

## SUMMARY

### **I INTRODUCTION**

- Authority:* This Draft Final Report has been prepared by the JICA Study Team in accordance with the Scope of Work (S/W) for the Study on Agricultural and Farm Road Development in the Kingdom of Bhutan agreed upon between the Ministry of Agriculture (MOA), the Royal Government of Bhutan (RGOB), and the Japan International Cooperation Agency (JICA) on December 11, 2001.

The Report presents the Master Plan and Action Plan which have resulted from all the works conducted in Bhutan and Japan since April 2002.

- Objectives of the Study* are; i) to improve self-sufficiency of food crops and ii) to upgrade the living standards of farmers in the Lhuntse and Mongar Districts. In order to achieve the long-term objectives, the Study consisted of the following components:
  - Formulation of the Master Plan on development of rural agriculture and farm road, which is based on due consideration for improvement of accessibility to markets and for enhancement of farm productivity.
  - Formulation of the Action Plan in the priority area(s) selected in the Master Plan.
  - Implementation of technology transfer to Bhutanese counterparts through on-the-job training in the course of the Study.
- Major Activities and Work Progress* performed in the first field work period are summarized below:

**Activities and Progress (Master Plan Stage)**

Activities	Year 2002				
	April	May	June	July	August
Data collection	██				
Primary data	██				
Farm HH interview	██				
Problem analysis WS	██				
RRA survey	██				
Farm road survey	██				
Irrigation survey	██				
Market survey	██				
Secondary data	██				
Zoning, Constraints, Potential	██				
Master Plan Outline	██				
Project justification	██				
Selection criteria for priority Gewogs	██				
General concept of A/P	██				
Reporting	██				
2nd Steering committee meeting	██				

## Activities and Progress (Action Plan Stage)

Major Activities	Year 2002/2003								
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	
Technical Transfer through OJT									
Horticulture Production	■								
Farm Road	■								
Irrigation	■								
Meeting on P/R(1) in Japan	□								
3rd Steering Committee Meeting		■							
Determination of Priority Gewogs		■							
Formulation of Dzongkhag A/P		■							
Formulation of Gewog A/P		■							
Preparation of Guideline		■							
Workshop with Priority Gewogs			■						
Formulation of A/P		■							
Seminar and Workshop				■					
Preparation, Discussion of P/R(2) at 4th Steering Committee Meeting				■					
Preparation of DF/R							□		
Discussion on DF/R at 5th Steering Committee Meeting							■		
Preparation of F/R									□

■ Work in Bhutan

□ Work in Japan

4. **Participatory Planning:** In this Study, various participatory survey and planning approaches such as RRA, PCM, interview, etc. were applied together with technical transfer to the counterpart personnel of the central government (MOA), Dzongkhags, Gewogs and even to beneficiaries.

## PART-1 THE MASTER PLAN

## II BACKGROUND

5. **Super Goal:** "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.
6. **Overall Goal of 9<sup>th</sup> FYP:** In accordance with the development philosophy of RGOB and taking due consideration on the review of achievement of 8<sup>th</sup> FYP, five (5) overall goals of the Ninth Five Year Plan (9<sup>th</sup> FYP) were set as follows:
- 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.

7. **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
<b>Min. of Agriculture</b>	<b>2,548.4</b>	<b>2,000.0</b>	<b>4,548.4</b>	<b>6.5</b>
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, 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
<b>Total Plan Outlay</b>	<b>31,681.5</b>	<b>38,318.5</b>	<b>70,000.0</b>	<b>100.0</b>

Source: Main Document, 9<sup>th</sup> Five-Year Plan, Planning Commission, 2002

8. **Objectives of RNR Sectors for 9<sup>th</sup> FYP:** Within the nation's overall policy framework, the objectives of the RNR sector for the 9<sup>th</sup> FYP are:

- To attain national food security,
- Conservation and management of natural resources,
- Enhancement of rural income, and
- Generation of employment opportunities.

### III THE STUDY AREA

9. **Profile of the Study Area:** The Study Area (Lhuntse and Mongar Dzongkhags) is located in the eastern part of Bhutan as shown in the location map of this report. Profiles of the Study Area are summarized in the following table.

Profiles of the Study Area			
	Study Area	Lhuntse	Mongar
Area	4,835 km <sup>2</sup>	2,888 km <sup>2</sup>	1,947 km <sup>2</sup>
Elevation	200 - 5,800 m	600 - 5,800 m	200 - 3,800 m
No. of Gewogs	24	8	16
No. of villages	284	156	128
Population	63,564	19,426	44,138
Population density	13.2 person/km <sup>2</sup>	6.7 person/km <sup>2</sup>	22.7 person/km <sup>2</sup>
No. of household	7,482	2,516	4,966
Average family size	8.5 persons	7.7 persons	8.9 persons

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

10. **Agro-ecological Zones:** Agricultural activities in the Study Area are conducted mostly in three agro-ecological zones, namely, humid sub-tropical, dry sub-tropical and warm temperate zones. Annual rainfall ranges from 860 mm to 1,100 mm. Wet season normally begins in April and continues till September.

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
<b>Warm Temperate</b>	<b>1,800 – 2,600</b>	<b>650 – 850</b>	<b>26.3</b>	<b>0.1</b>	<b>12.5</b>
<b>Dry Subtropical</b>	<b>1,200 – 1,800</b>	<b>850 – 1,200</b>	<b>28.7</b>	<b>3.1</b>	<b>17.2</b>
<b>Humid Subtropical</b>	<b>600 – 1,200</b>	<b>1,200 – 2,500</b>	<b>33.0</b>	<b>4.6</b>	<b>19.5</b>
Wet Subtropical	150 – 600	2,500 – 5,500	34.6	11.6	23.6

Source: MOA/ ISNAR, 1992

11. **Land Use:** 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 %. Land use in the Study Area is summarized in the following table:

Present Land Use				
		Area (ha)		
		Lhuntse	Mongar	Study Area
1	Forest	217,351	172,258	389,609
2	Pasture	9,452	1,551	11,003
3	Agriculture			
	Wet land	944	627	1,571
	Dry land	2,383	7,077	9,460
	Tseri land	3,289	5,904	9,193
	Mixed land	6,196	5,408	11,604
	Subtotal	12,812	19,016	31,828
4	Settlement	36	91	127
5	Others	49,109	1,821	50,930
	Total	288,760	194,737	483,497

Source: Land Cover Maps of Lhuntse and Mongar Dzongkhags (1/100,000), MOA

12. **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 lands in Lhuntse and Mongar Dzongkhags occupy 8 % and 6 % of wet land, while they occupy 17 % and 13 % of dry land, respectively. The average holding size in the Study Area is estimated at 2 ~ 3 ha per household.
13. **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 engaging in agriculture activity was 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.
14. **Major Food Crops** in the Study Area are maize and paddy rice. Maize production in the Study Area occupies 18 % of the national production. According to the estimation by the Study Team, average yields of paddy rice and maize are around 2 tons/ha.
15. **Major Horticulture Crops** currently cultivated in the Study Area are potato, chili and

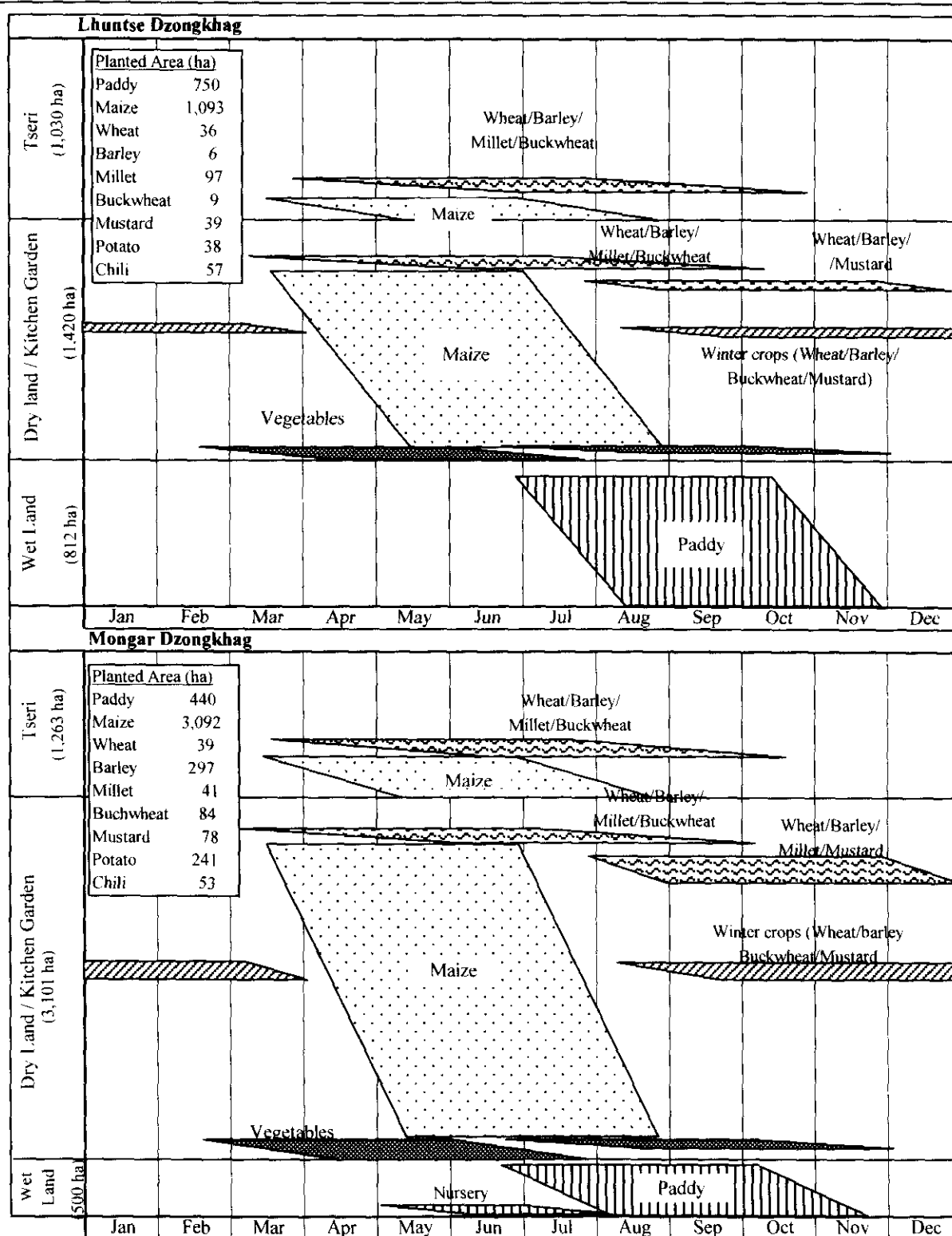
radish for vegetables, and mandarin orange, mango, peach and walnut for fruit crops. Even with suitable natural condition, production of the horticulture crops has not been developed very much due to the following reasons.

- Poor cultivation techniques (low production, poor quality, high losses, etc.),
- Small and scattered production,
- Lack of access to the market,
- Unawareness of farmers on farming technique,
- Limited extension activities, and
- Undeveloped market system.

16. **Livestock:** Cattle are the most important livestock in the Study Area. Average rearing number of cattle per household is 5.5 heads. High population of cattle is a constraint on land degradation by grazing, and shortage of feed and fodder in winter. Productivity of milk is low due to high ratio of local breeds. Due to religious sentiment, meat production is not very feasible. Accordingly, replacement of unproductive livestock can not be done properly.
17. **Cropping System:** 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 houses and from houses to motor roads for shipping. According to the RNR Statistics 2000, input cost consisting of mainly seed and fertilizer is estimated at about Nu. 1,000 - 1,500 per ha. Total production cost occupies about 20 % of the gross production value. Cropping system of major crops in the Study Area is summarized in the following table. Present cropping pattern of the Study Area is shown in following page.

**Cropping System of Major Crops**

Crop	Growing season	Farming practices	Inputs
Paddy	Nursery: Apr/May Transplanting: Jun/Jul Harvesting: Oct/Nov	Majority is local variety; dry nursery; transplanting; manual threshing in the farm several days after drying	Generally FYM is used, chemical fertilizer is less used, some farmers use herbicide for reduction of labor requirement for weeding
Maize	Sowing: Mar/Apr/May Harvesting: Aug/Sep	Improved variety is planted, farming practice provided by manual	Generally FYM is used, some chemical fertilizer is used
Other cereal crops	Summer cropping: Apr - Oct Winter cropping: Sep - Apr	Generally extensive farming practices	Generally no inputs
Beans (Soya/Rajma beans)/ Mustard	Summer cropping: Apr/May/Jun - Sep/Oct Winter cropping: Sep/Oct - Mar/May	Generally extensive farming practices	Generally no inputs
Vegetables	Sowing: Feb - Jul Harvesting: Jun - Dec	Most of vegetable planted in kitchen garden except part of potato	Generally FYM and chemical fertilizer are used, seed provided from DSC through Commission Agents
Fruit tree	Perennial	Generally poor management (pruning, thinning)	Usually no input, Saplings supplied from DSC through Commission Agents



**Present Cropping Calendar**

18. **Crop Cut Survey:** According to results of crop cut survey conducted in 2001 and 2002 in improved farming areas, the average yields of paddy (26 samples) and maize (41 samples) were 3.3 ton/ha and 3.0 ton/ha, respectively.
19. **Present Economic Condition** of farm household surveyed by the Study Team is

summarized below.

<b>Farm Household Economy (Cash Income and Expenditure)</b>			
	Study Area	Lhuntse	Mongar
<b>Income</b>			
- 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
<b>Expenditure</b>			
- 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).

<b>Farm Household Economy (Including self-consumption of own-products)</b>			
	Study Area	Lhuntse	Mongar
<b>Income</b>			
- 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).

20. **Findings of Farm Household Survey** are described below:

- Average cash income level is around Nu. 28,000, of which about 50 % is from agriculture and livestock.
- Major cash income sources of off-farm activities are NTFP (Non-Timber Forest Product), weaving, wages for labor at construction site, transportation service by horses, etc.
- Production cost including livestock is Nu. 9,300 or 33 % of the total cash expenditure,
- Income level including self-consumption is around Nu. 51,000, and 72 % of the total income comes from agriculture and livestock activities. Food expenditure occupies at 62 % of the living expenditure,
- Self-sufficient rate of food expenditure ranges from 80 % to 85 %.

21. **Cereal Consumption:** As for the national food security, RGOB aims to maintain self-sufficiency in food grain production at 70 %, and to cover the cost of import cereals by export of agricultural products. 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 9<sup>th</sup> FYP, namely 2007.

In the Study Area, per capita food cereal productions in Lhuntse and Mongar Dzongkhags are 230 kg and 222 kg, respectively. Food supply and demand are

supposedly balanced at present in both Dzongkhags. However, Gewogs located in remote area are generally in short of food.

**Production of Per Capita Food Grain**

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

Source: Production ← RNR Statistics 2000  
Population ← Dzongkhags

22. **Type of Roads:** Various types of roads are constructed by RGOB as follows:

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

District road connects capitals of Dzongkhags or with the national highway, while feeder road of MOC connects several Gewogs with the district road or the national highway. Forest road is constructed to transport timber from the forest, while farm road is used for transport of farm products and agricultural inputs between production area and market.

23. **Definition of Farm Road:** Farm road development is conducted conformed to the following standard, concept and approaches;

- Farm road should be implemented through participatory approach (labor contribution) of the beneficiaries,
- Construction is not contracted to the private sector, and MOA provides construction machinery and equipment with operators,
- Farm road should be motor road with water-bound macadam,
- At least, ten households or 70 people should be benefited per kilometer,
- Total cultivated area per season should not be less than 30 acres per kilometer, and
- Drainage or bridge structure should be a multi-cell culvert or a wooden bridge

24. **Accessibility:** Average walking hours of farm households in the Study Area to the motor roads are 3.4 hours in Lhuntse and 4.6 hours in Mongar. It should be noted that nearly 20 % of the households in Mongar should walk more than eight hours or one day to the motor road as shown in the following table.



---

**Accessibility to Motor Roads in the Study Area**

Walking hours	Unit: %	
	Lhuntse	Mongar
Less than 1	19.5	24.6
1 - 3	44.0	29.1
4 - 6	20.2	17.4
7 - 8	11.2	9.6
Over 8	5.1	19.3
Average	3.4 hours	4.6 hours

Source: RNR Statistics 2000

25. **Construction Machinery and Equipment:** MOA established Central Machinery Unit under DRDS for management of existing construction machinery and equipment. Most of the existing construction machinery and equipment were procured by the Paro Valley Agricultural Development Project (PVADP) by mid 1990s. Application of these machinery and equipment for the farm road construction in the Study Area is difficult due to the following reasons:
- Most of machinery and equipment have deteriorated after spending standard life time, and require large amount of repairing cost,
  - Those machinery and equipment are mostly with big capacity for flat and wide construction site like in Paro, and
  - Proposed construction sites are located at hilly and rocky mountain areas which require special attachments for the machinery working under such situation.
26. **Irrigation Schemes:** There are 62 irrigation schemes in Lhuntse and 48 schemes in Mongar as confirmed by MOA by 1999. They are mostly for paddy field irrigation. The total irrigated areas are about 1,220 ha in Lhuntse and 880 ha in Mongar. Scale of facilities of the existing irrigation schemes is not very large and mostly less than 20 ha. Little technical difficulty is anticipated for construction of such irrigation facilities, and most of them have been actually managed by the beneficiaries themselves.
27. **Agricultural Extension** services are provided by Extension Agent (EA) under coordination and guidance by RNR sector of Dzongkhags. A Dzongkhag basically appoints EAs of three sub-sectors, agriculture, livestock and forestry. They are assigned in RNR center or extension center in Gewog. 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.
-

Constraints and problems on extension activities at present are summarized below:

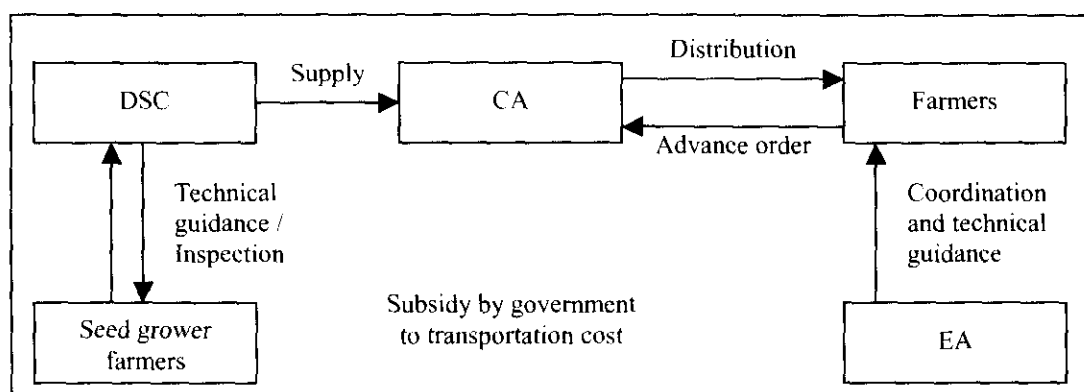
- An EA generally has to cover broad geographical area,
- Poor communication and transportation conditions for regular and temporary activities such as reporting and meeting at Dzongkhag,
- Less opportunities of EA training, and poor knowledge on horticulture crop farming, and
- Less linkage between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

28. **Research on RNR Sector** is carried out in RNR Research Center (RNR-RC) of 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 Lingmethang (Mongar Dzongkhag).

**Location of RNR-RC-East**

Center /Sub-center	Location	Altitude (m)	Farm area (ha)	No. of Staff
Khangma Sub-center	Trashigang	2,100	16	35
Wengkhar Center	Mongar	1,700	28	10
Lingmethang Sub-center	Mongar	640	16	8
<b>Total</b>			<b>60</b>	<b>53</b>

29. **Agriculture Input Supply** is handled or supported by; i) Druk Seed Corporation (DSC), ii) commission agent (CA) and iii) extension agent (EA) of Dzongkhags. The system of input supply is shown below:



**Input Supply System**

30. **Marketing:** Present condition on marketing of agriculture products in the Study Area are summarized below:

- Most of the farmers are operating self-consumptive agriculture, and accordingly, regional trade and market activities are quite limited in/around five local weekly markets in Mongar. No market exists in Lhuntse.
- Agriculture products dealt at the market are vegetables, dairy products, eggs. Cereal grains such as rice and maize are not sold in the market.
- Middlemen play important role for export through Samdrup Jongkhar to India. However, their activities are limited only to the east of Mongar town closer to Samdrup Jongkhar.

- 
- Market information through radio is not utilized by farmers because it does not cover local market information. Only some middlemen utilize to grasp auctioned prices at Samdrup Jongkhar.
  - Since scale of domestic market is quite small, export through Samdrup Jongkhar to India would be the only option to deal with increased future production in the Study Area.
  - Auction yard of Samdrup Jongkhar deals with 25 % of the export products of Bhutan. Dried chili, rajma bean, soybean, and squash are auctioned only at Samdrup Jongkhar, but share of these products from the Study Area is quite small.
  - Share of the products from the Study Area auctioned in Samdrup Jongkhar is only about eight percent, of which Lhuntse's share is negligible.
31. **Post-harvest:** As for post-harvest and agro-processing in the Study Area, 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. As for agro-processing, i) rice milling and maize grinding, ii) corn flaking, iii) lemon grass oil production, and iv) pine resin collection are undertaken in small scale of operation.
32. **Administration:** People in rural society follow instruction of chiefs and heads of community. They admire His Majesty the King and royal family, Dzongdag and government officials, Gup, etc. and sometimes blindly follow them. According to the strong decentralization policy of RGOB, the existing decision making system such as DYT and GYT will be empowered and strengthened. The first Gup election was held in October and November in the Study Area, and many of previous Gups were replaced with new Gups. Some of the previous Gups were disqualified at the nomination stage due to illiteracy and other reasons.
33. **Rural Household:** Intensive Household Survey was conducted in villages of poor access (4.5 hours walk to motor road, Ganzur, Lhuntse), good access (along a feeder road, Chaskhar, Mongar) and moderate access (1.5 hours to motor road, Drepong, Mongar). The following facts were found:
- Shipping, shopping and participation to meeting are mainly performed by men in poor access village, while in others, by women,
  - Heavy works such as plowing, labor contribution, etc. are roles of men,
  - They want to spend cash income (if they can get some more) for repair of houses, education, and purchasing of animals,
  - Most of household works including accounting are handled by women,
  - Decision making is undertaken both men and women except Drepong where it is undertaken by women,
  - Most of women have good skill of weaving but they do not sell the product,
  - Most of the households simply replied "Yes" when they were asked if they were satisfied with their life or not,
  - Dairy products are one of the main cash income sources,
  - Most of the farmers get instruction on farming practices from EAs,
-

- Children mostly admire their mother, and want clothes, shoes and books, and
- Influential person in rural society is Gup (chief of Gewog). They also follow what their neighbors do.

Rural society is not very closed even though certain permission is required for strangers to enter. People welcome the guests warmly and try to treat and entertain them. They understand importance of education mainly for getting good job.

34. **Environment:** Thrumshingla National Park, Bumdeling Wildlife Sanctuary and biological corridor which links these two protected areas are located in the Study Area. 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. The biological corridors do not have such protected regimes.

Protected Areas

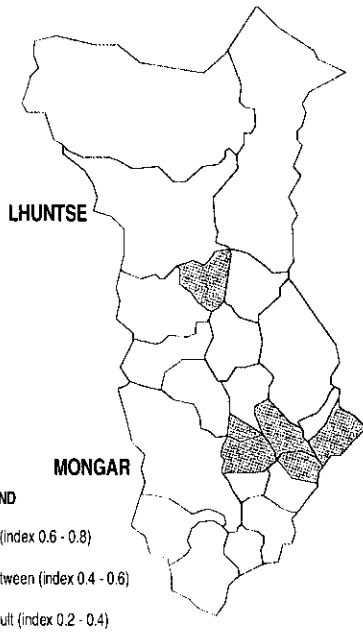
	Unit: km <sup>2</sup>			
	Whole Area	Study Area	Lhuntse	Mongar
Thrumshingla National Park	768	460	240	220
Bumdeling Wildlife Sanctuary	1,487	730	510	220
Biological Corridor	-	1,020	1,020	0
<b>Total</b>	-	2,210	1,770	440
Occupancy of the protected area		45.7 %	61.2 %	22.5 %

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

#### IV DEVELOPMENT CONSTRAINTS AND POTENTIAL

35. **Zoning of the Study Area:** On the basis of the following seven indexes, the Study Area was categorized by Gewog; i) to identify problems, development potential, constraints and ii) to recognize development stages for formulating strategic development plans.
- Living standard (Weighted Composite Index in Poverty Assessment and Analysis Report)
  - Agro-ecological Zones (warm temperate, dry sub-tropical, humid sub-tropical)
  - Food shortage ("surplus", "balanced" and "seasonal shortage" in RNR Statistics 2000)
  - Special Crops (paddy rice, horticultural crops, non-paddy cereal crops in RNR Statistics 2000)
  - Land resources (potential agricultural land per person, RNR Statistics 2000)
  - Access to motor roads (walking hours, RNR Statistics 2000)
  - Access to external market (distance to Samdrup Jongkhar)

Results of categorization are shown in the following pages.

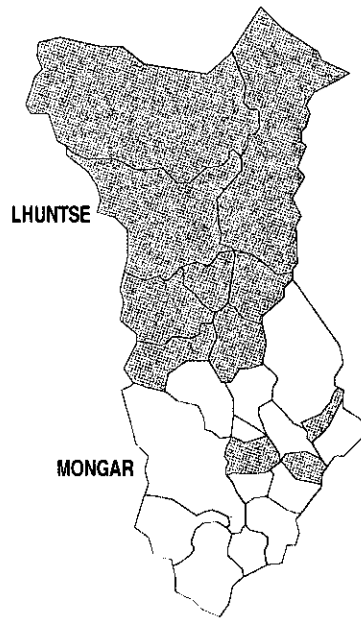


LEGEND

- 1(A): Fine (index 0.6 - 0.8)
- 1(B): In between (index 0.4 - 0.6)
- 1(C): Difficult (index 0.2 - 0.4)

**Index-1 Living Standard**

(Composite index with priority weights, Poverty Assessment and Analysis Report)

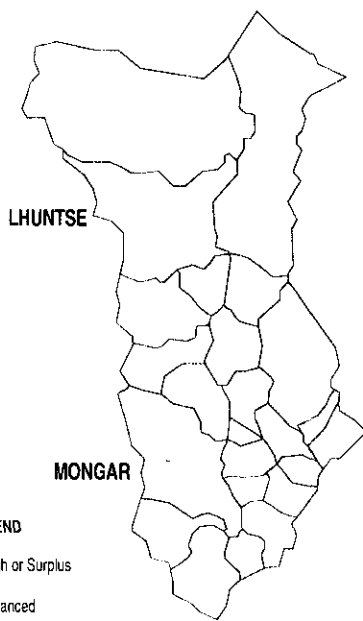


LEGEND

- 2(A): Warm Temperate
- 2(B): Dry Sub-tropical
- 2(C): Humid Sub-tropical

**Index-2 Agro-Ecological Zone**

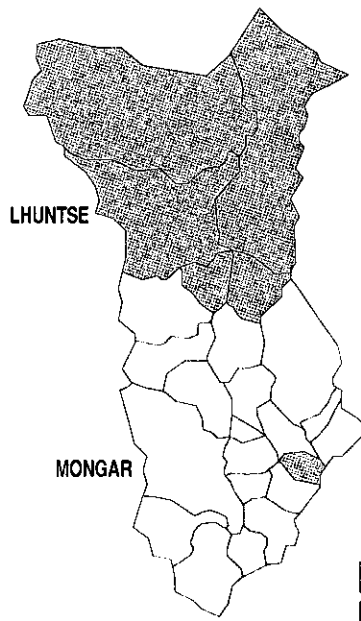
(Predominant agro-ecological zone in agricultural land resource)



LEGEND

- 3(A): High or Surplus
- 3(B): Balanced
- 3(C): Seasonal shortage

**Index-3 Food Security**



LEGEND

- 4(A): Paddy rice
- 4(B): Horticulture crop
- 4(C): Non-paddy cereal crop

**Index-4 Special Crops**

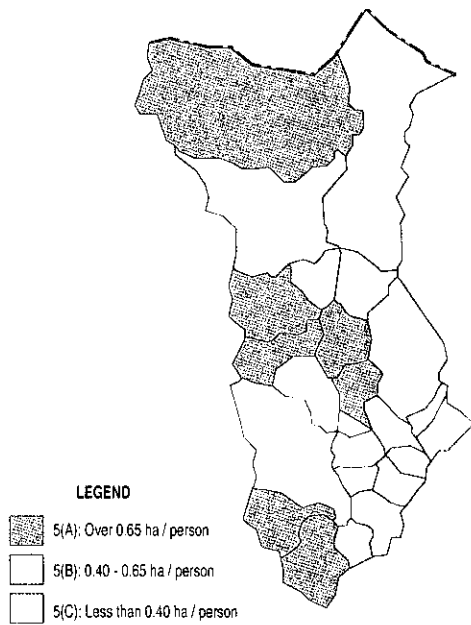
**LHUNTSE**

- L1 Ganzur
- L2 Jaray
- L3 Khoma
- L4 Kurtoe
- L5 Menbi
- L6 Metsho
- L7 Minjay
- L8 Tsenkhar

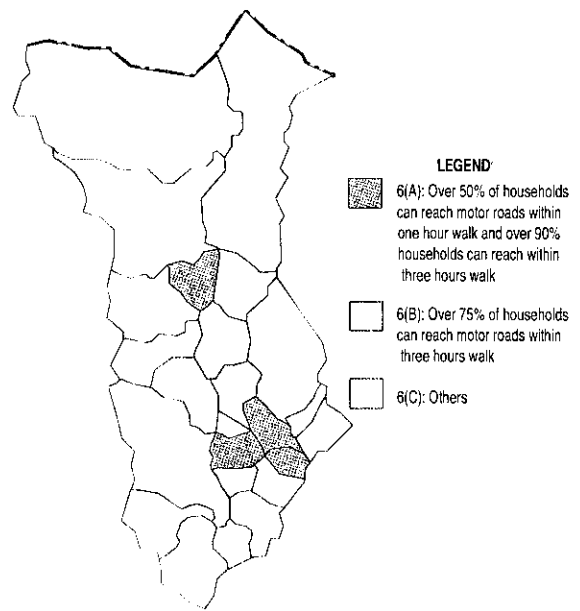
**MONGAR**

- M1 Balam
- M2 Chali
- M3 Chaskhar
- M4 Dramtse
- M5 Drepong
- M6 Gondue
- M7 Jurme
- M8 Kenkhar
- M9 Mongar
- M10 Ngatsang
- M11 Saieng
- M12 Serimuhung
- M13 Silambi
- M14 Thangrong
- M15 Tsakaling
- M16 Tsamang

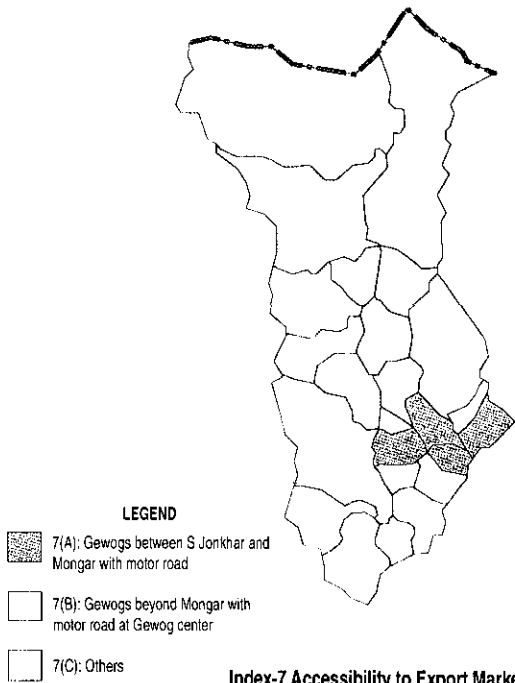
**Zoning by Index by Study Area (1/2)**



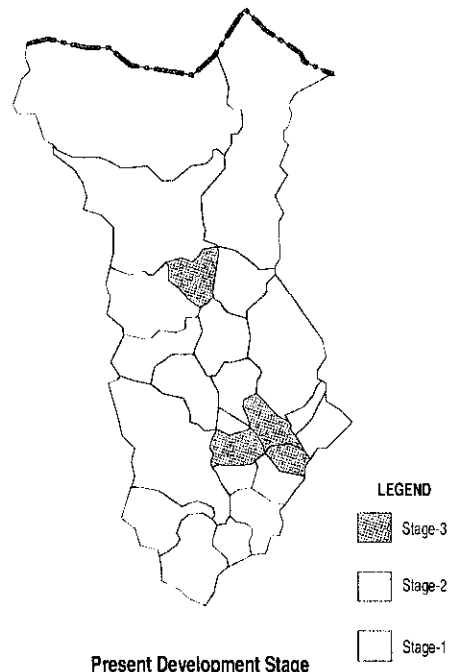
Index-5 Land Resources



Index-6 Accessibility to Motor Road



Index-7 Accessibility to Export Market



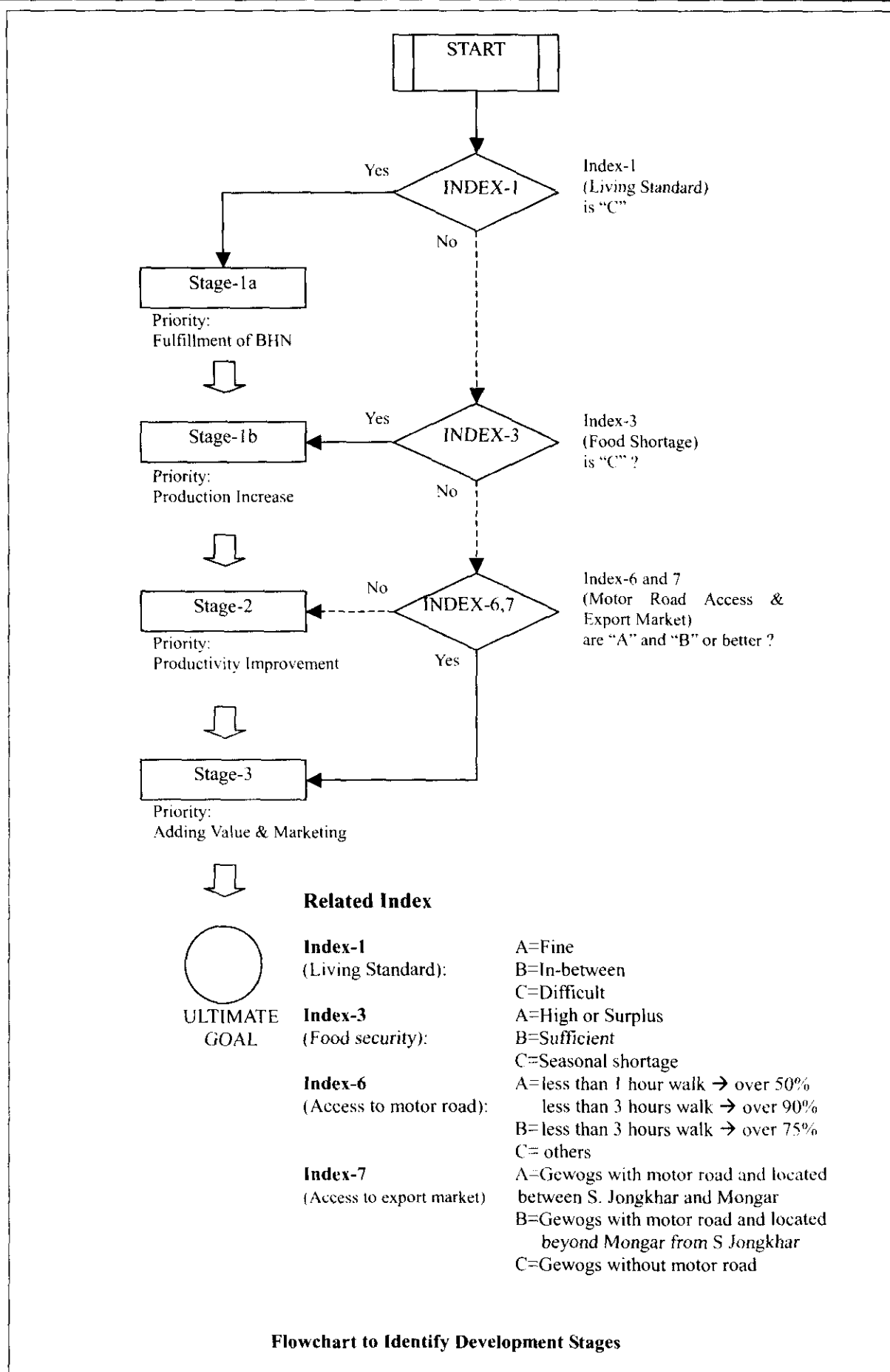
Present Development Stage

Zoning by Index by Study Area (2/2) and Development Stage

36. **Development Stage** of each Gewog was examined by using of four indexes on “living standard” including food security (Index-1, 3) and market potential (Index-6, 7) for “income increase” which are targets of the Master Plan. Development stages were categorized as shown in the following page. Accordingly, all the Gewogs were categorized as follows:

<b>Development Stage and Gewogs</b>	
Stage	Gewogs
1	Jaray, Khoma, Kurtoe, Metsho (Lhuntse) Drepong, Gongdue, Jurme, Kengkhar, Silambi, Thangrong (Mongar)
2	Gangzur, Minjay, Tsenkhar (Lhuntse), Balam, Chali, Drametse, Saleng, Serimuhang, Tsakaling, Tsamang (Mongar)
3	Menbi (Lhuntse), Chaskhar, Mongar, Ngatshang (Mongar)

37. **Stage-1:** Main problem and target of “Stage-1” are basic human needs (BHN) and food security. Fulfillment of BHN and increase of food crop production will be the main issues on the development. In this Study, rural access improvement and increase of food crop production will be covered for the Gewogs of this Stage.
38. **Stage-2:** Main targets of “Stage-2” are stable food crop production and income generation by horticultural crop development. Improvement of productivity, reduction of losses, extension of improved technology on horticulture and farm road improvement will be main project components for the Gewogs of this Stage.
39. **Stage-3:** Being located in advantageous location with better access, main targets of “Stage-3” are to add value to agricultural products and development of marketing system. Market oriented production will be promoted for the Gewogs of this Stage.
40. **Development Potential:** General development potential of the Study Area is as follows:
- Situated in three agro-ecological zones, various types of crops can be cultivated, and harvesting season will be adjusted accordingly seeking for better market prices,
  - According to the Land Use Planning Program (LUPP), potential agricultural area in the Study Area is about 32,000 ha, which is equivalent to 0.50 ha per person on average. Land resource potential itself is considered good enough, and
  - RNR or agricultural sector has extension staffs at Gewog level, which should be certain potential to improve extension activities rapidly by utilizing of the existing man power.
41. **Development Constraints:** General development constraints of the Study Area are as follows:
- Steep topographic condition increases development cost,
  - Sparse distribution of households is one of the reasons of low economic viability because of higher investment cost per beneficiary household,





- 
- Religious sentiment would restrain or influence meat production, plant protection from wild animals and insects, and replacement of livestock,
  - Even with sufficient land resources, labor shortage constrains development of lands and labor intensive cash crops,
  - Among six Dzongkhags in the Eastern Region, Lhuntse and Mongar Dzongkhags are located farthest from the export market, namely Samdrup Jongkhar,
  - Double cropping can not be conducted due to climatic condition,
  - The Kuri Chhu River running southward in the center of the Study Area hampers access between the eastern and western parts, and
  - Farmers' high expectancy or dependency on the government services.

## V THE MASTER PLAN

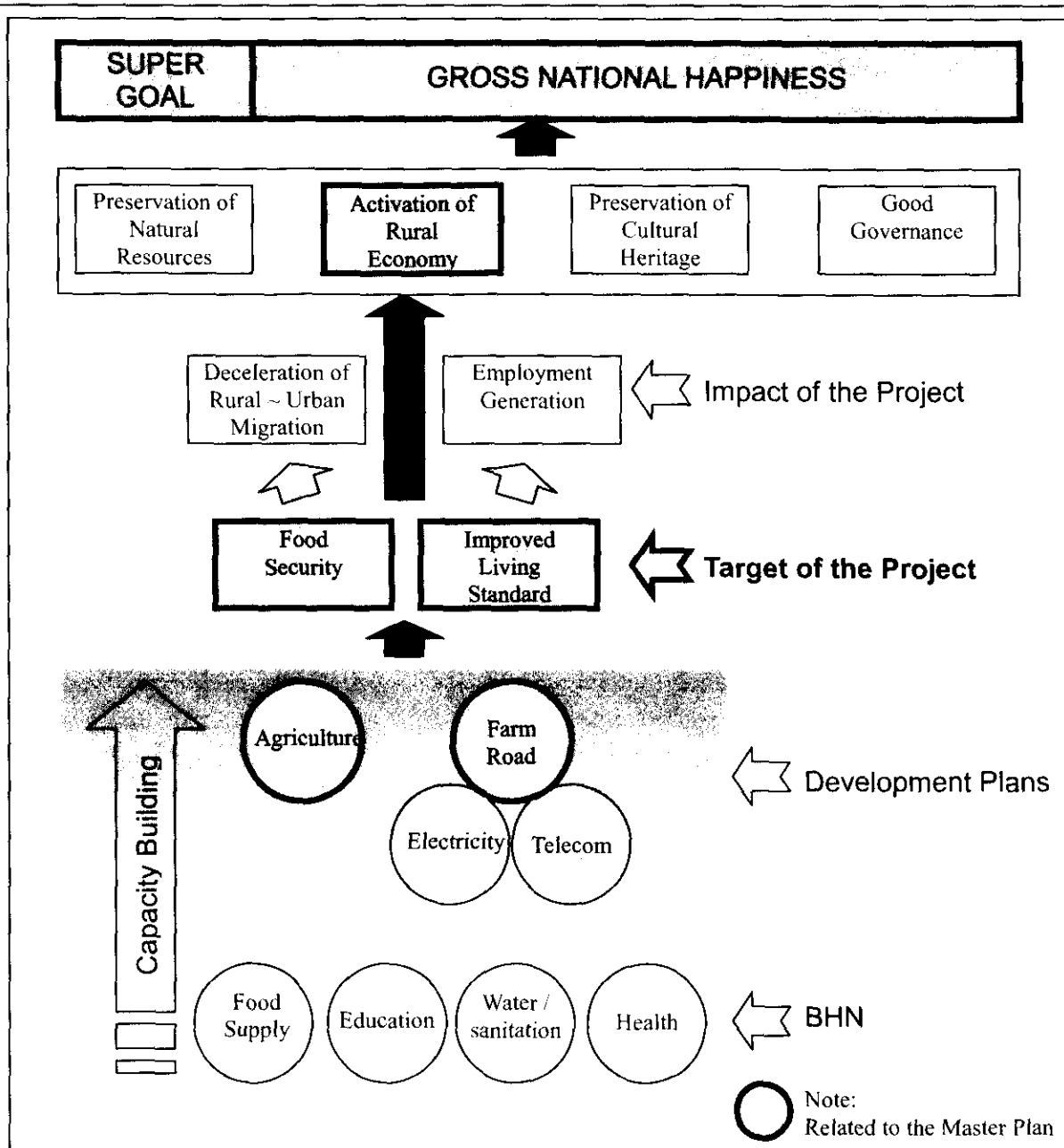
42. **Development Strategy of the Study Area:** Prior to formulate a master plan on regional agriculture development and farm road development, target, approach and strategy of the development of the Study Area was discussed. Then, position and roles of the proposed master plan was identified.

It is obvious at a glance that living standard and difficulty of living depend on accessibility to services, market and information, in other words, communication. By comparing rural households in poor access area with those of good access area, some suggestions for development approach can be obtained. In this case, "access" means not only road access but also access to the social services, such as electricity, education, training, health care, governance, etc. Development strategy and roles of the Master Plan to be formulated are illustrated in the following page.

43. **Component of Master Plan:** The Master Plan consists of two main plans of Regional Agricultural Development Plan, Lhuntse and Mongar (RADP-LM) and Farm Road Development Plan, Lhuntse and Mongar (FRDP-LM).

The objectives of RADP-LM are; i) to increase and improve food crop production and productivity and attain or maintain self-sufficiency in each Gewog, and ii) to increase income of farm households by promoting of cash crop production along with market system development.

FRDP-LM aims; i) to improve living condition of rural farm households by improving of access to the motor roads, and ii) to improve access for both better agricultural inputs and market in order to generate income on the basis of agricultural production.



44. **Regional Agricultural Development Plan (RADP):** Prospective outputs by RADP on food production increase and income improvement are:

- Paddy rice production will be increased by 55 % by 2012 with increased area (+30 %) and yield (+18 %),
- Maize production will be increased by 25 % by 2012 with increased area (+10 %) and yield (+15 %),
- Agricultural income of farm households will increase to 150 % ~ 200 % of that of 2002.

Target yield and planted area are given below:

	Yield and Planted Area of Cereal Crops					
	Lhuntse		Mongar		Total	
	2012	2002	2012	2002	2012	2002
<b>Paddy</b>						
Planted area (ha)	1,538	1,326	1,056	657	2,594	1,983
Yield (kg/ha)	2,600	2,200	2,600	2,200	2,600	2,200
<b>Maize</b>						
Planted area (ha)	1,944	1,700	5,951	5,574	7,895	7,274
Yield (kg/ha)	2,300	2,000	2,300	2,000	2,300	2,000

Prospective production is given below:

	Prospective Production of Food and Cash crops in 2012				Unit: ton
	Food crops		Cash crops		
	Total cereals	Paddy	Fruits	Vegetables	
<b>Target Year (2012)</b>					
Lhuntse Dzongkhag	8,471	4,000	1,989	3,490	
Mongar Dzongkhag	16,432	2,745	4,519	9,140	
<b>Total</b>	<b>24,903</b>	<b>6,745</b>	<b>6,508</b>	<b>12,630</b>	
<b>Present (2002)</b>					
Lhuntse Dzongkhag	6,318	2,918	197	667	
Mongar Dzongkhag	12,593	1,445	1,206	3,218	
<b>Total</b>	<b>18,911</b>	<b>4,363</b>	<b>1,403</b>	<b>3,885</b>	

Prospective income increase is shown below:

	Prospective Income Increase per Household						Unit: Nu.
	Agricultural Income			Cash Income			
	Stage 3	Stage 2	Stage 1	Stage 3	Stage 2	Stage 1	
Income level at 2002 *1	29,900	20,000	19,400	14,700	4,800	4,200	
Increase of income	18,900	17,900	9,100	13,300	12,300	3,500	
Income level at 2012	48,800	37,900	28,500	28,000	17,100	7,700	

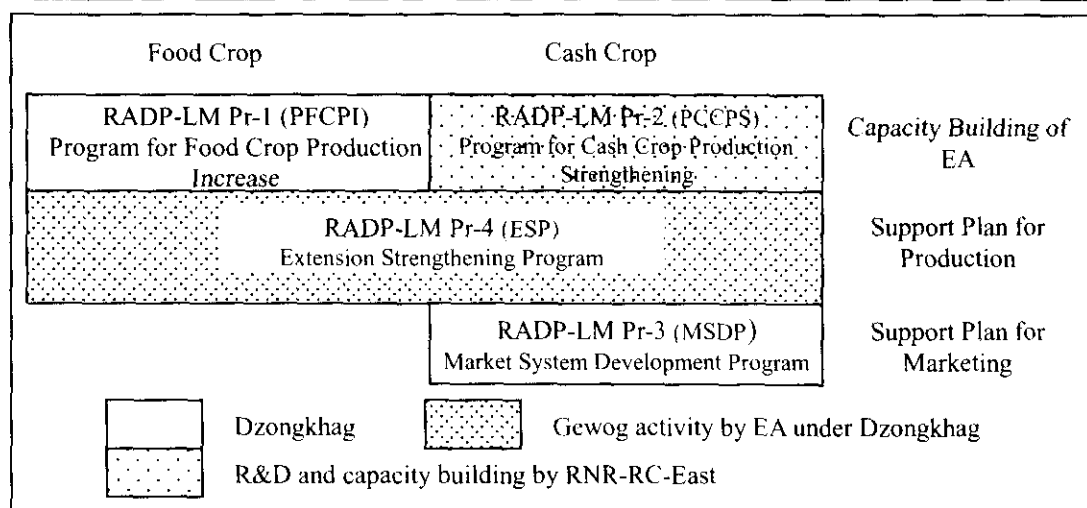
Note: Incomes from food crops, fruits and vegetable production

\*1: Farm household interview survey conducted by the Study Team

45. **Framework of RADP:** Considering the present problems and constraints on agriculture in the Study Area, the following approaches are necessary to attain the objectives:

- Extension of basic technique on farming and crop management,
- Research and development of suitable crops and farming technology,
- Strengthening of extension capacity for the above activities, and
- Market system development and value adding of agricultural products.

The framework and programs of RADP-LM were formulated as shown in the following page:



**Framework of Subprogram on Regional Agricultural Development Plan**

46. **Programs of RADP:** Each program of RADP consists of several sub-programs as shown below.

Programs and Sub-programs for RADP		
Program	Sub-program	Major Component
1) Program for Food Crop Production Increase  (Dzongkhag)	1a) Food security	Production plan of food crops; Land use plan;
	1b) Paddy rice production	EA training on farming
	1c) Irrigation development	Rehabilitation/expansion of irrigation facility; Strengthening of WUA
	1d) Backyard animal husbandry	Utilization of surplus maize to livestock; Training of EAs on animal husbandry
	1e) Post-harvest technology training	EA training on post-harvest losses reduction
2) Program for Cash Crop Production Strengthening  (RNR-RC East)	2a) Market research	Study and selection of suitable cash crops
	2b) Technical research and development	Varietal improvement; Research on production system and technology
	2c) Training of extension agents	Capacity building of EAs
	2d) Agro-processing technology training	Training on small size agro-processing
3) Market Development Program  (Dzongkhag)	3a) Collection depot construction	Collection shed construction for buyers
	3b) Group assembling	Assembling by farmers group
	3c) Group assemble and marketing	Assembling and shipping by farmers group
	3d) Marketing support by FCB	Shipping to auction yard by FCB
4) Extension Strengthening Program  (Dzongkhag)	4a) Extension strengthening for food crop	Dissemination of improved technology; Input supply including HYVs
	4b) Extension strengthening for cash crop	Awareness on cash crops; Dissemination of improved technology

47. **Farm Road Development Plan (FRDP):** The farm roads were proposed through a participatory planning approach, i.e. Problem Analysis Workshop in the course of the Study. Consequently, 18 roads totaling 425 km were identified. FRDP-LM was formulated considering physical conditions of the proposed roads and priority and/or necessity for implementation. The following programs were proposed.

48. **Farm Road Construction Program (FRCP)** is to construct motorable farm roads

with construction machinery and operators of MOA with beneficiaries' contribution for unskilled labor force.

49. **Farm Mule Track Construction Program (FMTCP)** is to construct roads with sufficient capacity for power tillers. The construction will be done manually by the beneficiaries with materials and technical supervision provided by the government.
50. **Light-load Bridge Construction Program (LBCP)** is to construct either suspension or suspended bridge with sufficient capacity for power tillers. Unskilled labor will be provided by beneficiaries' contribution. Since the light-load bridge is a new concept of suspension bridge, a technical guideline titled "Light-load Bridge Guideline" was prepared in the course of the Study. Preliminary design of the proposed light-load bridges was carried out by engineers of MOA and DOR with intensive guidance by the Study Team during the Action Plan Stage.
51. **Construction Machinery Center Program (CMCP)** is; i) to procure construction machinery and equipment that are required for the implementation of FRCP, and ii) to strengthen Central Machinery Unit of MOA at Bumthang through training of staff on O&M and road construction. Construction machinery is proposed to apply "fleet method" (package of machinery) for efficient construction works. It was estimated that possible construction works for one fleet is about 10 km per year.
52. **Proposed Farm Roads and Farm Mule Track:** Identified 18 routes and 425 km were prioritized, screened and distributed to each program. Consequently, the following roads were proposed for the Master Plan period (2002 – 2012)

**Proposed Roads in Lhuntse**

Name of Gewog		Road	Approx. Length	Remarks
1	Menbi & Metsho	Takila to Ongar	42.8 km	Selected for FRCP* (14.0 HH per km**)
2	Tsenkhar	Phawan to Domkhar	10.6 km	Selected for FRCP (24.4 HH per km)
3	Tsenkhar	Autsho to Tsenkhar	23.0 km	Selected for FRCP (7.4 HH per km)
4	Tsenkhar	Budur to Wambur	7.3 km	Selected for FRCP (11.8 HH per km)
5	Khoma	District Road to Khoma	6.3 km	Selected for FMTCP***
6	Gangzur	Thimyul to Jangcholing	5.2 km	Selected for FRCP (11.3 HH per km)
7	Gangzur	Lingabee to Ney	9.5 km	Selected for FRCP (12.4 HH per km)
8	Jaray	Autsho to Ladrong	22.4 km	Selected for FMTCP***
Total			98.4 km	FRCP
			28.7 km	FMTCP

## Proposed Roads in Mongar

	Name of Gewog	Road	Approx. Length	Remarks
1	Dramtse	Bangengla to Narang	20.0 km	Selected for FRCP* from Bangengla to Narang (Dramtse, 22.0 HH** per km)
2	Mongar, Chali	Themnangbi to Chali	12.0 km	Selected for FRCP* from Themnangbi to Chali (23.8 HH per km)
3	Drepong	Gyelposhing to Lapsa	23.5 km	Selected for FRCP (11.3 HH per km)
4	Thangrong	Chaskhar to Thangrong	12.3 km	Selected for FRCP (27.6 HH per km)
5	Jurme & Kengkhar	Jurme to Kengkhar	34.6 km	Starting from planned feeder road to Nganglam. Selected for FMTCP***
6	Gongdue & Silambi	Kuri Chhu (nearby Gorthongla) to Nagor	50.8 km	Light-load bridge is required to cross Kuri Chhu. Starting from the Kuri Chhu River. Selected for FMTCP
7	Saleng	Kalapang to Resa	16.8 km	Selected for FRCP (11.3 HH per km)
	Total		84.6 km	FRCP
			85.4 km	FMTCP

Note: \*; Farm Road Construction Program.  
 \*\*; Anticipated household number in 10 years with a population growth rate of 2.5 % per year.  
 \*\*\*; Farm Mule Track Construction Program,

Location of the proposed roads is shown in the attached figures "Programs of the Master Plan" in page S-28 and S-29.

53. **Light-load Bridge Construction:** As for Light-load Bridge Construction Program (LBCP), three bridges were proposed as follows:
- Replacement of the existing suspended bridge to Khoma (L = 80 m),
  - Replacement of the existing suspension bridge at Autsho (L = 91 m),
  - New bridge at Gorthongla (beginning point of the proposed farm mule track to Gongdue) (L = 90 m)
54. **Construction Machinery and Equipment Required:** Number of fleets required for implementation of FRCP (183 km in total) was estimated at two (2) on the basis of the working capacity of a fleet (10 km per year). Supporting equipment and machinery for repair works are required beside 2 fleets of machinery and equipment.
55. **Operation and Maintenance (O&M)** of the farm roads will be conducted by Farm Road User Cooperative (FRUC) that would be organized prior to the implementation of the farm road. O&M would be conducted for; i) routine maintenance (200 men-days per year), ii) annual maintenance (100 men-days per year) and iii) periodical repair works (1 in 5 years) by means of construction machinery.
56. **Implementation Schedule:** The period of implementation is set for 10 years from 2003 to 2012 including pre-stage for preparation of the action plan, and survey / design. Implementation schedule is shown in the following page..

Implementation Schedule of RADP and FRDP											
Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	
<b>RADP</b>											
1) Program for food crop production increase	[Implementation stage]										
2) Program for cash crop production strengthening	[Implementation stage]										
3) Market system development program	[Implementation stage]										
4) Extension strengthening program	[Implementation stage]										
<b>FRDP</b>											
1) Farm road construction program	[Implementation stage]										
2) Farm mule track construction program	[Implementation stage]										
3) Light-load Bridge construction program	[Implementation stage]										
4) Construction machinery center program	[Implementation stage]										

: Preparation stage
  : Implementation stage

Note: Refer to Table 5.5.1, 5.5.2 and 5.5.3 of Chapter 5.

57. **Project Cost:** Cost required for implementation of the Master Plan was estimated on the basis of the following conditions.

- The cost includes initial investment cost for construction works, procurement cost of the construction machinery and improvement cost of facilities in RNR-RC-East, etc.
- Construction costs of farm road and mule track were estimated on the basis of unit standard cost per km conformed to the Farm Roads Guideline.
- Construction machinery for FRDP will be provided by CMU of MOA. The cost for the machinery includes costs of operation, maintenance and depreciation of the machinery

Required costs for RADP and FRDP are as follows:

- Regional Agricultural Development Plan (RADP): Nu. 168.7 million
- Farm Road Development Plan (FRDP): Nu. 1,053.9 million

Contribution of beneficiaries to the Farm Road Construction Program is estimated at 15.8 % of the total construction cost, while that to the Farm Mule Track Construction Program is 64.9 %.

58. **Project Justification:** Justification on RADP and FRDP was examined on the following aspects.

- Economic and financial aspect,
- Technical soundness and capacity of stakeholders,
- Social aspect,
- Demonstration, model and ripple effect, and
- Sustainability

59. **Economic and Financial Aspects:** As for economic and financial aspects,

i) economic viability, ii) capacity to pay of beneficiaries, iii) income increase, iv) consistency with 9<sup>th</sup> FYP, were examined as follows:

- Economic viability is low of EIRR 7.7 %, due to high construction cost under severe topographic conditions and sparsely distributed population.
- Average income from agricultural products (food and cash crops) per farm household will be increased by 147 % to 190 % by 2012 (5 % per annum), which almost meet the target of the plan (150 % - 200 % for each development stage)
- Beneficiaries' contribution for O&M cost (construction machinery for periodical repair) is three (3) % of the increased income, which is considered within acceptable range,
- National target on horticultural crop production is 300 % (Year 2012) as much as that at present. Nine (9) percent of the production in 2012 will be covered by Lhuntse and Mongar Dzongkhags as an outcome of RADP and FRDP.

60. **Technology and Capacity of Stakeholders** were examined on beneficiaries, Dzongkhag staff, Gewog, RNR-RC East, MOA, CMU, supporting corporations such as DSC, FCB, CA, BDFC, etc. and middlemen.

- Beneficiaries' capacity on farming technology, awareness on horticulture crop production and marketing, labor force, and supporting services will be available, strengthened or improved in the course of implementation of the Plan.
- Capacity of government sectors will also be available, strengthened and improved through various programs on strengthening and supporting of horticulture production, marketing, crop research and development, extension services, etc.
- According to the results of experimental implementation of a farm mule track at Khoma Gewog, Lhuntse, technical level of both skilled and unskilled labor arranged by Gewog itself was confirmed good enough.
- GYT is the decision making committee on development of Gewog. It functions well not only for implementation of new projects but also for O&M works. People follow the decision made at GYT.

61. **Social Impact:** Non-agricultural social impact by the implementation of the Plans are; i) improvement of access to social services in rural and remote areas, ii) activation of regional economy through rural access improvement, improved agricultural production, market activation, etc, iii) increase of skilled labor (farmers) in rural areas, iv) activation and strengthening of local communities through group activities on marketing, farming, O&M, credit, etc, v) deceleration of rural to urban migration, and vi) enhancing enrollment of women to social activities through improvement of rural access.

62. **Demonstration, Model and Ripple Effect:** Approaches, criteria, procedures and results taken in the course of the Study can be applied for other Dzongkhags of the Eastern Region. Outcome and results of the Plans, for instance, trained EAs, experience of Dzongkhags officials in implementation, and Gewog and beneficiaries'



---

participation will be utilized for the planning of next development step in the Study Area and other Dzongkhags in the Eastern Region.

63. ***Sustainability*** was justified in consideration of the following:

- Target of the RADP was set reasonably within conservative range, pursuing self-sufficiency and income increase of 5 % per annum,
- Participation of beneficiaries has been conducted with coordination of Gewog and Dzongkhags, and farmers are aware of necessity of their contribution to the development activities,
- The Plans were financially justified, namely, capacity to pay for sustainable development was confirmed,
- CMU which will manage construction machinery and equipment indispensable for implementation of FRDP, has been established and MOA has already allocated certain budget for operation and supporting facilities for CMU for sustainable development of the farm road construction.

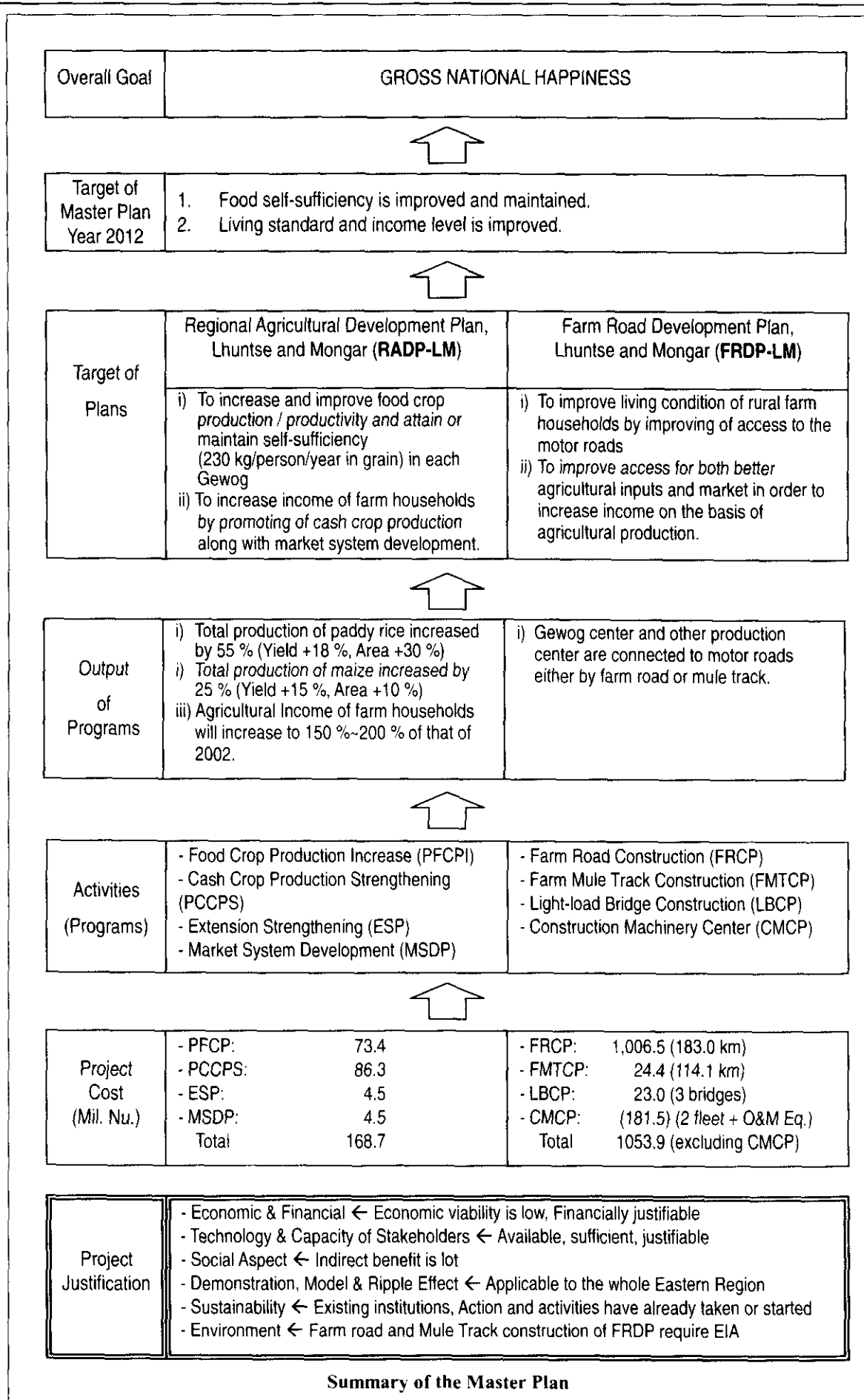
64. ***Confirmation of Beneficiaries' Intention:***

Farm household survey was conducted during the Action Plan period in order to confirm if concept, approach, and programs of the Master Plan are acceptable for the beneficiaries meeting their need. Interview survey was done in the priority Gewogs, namely, Gangzur, Drepong and Chaskhar. Number of samples was 40 for Drepong and Chaskhar, while 30 for Gangzur. The following things were confirmed:

- Most of the households will participate in construction works of farm road for labor contribution,
- Most of the households will participate in group activities on marketing such as joint assembling and shipping after completion of the farm roads,
- Many farmers in Mongar are interested in cultivation of cash crops, particularly vegetables (radish, cabbage, beans, etc) for increasing their income, while in Lhuntse, they want to increase income with paddy rice as well,
- Most of them feel "labor shortage" for farming practices, but ready to participate labor contribution during off-season from October to December in Mongar, while in Lhuntse in September and from December to February.

65. ***Initial Environmental Examination*** was conducted in accordance with the activities of the Plans. As a result, the Farm Road Construction Program and the Farm Mule Track Construction Program of FRDP were considered to bring significant impact to the environment, and environment impact assessment (EIA) is required prior to implementation of new road construction. For other programs and sub-programs of FRDP and RADP, no significant impact was confirmed in IEE.

Summary of the Master Plan, Project Design Matrix of RADP with FRDP, and location of programs are shown in the following pages.



**Summary of the Master Plan**

### Project Design Matrix (PDM)

Name of Development Plan: **RADP / FRDP**

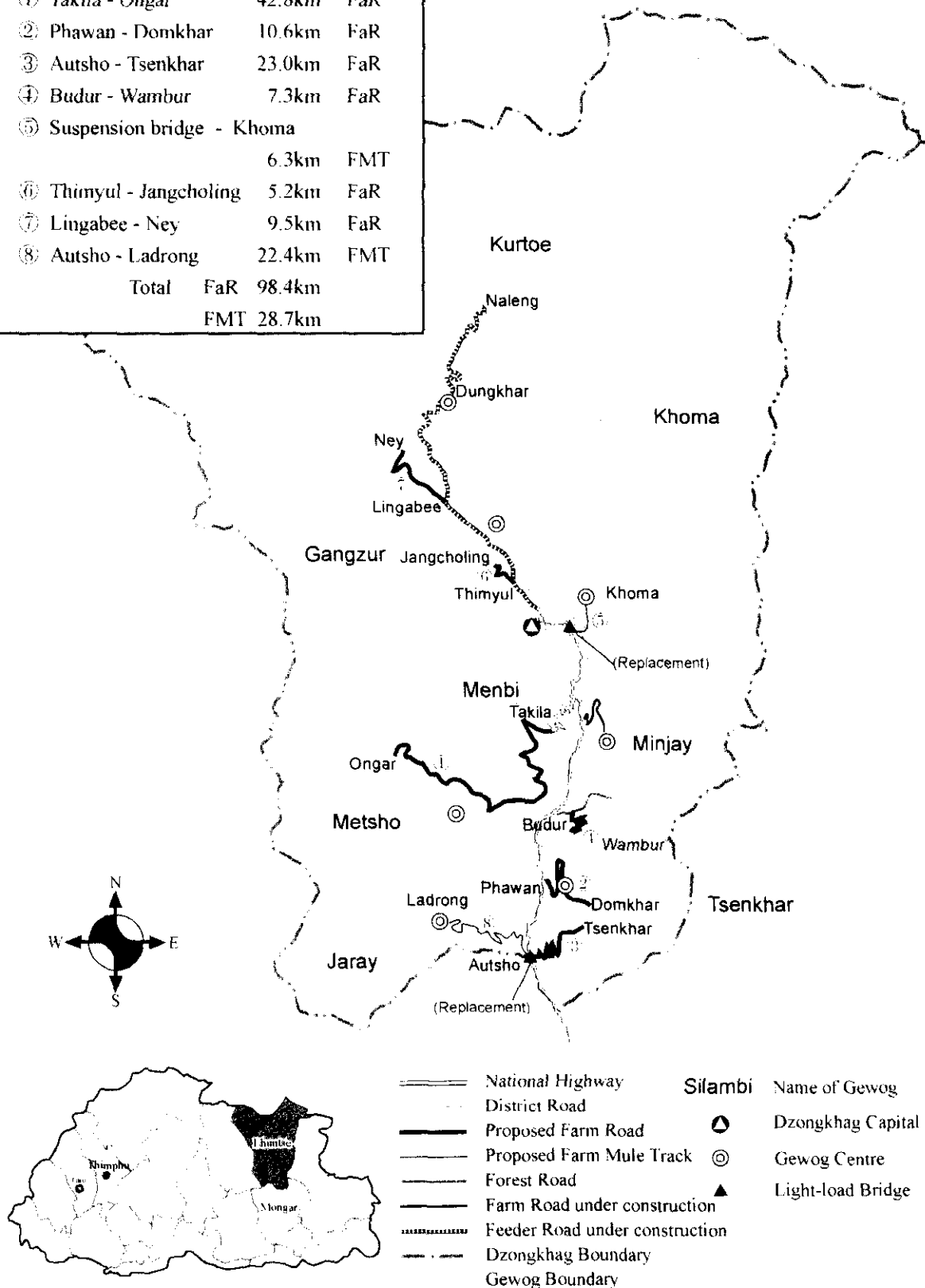
Period: **2003 - 2012**

Target Group: **Farmers in Lhuntse and Mongar Dzongkhag**

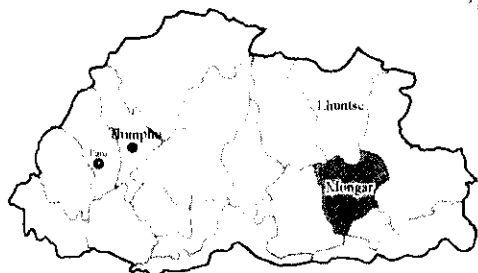
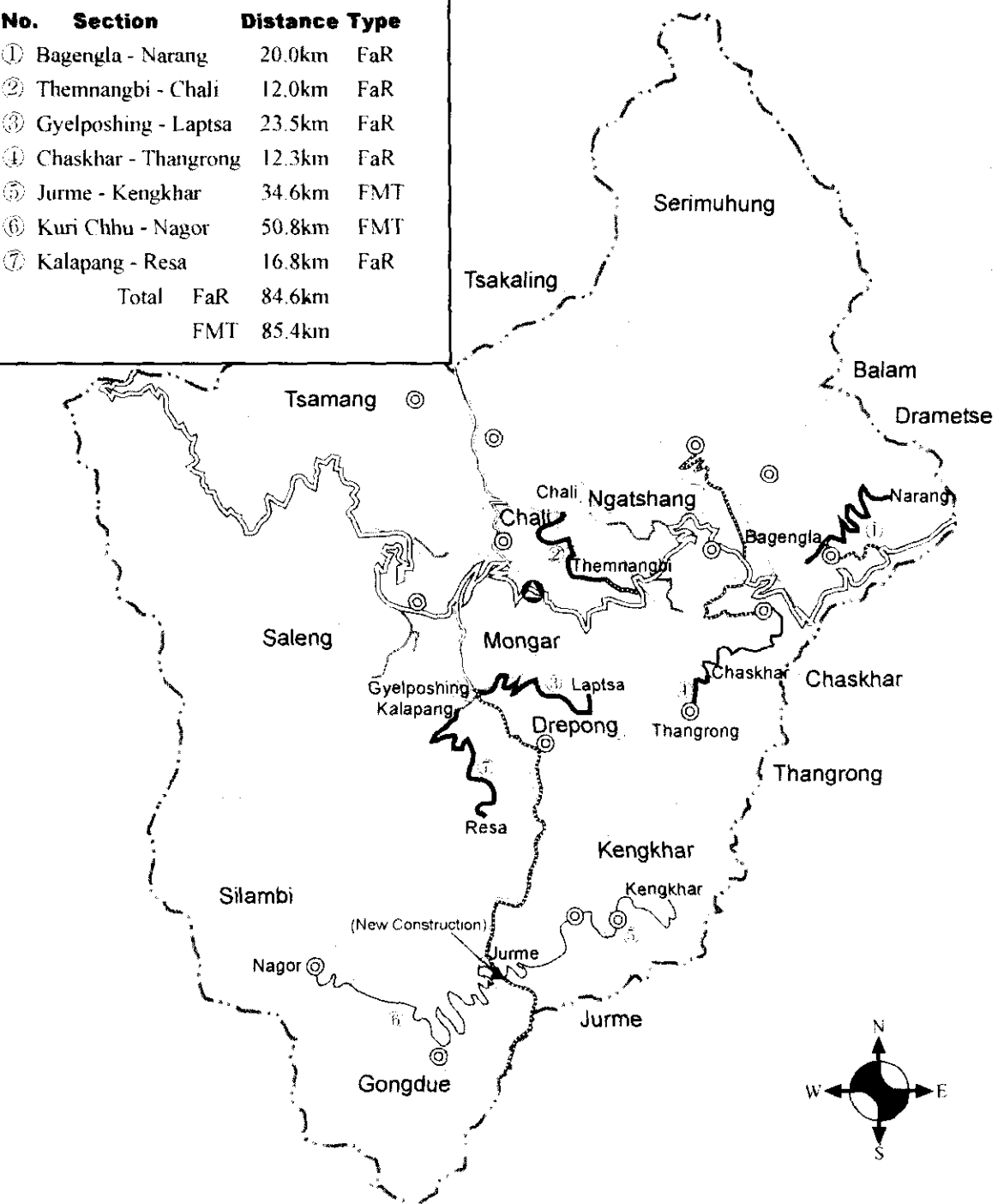
Date prepared: **Jul. 2002**

Project Summary	Verification Indicators	Means of Verification	Important Assumptions
<b>Super Goal</b> - Gross National Happiness	- Human Development Index (HDI): more than 0.6	HDI analysis	
<b>Overall Goal</b> - Attainment of food sufficiency - Improvement of living standard	- Self-sufficient rate of food in whole Gewogs: more than 100 % - Income increase to 200 % of present level	- Self-sufficient rate of food - Farm household economy survey	Economic and international situation do not change drastically
<b>Project Purpose</b> 1 Increase of food production 2 Increase of cash income	1 Grain consumed per capita: 230 kg 2- Agricultural income per household at 2012: 150 % of at 2002	1 Agriculture statistics and sample survey 2 Farm household economy survey	Serious natural disaster does not occur
<b>Outputs</b> 1.1 Proper use of agricultural land 1.2 Increase of production 1.3 Disseminated improved technology and varieties 2.1 Priority crops are selected to area-wised 2.2 Production increase of profitable / marketable cash crops 2.3 Increase of export of cash crop to India 2.4 Encouraged farmers group for marketing 3. Well maintained farm roads	1.1 Planted area increase in 2012: more than 115 % of present 1.2 Cereal Production at 2012: 130 % of present 1.3 Improvement ratio: > 75 % 2.1 Number of target crops: more than 5, and target crops for remote area are selected 2.2 Total production of fruits and vegetables in 2012: >19,000 ton 2.3 Export of cash crop products from the Study area in 2012: >14,000 ton 2.4 Participation rate of farmers to group marketing activity: >50 % 3. Passable period ratio of farm road: > 95 % Participation rate of beneficiaries: >75 %	1.1 & 1.2 Agricultural statistics 1.3 Field survey, Statistics 2.1 Research results of RNR-RC-East 2.2 Agricultural statistics 2.3 Trade statistics and FCB record 2.4 Survey on farmers groups 3. Operation and Maintenance records of farm road	Budget for the plan are allocated by the 9 <sup>th</sup> FYP and long term development plan
<b>Activities</b> 1. Food crops - Proper plan of land use - Strengthening of EA activity - Training of EAs 2. Cash crops - Market research and selection of target crops - Technical research - Training of EAs in RNR-RC-east - Field activity of EAs - Organizing and strengthening of farmers group 3. Maintenance of farm road by users group	<b>Inputs</b> 1. Farm road development 1.1 Farm road construction (11 routes, total length 183 km) 1.2 Farm mule track improvement (4 routes, total length 114 km) 1.3 Light load bridge construction (3 bridges) 1.4 Construction machinery center (machinery, training) 2. Strengthening of Cash Crop production 2.1 Experienced experts <ul style="list-style-type: none"> <li>• Long term (5 experts): cash crop development, fruit, vegetable, training/extension, and marketing</li> <li>• Short-term: plant protection, plant genetic resources / aromatic and medicinal plant, agricultural engineering, post-harvest, agro-processing, market research, and paddy rice</li> </ul> 2.2 Improvement of RNR-RC-East <ul style="list-style-type: none"> <li>- Laboratory and laboratory equipment</li> <li>- Greenhouse and research farm equipment</li> <li>- Training hall, dormitory and training equipment</li> </ul> 3. Construction of collection depots	Dzongkhag and MOA do not reduce assignment of manpower  <b>Preconditions</b> - National policy of development of agriculture and Lhuntse / Mongar dose not change.	

No.	Section	Distance	Type
①	Takila - Ongar	42.8km	FaR
②	Phawan - Domkhar	10.6km	FaR
③	Autsho - Tsenkhar	23.0km	FaR
④	Budur - Wambur	7.3km	FaR
⑤	Suspension bridge - Khoma	6.3km	FMT
⑥	Thimyul - Jangcholing	5.2km	FaR
⑦	Lingabee - Ney	9.5km	FaR
⑧	Autsho - Ladrong	22.4km	FMT
Total		FaR 98.4km	
		FMT 28.7km	



No.	Section	Distance	Type
①	Bagengla - Narang	20.0km	FaR
②	Themnangbi - Chali	12.0km	FaR
③	Gyelposhing - Laptsa	23.5km	FaR
④	Chaskhar - Thangrong	12.3km	FaR
⑤	Jurme - Kengkhar	34.6km	FMT
⑥	Kuri Chhu - Nagor	50.8km	FMT
⑦	Kalapang - Resa	16.8km	FaR
Total		FaR 84.6km	
		FMT 85.4km	



- National Highway
  - District Road
  - Proposed Farm Road
  - Proposed Farm Mule Track
  - Forest Road
  - Farm Road under construction
  - Feeder Road planned & under construction
  - Dzongkhag Boundary
  - Gewog Boundary
- Silambi** Name of Gewog
  - ▲ Dzongkhag Capital
  - ◎ Gewog Centre
  - ▲ Light-load Bridge

66 ***OJT and Experimental Implementation*** were carried out for; i) farm mule track construction at Khoma, ii) horticulture support (distribution of vegetable seed and piglet), and iii) small-scale pump irrigation at Fawan, Autsho (Lhuntse) and Kahu (Mongar). According to the results, the development approaches were justified and the following things were confirmed;

- Farm mule track will possibly be constructed at a rate of 5 km/year,
- Labor contribution by beneficiaries is highly applicable, even they feel that it is more comfortable to be paid,
- Construction works with labor contribution can be performed without women's labor contribution. Participants also consider that women's participation should be avoided,
- Skilled labor (blaster, mason, supervisor, etc.) can be recruited at Gewog level,
- At least two piglets can be reared by one household by household waste and byproducts,
- Farmers are quite eager to cultivate cash crops even their technical level is still low,
- More qualified and certified seeds are required (low germination rate),
- Total head of irrigation pump should be more than 40 m. Pump unit that can be driven by power tiller with belt might be a good alternative, and
- Farmers are familiar with engines, and engine pump can be maintained and operated by farmers.

## PART-2 THE ACTION PLAN

### VI INTRODUCTION

67. ***Objectives of the Action Plan*** are as follows:

- To acquaint stakeholders with details of the program / sub-program, such as target, activities, input, output, etc.
- To identify necessary actions that are prerequisite for achieving the targets,
- To understand responsibility and roles of each stakeholder on the above actions and schedule one another,
- To monitor and maintain implementation of the Action Plan, and
- To realize transparency of the process of the formulation and implementation.

68. ***Definition of Action Plan:*** The Action plan is a detailed plan consisting of; i) identification of stakeholders who should play certain roles in the implementation of proposed projects, ii) clarification of responsibility and role by stakeholder,

---

iii) identification of actions to be taken by stakeholder, iv) setting of time schedule for each action, and v) monitoring and coordination of each action.

69. **Guideline for Formulation of the Action Plan:** A comprehensive guideline for formulation of the Action Plan was prepared so that all the programs and sub-programs in Gewogs should be formulated by Gewog. The Action Plans of the priority Gewogs were also formulated jointly with stakeholders conformed to the guideline.

70. **Selection Criteria of Gewogs** for formulation of the Action Plan (A/P) were set as follows:

- One Gewog will be selected from each development stage which is introduced in Item No. 36 of this summary.
- Priority Gewogs should be situated close to the existing motor road,
- Special or predominant food crops of the priority Gewog for Stage-1 (food shortage) should be maize,
- The priority Gewog for Stage-3 (marketing and adding value) should be located closer to the export market, namely, Samdrup Jongkhar,
- At least one Gewog should be selected from Lhuntse and Mongar Dzongkhags

Accordingly, Drepong (Mongar) Gewog was selected for Stage-1, then Gangzur (Lhuntse) and Chaskhar (Mongar) were selected for Stage-2 and Stage-3, respectively. Since the farm mule track construction program and light-load bridge construction program were not included in the above priority Gewogs, Khoma Gewog of Lhuntse Dzongkhag was selected only for the two programs after making due discussions.

71. **Stakeholder:** Prior to formulation of the Action Plans, stakeholders by program / sub-program were identified as shown in the following page.

Responsibility of Stakeholders for Implementation of the Proposed Programs					
Plan / Program / Sub-program		Stakeholders			
		MOA	Dzong-khag	Gewog	Beneficiaries
<b>REGIONAL AGRICULTURE DEVELOPMENT PLAN (RADP)</b>					
<b>P1: Program for Food Crop Production Increase</b>					
P1-SP1	Food Security SP		⊙		
P1-SP2	Paddy-rice Production SP		⊙		
P1-SP3	Irrigation Development SP		△	⊙	○
P1-SP4	Backyard Animal Husbandry SP		⊙	○	○
P1-SP5	Post-harvest Technology Training SP		⊙		○
<b>P2: Program for Cash Crop Production Strengthening</b>					
P2-SP1	Market Research SP	⊙	○		
P2-SP2	Technical Research and Development SP	⊙	○		
P2-SP3	Training of Extension Agent SP	⊙	○		
P2-SP4	Agro-processing Technology Training SP	⊙			○
<b>P3: Market System Development Program</b>					
P3-SP1	Collection Depot Construction SP		○	⊙	○
P3-SP2	Group Assembling SP		△	⊙	○
P3-SP3	Group Assembling and Marketing SP		△	⊙	○
P3-SP4	Marketing Support SP by FCB	⊙	△		
<b>P4: Extension Strengthening Program</b>					
P4-SP1	Extension Strengthening for Food Crop SP	△	○	⊙	○
P4-SP2	Extension Strengthening for Cash Crop SP	△	○	⊙	○
<b>FARM ROAD DEVELOPMENT PLAN (FRDP)</b>					
<b>P1: Farm Road Construction Program</b>		○	⊙	○	○
<b>P2: Farm Mule Track Construction Program</b>			○	⊙	○
<b>P3: Light-load Bridge Construction Program</b>		○	⊙	○	○
<b>P4: Construction Machinery Center Program</b>		⊙			

Note: ⊙:Mainly responsible, ○:Responsible, △: Support

## VII GENERAL ROLES AND RESPONSIBILITY BY ADMINISTRATION

72. *Roles and Responsibility of RGOB* in general are as follows:

- Implementation of projects covering several Dzongkhags,
- Technical support to Dzongkhag and lower administration level,
- Research and training,
- Financial arrangement, and
- Inter-ministerial coordination

73. *DYT Chathrim (Act) 2002* defines structure, roles, responsibilities and power of DYT, Dzongkhag administration, tender committee, etc. DYT is the sole institution for decision-making on the development activities in Dzongkhag, either on planning, designing, or implementation. DYT consists of the following members:

- Chairperson who shall be elected by ballot among the members,
- Chimis, Gups, Mangmis, and one representative from municipalities and towns as voting members,



- Dzongrab as non-voting secretary, and
- Observers (officials of each sector, representative of related agencies, etc.)

74. ***Dzongkhag Plan:***

Dzongkhag programs will constitute development activities that have relevance to the Dzongkhag as a whole but are not necessarily applicable to a specific Gewog. The Dzongkhag Plan to a large extent includes programs geared towards institutional strengthening and capacity development of their sectoral human resources. Dzongkhag programs also includes coordination, supervision and quality control services for Gewogs and intra-Gewog activities along with technical backstopping support, which shall be executed and implemented by the Dzongkhag either independently or jointly with the sectors in the center. Since most of the RNR activities are implemented in Gewogs, the Dzongkhag RNR programs consist of providing coordination for intra-Gewog activities and technical backstopping support to the Gewogs.

75. ***Roles and Responsibility of Dzongkhag:***

Dzongkhag Administration carries out the decisions approved by DYT and performs roles and responsibilities directly related to the projects as follows:

- Accord technical sanctions for works up to Nu. 20 million,
- Award works or procurement order through Dzongkhag tender committee,
- Construct farm and feeder roads within Dzongkhag,
- Recruit and appoint all sectoral staff in the Dzongkhag,
- Prepare human resources development plan of the Dzongkhag,
- Promote crop varieties and breeds of livestock,
- Develop and implement strategies for marketing outlets for local agricultural products,
- Register co-operatives in accordance to the Co-operative Act 2001.

76. ***GYT Chathrim (Act) 2002*** defines structure, roles, responsibilities and power of GYT, Gewog, tender committee, etc. GYT is the sole institution for decision-making on the development activities in Dzongkhag, either on planning, designing, or implementation. GYT consists of Gup (as chairperson), Mangmi, and Tshokpa (chief of village cluster).

77. ***Gewog Plan:***

Gewog Plan mostly consists of social and rural infrastructure development. Farm roads, out reach clinics, primary schools and rural water supply schemes along with RNR programs are some of the major activities. Gewogs should prioritize their activities based on their ability to participate in terms of labor contribution and responsibility pertaining to land acquisition and resolution of disputes, etc. Since

Gewog Plan has not been included in Dzongkhag Plans, Gewog will be fully responsible for their activities.

78. ***Roles and Responsibility of Gewog:***

Gewog or GYT itself carries out the decisions approved by GYT and performs roles and responsibilities directly related to the projects as follows:

- Allocation of irrigation water in accordance with the Land Act,
- Setting-up of cooperatives,
- Identification, prioritization and formulation of activities for the Gewog Plan, for which the technical backstopping and advisory services must be provided by the sector staff of Dzongkhag Administration,
- Administration, monitoring and review of all activities that are part of Gewog's plans,
- Recruitment of manpower for activities in the Gewog, and
- Re-appreciation of Gewog plan budget and application

## **VIII THE ACTION PLAN BY PROGRAM**

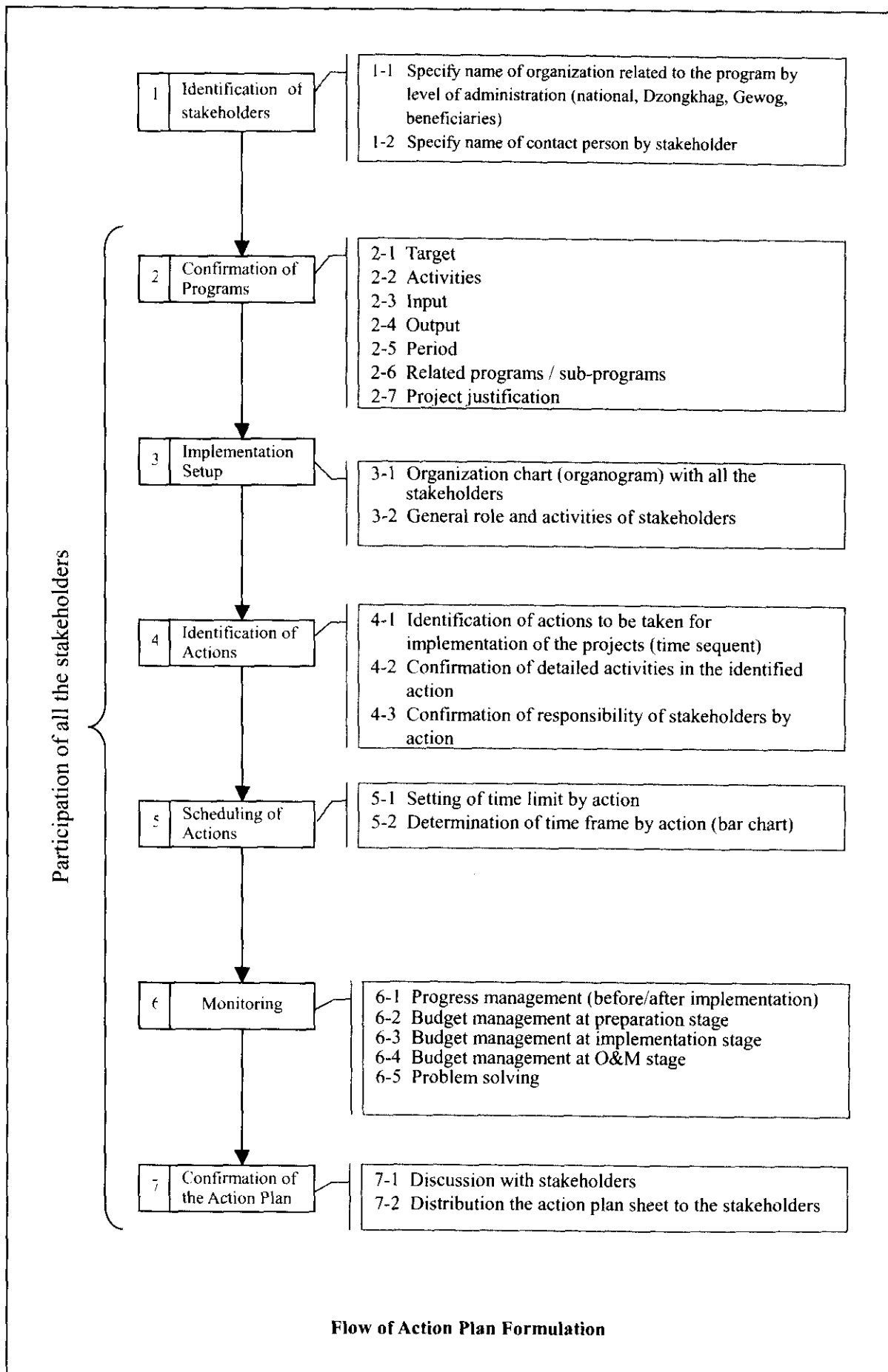
79. ***Action Plan Sheet:***

In order to make the formulation process of the Action Plans transparent, and to enable easy and comprehensive modification, "Action Plan Sheet" was prepared. The sheet was prepared conformed to the formulation procedure as shown in the following page.

80. ***Target Setting of Food Crop Production:***

Prospective production in the target year (2012) was set up through the following examinations:

- Expansion of planted area within the existing fallow lands by increasing of labor force in accordance with the population growth, irrigation development for paddy, and cultivation of winter crops after harvesting of summer crops, and
- Yield increase by utilization of improved HYVs, dissemination of improved crop management technique, and irrigation development



Target yield for the food crops were set as shown below, taking due consideration of results of crop cut, field observation and discussions with related officials (DAOs, RNR-RC).

- Paddy: 118 % of present level (present: 2.2 ton/ha → 2.6 ton/ha)
- Maize: 115 % of present level (present: 2.0 ton/ha → 2.3 ton/ha)
- Other cereals\*: 115 % of present level (present: 1.0 ton/ha → 1.15 ton/ha)

Note \*: Wheat, barley, millet and buckwheat

Food security was considered to fulfill self-sufficiency of food grain of 200 to 230 kg per capita per year catching up with the population growth rate of 2.5 % per year or 128 % at the target year.

#### 81. **Target Setting of Cash Crop Production:**

In the Study Area, horticultural crops listed in the following table were considered as priority crops.

<b>Priority Cash Crops</b>	
Cash crop	Characteristics of cash crop, and market potential
<b>Vegetables</b>	As highland or off-season crops, there should be certain advantage in the market, if the quality of the products is fairly improved.
Potato	The most popular vegetable in the Study Area and suitable for agro-ecological condition; presently exported to India through Samdrup Jongkhar; relatively high quality; high transportation cost.
Chili	The most popular vegetable in local market; small quantity as dried chili; high quality; necessity of market development.
Radish, Cabbage, Vegetable bean, Pumpkin, Turnip, Asparagus	Popular vegetables in local market; difficulty in transportation and maintenance of freshness for marketing; necessity of market research on shipping season.
Onion, Carrot	Suitable crops for agro-ecological conditions (temperate); presently imported from India; high market price; potential crop in the future.
<b>Fruits/Nuts</b>	
Mandarin orange	The most popular fruit in the Study Area, being exported to India and Bangladesh through Samdrup Jongkhar; comparatively high quality but requires improvement for higher quality and crop management; high transportation cost.
Mango	Popular fruits in humid sub-tropical zone; harvest season in the Area follows to that in India; a potential crop but little is being exported; low quality and small quantity of products.
Walnut	A popular nut in the Study Area; local variety (hard shell) dominant;
Apple	A major fruit in Western region of Bhutan; still low quality and small quantity in Eastern region, a potential crop for export to India in Warm Temperate Zone (1,800 m – 2,600 m in altitude).
Plum, Pear, Peach	Popular fruits in local market; low quality; difficulty in transportation and keep freshness; necessity of market research and quality improvement.
Persimmon	Mostly local variety (low quality); RNR-RC is tackling to improve variety as a potential crop for export to India.
<b>Seed beans/Peas</b>	Beans and peas such as soybean and Rajma bean lens pea will be potential crop in the future; with advantage of low transportation cost to the product value; more land is required for the production; presently little quantity is being shipped from Lhuntse; necessity of market research.

Cash crop	Characteristics of cash crop, and market potential
<b>Other crops</b>	
Lemon grass oil	An important commodity in the Study Area (collection of wild grass and distillation of essential oil) for getting cash income;
Medicinal plants	Growing many kinds of medicinal plants; cultivating some kinds of plants such as Artemesia.
Lac	A famous dyestuff in the Study Area (secretion of insect)
Pine resin	Collecting resin from natural pine tree.
Ginger	Producing for local market
Cardamom	Trial production in small area; necessity of market research.

Target setting of cash crop production was undertaken with due consideration of land resources, present yield, and capacity of transportation of farm household as the most dominating factor. The following parameters were estimated for the target setting:

- Marketable volume of cash crop per household was estimated at 2.0 to 2.5 tons per year,
- Yield of vegetables will increase by 20 % by the target year, and
- Yield of fruits per tree will increase by 60 % by the target year

Consequently, cash income increase with the crops of vegetables and fruits is expected approximately ranging from Nu. 5,000 to Nu. 8,000 per household.

#### 82. **Target Setting of Backyard Animals:**

Target setting of backyard animal husbandry was examined based on the following assumption taking into account current conditions:

- 60 % of households rear two pigs on the average,
- 80 to 85 % of households rear seven chickens on the average, and
- Productivity (number of piglet bred, number of eggs) will be improved by 30 to 60 %.

Consequently, income (production value) per household will be increased to Nu. 9,000 per household, which is 170 % to 290 % of present level.

#### 83. **Food Security Sub-program: (Action Plan Sheet AP-I)**

Action Plan of this sub-program was formulated with the target of food grain, namely 200 to 230 kg per capita per year at Dzongkhag level. Responsible institution on the sub-program is each Dzongkhag. The following activities will be carried out till 2012, the target year:

- Training of extension agents on improved food crop management, improvement of extension system (demonstration plot, farmers field school), preparation of food production plan for Gewog, and survey of present situation and development potential of food crops,
- Preparation of cereal production plan,

- Preparation of production support plan (extension and input supply),
- Preparation of crop management manual for extension agent and farmers,
- Support to establishment of Food Crop Working Group in each Gewog,

84. ***Paddy-rice Production Sub-program: (Action Plan Sheet AP-2)***

Concept of this sub-program is to maximize paddy rice production within the target of the Food Security Sub-program so that increasing demand for paddy rice be satisfied. The present paddy rice production will be increased at least to catch up with the population growth (2.5 % per annum or 128 % in 2012). This sub-program is handled by each Dzongkhag. The following activities will be done:

- Training of extension agents on improvement of paddy cultivation,
- Survey of yield of present and potential, potential of wet land / irrigation development, and
- Preparation of production plan and production support plan (extension & input distribution).

85. ***Irrigation Development Sub-program: (Action Plan Sheet AP-3, 4)***

This sub-program is for new construction or rehabilitation of irrigation facilities for paddy rice cultivation. Physical construction works and strengthening or formation of WUA are main activities. The Action Plan was prepared conformed to the existing manual titled National Irrigation Procedural Manual (Irrigation Module). Gewog will be the responsible stakeholder.

86. ***Backyard Animal Husbandry Sub-program: (Action Plan Sheet AP-5)***

This sub-program covers both planning at Dzongkhag level and implementation at field level. Dzongkhag will formulate production plan of backyard animals (pig, chicken) and also support formulation of Gewog production plans through EAs. Dzongkhag will take the main responsibility. Activities of this sub-program are as follows:

- Training of extension agent on backyard animal husbandry,
- Distribution of improved piglet and chick by Piggery and Poultry Breeding Center (PPBC) in Lingmithang, Mongar,
- Strengthening of livestock extension service through implementation of demonstration farm, farmers field school (FFS) and farmers study tour (FST),
- Encouragement of breeder farmers and breeder farmers group,
- Establishment of livestock working group in each Gewog aiming at strengthening of administration function of Gewog, and assistance and coordination of EA's activities.

The training of EA should be managed by DAHO with support of PPBC and RNR-RC.

87. ***Post-harvest Technology Training Sub-program: (Action Plan Sheet AP-6)***

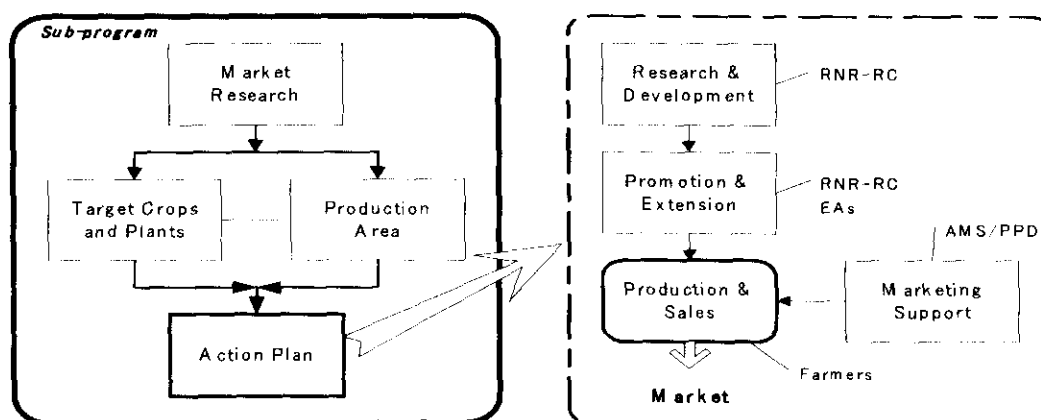
The objectives of the Sub-program are to reduce the post-harvest losses of grains and to support food self-sufficiency of farmers through introduction of technical extension program. The following activities will be conducted in the sub-program:

- Formulation of the training guideline for post-harvest technology on grains by the Post -Harvest Unit (PHU), and
- Training to EAs by DAO of each Dzongkhag in collaboration with the staffs of PHU and RNR-RC.

Dzongkhag will take responsibility on the sub-program.

88. ***Market Research Sub-program: (Action Plan Sheet AP-7)***

The objective of the Sub-program is to nominate or select promising cash crops from viewpoint of marketing. RNR-RC East (Wengkhar) will take responsibility on this sub-program in collaboration with AMS/PPD of MOA, FCB and Dzongkhags. Concept of the sub-program is given below:



89. ***Technical Research and Development Sub-program: (Action Plan Sheet AP-8)***

This sub-program aims at strengthening of research and development of horticulture crop in RNR-RC East for promotion of cash crop production in the Study Area. Technology and knowledge developed in RNR-RC would be disseminated into the Study Area through field activities of EAs.

The research activities cover fruits / nuts, vegetables, and medicinal / aromatic / spice plants and consist of the followings.

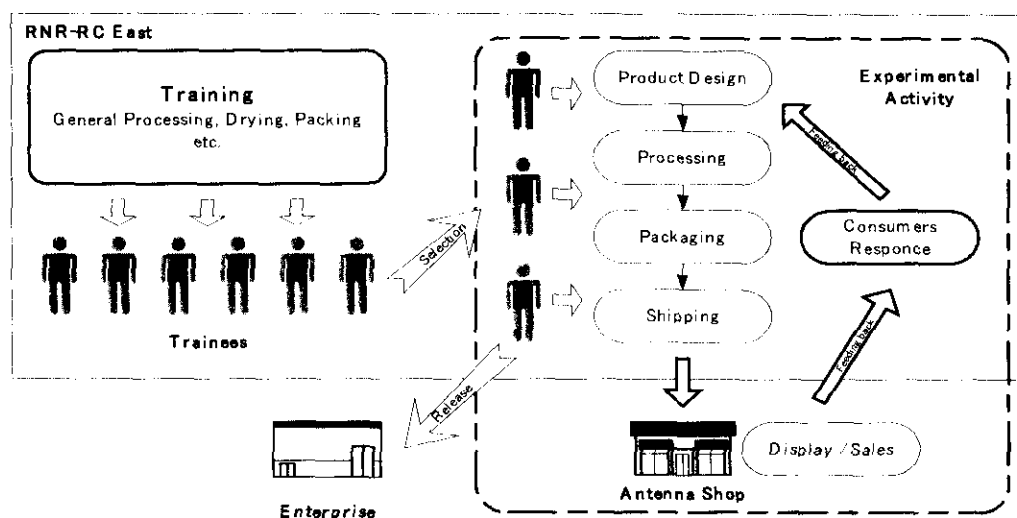
- Introduction of new varieties of fruit and vegetables,
- Development and propagation of technology,
- Variety improvement,
- Establishment of farming technology, and
- Potential survey and development of cultivation technology of medicinal, aromatic, and spice plants.

90. **Training of Extension Agent Sub-program: (Action Plan Sheet AP-9)**

Training of EAs will be carried out intensively at RNR-RC East, Wengkhhar. Trainees group will be organized with around five EAs for long-term training course. They will receive on-the-job training in the course of research and development activities of RNR-RC East. Another trainees' group will participate to the long-term training course every year. All EAs in the Study Area (24 agriculture EAs) will finally participate in the long-term training course during the total training period of six years.

91. **Agro-processing Technology Training Sub-program: (Action Plan Sheet AP-10)**

The objective of the Sub-program is to generate and increase opportunity of inhabitants especially women to participate in the agro-processing activities and realize income increase. The concept of the sub-program and interrelation of stakeholders are given below:



92. **Market System Development Program: (Action Plan Sheet AP-11, 12)**

The objective of four sub-programs is to expand marketing capacity of farmers through group activities and ensure the income increase with the “Program for Cash Crop Production Strengthening”.

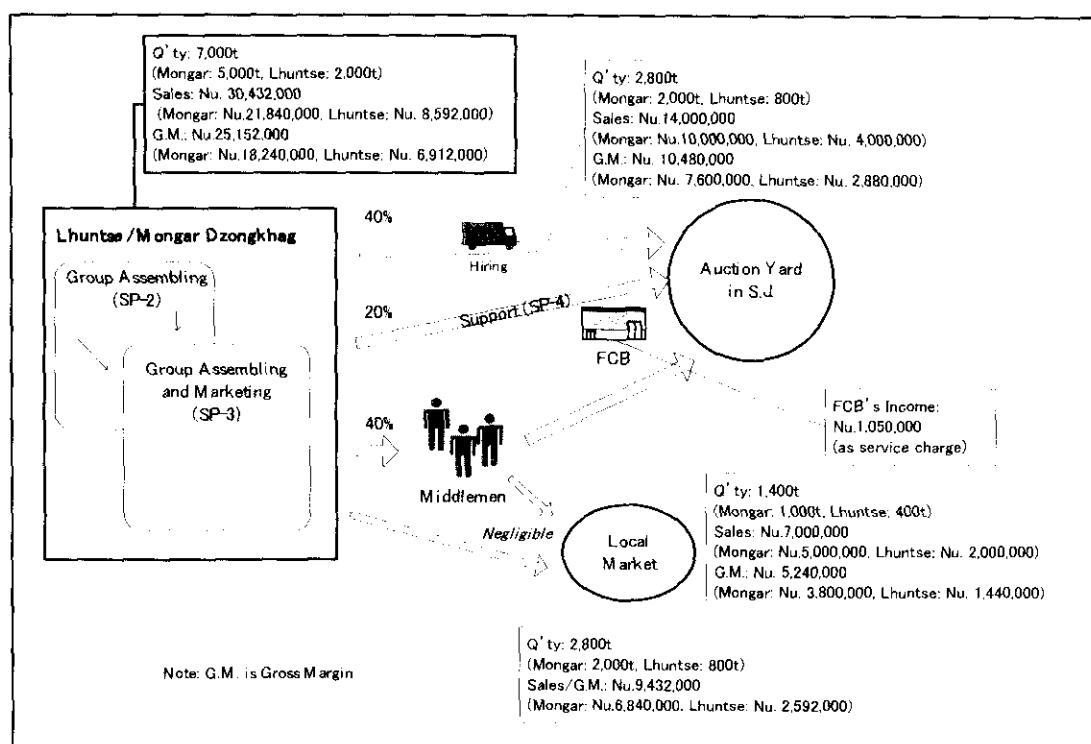
Linkage between the activities of four Sub-programs is shown in the following table.

**Linkage of Sub-programs**

Code	Name of Sub-program	Linkage of Activity
SP1	Collection Depot Construction	Provision of collection depot where farmers group activities promoted by SP2 and SP3 will be realized.
SP2	Group Assembling	Provision of group assembling and sales activity among farmers using collection depot constructed by SP1.
SP3	Group Assembling and Marketing	Provision of more sophisticated and profitable activity based on activity by SP2.
SP4	Marketing Support by FCB	Provision of support service by collection, transportation and sales at auction yard in Samdrup Jongkhar for the farmers group activity above.



Concept of the Program is given below:



93. **Extension Strengthening Program: (Action Plan Sheet AP-13, 14)**

This program aims to strengthen and improve extension system through training of EAs for food security and income increase of farmers through cash crop production increase and marketing. The following activities will be undertaken:

- Formation of working group in association with GYT,
- Potential survey of food crop,
- Preparation of food production plan and the production support plan,
- Demonstration plot,
- Farmers Field School (FFS),
- Farmers Study Tour (FST),
- Group purchase of inputs, and
- Seed multiplication at field level

This program will be handled by Dzongkhag. Major activities will be performed by DAO and EAs.

94. **Farm Road Construction Program: (Action Plan Sheet AP-15)**

This sub-program is for construction of farm roads. Physical construction works and formation and strengthening of Farm Road User Cooperative are main components. The Action Plan was prepared conformed to the existing manual titled Farm Roads Construction Procedural Manual (Farm Road Module). Dzongkhag or Gewog will be the responsible stakeholder. MOA (CMU) will provide construction machinery,

while Gewog will arrange labor both skilled and unskilled. Construction works will be performed with beneficiaries' participation with average construction speed of 10 km per year.

95. ***Farm Mule Track Construction Program: (Action Plan Sheet AP-16)***

Farm mule track will be constructed without heavy construction machinery. Construction is undertaken with hand tools and explosives if required. Dzongkhag or Gewog will be the implementation agency. Gewog will manage labor force. According to the experimental implementation conducted in the Study, proposed progress of the construction will be 5 km/year on the average. Dzongkhag will also apply for environmental clearance to NEC.

96. ***Light-load Bridge Construction Program: (Action Plan Sheet AP-17)***

Light-load bridge is a bridge that has capacity for power tiller with cart truck. The construction will be managed by Dzongkhag engineering section. A design guideline for light-load bridge is being prepared as an appendix of the Guideline for Formulation of Action Plans. Since there is no bridge engineer in MOA it is required to incubate bridge engineer in MOA through inter-ministerial personnel exchange and training between DOR/MOC and DRDS/MOA.

97. ***Construction Machinery Center Program: (Action Plan Sheet AP-18)***

This program will be handled by MOA/CMU. The program consists of procurement of construction machinery at CMU (Bumthang), and training of operators and mechanics. MOA will construct a workshop and take necessary arrangement for procurement.

## **IX CONCLUSION AND RECOMMENDATION**

98. ***Conclusion***

- The Master Plan consisting of two development plans, namely, the Regional Agricultural Development Plan, Lhuntse and Mongar (RADP-LM) and Farm Road Development Plan, Lhuntse and Mongar (FRDP-LM) were justified even with low economic viability, taking into consideration of the targets; i) self-sufficient food production in the Study Area, and ii) living standard and income improvement of farmers in the Study Area, both of which can not be evaluated with economic viability only. The project will bring various social effects such as; i) deceleration of rural-to-urban migration, ii) provision of model approaches for rural development in other areas, iii) increase of opportunities of getting cash income for rural households, and

---

iv) environmental conservation through well-balanced farming system of high productivity.

- Some of the components and approaches of the Master Plan were experimentally implemented in the course of the Study. It was confirmed that i) labor contribution by beneficiaries, ii) group activities, iii) strengthening of market-oriented cash crop production are applicable in the Study Area.
- The existing institution related to development activities, namely, DYT (District Development Committee) and GYT (Gewog Development Committee), Dzongkhag Administration have sufficient capacity or good potential to promote or implement development projects with guidance of Dzongkhag Administration and/or line agencies of RGOB.
- Guideline for Formulation of Action Plans was prepared attached with the Action Plans of Priority Gewogs and Design Guideline of Light-load Bridge. The Action Plan was formulated with a format named “Action Plan Sheet”.
- Action Plans of priority Gewogs for 15 sub-programs under RADP-LM and four programs under FRDP-LM were formulated jointly with related stakeholders, who agreed with their own roles and responsibilities in each program / sub-program.

99. **Recommendation**

- Considering the Master Plan Period (2002/03 ~ 2011/2012) and high viability and impact of the project, early implementation of the project is recommended in accordance with the Action Plans. The Master Plan and Action Plan were formulated involving the beneficiaries and other stakeholders who have understood their responsibilities and roles for implementation of the project and are ready for taking the actions. It is strongly recommended that RGOB should arrange necessary budget for the implementation either by the own resources or by the external resources, then accelerate implementation of the project from the beginning of the 9<sup>th</sup> Five Year Plan. Financial request for some components of the Master Plan have been already made. Follow-up and monitoring of the financial arrangement should be undertaken properly.
- The feeder road from Gyelposhing to Nganglam (Mongar) and the road bridge of Tangmachu (Lhuntse) are planned to be constructed or reconstructed by DOR. Construction of these road and bridge should be implemented earlier because some of the proposed farm mule tracks will start from the feeder road itself, and the bridge will provide sufficient capacity for construction machinery and equipment to pass through.

- The project will be implemented through “participatory approach”. Labor contribution by the beneficiaries is the prerequisite and conditionality for the implementation. However, taking special situation of Bhutan, namely, labor shortage and heavy work load of farmers mainly due to the poor access, magnitude of labor contribution should be decided by the beneficiaries or GYT themselves. Construction period should be modified flexibly according to the availability of labor force. The labor contribution by women and the weak should be carefully introduced so that the project implementation should not increase their burden upon them. Reduction of work load through mechanization and/or application of sharing of household and on-farm works should also be introduced positively.
- The Action Plan formulated in the Study should be authorized and kept by each stakeholder for further step of the programs and sub-programs. The Action Plans should be monitored and modified all the time in accordance with changes of situation on the program / sub-programs. Each stakeholder should pay due attention on the status of the program / sub-programs and make necessary modification for smooth implementation.
- Procurement of construction machinery and equipment is the prerequisite for implementation of the Farm Road Development Plan or Farm Road Construction Program. Mandate of farm road construction has been transferred from DOR to MOA, but MOA does not have enough construction machinery and equipment for the farm road construction. Taking into consideration importance of the machinery and labor shortage condition of Bhutan, especially in the rural areas, it is strongly recommended to procure the construction machinery and equipment as soon as possible to realize smooth commencement of the project.
- In this Study, only three Gewogs (out of 24 Gewogs) were selected for formulation of the Action Plan. It is recommended to formulate the Action Plans for the remaining Gewogs with full use of the Guideline for Formulation of Action Plans and experience of Dzongkhag and the priority Gewogs.
- The programs and sub-programs of the Master Plan will be able to be implemented separately or independently by using different resources. However, it is recommended to allocate one implementation setup (project management) to make overall management of RADP-LM and FRDP-LM.
- Off-farm income of the farm households occupies half of the total income on the average. Although the Master Plan was formulated on the agriculture and farm road development aiming at increase of agriculture income of the rural

households, development for enhancement of off-farm income should also be considered. Some of the off-farm income will be increased through access improvement by the project, but specific activities to enhance the off-farm income itself should be considered. Rural electrification, health care, and rural water supply will significantly improve the rural living condition along with farm road development. Primary and secondary education will be a long-term and fundamental necessity for supporting capacity building of rural households. Development components beside agriculture and farm road construction should also be promoted in an integrated manner.



**THE STUDY  
ON  
AGRICULTURE AND FARM ROAD DEVELOPMENT  
IN  
THE LHUNTSE AND MONGAR DISTRICTS  
IN  
THE KINGDOM OF BHUTAN**

**VOLUME I MAIN REPORT**

**Table of Contents**

Location Map	
Photographs of Present Conditions of the Study Area and Activities of the Study	
Summary	<u>Page</u>
Chapter 1 INTRODUCTION .....	1-1
1.1 Authority .....	1-1
1.2 Study Area .....	1-1
1.3 Objectives of the Study .....	1-1
1.4 Scope of the Study .....	1-2
1.5 Steering Committee .....	1-2
1.6 Technology Transfer and Participatory Approaches .....	1-3
1.7 Work Done .....	1-4

**PART-1 THE MASTER PLAN**

Chapter 2 BACKGROUND .....	2-1
2.1 Five-Year Plans .....	2-1
2.1.1 Development Philosophy of Bhutan .....	2-1
2.1.2 Review of the Eighth Five-Year Plan .....	2-1
2.1.3 The Ninth Five-Year Plan at National Level .....	2-1
2.1.4 The Ninth Five-Year Plan at Dzongkhag Level .....	2-2
2.2 Development Strategy of Renewable Natural Resources Sector .....	2-4
2.2.1 Basic Development Policy of RNR Sector .....	2-4
2.2.2 Objectives of the Ninth Five-Year Plan .....	2-5
2.3 Governmental Organizations Related to the Study .....	2-8
2.3.1 Ministries .....	2-8
2.3.2 Dzongkhag .....	2-8
2.4 Related Projects and Programs in the Study Area .....	2-9

2.4.1	Agricultural Development .....	2-9
2.4.2	Road Development.....	2-11
Chapter 3	THE STUDY AREA .....	3-1
3.1	Location and Administration.....	3-1
3.1.1	Location and Administration.....	3-1
3.1.2	Demography.....	3-1
3.2	Natural Conditions .....	3-2
3.2.1	Topography .....	3-2
3.2.2	Climate.....	3-3
3.2.3	Water Resources.....	3-4
3.2.4	Soils.....	3-4
3.3	Agriculture .....	3-5
3.3.1	Land Use .....	3-5
3.3.2	Land Tenure and Land Holding .....	3-6
3.3.3	Agricultural Labor Force .....	3-6
3.3.4	Food Crops.....	3-7
3.3.5	Horticulture Crops .....	3-7
3.3.6	Livestock.....	3-8
3.3.7	Cropping System and Farming Practices.....	3-8
3.3.8	Farm Household's Economy.....	3-9
3.3.9	Food Balance .....	3-10
3.4	Roads.....	3-11
3.4.1	Definition of Roads.....	3-11
3.4.2	Existing Road Network .....	3-12
3.4.3	Machinery for Road Construction .....	3-14
3.5	Other Agricultural Infrastructures .....	3-15
3.5.1	Irrigation .....	3-15
3.5.2	Other Infrastructures .....	3-16
3.6	Agriculture Support Services.....	3-17
3.6.1	Agricultural Extension Services .....	3-17
3.6.2	Agricultural Research .....	3-18
3.6.3	Agricultural Input Supply .....	3-18
3.6.4	Rural Credit Services .....	3-19
3.7	Marketing and Agro-processing.....	3-20
3.7.1	Marketing.....	3-20
3.7.2	Agro-Processing.....	3-23
3.8	Rural Society.....	3-24
3.8.1	Living Condition of Farmers in the Study Area.....	3-24



3.8.2	Rural Community and Community Groups .....	3-26
3.8.3	Poverty and Vulnerable Groups .....	3-26
3.8.4	Institution for Rural Development .....	3-26
3.8.5	Farmers' Needs and Awareness .....	3-27
3.8.6	Profile of Farm Household .....	3-28
3.8.7	Gender .....	3-31
3.9	Natural Environment .....	3-32
3.9.1	Protected Area and Endangered Species .....	3-32
3.9.2	Activities on Environmental Conservation .....	3-32
Chapter 4	DEVELOPMENT CONSTRAINTS AND POTENTIAL .....	4-1
4.1	Zoning of the Study Area .....	4-1
4.1.1	Concept and Approach .....	4-1
4.1.2	Development Stage .....	4-1
4.1.3	Zoning Criteria .....	4-1
4.2	Problems by Zone .....	4-4
4.3	Development Potential and Approaches by Zone .....	4-5
4.3.1	General Development Potential of the Study Area .....	4-5
4.3.2	Development Potential and Approaches by Zone .....	4-6
4.4	Development Constraints by Zone .....	4-7
4.4.1	General Development Constraints of the Study Area .....	4-7
4.4.2	Development Constraints by Zone .....	4-8
Chapter 5	THE MASTER PLAN .....	5-1
5.1	Development Approaches Identified at Problem Analysis Workshop .....	5-1
5.1.1	Dzongkhag Level .....	5-1
5.1.2	Gewog Level .....	5-2
5.2	Target and Framework .....	5-3
5.2.1	Vision of the Study Area .....	5-3
5.2.2	Development Strategy of the Study Area .....	5-5
5.2.3	Target of the Master Plan .....	5-9
5.2.4	Framework of the Master Plan .....	5-9
5.3	Regional Agriculture Development Plan (RADP) .....	5-13
5.3.1	Development Concept and Approach .....	5-13
5.3.2	Programs and Sub-programs of RADP-LM .....	5-17
5.3.3	Outline of Programs .....	5-20
5.3.4	Implementation Setup .....	5-22
5.4	Farm Road Development Plan (FRDP) .....	5-23
5.4.1	Development Concept and Approach .....	5-23
5.4.2	Road Development Programs .....	5-25

5.4.3	Outline of the Programs .....	5-27
5.4.4	Capacity Building .....	5-30
5.4.5	Operation and Maintenance .....	5-32
5.4.6	Implementation Setup .....	5-34
5.5	Implementation Schedule.....	5-35
5.5.1	Development Concept and Approach .....	5-35
5.5.2	Regional Agriculture Development Plan (RADP).....	5-36
5.5.3	Farm Road Development Plan (FRDP) .....	5-36
5.6	Cost Estimate .....	5-36
5.6.1	Conditions for Estimate .....	5-36
5.6.2	Unit Cost Study.....	5-37
5.6.3	Project Cost.....	5-39
5.7	Project Justification.....	5-39
5.7.1	Economic and Financial Aspects .....	5-40
5.7.2	Technology and Capacity of Stakeholders.....	5-41
5.7.3	Social Aspects .....	5-44
5.7.4	Demonstration, Model and Ripple Effect .....	5-44
5.7.5	Sustainability.....	5-45
5.7.6	Confirmation on Beneficiaries' Intention .....	5-45
5.8	Environmental Impact Examination (IEE) .....	5-47
5.8.1	Laws, Regulation and Institutions on Environment.....	5-47
5.8.2	Main Components and Necessary for IEE.....	5-48
5.8.3	Environmental Elements to be Examined.....	5-48
5.8.4	Results of IEE .....	5-48
5.9	Feedback from Experimental Implementation.....	5-49
5.9.1	General .....	5-49
5.9.2	Farm Road Construction Seminar.....	5-50
5.9.3	Horticulture Production Support.....	5-52
5.9.4	Small-scale Irrigation Support .....	5-55

## **PART-2 THE ACTION PLAN**

Chapter 6	INTRODUCTION .....	6-1
6.1	Objectives of Action Plan .....	6-1
6.2	Basic Concept and Approach of Formulation of Action Plan .....	6-1
6.2.1	Definition of Action Plan .....	6-1
6.2.2	Concept of Action Plan .....	6-1
6.2.3	Approach of Formulation of Action Plan .....	6-1
6.3	Programs and Sub-programs .....	6-2

6.4	Priority Gewogs .....	6-6
6.4.1	Basic Approach .....	6-6
6.4.2	Selection Criteria .....	6-6
6.5	Work Done .....	6-8
Chapter 7	GENERAL ROLES AND RESPONSIBILITIES BY ADMINISTRATION .....	7-1
7.1	General .....	7-1
7.2	Roles and Responsibilities of RGOB .....	7-1
7.3	Roles and Responsibilities of Dzongkhags .....	7-2
7.4	Roles and Responsibilities of Gewogs .....	7-5
Chapter 8	ACTION PLAN BY PROGRAM.....	8-1
8.1	Target Setting of Crop Production by Gewog .....	8-1
8.1.1	Food Crop .....	8-1
8.1.2	Cash Crop .....	8-3
8.1.3	Backyard Animal .....	8-5
8.2	Program for Food Crop Production Increase .....	8-6
8.2.1	Food Security Sub-program .....	8-6
8.2.2	Paddy-rice Production Sub-program .....	8-7
8.2.3	Irrigation Development Sub-program .....	8-8
8.2.4	Backyard Animal Husbandry Sub-program .....	8-10
8.2.5	Post-harvest Technology Training Sub-program .....	8-11
8.3	Program for Cash Crop Production Strengthening .....	8-11
8.3.1	Market Research Sub-program .....	8-11
8.3.2	Technical Research and Development Sub-program .....	8-13
8.3.3	Training of Extension Agent Sub-program .....	8-14
8.3.4	Agro-processing Technology Training Sub-program .....	8-15
8.4	Market System Development Program .....	8-16
8.5	Extension Strengthening Program .....	8-21
8.5.1	Extension Strengthening for Food Crop Sub-program .....	8-21
8.5.2	Extension Strengthening for Cash Crop Sub-program .....	8-22
8.6	Farm Road Construction Program .....	8-23
8.7	Farm Mule Track Construction Program .....	8-24
8.8	Light-load Bridge Construction Program .....	8-25
8.9	Construction Machinery Center Program .....	8-25
Chapter 9	CONCLUSION AND RECOMMENDATION .....	9-1
9.1	Conclusions.....	9-1
9.2	Recommendations.....	9-3

## List of Action Plans

	<u>Page</u>
Food Security Sub-program .....	AP-1
Paddy-rice Production Sub-program .....	AP-5
Irrigation Development Sub-program (New) .....	AP-8
Irrigation Development Sub-program (Rehabilitation) .....	AP-14
Backyard Animal Husbandry Sub-program .....	AP-19
Post-harvest Technology Training Sub-program .....	AP-23
Market Research Sub-program .....	AP-25
Technical Research and Development Sub-program .....	AP-29
Training of Extension Agent Sub-program .....	AP-34
Agro-processing Technology Training Sub-program .....	AP-38
Collection Depot Construction Sub-program, Group Assembling Sub-program, Group Assembling and Marketing Sub-program.....	AP-42
Marketing Support Sub-program by FCB .....	AP-47
Extension Strengthening for Food Crop Sub-program .....	AP-50
Extension Strengthening for Cash Crop Sub-program .....	AP-55
Farm Road Construction Program .....	AP-60
Farm Mule Track Construction Program .....	AP-65
Light-load Bridge Construction Program .....	AP-70
Construction Machinery Center Program .....	AP-75

## List of Tables

	<u>Page</u>
Table 1.6.1 Member List of JICA Study Team and Counterpart Personnel.....	T-1
Table 3.1.1 Population and Households in the Study Area .....	T-2
Table 3.2.1 Climate Conditions.....	T-3
Table 3.3.1 Present Land Use.....	T-4
Table 3.3.2 Agriculture Land Area by Data Sources .....	T-4
Table 3.3.3 Land Tenure Status and Cultivated Land Size Distribution.....	T-5
Table 3.3.4 Food Crop Production in the Study Area .....	T-5
Table 3.3.5 Production of Major Horticultural Crops in the Study Area .....	T-6
Table 3.3.6 Livestock Animals and Livestock Production.....	T-6
Table 3.3.7 Cropping System of Major Crops .....	T-7
Table 3.3.8 Farm Household Economy.....	T-8
Table 3.3.9 Food Production and Food Security in the Study Area.....	T-9

Table 3.4.1	Road Details in Bhutan .....	T-10
Table 3.4.2	Road Details in the Study Area .....	T-11
Table 3.4.3	Present Situation of the Construction Equipment (Paro Valley Project, 1989-1994) .....	T-12
Table 4.1.1	Summary of Zoning by Gewog.....	T-15
Table 5.3.1	Priority and Potential Crops Presented by Gewogs in Workshop .....	T-16
Table 5.3.2	Sub-program Description of Program for Food Crop Production Increase .....	T-18
Table 5.3.3	Sub-program Description of Program for Cash Crop Production Strengthening .....	T-20
Table 5.3.4	Sub-program Description of Market System Development Program .....	T-22
Table 5.3.5	Sub-program Description of Extension Strengthening Program.....	T-24
Table 5.3.6	Proposed Irrigation Scheme by Gewog.....	T-25
Table 5.4.1	Basic Fleet Machinery.....	T-30
Table 5.4.2	Support Machinery and Equipment .....	T-31
Table 5.4.3	Equipment and Tools for Workshop.....	T-32
Table 5.4.4	Machinery for Transportation .....	T-32
Table 5.5.1	Implementation Schedule of RADP .....	T-33
Table 5.5.2	Implementation Schedule of FRDP (Lhuntse).....	T-34
Table 5.5.3	Implementation Schedule of FRDP (Mongar) .....	T-35
Table 5.6.1	Farm Road Construction Cost per km (including WBM and permanent structure).....	T-36
Table 5.6.2	Mule Track Construction Cost per km (considering only excavation by blasting).....	T-37
Table 5.6.3	Construction Cost for Farm Road and Mule Track.....	T-38
Table 5.6.4	Construction Cost for Light-Load Bridge.....	T-39
Table 5.6.5	Cost Estimation for Construction Machinery and Equipment .....	T-40
Table 5.7.1	Economic Internal Rate of Return.....	T-41
Table 5.8.1	Project Description (PD).....	T-42
Table 5.8.2	Site Description (SD) .....	T-43
Table 5.8.3	Scoping Checklist (Social Environment).....	T-44
Table 5.8.4	Scoping Checklist (Natural Environment).....	T-45
Table 7.3.1	Schedule of Delegation of Powers to the Dzongkhag and Gewog Levels .....	T-46

### List of Figures

	<u>Page</u>	
Fig. 2.3.1	The Bhutanese System of Governance .....	F-1
Fig. 2.3.2	Organization Chart of Ministry of Agriculture .....	F-2

Fig. 2.3.3	Organization Chart of RNR and Engineering Sectors of Lhuntse .....	F-3
	Dzongkhag	
Fig. 2.3.4	Organization Chart of RNR and Engineering Sectors of Mongar .....	F-4
	Dzongkhag	
Fig. 3.3.1	Suitable Altitude Range of Major Crops in the Study Area .....	F-5
Fig. 3.3.2	Present Cropping Pattern of Major Crops in the Study Area .....	F-6
Fig. 3.9.1	Protected Area .....	F-7
Fig. 4.1.1	Flowchart to Identify Development Stages.....	F-8
Fig. 4.1.2	Zoning by Index by Study Area .....	F-9
Fig. 5.2.1	Development Vision of the Study Area.....	F-11
Fig. 5.4.1	Proposed Farm Road in Lhuntse .....	F-12
Fig. 5.4.2	Proposed Farm Road in Mongar .....	F-13
Fig. 5.4.3	Khoma Zam Planning (Suspended Bridge).....	F-14
Fig. 5.4.4	Autsho Zam Planning (Suspension Bridge).....	F-15
Fig. 5.4.5	Gorthongla Zam Planning (Suspended Bridge) .....	F-16
Fig. 5.8.1	Procedure for Project Assessment.....	F-17

### **List of Attachments**

Attachment 1	Scope of Work for the Study on Agriculture and Farm Road Development in the Lhuntse and Mongar Districts in the Kingdom of Bhutan.....	A-1
Attachment 2	Minutes of Meetings for the Study on Agriculture and Farm Road Development in the Lhuntse and Mongar Districts in the Kingdom of Bhutan.....	A-7
Attachment 3	Minutes of Meeting on the Inception Report of the Study on Agriculture and Farm Road Development in the Lhuntse and Mongar Districts in the Kingdom of Bhutan (1 <sup>st</sup> Steering Committee).....	A-11
Attachment 4	Minutes of Meeting on the Draft Progress Report (1) of the Study on Agriculture and Farm Road Development in the Lhuntse and Mongar Districts in the Kingdom of Bhutan (2 <sup>nd</sup> Steering Committee).....	A-15
Attachment 5	Minutes of Meeting on the Progress Report (1) of the Study on Agriculture and Farm Road Development in the Lhuntse and Mongar Districts in the Kingdom of Bhutan (3 <sup>rd</sup> Steering Committee).....	A-19

Attachment 6	Minutes of Meeting on the Progress Report (2) of the Study on Agriculture and Farm Road Development in the Lhuntse and Mongar Districts in the Kingdom of Bhutan (4 <sup>th</sup> Steering Committee).....	A-23
Attachment 7	Minutes of Meeting on the Draft Final Report of the Study on Agriculture and Farm Road Development in the Lhuntse and Mongar Districts in the Kingdom of Bhutan (5 <sup>th</sup> Steering Committee).....	A-27

**List of Annexes**

Annex	I	Rural Socio-economy
Annex	II	Agriculture, Livestock and Extension System
Annex	III	Horticulture
Annex	IV	Marketing and Post-harvest Processing
Annex	V	Road and Other Infrastructures
Annex	VI	Construction Machinery
Annex	VII	Environment
Annex	VIII	Results of Problem Analysis Workshop
Annex	IX	Technical Transfer through OJT
Annex	X	Guideline for Formulation of the Action Plan
Annex	XI	Guideline for Design of Light-Load Bridge

## Glossary

Ashi	Title for ladies of nobility and aristocracy
Chhu	River/Water
Chimi	Member of National Assembly (People's representative)
Dasho	Title conferred by HM the King with red scarf and ceremonial sword
Dratshang	An established monk body
Dungpa	Head of a sub-district
Dzongda	District Administrator
Dzongrab	Deputy District Administrator
Dzongkha	National language
Dzongkhag	District
Dzong	Fort-monastery
Gewog	Block
Gup	Elected leader of a Gewog
Kuensel	National Newspaper
Lhakang	Temple
Lyonpo	Minister
Lama	Priest
Mang Ap	Deputy Gup (male)
Mangmi	Deputy Gup
Nyekhor	Grass and water in the neighborhood of a village where horses and cattle graze and government land within the radius of one mile from the village which has not been registered in anybody's name
Sokshing	Government owned forest land used by farmers to collect leaf litters for the purpose of cow bedding and ultimately as a compost
Thrimpon	District Magistrate
Thrimkhang	Court
Thrimshung Chenmo	Supreme Laws
Tsamdo	Grazing land registered in individual's person's name
Tseri	Shifting Cultivation
Tshogpa	Village chief

## Abbreviation

ADB	Asian Development Bank
AEO	Agriculture Extension Officer
AMC	Agricultural Machinery Center
AMP	Aromatic and Medicinal Plant
BDFC	Bhutan Development Finance Corporation



BHU	Basic Health Unit
CA	Commission Agent
CMU	Central Machinery Unit
CSO	Central Statistical Organization
DAO	District Agriculture Officer
DAHO	District Animal Husbandry Officer
DE	District Engineer
DFO	District Forestry Officer
DESA	Department for Economic and Social Affairs (UN)
DOF	Department of Forestry Services of MOA
DOP	Division of Power
DOR	Department of Roads
DPO	District Planning Officer
DRDS	Department of Research and Development Services of MOA
DSC	Druk Seed Corporation
DYT	Dzongkhag Yargye Tshogchung (Dzongkhag Development Committee)
EA	Extension Agent
EC	European Community
EIA	Environmental Impact Assessment
ESCAP	Economic and Social Commission for Asia and the Pacific
FAO	Food and Agriculture Organization
FCB	Food Corporation of Bhutan
FEZAP	First Eastern Zone Agricultural Program
FSD	Forestry Services Division
FYM	Farmyard Manure
GDP	Gross Domestic Product
GNH	Gross National Happiness
GNP	Gross National Product
GSOB	Geological Survey of Bhutan
GYT	Gewog Yargye Tshogchung (Gewog Development Committee)
HDI	Human Development Index
IBRD	World Bank
ICS	Information and Communication Services
IDA	International Development Association
IEE	Initial Environmental Examination
IFAD	International Fund for Agricultural Development
IHDP	Integrated Horticulture Development Program
ILO	International Labour Organization

IMF	International Monetary Fund
IMR	Infant Mortality Rate
IPM	Integrated Pest Management
MOC	Ministry of Communications, Ministry of Construction
MOHA	Ministry of Home Affairs
NA	Not Available
NEC	National Environmental Commission
NHDR	National Human Development Report
NRTI	Natural Resources Training Institute
Nu.	Bhutanese Currency or Ngultrum
PCM	Project Cycle Management
PIU	Project Implementation Unit
PMU	Project Management Unit
PPD	Policy Planning Division of MOA
PRA	Participatory Rural Appraisal
QCRS	Quality Control and Regulatory Services
RGOB	Royal Government of Bhutan
RNR	Renewable Natural Resources
RRA	Rapid Rural Appraisal
SDC	Swiss Development Cooperation
SEZAP	Second Eastern Zone Agricultural Program
SNV	Netherlands Development Organization
SOB	Survey of Bhutan
TFDP	Third Forest Development Program
TFR	Total Fertility Rate
TOR	Terms of Reference
UN	United Nations
UNCDF	United Nations Capital Development Fund
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational Scientific Cultural Organization
UNICEF	United Nations Children's Fund
UNV	United Nations Volunteers
NTFP	Non-Timber Forest Products
VSA (NZ)	Volunteer Service Abroad (NZ)
VSO (UK)	Voluntary Service Overseas (UK)
WB	The World Bank
WFP	World Food Programme
WHO	World Health Organization

WUA	Water Users' Association
WWF	World Wide Fund for Nature

### Units and Measures

#### Length

mm	millimeter
cm	centimeter
m	meter
km	kilometer

#### Area

cm <sup>2</sup>	square centimeter
m <sup>2</sup>	square meter
km <sup>2</sup>	square kilometer
ha	hectare

#### Volume

cm <sup>3</sup>	cubic centimeter
m <sup>3</sup>	cubic meter
MCM	million cubic meter

#### Weight

g	gram
kg	kilogram
t	ton
MT	metric ton

#### Time

s	second
m	minute
hr	hour
d	day
mon	month

#### Power and Energy

A	ampere
V	volt
W	watt
kN	kilo Newton
kW	kilowatt
kWh	kilowatt hour
HP	horse power

Others

ppm	parts per million
°C	degree centigrade
%	percent
HH	household

Currency

\$	USA Currency (Dollar)
¥	Japanese Currency (Yen)
Nu, Ngultrum	Bhutanese Currency

Exchange Rate (Internal Bank Rate): as of December 1, 2002

\$ 1.00 = Nu 47.89

¥ 1.00 = Nu 0.391

\$ 1.00 = ¥ 122.58

## Chapter 1 INTRODUCTION

### 1.1 Authority

This Final Report has been prepared by the JICA Study Team in accordance with the Scope of Work (S/W) for the Study on Agriculture and Farm Road Development in the Kingdom of Bhutan agreed upon between the Ministry of Agriculture (MOA), the Royal Government of Bhutan (RGOB), and the Japan International Cooperation Agency (JICA) on December 11, 2001. The S/W for the Study and the Minutes of Meeting (M/M) on S/W for the Study are attached to this report as Attachments 1 and 2.

The Report presents the Master Plan and the Action Plan, which have resulted from all the works conducted through the work period (April 2002 to March 2003).

The Report consists of the following separate volumes:

- Volume-I: Main Report
- Volume-II: Annexes

### 1.2 Study Area

The Study Area is composed of Lhuntse and Mongar Dzongkhags as shown in the Location Map and summarized in the following table:

The Study Area	
Item	Description
-Districts	Lhuntse, Mongar
-Distance from Thimphu	160 km to the east (direct distance) 410 km via the East-West National Highway (to Mongar)
-Area	4,835 km <sup>2</sup> (Lhuntse 2,888 km <sup>2</sup> , Mongar 1,947 km <sup>2</sup> ) <sup>1)</sup>
-Boundary	North: International border to China West to South: Bumthang and Zhemgang Dzongkhags East to South: Trashiyangtse, Trashigang, Pemagatshel Dzongkhags
-Location	Latitude: 26° 57'N – 27° 36'N Longitude: 90° 57'E – 91° 30'E
-Number of Gewogs	24 (Lhuntse 8, Mongar 16)

Source: 1) LUPP Dzongkhag Data Sheets for Bhutan, MOA (1995)

### 1.3 Objectives of the Study

The long-term objectives of the Study are to improve self-sufficiency of food crops and to upgrade the living standards (economically, socially and environmentally) of people in the Lhuntse and Mongar Districts. In order to achieve the long-term objectives, the Study consisted of the following activities:

- ① Formulation of the Master Plan on development of rural agriculture and farm road, which is based on due consideration for improvement of accessibility to markets and for enhancement of farm productivity.
- ② Formulation of the Action Plan (including project documents and strategies for implementation of the projects) in the priority area(s) to be established in the Master Plan.
- ③ Implementation of technology transfer to Bhutanese counterparts through on-the-job training in the course of the Study.

## 1.4 Scope of the Study

The overall scope of the Study was defined in Clause IV of the S/W (refer to Attachment 1 of this report) as follows:

- ① Data collection
  - Existing data (natural, social and economic conditions / national policy, strategy and plans / farming systems / post harvesting and marketing / agricultural and social infrastructures / operation and maintenance of the existing agricultural infrastructures and facilities / agricultural extension and credit / environmental issues, and others
  - Field survey for supplemental data collection
  - Review of relevant projects and plans
- ② Identification of potentials and constraints through data collection
- ③ Formulation of the Master Plan consisting of the following aspects
  - Agriculture
  - Marketing
  - Farm road
  - Environment
  - Institution and capacity building
  - Monitoring and evaluation, and others
- ④ Selection of the priority area(a) in accordance with social, economic, physical and environmental conditions
- ⑤ Formulation of Action Plan

## 1.5 Steering Committee

In accordance with the S/W, Ministry of Agriculture (MOA) which is the coordinating body for the Study, established the Steering Committee (SC) to discuss and set forth the outcomes in the course of the Study. Five (5) meetings with SC were scheduled during the whole Study period as shown in the table below. The related organizations of the committee are as follows:

- MOA as the coordinating body,
- Ministry of Finance (MOF),
- Department of Roads (DOR), Ministry of Communication (MOC), and
- National Environment Commission (NEC)

<b>Steering Committee</b>			
No.	Time of Meeting	Reports, etc.	Agenda
1	(First Field Work ~ M/P stage) At the commencement of 1 <sup>st</sup> Field Work	Inception Report	- Plan of Operation - Technology Transfer
2	At the middle of 1 <sup>st</sup> Field Work	Draft Progress Report (1)	- Draft M/P - Draft selection criteria for priority Blocks - Draft formulation approach of A/P
3	(First Field Work ~ A/P stage) At the commencement of A/P Stage	Progress Report (1)	- M/P - Formulation approach of A/P - Selection of Gewogs
4	At the end of 1 <sup>st</sup> Field Work ~ A/P Stage	Progress Report (2)	- Results of 1 <sup>st</sup> Field Work - Action Plan by Program / Sub-program
5	(Second Field Work) At the commencement of 2 <sup>nd</sup> Field Work	Draft Final Report	- Final Results of the Study

## 1.6 Technology Transfer and Participatory Approaches

As shown in the conceptual figure in the following page, development consists of various activities which are accelerated and sustained by continuous inputs by applying of a variety of inputs.

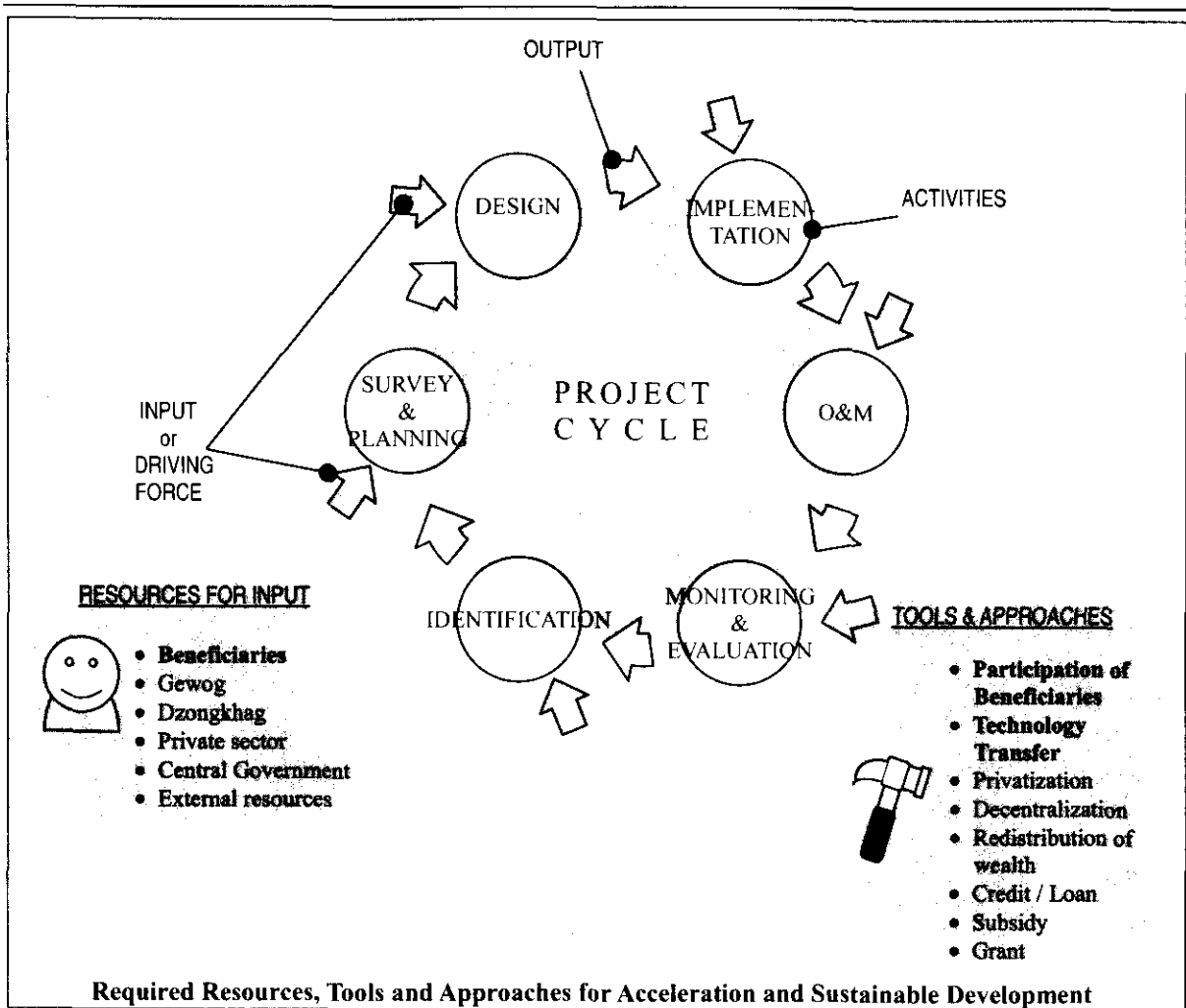
Each development activity has own output which is utilized as one of the inputs for the next step, then a project cycle is formed, which is maintained by different resources. Among the inputs or in other words, “driving forces of the project cycle”, the most important one should be “participation of beneficiaries”.

Any decision should be made by the beneficiaries themselves and required inputs should be duly considered and managed by themselves.

For this, participatory approaches should be adopted at any activities of the development or project cycle, namely, survey, planning, design, implementation, operation and maintenance, and monitoring and evaluation. In this Study, various participatory survey and planning approaches such as RRA, PCM, interview, etc. have been applied along with technical transfer to the counterpart personnel of the central government (MOA), Dzongkhags, Gewogs and even at village levels. “Involvement of the beneficiaries” was the very basic approach that has been undertaken primarily throughout the Study.

The Study Team always worked in collaboration with the counterpart personnel in Lhuntse and Mongar Dzongkhags throughout the Study period. The members of the Study Team and the counterpart personnel are shown in Table 1.6.1. An office for the Study Team was opened at Mongar Dzongkhag. For mutual understanding of the Study and technology transfer, a biweekly meeting with the counterpart personnel was held in Lhuntse and Mongar.

Moreover, during the Action Plan Stage of the First Field Work Period, a bridge engineer was additionally assigned for preparation of a technical guideline on suspension bridge which was proposed in the Master Plan. Engineers of MOA and DOR of MOC worked together with the Study Team as “on-the-job training”.



### 1.7 Work Done

The Study was conducted in accordance with the plan of operation. Major activities and work progress performed are summarized below:

**Activities and Progress (Master Plan Stage: 2002)**

Activities	April	May	June	July	August
<b>Data collection</b>					
Primary data					
Farm HH interview					
Problem analysis WS					
RRA survey					
Farm road survey					
Irrigation survey					
Market survey					
Secondary data					
Zoning, Constraints, Potential					
<b>Master Plan Outline</b>					
Project justification					
<b>Selection criteria for priority Gewogs</b>					
General concept of A/P					
<b>Reporting</b>					
2nd Steering committee meeting					

**Activities and Progress (Action Plan Stage: 2002/03)**



Major Activities	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
<b>Technical Transfer through OJT</b>								
Horticulture Production	■	■	■	■				
Farm Road	■	■	■					
Irrigation	■	■	■					
<b>Meeting on P/R(1) in Japan</b>		□						
3rd Steering Committee Meeting		■						
<b>Determination of Priority Gewogs</b>		■						
Formulation of Dzonkhag A/P		■	■					
<b>Formulation of Gewog A/P</b>		■	■	■	■			
Preparation of Guideline		■	■					
<b>Workshop with Priority Gewogs</b>			■					
Formulation of A/P			■	■	■			
<b>Seminar and Workshop</b>					■			
Preparation, Discussion of P/R(2)					■	■		
<b>Preparation of DF/R</b>						□		
Discussion on DF/R						■		
<b>Preparation of F/R</b>								□

■ Work in Bhutan

□ Work in Japan