially viable.

Mechanization Services

In recent years the AMC at Paro has absorbed a major share of agricultural sector financing. For 1995/96 the budget for AMC is Nu 109 million. An evaluation of the programme undertaken in 1992/93 highlighted its high cost and limited impact. During the 8 FYP the machinery maintenance operations of AMC are planned to be privatized and only a small machinery development and testing unit retained under the MOA.

Agricultural Credit

The Bhutan Development Finance Corporation(BDFC) continues to be the main source of seasonal and medium-term credit for the agriculture sector. Annual lending by BDFC to the RNR sector is projected to increase to Nu 175 m by 2002. By the end of the 7 FYP, BDFC had introduced a rural savings scheme and a group lending programme on a pilot basis in two dzongkhags.

Agricultural Marketing

Direct RGOB involvement in the marketing of food and agricultural produce is through the Food Corporation of Bhutan (FCB). During the 8 FYP the role of FCB in the marketing of horticultural produce will be reviewed.

Forest Management Services

The 7 FYP has seen significant progress towards the development of a forest policy and strategy that balances requirements for conservation with the needs of local communities. In the 8 FYP forest management activities will focus on three major programme areas: (i) sustainable forest management; (ii) nature conservation and protected area management; and (iii) social forestry and extension.

Sustainable Forest Management

The sustainable forest management programme in the 8 FYP will involve the following main activities:

- **Forest Protection:** covering both protection of forests against encroachment and illegal felling, fire protection measures, and surveillance and preventive measures against pests and diseases.
- **Sustainable Management for Multiple Use:** involving strengthening forest management and placing it on a more scientific basis following the preparation by FSD of forest management plans. Currently, about 25% of national demand is being met from areas under forest management plans. During the 8 FYP institutional capacities to implement the programme will be strengthened, and

measures taken to ensure greater sensitivity to traditional community uses of the forest.

- **Commercial Forestry Operations:** involve bringing commercial logging operations under forest management concessions, ensuring better linkage between forest logging operations and forest management and considerably reducing budgetary demands on government. Wood prices will be adjusted to reflect economic values to facilitate efficient utilization of forest resources, make an appropriate contribution to RGOB revenues, and improve the viability of Bhutan Logging Corporation.

Nature Conservation and Protected Area Management

The protected areas consist of four national parks (Jigme Dorji, Black Mountains, Royal Manas, and Thrumshingla), five wildlife sanctuaries (Phipsoo, Kulong Chhu, Sakteng, Bomedelling and Khaling) and one strict nature reserve (Torsa). Together, these account for 26% of the total land area of Bhutan. By the end of the 7 FYP, management plans were prepared for the Royal Manas National Park, the Jigme Dorji National Park and the Black Mountain National Park. During the 8 FYP management plans will be completed for another four areas (Bomedelling, Thrumshingla, Khaling and Sakteng). Priority will be given to protected areas in the south that include endangered species such as tiger, one-horned Indian rhinoceros and elephant, and where wildlife populations are most threatened.

Social Forestry and Forestry Extension

The social forestry and extension programme aims to address the demands of the rural population for forest products and involve rural communities in the management of forest resources. The programme has three main aspects: (i) designation of community forest areas to be managed by village forest management units; (ii) community afforestation/reforestation initiatives in degraded areas; and (iii) agro-forestry and private forestry on privately owned agricultural land. Implementation of the social forestry programme will be the responsibility of the Dzongkhag Forest Extension Officers who form part of the unified RNR extension service at the Dzongkhag level. The programme, which is currently being implemented on a pilot scale mainly in the Eastern Dzongkhags, will be expanded during the 8 FYP.

Export Horticulture Development

Export horticulture provides one of the best opportunities for economic growth in the RNR sector and raising of living standards among the rural population. For the 8 FYP, a twin track approach to promoting horticultural production will be adopted. First, horticulture is included under the research and extension programmes where the focus will be on the role of horticultural crops within the household farming system. Second, an innovative programme for promoting export horticulture will be developed. The starting point for this initiative will be assisting Bhutanese growers in exploiting opportunities in horticultural export markets, but it is expected that it will develop to cover the commissioning of research and the provision of technical advice and services to growers. Because of its commercial emphasis, the programme will be most appropriately organized outside of government, perhaps under a representative organization such as a horticultural growers' federation. The eventual aim will be for the programme to become self-financing.

Human Resources Development

Diploma level training of MOA staff is undertaken at the Natural Resources Training Institute (NRTI) at Lobeysa in Wangdue. During the 8 FYP, existing gaps in MOA staff establishment are expected to be filled, after which the diploma training programme will focus on replacement requirements (estimated at 25-30 per year) and refresher courses for long-serving field staff. A review of NRTI will be undertaken towards the end of the Plan period to determine its future role. Training of Forest Guards is undertaken at the Bhutan Forestry Institute (BFI) at Taba which offers a one year certificate level course. The maximum intake at BFI is 40 with the actual intake adjusted according to the level of establishment vacancies. Following completion of the European Union assisted graduate and postgraduate training programme, professional training requirements of the Ministry are expected to be financed through the National RCSC HRD programme and through individual projects in the RNR sector. It is estimated that

12-15 undergraduate and 3-5 postgraduate placements will be required each year to meet the future manpower requirements of the ministry.

Financial and Manpower Requirements for the 8 FYP

Financing Strategy

Domestic Financing

Domestic financing for the RNR sector is not projected to increase in real terms during the 8 FYP. This has a number of implications for the Government's programme for the sector:

- There will be considerable upward pressure on personnel costs as the proportion of qualified graduate and diploma level staff in MOA increases. In order to accommodate these additional costs, MOA will have to look to reducing its overall staffing level.
- It will be important to develop unit costs for key services to ensure an appropriate balance between wage bill and operations expenditures.
- The on-going initiative to eliminate unnecessary subsidies and to commercialize (and where possible privatize) input supply services will need to be intensified.
- Programmes which are not performing satisfactorily will need to be reviewed with a view to downsizing or closure.
- It will be necessary to continue to secure aid financing to meet a significant proportion of the recurrent costs of RNR sector programmes. Already aid financing covers 28% of the recurrent budget of the MOA, and 23% of the RNR sector as a whole.

Aid Financing

Aid financing requirements for the sector are not expected to increase in real terms for the 8 FYP. Instead the emphasis will be on increasing the efficiency of resource use in the sector. In managing aid funding, particular attention will be given to ensuring that: (i) projects are consistent with the wider sub-sectoral programme framework to which they relate; (ii) the accountability of projects to the management structure of MOA is clearly spelt out; (iii) aid proposals do not distort resource allocation by making available levels of funding which cannot be sustained in the longer-term; (iv) realistic assumptions are made about the speed and capacity of MOA to take over the recurrent financing commitments being covered under aid financed projects; and (v) aid projects are subject to regular monitoring and impact assessment.

Aid funding for the sector is expected to continue to be provided through two main types of projects:

- Programme support projects: which provide direct support to a programme or sub-programme in the sector by: (i) supporting the development and management of the programme; and (ii) financing programme activities where these are not covered by an ADP.
- Area development projects: which fund the activities of a number of RNR programmes or sub-programmes within a particular Dzongkhag or group of Dzongkhags and which will be integrated into the technical support structure provided by the RNR-RC network. Currently 17 out of the 20 Dzongkhags are covered, or are scheduled to be covered by ADPs.

Technical Assistance

The costs of technical assistance personnel represent a significant share of the external assistance to the sector. In recent years there has been an imbalance in the use of technical assistance with too much emphasis on the

preparation of sector analysis and master plans and insufficient attention being given to supporting the implementation of programmes in the field. During the 8 FYP it will be necessary to utilize technical assistance resources more efficiently by: (i) appraising requests and proposals for foreign technical assistance more stringently; (ii) utilizing junior experts and volunteers for positions which do not require the experience of a senior expert; and (iii) giving greater emphasis on the posting of technical assistance personnel outside of Thimphu to support the implementation of programmes.

Manpower