

PART-1 THE MASTER PLAN

Chapter 2 BACKGROUND

2.1 Five-Year Plans

2.1.1 Development Philosophy of Bhutan

“Gross National Happiness” is the overarching development philosophy of Bhutan. The Gross National Happiness is fulfilled with not only economic growth or materials but also spiritual and emotional satisfaction, which are supported by the main four (4) pillars of;

- Economic growth and development,
- Preservation and promotion of cultural heritage,
- Preservation and sustainable use of the environment, and
- Good governance

For these, special emphasis is put on human resources development and communication improvement, and on decentralization and devolution of power to realize the good governance and to contribute to human well-being and happiness along with the preservation and promotion of cultural heritage and rich environment of the country.

2.1.2 Review of the Eighth Five-Year Plan

According to the Eighth Five Year Plan (1997 – 2002) Mid-Term Review Report (2000), expenditure delivery during the first half (two and half years) of the period was Nu. 10,247 million or 39 % of the total plan outlay. It was reported that the resource gaps were likely to occur in power, telecommunications, roads, human resources development and in the project tied programs under GOI particularly in RNR, education and health sector.

The Main Document of the Ninth Five-Year Plan (2002 - 2007) concluded that the actual GDP¹ growth during the period of 8th FYP was 6.7 % against the projected growth rate of 6.5 %. The following table shows the projected and actual growth rate by sector.

Sector	Sector Compound Growth Rate (%)	
	Projected	Actual
Agriculture	2.5	3.8
Manufacturing	12.0	9.3
Electricity	7.0	4.5
Construction	7.0	17.3
Trade and commerce	4.0	4.0
Mining, etc.	19.4	3.6
Transportation and Communication	10.0	8.5
GDP Growth	6.5	6.7

Source: Main Document, 9th Five-Year Plan, Planning Commission, 2002

2.1.3 The Ninth Five-Year Plan at National Level

In accordance with the development philosophy of RGOB and taking due consideration on the review of achievement of 8th FYP, five (5) overall goals of the Ninth Five Year Plan (9th FYP) were set as follows:

¹ GDP at factor cost in 1980 prices.

- Improving quality of life and income, especially of the poor,
- Ensuring good governance,
- Promoting private sector growth and employment generation,
- Preserving and promoting cultural heritage and environment conservation, and
- Achieving rapid economic growth and transformation.

In order to attain these goals, four (4) strategic development policies were identified. They are;

- Infrastructure expansion, whose major components are rural access improvement, expansion of power transmission and telecommunication, housing in urban areas,
- Sound macro-economic policy, that aims to meet the entire recurrent expenditures with domestic revenue,
- Ensuring good governance, that aims to promote decentralization and devolution of power with certain allocation of development budget to local administrations, namely, Dzongkhags and Gewogs, and
- Improving access and enhancing social services, by means of improvement of physical access particularly in rural areas, then accordingly to the social services on education, health care, safe water and others

Ninth Plan outlay and allocation are summarized in the following table.

Ninth Five-Year Plan Outlay and Allocation by Organization

(Unit: Nu. Million)

Organization	Recurrent	Capital	Total	Percent
Autonomous agencies	4,649.3	4,972.5	9,621.8	13.7
Min. of Home Affairs	486.4	130.6	617.0	0.9
Min. of Finance	1,257.2	354.9	1,612.1	2.3
Min. of Foreign Affairs	1,278.7	176.2	1,454.9	2.1
Min. of Health and Education	4,581.1	2,893.4	7,474.5	10.7
Min. of Agriculture	2,548.4	2,000.0	4,548.4	6.5
Min. of Trade and Industry	2,210.4	6,351.1	8,561.5	12.2
Min. of Communication	1,710.6	8,672.5	10,383.1	14.8
Others	5,156.9	3,449.1	8,606.0	12.3
Sub-total (Central, Autonomous, and Others)	23,879.0	29,000.2	52,879.2	75.5
Dzongkhags	7,655.3	7,224.7	14,880.0	21.3
Gewogs	147.2	2,093.6	2,240.8	3.2
Sub-total (Dzongkhag and Gewogs)	7,802.5	9,318.3	17,120.8	24.5
Total Plan Outlay	31,681.5	38,318.5	70,000.0	100.0

Source: Main Document, 9th Five-Year Plan, Planning Commission, 2002

It should be noted that nearly a quarter (24.5 %) of the total plan outlay was allocated to Dzongkhags and Gewogs, while the agriculture sector is allocated with 6.5 % of the total outlay.

2.1.4 The Ninth Five-Year Plan at Dzongkhag Level

(1) Lhuntse Dzongkhag

Development in the Dzongkhag during the 9th FYP will be guided by the following objectives:

- To promote decentralization, good governance and people's participation,
- To consolidate and improve the existing service facilities,
- To optimize and harness real development potentials,

- To bring about institutional strengthening and capacity development,
- To promote balanced development amongst the Gewogs,
- To conserve the environment and natural resources base through awareness building and sustainable utilization mechanisms, and
- To protect and preserve the rich cultural heritage.

The above objectives will be achieved through the following strategies.

- Strengthening of DYT, GYT and other community based organization by providing basic support services i.e. construction of Gup's office, telephones, furniture and stationeries,
- Providing coordination for the effective implementation of development activities at the Gewog level,
- Building of feeder and/or farm road wherever possible and exploring market potentials to establish wider business links,
- Institutional strengthening and capacity building will be done through proper manpower resource management and by providing the required exposure and training to the community members as well as the extension and sector heads level,
- Build mechanism in each of the sectors particularly in the RNR sector and organize workshops throughout the 9th FYP, in which integration of environmental considerations will be worked out, and translated into concrete activity planning,
- Inventorising of the existing infrastructure facilities. Improvement of the service in terms of quality through provision of adequate facilities and manpower,
- Reconstruction/renovation of important places of historical and religious significance and promotion of national dress and language to instill the value system in all students and the general public.

The Ninth Plan outlay of for Lhuntse Dzongkhag is Nu. 886.310 million of which Nu. 190.088 million is allocated for eight (8) Gewogs.

Dzongkhag and Gewog Plan Outlay of Lhuntse

Organization	Recurrent	Capital	Total	Percent
Agriculture	15.358	101.522	116.880	13.2%
Livestock	19.641	23.604	43.245	4.9%
Forest	4.530	11.240	15.770	1.8%
Education	115.067	267.199	382.266	43.1%
Health	53.253	46.932	100.185	11.3%
Roads, Suspension bridges, Mule tracks	3.941	22.573	26.514	3.0%
Telecommunication	0.000	0.000	0.000	0.0%
Power	1.329	0.000	1.329	0.1%
Trade and Industry	0.000	0.000	0.000	0.0%
Urban Development Housing Division	3.158	68.700	71.858	8.1%
Dzongkhag Administration	52.783	75.480	128.263	14.5%
Total Plan Outlay	269.060	617.250	886.310	100.0%

Source: 9th Five-Year Plan of Lhuntse Dzongkhag, 2002

(2) Mongar Dzongkhag

The main objectives of the Mongar Dzongkhag Development Program are:

- To reach the un-reached people in social sector through better delivery of extension services and input supplies, and also by giving more focus on primary education,
- To promote sustainable development,

- To improve economic self-reliance through efforts of income generating activities,
- Nature conservation and preservation, and
- Preservation of cultural heritage.

The above objectives will be achieved through the following strategies.

- Promotion of cottage industry and agro-based industry with storage facility,
- Nature conservation and preservation through awareness campaign and promotion of sustainable use of natural resources,
- Preservation of cultural heritage through timely maintenance and rehabilitation services

The Ninth Plan outlay of for Mongar Dzongkhag is Nu. 1,148.085 million of which Nu. 153.736 million is allocated for 16 Gewogs.

Dzongkhag and Gewog Plan Outlay of Mongar

Organization	Recurrent	Capital	Total	Percent
Agriculture	32.793	63.608	96.401	8.4%
Livestock	33.518	19.914	53.432	4.7%
Forest	5.546	2.272	7.818	0.7%
Education	251.226	363.589	614.815	53.6%
Health	50.364	41.223	91.587	8.0%
Roads, Suspension bridges, Mule tracks	5.810	12.620	18.430	1.6%
Telecommunication	0.000	0.000	0.000	0.0%
Power	0.000	0.000	0.000	0.0%
Trade and Industry	0.000	1.200	1.200	0.1%
Urban Development Housing Division	15.866	84.080	99.946	8.7%
Dzongkhag Administration	95.269	69.186	164.455	14.3%
Total Plan Outlay	490.393	657.692	1148.085	100.0%

Source: 9th Five-Year Plan of Mongar Dzongkhag, 2002

2.2 Development Strategy of Renewable Natural Resources Sector

2.2.1 Basic Development Policy of RNR Sector

The over riding policies of the RNR Sector are;

- To pursue a development path that puts people in the center and meets their aspirations for a better life through their **active 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 a **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 **environmental 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.

2.2.2 Objectives of the Ninth Five-Year Plan

(1) Objectives

Within the nation's overall policy framework, the objectives of the RNR sector for the 9th FYP are:

- OBJ-1 : To attain national food security,
- OBJ-2 : Conservation and management of natural resources,
- OBJ-3 : Enhancement of rural income, and
- OBJ-4 : Generation of employment opportunities.

(2) Priority Areas

In order to attain the above objectives, six (6) priority areas or programs were identified as follows:

- PR-1 : Enhancing household and national food security,
- PR-2 : Enhancement of rural livelihood and income,
- PR-3 : Development of farm infrastructure,
- PR-4 : Development and organization of farm-business and wood-based industries,
- PR-5 : Conservation and utilization of natural resources, and
- PR-6 : Development of internal and external markets for farm production and products.

(3) Strategies

In order to implement the above programs, 17 strategies were set up as follows:

- STR-1 : Creation of an enabling policy and legal framework,
- STR-2 : Improving planning and management of the programs,
- STR-3 : Improving the monitoring and evaluation of the programs
- STR-4 : Generation of appropriate technology
- STR-5 : Delivery of extension services
- STR-6 : Creation of an enabling financial environment
- STR-7 : Delivery of inputs to the farmers
- STR-8 : Mechanization of farms
- STR-9 : Enhancing markets for primary products
- STR-10 : Developing adequate level of vital infrastructure
- STR-11 : Diversifying the economic base of the sector
- STR-12 : Enhancing the integrity of the natural resources
- STR-13 : Promotion of economic growth and employment
- STR-14 : Strengthening human resources and capacity building
- STR-15 : Introduction and adoption of information technology
- STR-16 : Mobilization of financial resources
- STR-17 : Strengthening administrative and financial management of the programs

(4) Programs

In order to realize and give shape to the above strategies, Field Programs, Regional and Area Development Programs and National Programs were identified:

- (a) Field Programs
- FP-1 : Food security
 - FP-2 : Income Generation
 - FP-3 : Rural Livelihood Support
 - FP-4 : Nature Conservation and Environment Protection
 - FP-5 : Employment generation
 - FP-6 : Institutional and capacity development
- (b) Regional and Area Development Programs
- RP-1 : Western Area RNR Development Program
 - RP-2 : West Central RNR Area Development Program
 - RP-3 : East Central RNR Area Development Program
 - RP-4 : Eastern Area RNR Development Program
- (c) National Programs
- NP-1 : Direction and management
 - NP-2 : Policy and legislation
 - NP-3 : Land use planning
 - NP-4 : Agriculture marketing
 - NP-5 : Human resource development
 - NP-6 : Information, communications and statistics
 - NP-7 : National biodiversity center
 - NP-8 : Quality control and regulation
 - NP-9 : Plant protection services
 - NP-10 : National soil services
 - NP-11 : Research
 - NP-12 : Extension
 - NP-13 : Horticulture development
 - NP-14 : RNR engineering
 - NP-15 : Farm mechanization
 - NP-16 : Livestock development
 - NP-17 : Forestry services
 - NP-18 : Druk Seed Corporation
 - NP-19 : Forestry Development Corporation
 - NP-20 : Food Corporation of Bhutan
 - NP-21 : Rural credit and farm business financing

The Field Programs of the RNR Sector identified in the Gewog-wise 9th FYP is given in the following page.

List of the Field Programs by Gewog

Program	Sub Program	Dzongkhag		Lhuentse							Mongar																
		Geog		Gangbur	Jaray	Khoma	Kurtoe	Mendi	Mekho	Minyi	Tsenkhar	Balarn	Chaskhar	Chali	Dramtse	Drepang	Gongdue	Jurme	Kengkhar	Mongar	Ngatshang	Saleng	Ehermung	Stambi	Thangrong	Tsakaling	Tsamang
Food Security	Rice Improvement			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	Maize Improvement			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	Wheat Improvement																										
	Buckwheat Improvement																										
	Millet Improvement																										
	Oilseed Improvement				•							•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Income Generation	Horticulture - chili					•																					
	Horticulture - Potato					•																					
	Horticulture - Asparagus					•																					
	Horticulture - Other vegetables (tomato, cabbage, cauliflower, etc.)					•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	Horticulture - Ginger					•																					
	Horticulture - Citrus					•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	Horticulture - Walnut					•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	Horticulture - Cardamom					•																					
	Horticulture - Mango					•																					
	Horticulture - Other Fruits (strawberry, plum, peach, etc.)																										
	Medicinal and Aromatic Plants																										
	Mushroom																										
	Backyard farms - poultry					•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	Backyard farms - dairy								•	•																	
	Backyard farm - piggery								•	•																	
	NTFPs																										
Private Nursery					•			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
Private Forestry											•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
Peri - Urban Production Units																											
Rural Livelihood Support	Credit																										
	Irrigation					•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	Farm Road					•																					
	RNR Center (Construction & Renovation)						•	•																			
	Processing, storage and post harvest facilities																										
	Soil fertility Management/ Agroforestry																										
	Feed and Fodder					•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	Livestock Breed Improvement and conservation - Cattle					•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	Livestock Breed Improvement and conservation - Others					•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	Animal Health Services					•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	Community Forestry					•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Water Harvesting																											
Nature Conservation and Environment Protection	Afforestation																										
	Fire Management																										
	Tsarndrog and Sokshing management																										
Institutional and Capacity Development	Watershed Management																										
	Farmers' training					•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	Information, education, and communication for awareness raising (field days, study tours, livestock shows etc.)					•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	Machineries and equipment supply					•																					

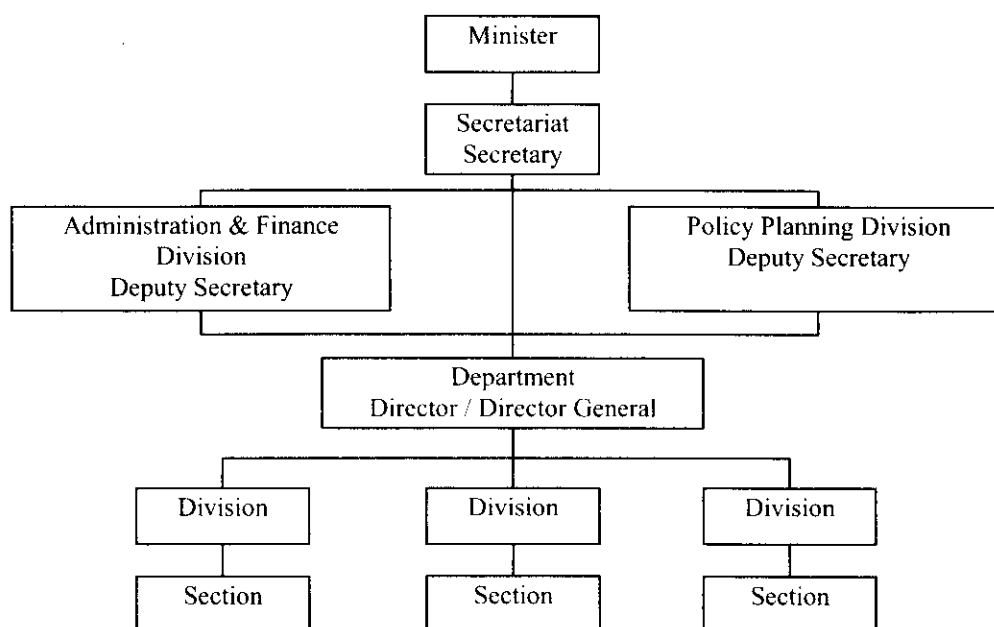
Source: Ninth Plan (2002-2007), RNR Sector, Lhuentse and Mongar Dzongkhag

2.3 Governmental Organizations Related to the Study

2.3.1 Ministries

In accordance with the National Development Philosophy, “Good Governance” was taken into shape in the 9th FYP, as proposed in “Enhancing Good Governance, Promoting Efficiency, Transparency and Accountability”. In the proposed system of governance, decentralization of the governance was embodied with clear roles and positioning of Dzongkhag Development Committee (DYT) and Gewog Development Committee (GYT) as shown in Fig. 2.3.1.

All ministries are structured in uniformity in basic structural components as shown below to reduce substantial variations in the functions and posts by ministry.

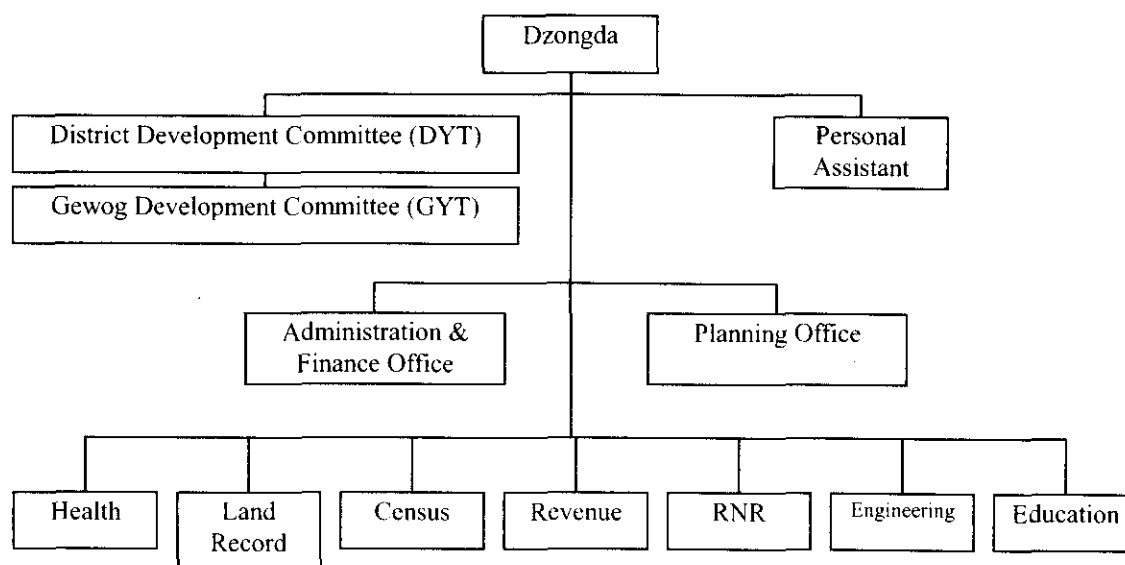


General Organogram of Ministry

As for Ministry of Agriculture (MOA), research and extension services are arranged independently under Council of Research and Extension (CORE), and Secretariat of CORE is located at the same level of three departments, namely Agricultural Services, Livestock Services and Forestry Services. Besides, four (4) non-departmental agencies and three (3) corporations are arranged as line agencies. The proposed organogram of Ministry of Agriculture which will be arranged in the course of the 9th FYP is given in Fig. 2.3.2.

2.3.2 Dzongkhag

Similar to ministries, a standard structure was arranged for Dzongkhags as shown in the following:



Organogram of Dzongkhag Administration

Staffing pattern for each Dzongkhag is categorized into either A, B or C according to the size of the Dzongkhags. Lhuntse Dzongkhag belongs to Category C having eight (8) Gewogs, while Mongar Dzongkhag belongs to Category A with 16 Gewogs. The organograms of Lhuntse and Mongar Dzongkhags are given in Fig. 2.3.3 and Fig. 2.3.4, respectively.

Though Dzongkhag administration is situated under Ministry of Home Affairs, staffs of each sector are arranged in connection with each line agency. For instance, the staffs of RNR sector are allocated by MOA, while staffs of the engineering sector are assigned by MOA and/or MOC.

RNR sector has staffs at Gewogs, namely “extension agents”, who have certain technical background as “diploma” and play important roles on dissemination of agricultural technologies and development planning at Gewog level.

2.4 Related Projects and Programs in the Study Area

2.4.1 Agricultural Development

(1) Second Eastern Zone Agricultural Program by IFAD

The purpose of the program is “to alleviate rural poverty in the Eastern Zone of Bhutan² by enhancing the incomes, living standards and food security of rural households through sustainable, community-based resource use”, which is quite similar to the purpose of this study. Total program cost allocated was US\$ 17.83 million for eight (8) years from 2000.

Components of the program consist of the following:

- Local development initiatives (strengthening of local institutions such as GYT through staff training, farmers associations, special interest group, small-scale

² Six (6) Dzongkhags are targeted; they are Lhuntse, Mongar, Trashiyangtse, Trashigang, Pemagatshel, and Samdrup Jongkhar.

- Community-based natural resource development (production support activities at Dzongkhag level on; irrigation rehabilitation and upgrading, sustainable crop intensification and diversification, improvement of storage, marketing and input supply, livestock improvement, use and conservation of non-timber forestry products, agro-processing, etc.)
- Renewable natural resources services (strengthening of activities and capacity of RNR centers and sub-centers),
- Rural financial services (credit for groups, joint voluntary saving, etc.),
- Program facilitation and management (provision and operation of program facilitating office, operation and maintenance support, placement of technical assistance, etc.)

In the course of the community-based natural resources development, farm roads have been constructed in Lhuntse (Minjay Gewog, 5 km) and Mongar (Chaskhar Gewog, 10 km) Dzongkhags through participatory approach.

(2) Integrated Horticulture Development Program by UNDP

The Integrated Horticulture Development Program (IHDP) constitutes the national program of the Royal Government of Bhutan (RGOB) to develop the horticultural sub-sector of the whole country. For the first phase of the Integrated Horticulture Development Program (July 1997 – June 2002), UNDP agreed to provide US\$ 6.5 million in support for six sub-programs as follows:

- ① Coordination,
- ② Marketing,
- ③ Post harvest,
- ④ Technology generation (research),
- ⑤ Extension, and
- ⑥ Development of aromatic and medicinal plants (both research and marketing).

The Integrated Horticulture Development Program builds upon earlier projects, to lay the foundation for long-term (10-20 years) development of horticulture in Bhutan. IHDP was designed to respond to the RGOB's National Policy Objectives for the Horticulture Sub-sector, to increase income, living and nutritional standards of the rural population, and to promote sustainable land use, environment, and employment, mitigating rural-urban migration.

The program was designed for national execution, with efforts to build government staff capacities. The ultimate beneficiaries are the rural farmers of Bhutan.

For the Integrated Horticulture Development Program, the short-term immediate objectives for Phase I (8th FYP, 1997-2002) were:

- ① To improve the coordination of horticultural development in Bhutan;
- ② To improve the marketing system for domestic / export horticultural produce;
- ③ To reduce post-harvest losses of horticultural produce;
- ④ To provide appropriate and locally adapted management recommendations for horticultural crops and enable growers to optimize their returns from horticultural produce;
- ⑤ To develop an effective horticultural extension program with on the ground demonstrations – growing potential crops in farmers' fields and demonstrating improved crop management practices;

- ⑥ Develop existing commercial aromatics and medicinal plants and identify additional species with potential for commercial exploitation generating alternate sources of sustainable income to the farmers;
- ⑦ Promote rural agro-based industries through provisions of efficient marketing, processing and quality control services to the producers and exporters of horticulture produce including essential oils and medicinal plant products, starting with lemon grass oil.

Among the sub-programs, the following activities were undertaken in Mongar;

- Market shed construction, and
- Strengthening of RNR Research Center for low-altitude plants,

2.4.2 Road Development

(1) Rural Access Program (World Bank)

The Rural Access Program aims to improve the access of rural communities to markets, schools, health centers, and other economic and social infrastructure, in order to improve the quality of life and productivity of rural communities and to help strengthen institutional capacity for implementing environmentally friendly approaches to improve rural access, community involvement in rural roads selection and management, an improved infrastructure maintenance. There are three project components as follows:

- Construction of feeder roads,
- Provision of necessary equipment to DOR, and
- Six sub-components consisting of; i) project management assistance and training; ii) environmental and social assessment studies, iii) the introduction of a LACI-(Loan Administration Change Initiative) type format, and the funding of experts and related hardware and software; iv) feeder road maintenance planning; v) the socio-economic evaluation of completed roads; and vi) pre-investment studies for a follow-up project.

Feeder road construction has been conducted in three Dzongkhags for 122 km in total length, of which 39 km is being constructed in Lhuntse Dzongkhag. The feeder road will connect Kurtoe Gewog (Dungkhar village) with the District Road to Lhuntse town. The project will continue until the year 2005. Total project cost is US\$ 14.9 million.

(2) Forest Development Program (World Bank)

The objective of this project is to support Bhutan's efforts to develop and implement an approach for sustainable protection, management and use of its forest resources in line with its national development priorities.

The project consists of four components:

- ① National forest management involving the planning and management of selected forests by the government;
- ② Social forestry involving rural communities in managing forest areas allocated to them, and improving farm output by introducing tree planting on private lands;
- ③ Afforestation / reforestation involving rehabilitation of degraded forests on government lands; and
- ④ Institutional strengthening including support for improved planning and policy development, training and capacity building of the Department of Forestry (DOF) at the field as well as central level.

the field as well as central level.

Total project cost is US\$ 10.8 million. The third stage of the program (TFDP) was terminated in June 2002. In the course of the program, the following forest roads have been constructed in Lhuntse and Mongar Dzongkhags for five years (1995/96 – 2001/02);

- Korila 9.7 km (Mongar)
- Lingmithang 16.1 km (Mongar)
- Romangchhu 6.0 km (Lhuntse)

Chapter 3 THE STUDY AREA

3.1 Location and Administration

3.1.1 Location and Administration

The Study Area (Lhuntse and Mongar Dzongkhags) is located in the eastern part of Bhutan. Lhuntse Dzongkhag is bounded by Bumthang Dzongkhag to the west, Trashiyangtse Dzongkhag to the east and Mongar Dzongkhag to the south. It borders on Tibet to the north. In the past, one of the important trade routes to Tibet passed through Lhuntse Dzongkhag. Mongar Dzongkhag is bounded by the Lhuntse Dzongkhag to the north, Zhemgang Dzongkhag to the west and the Trashiyangtse, Trashigang and Pemagatshel Dzongkhags to the east and south-east. The Kuri Chhu River flows through the heart of two Dzongkhags and the Dangme Chhu River flows in the east of Mongar Dzongkhag. Profiles of the Study Area are given below:

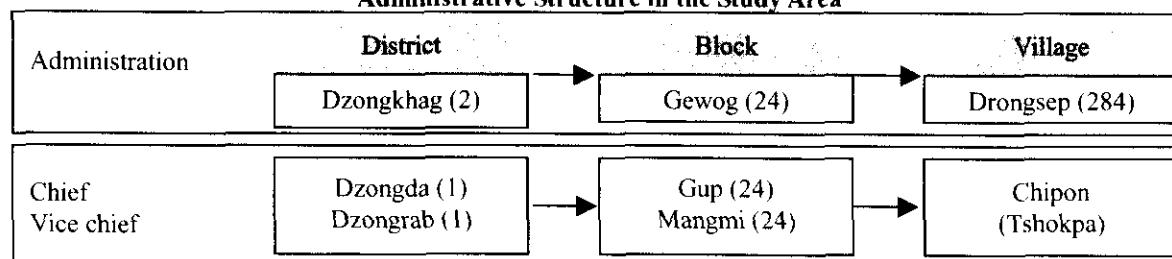
Profiles of the Study Area

	Bhutan	Study Area	Lhuntse	Mongar
Area	46,500 km ²	4,835 km ²	2,888 km ²	1,947 km ²
Elevation	200 - 7,500 m	200 - 5,800 m	600 - 5,800 m	200 - 3,800 m
Nos. of Gewogs	-	24	8	16
Nos. of villages	-	284	156	128

Sources: Statistic Yearbook of Bhutan, 2001 Central Statistical Organization, RGOB
9th Plan (2002-2007), Renewable Natural Resources Sector, MOA and Dzongkhag.

Local administration in Bhutan is structured with Dzongkhag (District), Gewog (Block) and Drongsep (village) as shown below. Gewog is the bottom unit of public administration. Dzongkhag has an appointed chief of public administration (Dzongda), while Gup, the chief of a Gewog is elected by the public every three years. Dzongrab and Mangmi are deputy chiefs for each administration, respectively. Some large villages consist of small villages with small number of households (village chief is called "Tshokpa"). The small villages are under neighboring Chipon (chief of big village). Profiles of the each Gewog are shown in Table 3.1.1.

Administrative Structure in the Study Area



3.1.2 Demography

(1) Demography

Total population and households in the Study Area are about 63,600 persons and 7,500 households, respectively. Average family size is 8.5-person/household. The population and

number of households in the Study Area are summarized in the following page.

Demography				
	Bhutan	Study Area	Lhuntse	Mongar
Population	698,950	63,564	19,426	44,138
Population density	15.0 person/km ²	13.2 person/km ²	6.7 person/km ²	22.7 person/km ²
Household	-	7,482	2,516	4,966
Average family size	-	8.5	7.7	8.9

Sources: Statistic Yearbook of Bhutan, 2001 Central Statistical Organization, RGOB.
9th Five Year Plan (2002-2007), Renewable Natural Resources Sector, MOA and Dzongkhag.

Interview survey to sample households was conducted in the Study Area¹. Results of the interview survey on demography are summarized below.

Population Movement				
	Bhutan	Study Area	Lhuntse	Mongar
Sex ratio (% of male/female)	102.0	95.7	113.2	91.4
Labor force (15-60 years old)	50.7	54.4	54.9	53.9
% of 60 years old and over	7.2	8.1	7.6	8.4
% of less than 15 years old	42.1	37.5	37.5	37.7

Sources: Statistic Yearbook of Bhutan, 2001 Central Statistical Organization, RGOB.
Farm household survey, conducted by the Study Team (2002).

(2) Ethnic group

Bumthangpa (*Ngalong*) and *Sharchop* (*Tshangla*) are dominant ethnic groups in the Study Area. *Bumthangpa* is common in central part of Bhutan; whose origin is supposed to be Tibet and settles in Kheng² and Kurtoe Gewog. *Sharchop* is commonly distributed in eastern region of Bhutan; and the aborigines of Mongoloid descent. Some *Dung* lineage; minority race, lives in Gongdue Gewog (Lhuntse Dzongkhag).

(3) Languages and Dialects

Most of young generation understands Dzongkha; the national languages. *Cho-ca-nga-ca-kha* which is a dialect of Dzongkha is dominant in Lhuntse Dzongkhag. *Kengkha*, *Kurtoepkha*, *Chalikha*, *Khomakha* (*Dzalakha*) which are dialects of *Bumthangkha*, while *Sharchopkha* (*Tshangla*) and *Gongdubikha* which are dialects of other Tibetan-Burmese language system are spoken in some particular areas in Lhuntse Dzongkhag.

Sharchopkha (*Tshangla*) is familiar in Mongar Dzongkhag. *Gongdubikha*, *Khengkha*, *Kurtoepkha*, *Chalikha* are spoken in some particular areas in Mongar Dzongkhag.

3.2 Natural Conditions

3.2.1 Topography

The Study Area is situated in the eastern part of the Himalayan range, so called as High Himalaya and Inner Himalaya, and has generally rugged mountainous topography such as undulating steep slopes and deep valley covering an area of 4,835 km². The Study Area slopes from north to south, with the altitude ranging from over 5,800 m in the northern part to about 200 m in the Kuri Chhu River at the southern edge of the Study Area.

¹ The "Farm Household Survey" was carried out in the Study Area. Interviewees were selected from each Gewogs and random sampling was conducted for 4 % from each Gewogs' households.

² Prospered area in ancient times, around where Silambi and Gongdue Gewog are located at present.

Agro-ecological Zones of Bhutan

Agro-ecological Zone	Altitude Range (mean above sea level)	Annual Rainfall (mm)	Air Temperature (°C)		
			Max.	Min.	Mean
Alpine	3,600 – 4,600	< 650	12.0	-0.9	5.5
Cool Temperate	2,600 – 3,600	650 – 850	22.3	0.1	9.9
Warm Temperate	1,800 – 2,600	650 – 850	26.3	0.1	12.5
Dry Subtropical	1,200 – 1,800	850 – 1,200	28.7	3.1	17.2
Humid Subtropical	600 – 1,200	1,200 – 2,500	33.0	4.6	19.5
Wet Subtropical	150 – 600	2,500 – 5,500	34.6	11.6	23.6

Source: MOA/ ISNAR, 1992

3.2.2 Climate

At least, three major climatic regions in the Study Area can be recognized: the hot and humid subtropical area of the southern foot hills, the cooler (micro-thermal) region of the inner Himalaya and the tundra region of the great Himalaya.

The inner Himalaya has micro-thermal climates and can be divided into the lower and upper zones, extending to about 4,600 m that is the upper limit of agriculture and natural tree growth. Winter ranges from moderately cool to severe and summer varies from warm to cool and is rainy.

The climate of the Study Area is classified as that of the lower zone of the micro-thermal Himalayan climates. The climate of Lhuntse area varies from dry sub-tropical to alpine. Mongar area is characterized with the typical climate in the lower zone of the micro-thermal Himalayan climates. Four stations located in various elevations were selected to explain the climatic condition of the Study Area. They are Tangmachu (1,750 m, Lhuntse), Autsho (800 m, Lhuntse), Lingmithang (700 m, Mongar) and Mongar (1,600 m, Mongar). The climate conditions are shown in Table 3.2.1.

(1) Rainfall

The climate of the Study Area is characterized by two distinctive seasons, wet and dry, according to the seasonal distribution of rainfall. During the period from November to March, the monthly rainfall is very little. The rainfall increases from April and concentrates during June to September. Annual mean rainfall varies from 860 mm to 1,100 mm. The mean monthly rainfall at the representative stations in the Study Area is shown below;

Rainfall

Station	Unit: mm												Total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Tangmachu	10.2	22.2	30.7	50.9	114.0	141.2	188.4	126.2	115.4	45.9	11.5	3.8	860
Autsho	12.4	19.3	50.7	70.3	114.4	181.8	247.7	177.6	121.9	60.6	17.8	11.7	1,086
Lingmithang	13.3	17.6	34.2	57.1	94.6	175.8	221.2	166.0	117.6	45.9	4.9	4.5	953
Mongar	8.3	24.9	34.5	54.3	88.1	143.5	205.2	191.9	86.4	49.8	7.3	4.0	898

Source: Department of Power, Ministry of Trade and Industries

(2) Temperature

Average monthly maximum temperature and minimum temperature of four stations are given

below:

Temperature (Average of max.)

Station													Unit: °C
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave.
Tangmachu	14.5	15.4	19.7	23.3	25.4	26.6	27.0	27.3	25.7	23.8	20.7	16.5	22.2
Autsho	19.3	20.9	24.6	27.9	29.7	30.4	30.1	30.3	29.4	28.0	24.8	21.3	26.4
Lingmithang	22.4	23.8	27.1	29.6	31.3	32.3	31.9	31.9	30.2	30.0	27.0	24.12	28.5
Mongar	16.0	17.9	21.3	24.2	26.0	26.6	24.1	26.9	26.3	24.2	20.6	17.2	22.6

Source: Department of Power, Ministry of Trade and Industries

Temperature (Average of min.)

Station													Unit: °C
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave.
Tangmachu	4.8	6.4	8.9	9.5	13.0	16.1	16.9	17.0	17.0	11.4	7.0	4.8	11.1
Autsho	7.6	9.4	13.0	15.6	18.7	20.6	20.9	21.1	19.8	16.5	12.4	9.0	15.4
Lingmithang	8.7	10.9	13.5	17.0	20.2	22.5	23.0	22.1	20.6	18.0	12.3	9.4	16.5
Mongar	6.5	8.0	11.2	14.5	16.6	19.0	18.4	18.7	17.7	14.4	10.6	7.9	13.6

Source: Department of Power, Ministry of Trade and Industries

(3) Relative Humidity

The monthly mean relative humidity in four stations is summarized below. Variation of relative humidity in a day is from 40 % to 100 %.

Relative Humidity

Station													Unit: %
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave.
Tangmachu	83.1	82.0	81.5	80.2	82.6	84.0	89.3	90.2	89.0	86.3	83.0	81.8	84.4
Autsho	86.1	81.8	78.8	75.1	81.1	85.4	88.2	88.3	87.5	83.1	81.0	82.9	83.3
Lingmithang	88.7	85.4	81.2	78.8	81.0	84.2	87.6	85.3	83.3	82.3	80.9	85.8	83.7
Mongar	56.2	56.2	59.2	60.7	62.6	76.6	73.2	76.2	75.1	70.8	66.9	64.9	66.5

Source: Department of Power, Ministry of Trade and Industries

3.2.3 Water Resources

The main river in the Study Area is the Kuri Chhu River, which flows southward from Tibet through Lhuntse and Mongar Dzongkhags with a catchment area of about 4,000 km² at the confluence with the Manas River, the biggest river in the country, at the southern boundary of Mongar Dzongkhag. In the upper reaches of the Kuri Chhu River, it is formed of two major rivers known as the Lhubrak Chhu River and the Khoma Chhu River. The Kuri Chhu River has a very high potential for hydropower and a 60 MW hydro project is about to be completed at Gyelposhing.

The main water resources of the Study Area are small and medium sized tributaries of the Kuri Chhu River, the Khoma Chhu River, the Seri Chhu River and the Shongar Chhu River. These small tributaries have certain flow throughout the year, and are utilized for irrigation and domestic water use.

3.2.4 Soils

Soils in the Study Area are developed on steep sloped of rugged mountainous terrains with

from subtropical to alpine climate conditions according to the altitude between 200 m and 5,800 m, diverse vegetation provided by the temperature and rainfall circumstances, and various soil parent materials. The soil distribution is intricate by the topography, relieves, geology, vegetation and activities of the inhabitants. The soils on the gentle slopes are relatively fertile compared with those on steep slopes. The soils on the steep and sloped lands are eroded, shallow and contain gravels and stones. Lands of relatively gentle slopes are suitable for field and horticultural crops.

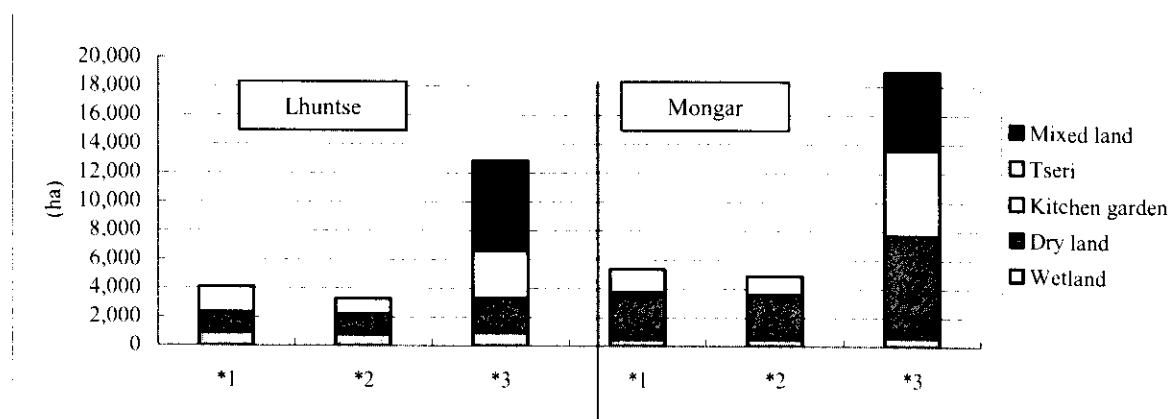
3.3 Agriculture

3.3.1 Land Use

Agriculture land is categorized into sub-categories of wet land (paddy land, Chuzhing), dry land (upland crop land, Kazhing), shifting cultivation land (slush and burn land, Tseri), and mixed agriculture land which is mixed land of the above land uses.

As shown in Table 3.3.1, forest occupies at 75.3 % and 88.5 % of the total land in Lhuntse and Mongar respectively, while cultivated land occupies at 4.4 % and 9.8 %, respectively. Wet land is terraced to small plots according to the inclination and generally irrigated. Dry land is generally un-terraced and un-irrigated. Tseri land is cultivated for one or two years, then left uncultivated for a couple of years waiting for restoration of soil fertility. The cropping ratio of the Tseri is estimated at about 30 % of the land area.

As for the land use area, three data sources are available. They are; i) land registration record, ii) RNR Statistics 2000 (Agriculture Census), and iii) land use map prepared by MOA. The land use areas by data source are shown in Table 3.3.2 and illustrated below. The private lands are registered to certify the land ownership. Land tax is imposed according to the registered area. It is conceivable that the registered land areas are quite small compared with the actual land areas. Reviewing of the registered land area has just started covering the whole country. According to the review survey, registered land areas have been revised to be 1.5 to 2 times as large as the previous registration. It is estimated that the actual cultivated land is considerably larger than the registered land. Tseri and mixed cultivated land will be able to be used more intensively in the future for food and horticulture crops production to catch up with the population growth.



Source *1: Land registration record, *2: RNR Statistics 2000, and *3: Land Cover Maps Lhuntse and Mongar Dzongkhags (1/100,000), MOA

Agriculture Land Area by Data Sources

The government is going to change land use system of Tseri from slush and burn to

The government is going to change land use system of Tseri from slush and burn to i) permanent cultivation land, ii) orchard iii) private pasture, or iv) community forest. It is estimated that approximately 50 % of the Tseri land could be changed to dry land at the maximum for the conservation of natural environment, prohibition of slush and burn cultivation, and effective land utilization.

Constraints and potentials on the land use are summarized as follows:

- Cultivated land ratio in the Study Area is only 6.6 %, which is scattered on the steep slopes in the mountainous terrain. It hampers effective use of farmland,
- Wet lands are distributed unevenly, therefore farmers without wet land do not have access to rice due to low income to purchase rice,
- Areas of the land registration record are supposedly smaller than actual land area. For land potential analysis and future land use planning, more accurate data on present land use are necessary,
- Tseri land occupies around 25 to 30 % of the cultivated land. For prohibition of slush and burn farming and sustainable land use, change of land use from Tseri to other use is a main subject for food security, horticulture development, and natural environmental conservation, and
- As the altitude range in the Study Area is large, various kinds of crops can be cultivated, and harvesting period can be prolonged.
-

3.3.2 Land Tenure and Land Holding

There are few landless farmers in the Study Area. Private land holding size is limited at 10 ha (25 acres) or less per household by the government. Fallow land in Lhuntse and Mongar Dzongkhags occupies 8 % and 6 % of wet lands, while they occupy 17 % and 13 % of dry lands, respectively. Reasons of high ratios of the fallow land are i) shortage of labor force, ii) water shortage and malfunctioned irrigation facilities, iii) sufficient production for self-consumption of food (maize), and iv) no market for selling surplus products.

Land tenure status and farming size per household are shown in Table 3.3.3. As shown in the table, most of planted lands are cultivated by owner farmers. However, in Lhuntse, especially Menbi and Minjay Gewogs, where paddy rice is predominantly cultivated, some of the wet lands are leased in or leased out from/to other farmers in the rice deficit areas such as Bumthang Dzongkhag under crop sharing system.

Average farm sizes including Tseri land per household of Lhuntse and Mongar Dzongkhag are estimated at 1.6 ha and 1.1 ha, respectively, which were calculated on the basis of the land registration record and number of farm households. These holding sizes might be smaller than the actual ones due to the aforementioned “small registration areas”. On the other hand, it is estimated that the potential land resources per household are estimated at 5.1 ha and 3.8 ha respectively, on the basis of the land use map. The average holding size in the Study Area is estimated to be at 2 - 3 ha per household.

3.3.3 Agricultural Labor Force

Average labor force for farming practices per household was estimated on the basis of “Labor Force Survey 1998 and 1999”. It is estimated that population employed in agriculture activity is 34.4 % of the rural population. As the average family sizes of Lhuntse and Mongar Dzongkhags are 7.7 and 8.9 persons, respectively, average agricultural labor forces per household are estimated at 2.6 and 3.1 persons, respectively.

Traditional labor exchange system is undertaken during busy season in the Study Area. Plowing, sowing, transplanting and harvesting are carried out by traditional labor exchange system. Considering the above labor requirement and available labor force, average cultivable land area per household is estimated at 2.0 ha at the maximum, and 1.5 ha on the average, even applying the labor exchange system. It might be a reason for the low cropping intensity and high ratio of fallow land.

3.3.4 Food Crops

As shown in Table 3.3.4, major food crops in the Study Area are maize and paddy rice, followed by wheat, barley, buckwheat, and millet even with small share. Production of maize and paddy rice to the total cereal crops occupies about 73 % and 23 %, respectively. The Study Area is a major maize production area in Bhutan, occupying 18 % of the national production. Beside cereal crops, mustard, soybean and Rajma bean (kidney bean sp.), which are exported even in small amount to India, are major field crops in the Study Area.

According to the estimation by the Study Team, average yields of paddy rice and maize are around 2 ton/ha.

3.3.5 Horticulture Crops

Many kinds of horticulture crops are grown in the Study Area under the climate conditions of humid sub-tropical, dry sub-tropical, warm temperate and cool temperate. Horticulture crops might have high potential for increase of cash income of the farm households through export to India. However, despite such high potential, their production still remains at low level due to the following reasons:

- Difficulty of marketing because of small capacity of domestic market in and around the Study Area, high transportation cost due to poor road network and long distance to export to India, Samdrup Jongkhar, and small quantity and low quality of products for marketing,
- Less intention of farmers for horticulture production. Most of farmers intend to produce food for their self-sufficiency,
- Less knowledge of farmers on horticulture crop farming,
- Less supporting activities for farmers on the horticulture such as technical guidance, input supply (seeds and saplings),
- Less technical and institutional capacity at Dzongkhag and Gewog levels.

Major horticulture crops currently cultivated in the Study Area are potato, chili and radish among vegetables, and mandarin orange, mango, peach and walnut among fruits including tree crops. Production of major horticulture crops is shown in Table 3.3.5. The number of non-bearing trees occupies nearly 50 % of the total.

The major producing areas of horticulture products are Drametse Gewog that is located at eastern area in Mongar Dzongkhag for potato, and southern Gewogs that are situated in Mongar Dzongkhag for orange. The former has an advantage of transportation being located closer to Samdrup Jongkhar, export outlet to India, while the latter areas, even having been cultivating orange for long time, face difficulty in marketing due to lack of proper access to the market.

Beside the horticulture crops, various AMPs (Aromatic and Medicinal Plant), such as lemongrass (essential oil plant), artemisia annua (medicinal plant), are grown under natural condition or cultivation. They are also prospective income sources of the farm households.

3.3.6 Livestock

Cattle, horse, mule, pig and poultry are major livestock animals. Present situation of livestock husbandry and livestock production in the Study Area are shown in Table 3.3.6.

The most important livestock is cattle for home-made milk products and draft power of plowing. Farm households process milk to local butter and cheese. The products provide essential diet of fat, protein and minerals to rural population. The surplus products, which are sold in and around their villages mostly by barter trading, bring farmers income. Average rearing numbers of cattle per household is 5.5 heads. About 20 % of the cattle are adult-male for draft power of plowing. Plowing is done by a pair of bulls using traditional plow. A pair of bulls for plowing is driven by two farmers: one for bull control at the front and another for plow control behind the plow. This high labor requirement causes labor shortage during the land preparation period. A pair of bullocks can plow 0.13 ha per day. A bull-work day is equivalent to two labor days in the labor exchange system in the community.

Horse, mule and donkey are important transportation means in rural areas. Sheep and goat are not promoted due to prevention of soil erosion from over-grazing.

Pig and poultry are backyard livestock to supply meat and eggs to rural people, but their rearing scales are small. The products of meat and eggs are distributed limitedly in and around the village. Bhutanese taste and demand for meat is high, but they refrain from killing animals due to the Buddhism sentiment. The rearing farmers must ask for slaughtering of animals with high treatment charge (usually in kind of meat). Such contradiction makes livestock development difficult.

Livestock husbandry provides materials of FYM (Farm Yard Manure). Animal shed/pen should be improved in order to provide better materials for compost preparation and to improve the productivity of livestock.

The development constraints on livestock sector are;

- Low productivity and high population of cattle due the local breeds, and
- Buddhism sentiment hampering production of livestock for meat

Provision of surplus maize and/or their by-products, and small-scale backyard animal husbandry of pig and poultry might have high potential; i) to provide meat and eggs to rural people, and ii) to increase farm household income, and iii) to provide materials for FYM.

3.3.7 Cropping System and Farming Practices

Farming is generally practiced in traditional farming system. The farming system of major crops is shown in Table 3.3.7.

As mentioned above, labor requirement for crop production is generally high. It includes; i) watching and fencing to protect crops against damage by wild animals (wild boar, deer, and monkey), ii) carrying and hauling of outputs from the farm land to farmers houses and houses to motor roads for marketing of the products.

According to the RNR Statistics 2000, FYM is applied generally for maize cultivation at a rate of over 60 % of households. Chemical fertilizer, however, is used for paddy and maize only by 20 - 30 % of the households. Insecticide and fungicide are rarely applied for food and horticulture crops. The input cost mainly consisting of seed and fertilizer is estimated at about Nu. 1,000 - 1,500 per ha. Total production cost occupies around 20 % of the gross production value.

Many kinds of crops can be grown under various agro-ecological conditions in the Study Area. Altitude range suitable for crop production is shown in Fig. 3.3.1. A typical cropping calendar of these crops is illustrated in Fig. 3.3.2.

3.3.8 Farm Household's Economy

Present economic condition of farm households surveyed by the Study Team is shown in Table 3.3.8, and summarized bellow. The balance of farm households' economy is shown by two kinds of analysis: i) the balance of actual cash income / expenditure values, and ii) the balance of income / expenditure including self-production and self-consumption values.

Farm Household Economy (Cash Income Expenditure)			
	Study Area	Lhuntse	Mongar
Income			
- Food crop	3,400	7,700	1,200
- Horticulture crop	4,600	1,900	5,900
- Livestock	6,100	6,200	6,000
- Off farm income	14,100	14,100	14,100
- Total Income	28,200	29,900	27,300
Expenditure			
- Production Cost	9,300	8,400	9,800
- Living expenditure	18,900	21,500	17,500
- Food total	5,400	7,400	4,300
- Other living expenditure	13,500	14,100	13,200
- Total Expenditure	28,200	29,900	27,300

Source: Farm household survey, conducted by the Study Team (2002).

Farm Household Economy (Including self-consumption of own-products)			
	Study Area	Lhuntse	Mongar
Income			
- Food crop	15,400	19,700	13,200
- Horticulture crop	7,800	5,100	9,100
- Livestock	13,700	13,800	13,600
- Agriculture/livestock total	36,900	38,500	36,000
Off farm income	14,100	14,100	14,000
Total Income	51,000	52,600	50,100
Expenditure	51,000	52,600	50,100

Source: Farm household survey, conducted by the Study Team (2002).

The results of examination are as follows:

- Average cash income level is around Nu. 28,000, of which about 50 % is from agriculture and livestock. Farmers in Lhuntse earn large part of the income from food crops and livestock, while farmers in Mongar earn from horticulture crops and livestock
- Major cash income sources of off-farm activities are NTFP (Non-Timber Forest Product) such as wild vegetables, lac (dyes), resin, and lemongrass, then weaving, temporary wage work for construction, transportation service by horses, etc. follow.
- Production cost including livestock is Nu. 9,300, which is 33 % of the total cash expenditure,
- Income level including self-consumption is around Nu. 51,000, out of which 72 % of the total income comes from agriculture and livestock activities. Food

- expenditure occupies around 62 % of the living expenditure, and
- Self-sufficient rate of food expenditure ranges from 80 % to 85 %.
- Off-farm activities are an important cash income source for the rural households occupying 50 % of the total income on average. Around 66 % of respondents were earning cash income from off-farm activities such as selling non-timber forest products (extraction of lemongrass oil, collection of resin, lac, wild vegetables/mushroom and fuel wood), labor wage (on-farm, construction and carpenter), handicraft (weaving and bamboo craft), business (commodity transportation by mule/horse, milling of maize/rice, general shop), etc. 70% of respondents in Khoma, where is a famous Gewog for silk textile, earned more than Nu.10,000 per household by weaving.

3.3.9 Food Balance

As for the national food security, RGOB targets to maintain self-sufficiency in food grain production at the minimum of 70 %, and to cover the cost of import cereals by export of agricultural products mainly consisting of horticulture products. RGOB currently imports about 40,000 tons of food per year, mainly milled rice. MOA estimated the self-sufficient rate in 2000 at 68.6 % out of 195 kg of per capita as total food grain consumption. MOA also forecast that the per capita food grain demand would be 216 kg at the end of 9th FYP, namely 2007.

As shown in Table 3.3.9, per capita food cereal production in Lhuntse and Mongar Dzongkhags are 230 kg and 224 kg, respectively. Food supply and demand are supposedly nearly balanced at present in both Dzongkhags. However, Gewogs located in remote area are generally in short of food, and experience frequent seasonal food shortage, especially, in Jaray of Lhuntse Dzongkhag, Drepong, Gongdue, Jurme, Kengkhar, Silambi and Tsamang Gewogs of Mongar Dzongkhag.

	Unit: kg/person	
	Lhuntse	Mongar
Rice	90	20
Maize	130	191
Other cereals	10	11
Total	230	222

Constraints on food security are as follows:

- The food balance in the Study Area is nearly balanced, but seasonal food shortage occurs mainly in remote area,
- Increase of food crop production is necessary to cope with high population growth, and
- Rural people depend on maize for staple food, especially in Mongar Dzongkhag. Demand of paddy rice will probably increase according to improvement of their living standard.

3.4 Roads

3.4.1 Definition of Roads

(1) Road Classification System in Bhutan

In order to achieve logical road numbering and to facilitate new roads into the road classification system, modification has been proposed in the present road system of Bhutan. In this context, road numbering system was proposed in the Roads Planning and Management Strengthening Project (ADB), even though the proposal in the above was subject to further discussions with relevant agencies like DOR, Planning Commission, Department of Forest, Department of Power, etc.

The system proposed was based on the concept of administrative and geographical boundaries, at the same time linking with road functions for simplicity and easy reference. Therefore it is proposed that the roads are categorized into functional classes including forest road as follows:

Road Category by Functional Classes

Category	Proposed Numbering System*	Functions
- National Highway	N	to connect capital and main commercial centers
- District Road	D	to connect district headquarters
- Feeder Road	F	to link district headquarters with villages
- Urban Road	U	to link places within a town
- Forest Road	R	to link places of logging within a forest (not mention clearly)

Note: * road numbering system is being proposed in the Roads Planning and Management Strengthening Project (ADB)

Details of the roads are given in Table 3.4.1.

(2) Definition of Farm Road

MOA has been conferred with mandate for construction of farm road to link potential agricultural surplus areas to markets and facilitate the movement of agricultural inputs to them. After the mandate was given, MOA prepared the Guidelines for Farm Roads Development (hereinafter referred to as the “Farm Road Guidelines”), and it is written in the Farm Road Guidelines that a farm road is defined as “A road that links agricultural production area to the national highways and feeder roads to enable transportation of inputs to the farm and produce to the markets”.

However MOA had not had the section or organization for construction of farm road until the mandate was transferred and has entrusted the construction of farm road to DOR after arranging the budget for that, even the projects were promoted by MOA.

Until recently, the road construction including feeder road had been mainly executed by the PWD / DOR under the MOC except forest roads which had been constructed by DOF of MOA. The feeder roads include roads from other agencies beside DOR, e.g. Education, Power, Telecom, Dzongkhag Administration, and Agriculture as shown in Table 3.4.2. However, from now on, the farm roads will be independently constructed in accordance with the Farm Road Guidelines of MOA.

Definition of the farm road is as follows;

- To be implemented through participatory approach (labor contribution) of the beneficiaries,
- To be a motorable road with road width of 4.0 m and pavement of water-bound macadam for carriage way (3.0 m),
- A minimum of ten households of 70 people per km should be benefited,
- Total cultivated area per season should not be less than 30 acres per km, and
- The drainage or bridge structure should be a multi-cell culvert or a wooden bridge for larger catchment

Accordingly, the project implementation body is obviously decided as follows;

- Farm Road: MOA
- National Highway: DOR, MOC
- District Road: DOR, MOC
- Feeder Road: DOR, MOC
- Forest Road: DOF, MOA (actually to be implemented by Forestry Development Corporation)

3.4.2 Existing Road Network

(1) National Road Network

Bhutan has road network of about 3,740 km at present serving almost all the Capitals of Dzongkhags through the national highways and district roads directly, and a large population of the rural settlements. However, many rural communities are still isolated from the road network and depend on animal and manpower transport. One-third of Gewogs have no connection to the feeder roads, while in another one-third, only some part is connected to them. In this situation, farmers remain dependent on subsistence agriculture, with no access to markets or social services, and there is a strong need to expand the road network entirely and properly to improve their living conditions in the Study Area.

(2) Road Network in the Study Area

Centers of Lhuntse and Mongar are directly connected with a district road. Mongar has a stretch of the national highway of 177 km, which is the longest among all the Dzongkhags, while there is no national highway in Lhuntse. Though some feeder roads and approach roads to school and to station for power / project are developed in agency-wise, there is only one feeder road and one approach road to power project confirmed until June, 2001 in Lhuntse. With respect to the existing farm road, a road to RNR RC Wengkhar, Mongar from the national highway (2.5 km) is the only farm road developed by DRDS of MOA in the Study Area so far.

(3) Road Construction Project and Plan in the Study Area

The following four road projects are being implemented in the Study Area.

(a) Road Construction in Lhuntse

1) Feeder Road of RAP

A feeder road of Rural Access Project (RAP, World Bank) has been constructed by a

Bhutanese contractor. Out of the total length of 39 km from the center of Lhuntse to Naleng of Kurtoe Gewog, 11 km up to Lingabee of Kurtoe where the road passes the Kuri Chhu River had been constructed by May 2002. The construction of the feeder road is planned to be completed in two years.

2) Farm Road at Minjay

At Minjay Gewog, a farm road to connect Chagzam and Legapache through certain farmland has been constructed under SEZAP for 5 km. The construction of the farm road was scheduled to be extended up to next fiscal year and the road is supposed to reach Dragong (6 km).

3) Forest Road

A forest road at Rongmanchu has being developed for about 6 km from Tsenkhar Gewog to Minjay Gewog, and proposed farm road, Budur - Wambur is planned to be connected to the forest road.

(b) Road Construction in Mongar

1) Farm Road at Chaskhar

At Chaskhar Gewog, a farm road to connect Chaskhar and Thangrong had been constructed under SEZAP for 5.5 km by June, 2002. Schedule of construction of the farm road was extended up to the fiscal year 2002/03.

2) Feeder Road at Ngatshang

In Ngatshang Gewog, a feeder road to connect Yadi and Sanakhar, Serimuhung has been constructed by DOR for about 10 km up to Kafu, Serimuhung. Though the feeder road was committed to be constructed up to Sanakhar, Serimuhung as aforementioned, financial arrangement has not been made yet.

3) Forest road

Five routes of forest road at Korila, Lingmithang (Songgjari), Lingmithang (Kalapang) and Tsamang have been constructed for 31.4 km in total.

Details of Forest Road in the Study Area

No.	Dzongkhag	Location	Total	Remarks
1	Lhuntse	Rongmanchu	6.011	Total length will be 7.0 km. (on-going)
Total			6.011	
2	Mongar	Korila	9.716	
3	Mongar	Lingmithang (Songgjari)	13.143	
4	Mongar	Lingmithang (Kalapang)	3.033	Total length will be 4.0 km (on-going)
5	Mongar	Tsamang	5.500	
Total			31.392	

Unit: km

4) Feeder Road from Gyelposhing to Nganglam (Plan)

A feeder road from Gyelposhing, Mongar to Nganglam, Samdrup Jongkhar was committed by the Government. Environmental assessment and preliminary route survey have been executed by DOR. In the National Assembly held in June to July, 2002, it was informed that the construction of the feeder road had begun, and 25 km out of 64 km in total length would be taken up in the 9th FYP.

3.4.3 Machinery for Road Construction

(1) Observation of On-going Road Construction Project

The on-going road construction projects mentioned above have been conducted using machinery. It is observed that construction machinery is indispensable for the construction of road in consideration of the environment friendly road construction method, especially in the hilly with rocky and mountainous districts. However, appropriate disposal of cut soil or rock is physically very difficult and introducing proper method for treating cut soil and rock will be required.

(2) Road Construction Machinery

Though excavator and bulldozer are used in a queue in lengthwise, it is assumed that the excavator is one of the most useful machinery for the road construction at the steep rocky area. Because the excavator can properly make up a hillside slope by battering as per the requirement from the alignment, formation, slope standard, etc. Such works can not be done with the bulldozer. Therefore at the point of the road construction site, the excavator will be definitely deployed and its capacity of excavation and slope battering will be the critical path for the schedule of the road construction in the steep rocky area.

(3) Road Construction Machinery in MOA

Considering present construction equipment of MOA, most of the equipment was procured in early 1990s by the Paro Valley Agricultural Development Project (PVADP), and after completing PVADP in 1995, the equipment has been working in the whole country of Bhutan.

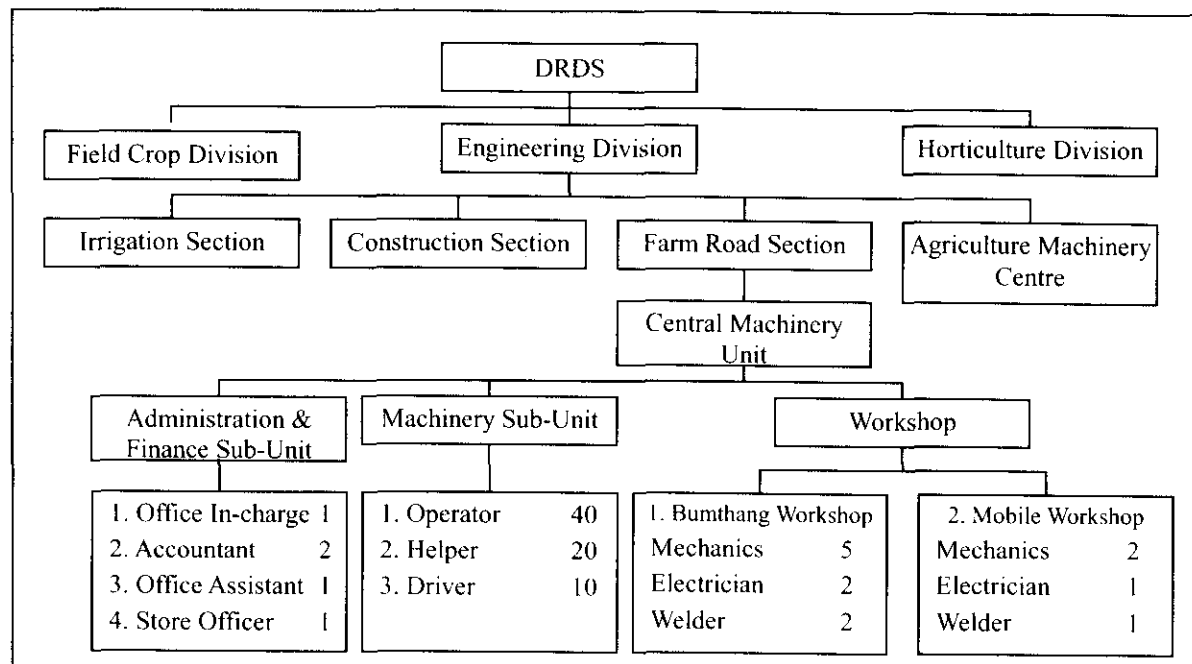
However, the equipment of PVADP is rather old and it has been operated for 7 to 12 years till now. Those machines and equipment have worked over standard life time. Therefore, workable period in the future is estimated at 1~2 years more. Furthermore, present working condition in the Study Area is very severe, because there are a lot of hard rocks, sharp slope, narrow and curved road, and deep valley.

Therefore, present construction equipment would not fit to the sites in the Study Area. Moreover, with respect to repair of such old equipment, it is estimated at Nu. 2 million per unit for overhauling. Frequency of equipment failure will be getting higher, and repairing cost will drastically increase as well.

Thus, it is recommended that old equipment should be mainly utilized for road maintenance, and new equipment which is suitable for severe physical condition of the Study Area should be introduced for new farm road construction. Present situation of construction equipment is given in Table 3.4.3.

(4) Capacity of Central Machinery Unit

MOA established Center Machinery Unit (CMU) in 2002 and to control the construction machinery for the development of farm road of the whole Bhutan, a workshop is planned to be constructed in Jakar, Bumthang. The organization of MOA related to the development of farm road including CMU is shown in the following figure.



Organization Related to Farm Road Development of MOA

Sub-units of CMU are responsible for operating construction machinery and driving vehicles including dump truck for the farm road development plan. Numbers of operators for construction machinery and drivers for vehicle are 40 and 10, respectively. The operators have qualification not only for the construction machinery but also for vehicles including the dump truck. The operators have experience of 11~26 years including the period of Paro Valley Agricultural Development Project. They have skillful techniques in operating the construction machinery even in severe conditions of farm road construction site.

Furthermore, a workshop is also planned to be constructed in Jakar (Bhumthang) and staffs of CMU for repairing and maintaining of construction machinery and equipment will be assigned to the workshop. Two mechanics to be assigned in the workshop were trained in Japan while they were working for the Paro Valley Agricultural Development Project. Repairing and maintenance for construction machinery and equipment are considered possible if the certain facilities, equipment and tools for the workshop are introduced.

3.5 Other Agricultural Infrastructures

3.5.1 Irrigation

(1) Existing Irrigation Schemes in the Study Area

There are 62 irrigation schemes in Lhuntse and 48 schemes in Mongar as confirmed by MOA by 1999 (refer to Attachment V-14 in Annex V). They are mostly for paddy field irrigation. In the southern part of Mongar like Jurme, Kengkhar and Silambi, there is no irrigation scheme at all.

Most of the irrigation schemes were established before 1970 and they have been managed by beneficiaries themselves without any assistance from the Government. Over 70 % of the irrigation schemes are maintained by beneficiaries in Lhuntse, while 54 % are maintained as well in Mongar. Larger schemes are managed by WUA organized through the system of NIP (National Irrigation Policy) / GAS (Government Assisted Scheme) of MOA. However, rate of WUA establishment still remains at low level of 24 % in Lhuntse and 23 % in Mongar.

The total irrigated areas are about 1,220 ha in Lhuntse and 880 ha in Mongar. The smallest number of beneficiaries for the scheme is two households (HHs) in Lhuntse and 4 HHs in Mongar. The largest number of beneficiaries is 148 HHs in Lhuntse and 199 HHs in Mongar. Most of the beneficiaries have recognized that the productivity is moderate or high in/both Lhuntse and Mongar. Some schemes are not functioning well due to harsh natural conditions that often cause damages to the channels by land slide, land collapse, etc.

(2) Irrigation Facilities

Lining of existing irrigation channel is basically divided into four types, earthen, masonry, wooden and pipe. The earthen channel is the most popular among them in the Study Area, because of cheaper construction cost and easy construction. However, the channels are mostly passing along steep and hilly area and soil erosion and scouring occur along the channel especially in the earthen section.

For this, it is preferable to keep proper velocity of irrigation water in the channel. Therefore, spillways for excess irrigation water, drops, sand traps which are effective facilities to reduce such erosion for keeping proper velocity, are to be introduced to some existing irrigation schemes. Masonry-lined channels are common and even pipes are introduced to some existing irrigation schemes. It is observed that the pipes are usually installed at the steep area.

(3) Participatory Approach for Construction and Maintenance

Scale of facilities of the existing irrigation schemes is not very large. Little technical difficulty is anticipated for construction of such irrigation facilities, and most of them are actually managed by the beneficiaries themselves. The facilities are mostly made of wet masonry which the beneficiaries can construct and maintain getting some technical advice.

Considering the above, it is considered that renovation or rehabilitation of the existing irrigation facilities will be possibly carried out through a participation of the beneficiaries, even for the new construction, if cement, sand and other materials are procured and technical support is given in accordance with the policy of MOA.

3.5.2 Other Infrastructures

Agricultural infrastructures related to the agricultural sector other than irrigation facilities and farm road are auction yard, transit shed, market shed and facilities of RNR sector in the Study Area. There is a shed in Mongar, but no market shed exists in Lhuntse.

As for the facilities on RNR, RNR research center is now under construction at Wengkhar and a research sub-center exists at Lingmithang. RNR centers were constructed at three Gewogs out of eight Gewogs in Lhuntse and 14 Gewogs out of 16 Gewogs in Mongar including those under construction. In the Gewogs that do not have the RNR center,

agricultural extension center, livestock extension center and others were constructed for the RNR center. In 9th FYP, an auction yard is planned to be constructed in Mongar and RNR centers are proposed in Jaray and Minjay of Lhuntse. Transit sheds for four Gewogs and a marked shed are also planned in Lhuntse.

3.6 Agriculture Support Services

3.6.1 Agricultural Extension Services

Agricultural extension activities are provided by Extension Agent (EA) under coordination and guidance by RNR sector of Dzongkhags. Dzongkhag appoints EAs of three sub-sectors, agriculture, livestock and forestry. They are assigned in RNR center or extension center in the Gewog. The extension services are integrated in RNR center in Gewog for covering the three sectors. EAs in RNR center work in cooperation with sub-sectors each other.

Tasks of EAs cover wide fields as follows:

- Coordination of input supply
- Technical guidance on crop and livestock production
- Resource management on soil, water, labor, farm mechanization
- Post-harvest management including storage, agro-processing and marketing
- Advice on farm management, finance and credit
- Support of farmers group and association
- Farm survey on data collection and monitoring, and
- Environmental management

Establishment of RNR centers and number of EAs will be increased during 9th FYP. One or two EAs is (are) assigned to each Gewog in Lhuntse, while two to three in Mongar. Present conditions of the extension facilities and staffs are shown in the table below:

Extension facility and Extension Agents in the Study Area		
	Lhuntse	Mongar
RNR Center	2	14
Agricultural Extension Center	5	2
Livestock Extension Center	6	0
Forestry Extension Center	0	3
Agricultural EA	15	15
Livestock EA	9	16
Forestry EA	0	3

Source: Dzongkhag

Extension activities are carried out under supervision and coordination of RNR sector of Dzongkhag in linkage with research and extension programming of Regional RNR-RC (RNR Research Center).

Training for EAs is conducted by NRTI (Natural Resource Training Institute) and other programs or functions of MOA..

Constraints on extension activities are summarized below:

- An EA generally has to cover broad geographical area,
- Poor communication and transportation conditions for regular and temporary activities such as reporting and meeting at Dzongkhag,
- Less opportunities of EA training, and poor knowledge on horticulture crop farming, and

- Less linkage between research and extensions, especially in horticulture fields

3.6.2 Agricultural Research

Research on RNR sector is carried out in RNR Research Center (RNR-RC), MOA. RNR-RC of the Eastern Zone (RNR-RC-East) is located at Wengkhar in Mongar Dzongkhag. RNR-RC-East has two sub-centers at Khangma (Trashigang Dzongkhag) and Lingmithang (Mongar Dzongkhag).

The above three centers cover major agro-ecological zones of the Eastern Zone:

Location of RNR-RC-East				
	Location	Altitude (m)	Farm area (ha)	No. of Staff
Khangma Sub-center	Trashigang	2,100	16	35
Wengkhar Center	Mongar	1,700	28	10
Lingmithang Sub-center	Mongar	640	16	8
Total			60	53

RNR-RC-East was established at Khangma in 1987 by an IFAD project. The center was moved to Wengkhar in 2001 during the Phase I of SEZAP. In the Phase I, research farm, irrigation facility and administration building were constructed. Laboratory, greenhouse, and training facilities have not been facilitated.

RNR-RC-East covers agronomy (field crops, horticulture, and aromatic/medicinal plant), livestock, forestry, irrigation engineering and extension. Among these items, priority of research and development is given to horticulture, especially, citrus, mango, walnut, potato and vegetables, which are regarded as "target crops" in the Eastern Zone.

The constraints of RNR-RC-East are summarized below:

- Improvement of the research and training facilities of the Wengkhar Center has not been completed for full activity of the Center. Due to limitation of resources, the improvement of research infrastructure and equipment is delayed,
- Capacity of staffs for horticulture development is not enough to conduct proper researches and dissemination of the results. It is necessary to train and build capacity of researchers and extension agents, and
- Lack of research on post-harvest and marketing of horticulture development.

3.6.3 Agricultural Input Supply

Organizations and agents related to input supply and distribution are mentioned in the following.

(1) Druk Seed Corporation

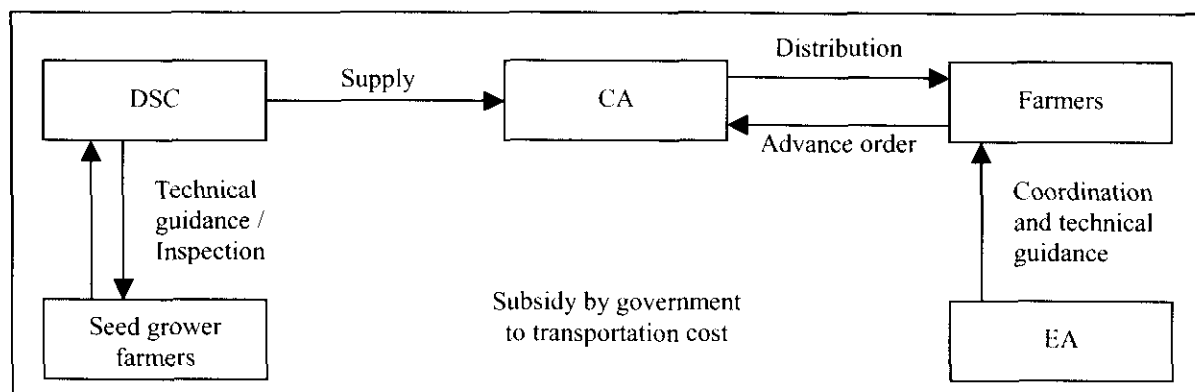
Druk Seed Corporation (DSC) is an autonomous body under MOA. DSC plays roles of; i) seed multiplication, import and distribution including seedlings of horticulture tree crops, and ii) import and distribution of chemical fertilizer and agro-chemicals. DSC has a central office in Paro, four regional centers and three seed production farms in the country. Regional center of the eastern zone is located in Trashigang Dzongkhag. DSC supports seed grower farmers, and farmers groups. Produced seeds by the farmers are inspected, processed, and distributed as certified seeds to user farmers.

(2) Commission Agent

Commission Agent (CA) is private individual agent certified by MOA to distribute agricultural inputs from DSC to farmers. CAs take orders of inputs from farmers in their service area, and procure them from neighboring DSC, then distribute them to the farmers and give instruction on usage of the inputs. Transportation cost is subsidized by the government, and the prices of the inputs are maintained same in the whole country. Farmers carry the inputs from the delivery point near by motor roads to their house by themselves. In the Study Area, there are six CAs in total, two in Lhuntse, and four in Mongar.

(3) Extension Agent

Coordination of input supply to farmers is one of the roles of extension services of Extension Agents (EA). They also give advice and technical guidance on inputs to farmers.



Input Supply System

Constraints on input supply are;

- Prices of inputs are subsidized on the transportation cost; however, it is still expensive for farmers, and
- Capacity of production of seeds and seedlings is still low. Some farmers do not have access to inputs at right time for required quantity at hand.

3.6.4 Rural Credit Services

BDFC (Bhutan Development Finance Corporation) is providing micro-finance to farmers in the rural area. Financing services of BDFC have been decentralized to Dzongkhag branch level, and are going further to decentralize to Gewog level using mobile banking activity and group credit system.

Agriculture lending of BDFC is targeted for rural and agriculture sector development: short-term loan (one season / year) for agricultural inputs and middle / long term loan for developments of land, livestock and orchard, and other for farm and non-farm activities. EAs are involved in lending the short-term loan for input distribution to the farmers. Group guarantee lending / savings is undertaken at Gewog level. The loan amount ranges from Nu. 5,000 to 50,000 per user. The interest rate varies from 13 % to 15 %.

Although BDFC established micro-credit service system for the farmers, users of the system are not many due to undeveloped money economy in the rural area. Most farmers want to repay with in-kind for the input loan.

3.7 Marketing and Agro-processing

Marketing of farm products reflects the subsistence nature of the production system. Most households produce crops and livestock for household consumption, and surpluses entering the formal and informal marketing systems are small and limited in each area. There is an increasing trend towards producing cash crop such as fruit, vegetable and pulses in response to; construction of roads into remote areas; establishment of weekly markets; and access to market. Back-yard fruit and vegetable surpluses are mainly sold at roadside or at weekly market.

In addition, there are also small-scale cottage activities carried out at home, such as weaving, and cheese and butter making for cash income.

3.7.1 Marketing

(1) Marketing

The East-West Highway runs through the four Gewogs in the middle of Mongar Dzongkhag, and Lhuntse Town is connected with a black-top Dzongkhag road. Even having feeder roads, nearly half of Gewogs in the Study Area are inaccessible through a motorable road; and horses and mules are the main means of transportation. Typical walking time from farm to road head is about 2-3 hours. For more remote Gewogs, it may take three days; and one-day walk is common³.

Lack of road and market outlet constrains farmers from producing more than requirement for their consumption. Therefore, farmers' motivation is focused on their self-sufficiency more than marketing of their products. Product is likely to be sold within the village first mainly in bartering manner. Such condition is also applied to agro-processing activities that are only operated on the family basis.

The marketing condition in the Study Area is summarized below:

The majority of households in the Study Area are farmers and local consumers are very limited to officials, teachers, monks, canteens in the hospital and the school and temporary workers of the projects such as road construction. Therefore, the capacity of local market is very small and it is judged that the distribution of local products between farmers, a farmer and a consumer, a farmer and a shopkeeper, and a shopkeeper and a consumer is almost limited in the area around a market and/or town shops. It can be said that the outlet of the marketable products from the Study Area is only for export via Samdrup Jongkhar.

The farmers seem to come down to a town only when they need cash, beside those who live close to town at a distance up to 2 - 3 hours on foot and those who are used to come to a market and/or town shops for selling their products.

Under such circumstance, the pricing condition by farmer is not flexible and determined roughly by every Nu. 5 but not Nu. 1. Then the price seems to be less affected by the balance between supply and demand, and the price does not vary significantly by market place.

Farmers do not listen to the broadcasting program of market information because it does not cover the regional market price information. On the other hand, middlemen engaged in trading of export products listen to the information concerning the auction yard in Samdrup

³ RNR Statistics 2000

Jongkhar.

Telecommunication is very important marketing facility together with road network. A nation-wide telecommunication system has been established and started recently but it covers only major cities and towns. Many Gewogs cannot enjoy the benefit and even local government officials in the remote area do not have effective means of communication with the outside.

Middlemen, generally farmers and shopkeepers, are found to play a significant role in the marketing process especially for export commodity, but mostly for potato in the Study Area. Middlemen go to neighboring villages and weekly markets to purchase products even though the area they can cover is very limited almost within their Gewogs due to the poor road network. They purchase commonly by bartering. Some shopkeepers in Drametse Gewog said that only one third of purchased potato was paid with cash in 2001.

Potato production and marketing provide an important source of income for farmers and middlemen in the surplus potato production area. They are mainly exported to India via Samdrup Jongkhar. Therefore, the farm gate price in the shipping area is relatively lower and affected by the price at the auction yard in Samdrup Jongkhar. However, the market price in other areas does not link to the price in Samdrup Jongkhar.

The prosperous area for exporting products is mainly to the east of Mongar in the Study Area.

(2) Market

There are five markets in the Study Area, all in Mongar Dzongkhag, while the first market in Lhuntse Dzongkhag will be constructed at Lhuntse town in the near future after adjustment to the urban planning by the Municipality Office. Four markets except Mongar market were constructed in 1999 by the assistance of the IHDP.

Location	Open Day	Platform	
		With roof	Without roof
Mongar	Saturday	3	1
Lingmithang	Saturday	1	-
Gyelposhing	Sunday	1	-
Drametse	Sunday	1	-
Yadi	Friday	2	-

The outline of the survey result at each market is as follows:

- Market facility belongs to the Gewog office. Any sellers can use the place in the market for free of charge.
- Distance to the market for farmers is mostly less than that of three hours walking.
- Participation numbers of farmers fluctuate by season.
- Almost all the farmers come to a market on foot with a basket or a sack on back. Therefore their selling unit is small.

Commercial linkage between markets has not been established yet because of small marketing unit, small market capacity and high transportation cost.

Major products sold in the market are vegetables and fruits, and sometimes cheese and butter, egg and meat of pork and beef. However, general grain such as rice and maize are not sold in

the market. Imported rice and other products and some local products such as potatoes and onions which can be stored are sold in town shops.

(3) Auction Yard in Samdrup Jongkhar

Samdrup Jongkhar is the only outlet for export products in the Study Area. Since the capacity of local market is small and limited, the foreign market especially Indian market via Samdrup Jongkhar is judged only the potential outlet for increased cash crop production of the Study Area even in the future. The auction yard in Samdrup Jongkhar is operated by the FCB throughout the year and almost all the products of the Study Area transported there are sold to Indian buyers in this auction yard.

The FCB auctions the products carried in by sellers as middlemen that are usually farmers or shopkeepers in the production area. The buyers in the auction yard are all Indian traders. The FCB collects the commission that is 3 % of trading amount each from the seller and the buyer.

The FCB operates five permanent auction yards including Samdrup Jongkhar, two temporary auction yards and some mobile auction yards for supporting the marketing activities of farmers. The share of the auction yard in Samdrup Jongkhar among all the auction activities is around one-fourth (25 %) following Phuentsholing whose share is more than 60 % in the trading value.

The trading quantity of major products in the auction yard of Samdrup Jongkhar and the products quantity from the Study Area among them are compiled in the following table.

Product	Quantity of Major Products traded in Auction Yard(s) in 2001				
	All country kg (a)	Samdrup Jongkhar kg (b)	Share (%) (b/a)	Mongar/Lhuntse* kg (c)	Share (%) (c/b)
Potato	26,452,504	6,198,125	23.4	697,269	11.2
Orange	6,544,782	3,014,858	46.1	19,199	0.6
Chilly	95,266	5,300	5.6	113	2.1
Dry Chilly	4,412	4,412	100.0	117	2.7
Rajma	21,015	21,015	100.0	6,368	30.3
Soybean	169,092	169,092	100.0	10,259	6.1
Radish	187,439	51,988	27.7	190	0.4
Squash	20,183	20,038	99.3	384	1.9
Vegetables	1,654,190	98,000	5.9	-	-

* The products in Mongar or Lhuntse Dzongkhags traded at auction yard in Samdrup Jongkhar.

Source: FCB

The products from six Dzongkhags in the eastern region of Bhutan are auctioned only in Samdrup Jongkhar. The products of Trashigang share at almost 50 % and those of Samdrup Jongkhar follow at 25 % at Samdrup Jongkhar auction yard in 2001. The products of Mongar and Lhuntse, the Study Area, share at only 8 %, among which the products from Lhuntse are negligible. It is considered that Mongar and Lhuntse together with Trashiyantse sharing at only 15 % have not been well developed for export oriented production and marketing, because these Dzongkhags are geographically far from Samdrup Jongkhar, compared with the location of other three Dzongkhags and may not be attractive for farmers to ship the products to Samdrup Jongkhar due to higher transportation cost.

Share of Origins among Products Auctioned in Samdrup Jongkhar

Dzongkhag	Q'ty (kg)	%	Value (N.)	%
Pemagatshel	1,166,707	12.3	5,965,811	11.6
Lhuntse	673	0.0	15,418	0.0
Mongar	733,436	7.7	4,247,835	8.2
S/Jongkhar	2,405,218	25.3	11,582,716	22.5
Trashigang	4,634,846	48.7	25,984,228	50.4
Trashiyantse	572,132	6.0	3,770,259	7.3
Total	9,513,012		51,566,268	

Source: FCB

(4) Transportation

As mentioned above, the farmers in the Study Area sell or barter their products to neighbors, town shops and consumers in the market. The farmers bring their products either on foot or by horse.

By contrast, the export products, mainly potato, are collected by farmers and shopkeepers and transported by trucks to Samdrup Jongkhar even though the area is mostly limited to the eastern area from Mongar town along the East-West Highway centered at Drametse Gewog. There are about eight (8) transporters having one to two trucks each in Mongar town. They are facing difficulties to find out any local commodities including the agricultural products going out from the Study Area. And their trucks go out of this area without loading. Therefore, their business is carried out for and relies on mainly transportation of imported commodities from Samdrup Jongkhar and/or Phuentsholing to this area. In the potato-harvesting season, some trucks pick up the sacks of potato by requests of middlemen as farmers or shopkeepers at the area from Drametse to Kanglung in Trashigang Dzongkhag on the way to Samdrup Jongkhar.

The transportation rate collected in Samdrup Jongkhar is as follows:

Transportation Rate of Truck (8 tons) from Various Places to Samdrup Jongkhar

From	Nu. / sack (50 kg)	Nu. / truck (8 tons)
Pemagatshel	15	2,400
Trashigang	25	4,000
Trashiyantse	40	6,400
Mongar	40	6,400
Lhuntse	50	8,000

* Including driver charge and fuel.

Seeing the figures in the table above, it can be recognized that the products in the Study Area are facing the comparative disadvantage to the products in the other Dzongkhags in the eastern region in view of the transportation cost.

3.7.2 Agro-Processing

(1) General Background

There is no special processing adopted after harvesting of the products other than cheese and butter production from milk and alcohol drink production from grains, mainly maize. There are no factories that can be called "industry" in the Area. But traditional food processing

operated by family is widely seen over the Study Area.

(2) Post-Harvest Processing

It is reported that post-harvest loss occurs on most products due to poor handling and storage. Post-harvest losses of maize and rice at the household level are substantial because insect infestation and fumigant are not applied⁴. As for vegetable and fruit, loss generates remarkably by bruising, exposure and spoilage due to poor harvesting, packing and handling practice.

Since the grading and packing standards do not exist yet, the fare and effective pricing and smooth auction procedure are impeded and serious losses occur on exported products such as potato and orange in transportation and handling procedure.

The Post-Harvest Unit of MOA in Paro is the sole organization in Bhutan for research & development in this field. However, their activities have just started recently and necessary extension program for post-harvest practice improvement has not been realized yet.

(3) Agro-Processing

Households conserve surplus back-yard horticultural production by drying and pickling vegetables for winter consumption. Maize is grinded and rice is milled for cooking. Surplus maize is used to distill alcohol, and residue is used for animal-feed. Meat is sun dried, smoked, or processed into sausages, and stored in the attic. The attic is also used for drying and storing of grains. Milk is churned into butter and cheese using traditional methods.

Fundamental industries supplying various materials to agro-processing factories have not been developed well in Bhutan, and none in the Study Area. These industries produce processing machinery and equipment, packaging materials, chemicals, other consumables, etc. used in the agro-processing industry. At present, the processors must use many imported machines, equipment and materials that are usually expensive and difficult to be obtained. On the other hand, many imported agro-processing commodities, mainly Indian, are sold at the markets. Such conditions discourage the local agro-processing business in view of production cost.

Small processing activities have just started such as rice milling, maize grinding and flaking and lemon glass oil distillation.

3.8 Rural Society

3.8.1 Living Condition of Farmers in the Study Area

Interview survey was conducted with questionnaire in May and June 2002. The questionnaire survey was conducted for 4 % of household in each Gewogs. Details of results of the survey are given in Annex-I.

(1) Type of house building

Most of farmers live in stone laid or plastered two-storied house with tin roof fixed with stone as a weight. Ground floor is used for shed, and loft is used for food drying space cum food storage space. Upper floor of shed is living cum kitchen space. Except for main building,

⁴ "Appraisal Report for SEZAP", IFAD, May 1999

⁵ EDOP

some of households have cattle shed, small hut (*Bago*) in their farm field for watching wild animal in harvesting season, and toilet with roof.

(2) Toilet facility

Effective campaign for clean toilet facility raised percentage of holding of toilet with roof. The result of questionnaire survey shows more than 80 % of households have toilet with roof.

(3) Transportation

The result of questionnaire survey shows more than 40 % of household have horse and/or donkey. Some of farmers are raising horses and/or donkey for sale, and some of farmers have one or two for transportation means. However, most of farmers do not have any horse and/or donkey and they borrow from villagers in need. Horse and donkey are not used for transportation of human.

(4) Electricity

Only 10 % of households in the Study Area are electrified according to the interview survey. According to the document of 9th FYP of Lhuntse and Mongar Dzongkhags, percentage of households served with electricity supply is 6.5 % for Lhuntse and 16.5 % for Mongar. Kerosene lamp and/or candle are used for light. Neither radio nor television is used at most households. Flashlight is used for night in outdoor. Farm households which have been recently electrified and will be electrified soon showed their wish to use electricity for electric lamp and cooking. Some villages use electricity for cooperative rice mill.

(5) Drinking water

Most households have simple water supply system, simple pipeline from water sources (mountain stream). Groundwater and rain water are not used commonly. The result of questionnaire survey shows more than 60 % of households have water source within 50 m from their residence. Water availability depends on weather. Tapped water is stored into big jars. Quality of the tapped water seems good except after rain. Sterilizing by boiling is not so common.

(6) Fuel for cooking

Fuel for cooking is firewood. Charcoal is not common. They use branches of standing trees as firewood during summer. Trunk of cut tree is stocked for winter around house..

(7) Medical system

Two Dzongkhag hospitals, 27 BHUs and 75 outreach clinics are distributed in the Study Area. Some villagers ask for astrologists' instruction whether they should continue praying or get medical treatment. Though some of sick persons might get cured naturally during praying, most of younger generation goes to hospital directly. Medical service is free of charge including consultation, medicine and hospitalization.

(8) Education

The school enrollment up to junior high school is high. Boys' enrollment is about 35 % higher than that of girls. Although school education is accessible for free of charge, expenditure related to education such as uniform, stationeries and others occupies high percentage of total

household expenditure. Number of high school is not many, and entrance examination is very difficult to pass. Since expenditure for boarding is quite costly, enrollment of farmers' children in high school education is very low. Old generation had difficulty to go to school because no school was available near their villages.

Number of Education Facilities by Type

	Community school	Primary school	Junior school	High school	Total
Lhuntse	7	8	1	1	17
Mongar	22	10	3	2	37

Source: Statistical Yearbook of Bhutan 2001, Central Statistical Organization, Planning Commission

3.8.2 Rural Community and Community Groups

As most of villagers live sparsely near their own agricultural land, communities are not well organized. Festivals in village take place once or twice a year. Villagers gather with food and local rice wine (*Ara*). Pork and/or chicken meat is provided by villagers especially for these special festivals.

Exchange labor system for on-farm works is common in most villages especially in the busy season, such as transplanting and harvesting period. Farm work on other farmers' field is basically returned with the same farm work-days for his/her land. Payment by cash for farm work is limited only in case of unequal work exchange. Working by male and female is accounted for the same rate. Bull's work is counted as double as manpower.

Around 20 % of husbands and wives belong to some village organizations. Around 10 % of husbands are members of production group, religious group or drinking water users' group. Some of wives belong to the same group as their husbands. Some wives are also member of women's group.⁶

Influential persons in rural society are Gup, vice-Gup (*Mangmi*), village chief (*Chipon*) and his assistant, secular monk (*Gomchen*) and elder person.

3.8.3 Poverty and Vulnerable Groups

Percentage of owner farmer is quite high. Most of small land owners get income from bred livestock and/or dairy products. Marriage and divorce procedures are very simple. There are Widows with children are not so unusual. Remarriage is frequently undertaken. Children with different parents often live together with such new family. Aged persons without children are taken care of by the community.

3.8.4 Institution for Rural Development

Decentralization is one of the most emphasized policies that underlies in 9th FYP. Development plan at each Gewog is prepared by Gup and GYT. Gup and GYT get lots of advice from Dzongkhag officers to draft up their development plan.

Dzongkhag has responsibility for support and implementation of the development plan, and villagers have to join construction works such as road, irrigation facility, drinking water supply development as beneficiaries' contribution. Gup and village organize beneficiaries' participation for construction works.

⁶ Results of interview survey.

3.8.5 Farmers' Needs and Awareness

(1) Needs for Necessities of Life

Farmers' needs for necessities of life (choices are drinking water source near house, electricity, toilet and gas for cooking) were confirmed in the questionnaire survey. Present condition is summarized below. More than 80 % of household have permanent toilet, and more than 60 % have drinking water source near his house (within 50 m).

Coverage for Main Utilities

	Study Area	Lhuntse	Mongar
Drinking water source near house	65	76	58
Electricity	14	12	15
Toilet	84	78	87
Gas	9	10	8

Unit: %

Sources: Farm household survey, conducted by the Study Team (2002).

Needs for necessities of life are summarized below. Demand for electricity is high.

Expectations for Main Utilities

	Study Area	Lhuntse	Mongar
Drinking water source near house	32	1	39
Electricity	76	79	77
Toilet	11	16	9
Gas	61	60	62

Unit: %

Note: More than one item could be chosen.
Figures are sum of 1st and 2nd selections.

Sources: Farm household survey, conducted by the Study Team (2002).

(2) Needs on Living Condition

Farmers' needs on living condition (choices are Food shortage, Health condition, Work opportunity, Debt, House building and Education) were confirmed in the questionnaire survey. Present condition is summarized below. Although constraints on the items show little difference, rice availability for self-consumption is quite low. Although more than 80 % of households purchase rice (about Nu. 4,000 /year in average), their constraint on food shortage is not so high. Although constraint on debt is around 30 %, households which have debt are only 5 %. This shows that most of households which have constraints on debt may have constraints on complicated procedure of loan application, less cash income for repayment, or high interest rate.

Constraints for Living Condition

	Study Area	Lhuntse	Mongar
Food shortage	54	61	50
Health condition	45	57	39
Work opportunity	50	34	58
Debt	31	29	32
House building	47	52	29
Education	48	49	47

Unit: %

Note: More than one item could be chosen.
Figures are sum of 1st and 2nd selections.

Sources: Farm household survey, conducted by the Study Team (2002).

		Food Availability		
		Unit: %		
		Study Area	Lhuntse	Mongar
Rice	Sufficient/Just enough	10	17	6
	Short/Very short	85	83	85
Maize	Sufficient/Just enough	84	77	87
	Short/Very short	15	22	12

Sources: Farm household survey, conducted by the Study Team (2002).

Expectation for provision or development of necessities of life is summarized below. Expectations are almost same for each item.

		Expectations for Necessities of Life		
		Unit: %		
		Study Area	Lhuntse	Mongar
Food shortage		55	59	53
Health condition		44	46	43
Work opportunity		43	22	54
Debt		32	26	36
House building		46	51	43
Education		49	50	48

Note: More than one item could be chosen.

Figures are sum of 1st and 2nd selections.

Sources: Farm household survey, conducted by the Study Team (2002).

3.8.6 Profile of Farm Household

Interview survey was conducted in a village of poor access (Ney village, Gangzur Gewog, Lhuntse), a village of good access (Chaskhar Gewog center, Mongar) and a village of moderate accessibility. Forty (40) samples were interviewed respectively. According to the results, the following characteristics and profiles of farm household were identified. Details of results of the survey are given in Annex-I.

(1) Village of Good Accessibility ~ Center of Chaskhar Gewog, along feeder road

In this village, half of the householders (18 out of 40 samples) are female. Labor force of one household is 3.6 persons on the average, but 65 % of the households feel "labor shortage" for their farming activities. If they can get more cash income, they intend to spend for i) repayment of debt (30 %), ii) improvement of house (27.5 %) and iii) purchase of livestock animals (20 %). Nearly half (40 %) of them think the best way to get more cash income is livestock rearing. Besides, they would like to get cash income from vegetables (potato), then sales of maize.

Few households come to either Trashigang, Samdrup Jongkhar or Thimphu. Even to Mongar, the capital of Dzongkhag, only 17.5 % of households come often. More than half of households come to Mongar only once a year or once several years. As for Gewog center, half (50 %) of households often visit there for medical care at BHU or meeting. Even with a feeder road of good condition, group activity for marketing (joint assembling, shipping) is not conducted vigorously, and only 15 % of households are joining such activity.

Major roles and responsibility of women in the household are;

- planting, harvesting and post harvest treatment of products,
- feeding of livestock,
- shipping of products

- village meeting,
- domestic water conveying,
- cooking,
- washing clothes,
- accounting,
- lemon grass processing, and
- child care

Major roles of men are;

- plowing,
- working as labor at construction site,

Other works such as firewood collecting and shopping are undertaken by both men and women. Decision making is undertaken by both husband and wife.

When they were asked, “Are you satisfied with present life here?”, Most (90 %) of the interviewees replied “Yes”. Half of children admire or respect mother but few replied “father”. Most of the children want to be “farmers”, while “teacher” was the second choice. Commodities that children want are mostly clothes and shoes.

In Chaskhar, it seems that economic activity is more active with feeder road, shops and FCB fare price shop. Cash expenditure is likely to be more, but on the contrary, more of them owe debt and feel financial problem. Because of small land holding size, they prefer to rear livestock and cultivate potatoes to increase their income.

(2) Village of Moderate Accessibility ~ Laptsa Village, Drepong Gewog, 1.5 hours walk to motor road

In this village, half of the householders are women. Labor force of one household is 2.5 persons on the average, but 70 % of the households feel “labor shortage” for their farming activities. If they can get more cash income, they intend to spend for i) improvement of house (42.5 %), ii) education (30 %) and iii) purchase of livestock animals (17.5 %). Most (97.5 %) of them think that they could get more cash income from vegetable cultivation (mainly cabbage, radish, beans). Besides, they would like to get cash income from livestock, then sales of maize.

Most (90 %) of the interviewees come to Mongar frequently (more than once a month) mainly for selling their products and purchase commodities on the way back home. They also come to Gewog center frequently to see medical staff at BHU, then to attend meeting. They seldom go to Trashigang, Samdrup Jongkhar or Thimphu but for visiting their relatives and family.

Major roles and responsibility of women in the household are;

- post harvest treatment of products,
- feeding of livestock,
- village meeting,
- domestic water conveying,
- cooking,
- washing clothes,
- accounting,
- shopping, and

- child care

Decision making and management of house economy are mostly undertaken by women. Major roles of men are;

- plowing, and
- working as labor at construction site,

Other works such as; planting, harvesting, firewood collecting, etc. are undertaken by both men and women.

When they were asked, “Are you satisfied with present life here?”, almost all (95 %) replied “Yes”. Half of children admire or respect mother but none replied “father”. One-third of the children want to be farmers, while another one-third want to be teacher, then nurse, soldier, public servant, house wife were followed. Commodities that children want are mostly clothes and shoes.

(3) Village of Poor Accessibility ~ Ney, Gangzur Gewog, 4.5 hours to the feeder road

Ney village has a characteristic or historical background in its social hierarchy of “land lord and slaves”. In old times, a big land lord possessed the land and brought slaves to the land to cultivate or work for the land lord family. Even now there is a mansion of the land lord in the midst of the village surrounded by other houses. Although the land was emancipated to the people at the time of the 3rd King, certain customary seems to remain up to now.

In this village, 60 % of the householders are men. Labor force of one household is 2.2 persons on the average, but 75 % of the households feel “labor shortage” for their farming activities. If they can get more cash income, they intend to spend for i) education (32.0 %), ii) others (26 %) and iii) purchase of livestock animals (19.0 %). More than half of the interviewees replied that the source for increasing income would be paddy rice (52 %), while vegetables cultivation (42 %) followed. Besides, they would like to get cash income from livestock, fruits (pear and plum) and maize.

Mostly due to poor access, only 18 % of the interviewees come to Lhuntse town frequently, while 54 % of them come several times a year. Nearly 30 % of the interviewees replied that they come to Lhuntse town once a year or several years. The purposes of visit were shopping, business and to see acquaintance.

As for Gewog center, similar percentage of the interviewees replied to visit the center frequently (19 %) or several times a year (50 %), and the remaining replied once a year (31 %). Gewog center (Thimyul) is located at 4.5 hours walk and 20 minutes ride of vehicle, while Lhuntse town is at 4.5 hours walk and 30 minutes ride of vehicle. However, most farmers walk along the motor road unless nobody gives a ride. The purpose to come to the Gewog center was meeting and business.

They seldom go to either Trashigang, Samdrup Jongkhar or Thimphu.

Major roles and responsibility of women in a household are;

- planting and transplanting of crops,
- harvesting,
- post harvest treatment of products,
- cooking,
- washing clothes,
- accounting, and

- child care.

Major roles of men are;

- plowing,
- feeding of livestock,
- shipping of products,
- meeting,
- shopping, and
- working as labor at construction site,

Firewood collecting and decision making are undertaken by both male and female.

When they were asked, “Are you satisfied with present life here?”, most of them (90 %) replied “Yes”.

It is guessed that shipping, shopping and participation to meeting are undertaken by men, because venues for these activities are all located very far.

3.8.7 Gender

Women in the Study Area enjoy fair amount of independence in their personal, social, economic and political sphere. They are involved in the decision making processes within household and attend the village and Gewog meeting too. In agricultural activities, planting, harvesting and post-harvest processing, livestock feeding are major roles for women. Heavy works such as land preparation, plowing and labor works at construction sites are managed by men. There is no discrimination between girls and boys. In the Study Area, many of women inherit property and they marry men from other household and stay together with women’s parents.

Pleasant socio-cultural perceptions of both men and women see women as less capable and confident than men in matters of governance and interaction with external agencies. In most workshop, meeting and seminar held in Dzongkhag, very few women are seen as attendants. However in the village or Gewog, women are attending both official and unofficial meeting held at the Gup office, BHU, school, etc. Women are considered physically weak and positions of Gups etc. deemed unsuitable as the jobs are physically demanding. Socio-cultural perceptions validate male superiority while not adequately recognizing female capabilities.

Women’s access to training and technology is limited as also their involvement in decisions relating to business opportunities, nonetheless women play main role in cottage industry such as lemon grass oil processing, weaving, etc. In most of rural households, women are weaving cloth to make clothes for their family. Only in Khoma, which is very famous for weaving and some merchants come to the village to purchase the products, women are weaving for sales. Property ownership and inheritance patterns varies by location, but in rural area, head of the household is usually the person who own the property, and the property is mainly inherited by the person who takes care of the previous owner. In general, many women inherit the property and stay at the household even after marriage with his husband and children. Accounting and decision making in the household are mostly undertaken by the wives.

Lower level of education and skill-enhancement result in women being less employable. Heavy demands on women’s time and mobility constrain their participation in Dzongkhag level meetings, because such outside meetings require night-stay. Their lack of participation further promotes the perceptions of women as shy and inarticulate in public forums rather than attributing it to their minimal experience in decision making at higher levels.

Despite equal opportunities and entitlements for both women and men, differences are seen in equitable access especially in education and governance resulting in lower levels of achievement for women.

3.9 Natural Environment

3.9.1 Protected Area and Endangered Species

Thrumshingla National Park, Bumdeling Wildlife Sanctuary and biological corridor which links these two protected areas are located in the Study Area. Location of the protected areas is shown in Fig. 3.9.1. There are five National Parks and four wildlife sanctuaries in Bhutan. Several biological corridors are set up to link all the nine protected areas. Some part of the national park and the wildlife sanctuary is situated in the Study Area. The biological corridor is located in the Lhuntse Dzongkhag. About 60 % of the Lhuntse Dzongkhag is covered by these protected areas as shown below.

Protected Areas				Unit: km ²
	Whole Area	Study Area	Lhuntse	Mongar
Thrumshingla National Park	768	460	240	220
Bumdeling Wildlife Sanctuary	1,487	730	510	220
Biological Corridor	-	1,020	1,020	0
Total	-	2,210	1,770	440
Occupancy of the protected area		45.7 %	61.2 %	22.5 %

Sources: Thrumshingla National Park Conservation Management Plan 2002/03-2006/07, DOF/MOA
Bumdeling Wildlife Sanctuary Conservation Management Plan July 2001-June 2007, DOF/MOA

3.9.2 Activities on Environmental Conservation

All wild animals and wild plants are basically prohibited to kill, injure, destroy, capture and collect whether or not they are in protected area or suggested not to kill, injure, destroy, capture and collect.

Fishing in any stream, river, lake or other watercourse is governed by fishing rules. Tseri land is recommended to be converted to other land use to prevent damage on soil, water and wildlife resources. Grazing in reserved forest⁸ is regulated. Every village head (messenger) has to organize fire watcher and teams to prevent forest fire. Fire near reserved forest except controlled campfires is required to obtain permit.

The protected area (national park and wildlife sanctuary) is defined in four zones, i) core zone, ii) multiple use zone, iii) buffer zone and iv) travel route (national highways and feeder roads). Construction of roads, fence and any kind of physical structures, settlement / cultivation, grazing are prohibited in core zone of protected area, restricted with permit in multiple zone of protected area. Details are summarized below. The biological corridors do not have such protected regimes for national parks and wildlife sanctuaries.

⁷ List of protected mammals, birds, plant provided in the Forest and Nature Conservation Act of Bhutan, 1995.

⁸ All forests are declared to be government reserved forest including community forest.

Protected Regimes for Management Zones in the Protected Area

Activity	Core zone	Multiple-use zone	Buffer zone
Construction of roads, fences, any physical structures	×	△	△
Settlement or cultivation	×	△	○
Commercial logging	×	×	△
Non-commercial logging	×	△	△
Grazing	×	△	△
Collection of firewood	×	△	△
Hunting	×	△	△
Fishing	×	△	△
Collection of Non-timber Forest Products (NTFP)	×	△	△

Notes: ○: Permission, △: Permission with restriction, ×: Prohibition

Source: Thrumshingla National Park Conservation Management Plan 2002/03-2006/07, DOF/MOA.

Bumdeling Wildlife Sanctuary Conservation Management Plan July 2001-June 2007, DOF/MOA.