

## CHAPTER III

### THE STUDY AREA

The Kingdom of Bhutan is divided into 20 districts and is further sub-divided into 201 *geogs* (blocks) for administrative purposes. However, based on the altitude, rainfall and temperature it is divided into six main agro-ecological zones (Table 3.1)

Table 3.1. Agro-Ecological Zones of Bhutan

Agro-Ecological Zone (AEZ)	Altitude m.a.s.l	Temperature			Rainfall mm
		Max	Min	Mean	
Alpine	>3,500	12	-1.0	5.5	<650
Cool Temperate	2,500-3,500	22	1.0	10	650-850
Warm Temperate	1,800-2,500	26	1.0	13	650-850
Dry Sub-tropical	1,200-1,800	29	3.0	17	850-1200
Humid Sub-tropical	600-1,200	33	5.0	20	1,200-1,500
Wet Sub-tropical	150-600	35	12.0	24	2,500-5,500

Source: Adapted from Dorjee, 1995

These different agro-ecological zones allow a considerable variety of crops to be grown in the country with paddy as the major cereal crop. Paddy is grown mainly from the wet-sub tropical to warm temperate zone.

#### 3.1 Location

For the purpose of this study three districts representing three major paddy growing agro-ecological zones were selected. The selected locations to represent the Wet Sub-tropical zone are Sipsoo and Chengmari (Samtse district), for the Dry Sub-tropical zone Lobesa (Thimphu district) was selected while Paro valley (Paro district) was selected to represent the Warm Temperate Zone. The representative areas were

selected in consultation with the researchers involved in paddy and also with extension based on the following criteria.

- Representative rice growing areas for the particular agro-ecological zone
- Rice is the major crop of the area
- Presence of modern varieties together with traditional varieties

### 3.2 Sample selection

From each district or each of the three agro-ecological zones, 30 households were selected making a total of 90 households for the study using purposive sampling technique. Discussions were held with the extension agent to find out the rice surplus farmers, the likely respondents. Care was taken to select those household members that were actually involved in the decision making of the use in inputs, output and management of the crop under study.

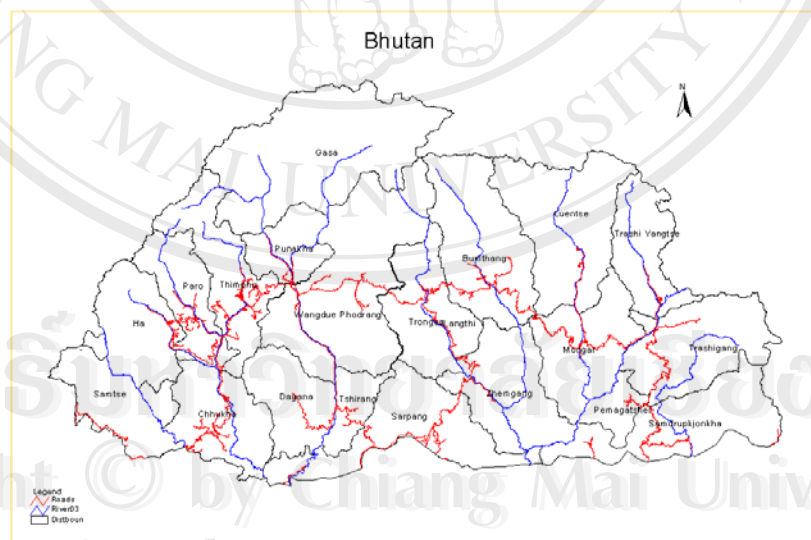


Figure 3.1. Map of Bhutan showing roads and rivers

### 3.3 Data Source

Primary data was collected through household interview using structured questionnaire. Secondary data requirements were collected from the Food Corporation of Bhutan, Department of Revenue and Customs, Druk Seed Corporation and from the Central Statistical Organisation.

### 3.4 Site description

#### 3.4.1 Lobesa

Lobesa is under Baap block (*Geog*) of Thimphu district (Figure 3.2). It is about 55 Km from Thimphu and situated along the Thimphu-Punakha and Thimphu-Wangdue National Highway. It covers an area of about 27 sq. km with elevations ranging from 1300 meters to 3000 meters above sea level.

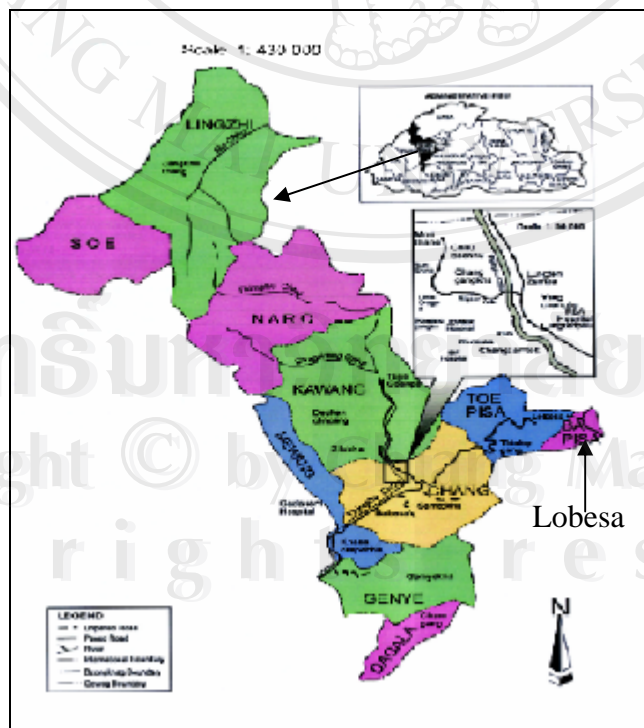


Figure 3.2. Study area in Thimphu district

The *geog* being in the subtropical region experiences hot and humid summers with heavy rainfall during the monsoon months of June, July and August. Winters are moderate.

The *geog* has about 21 villages consisting of 268 households. Over 80 percent of the households have electricity connections and about 75 percent of the population has access to piped drinking water supply. It has a Junior High School and at the same time there are a number of schools in close proximity to the area. The Natural Resources Training Institute (NRTI) is also located within this block. Students from this institute carry out a number of their field works in the area thus helping the farmers to a great extent. The population avail health services from Wangdue Phodrang, Punakha, and Thimphu, while the Out Reach Clinic at Lobeyesa renders maternal and child health services.

Wetland or paddy field (Table 3.2) is the most dominant land use type with 86 percent followed by dryland (five percent) and orchard (three percent). The other land use categories are kitchen garden and *tseri* (slash and burn). With wetland as the dominant land use system, paddy is the main cereal crop grown in the summer and wheat as a winter cereal crop. The major modern rice varieties grown in the area are IR-64, *Bajo Kaap*, *Majo Maap* and No.11 while the most favoured traditional varieties are *Tan Tshering* and *Dumja*. However, unlike in the past, many farmers do not grow wheat and so it is only about 50 percent of the farmers that do grow this winter crop.

Table 3.2. Land use category and area, Lobesa

Land use type	Unit	Area	Percent land use
Wetland (Paddy field)	Ha	242	86
Dryland	Ha	15	5
Slash and burn	Ha	4	1
Kitchen garden	Ha	11	4
Orchard	Ha	8.5	3

Source: Renewable Natural Resources Statistics, 2000

A number of farmers instead are into cultivation of oil seed crops, especially mustard after paddy as a winter crop. Minor cereals like millets are grown but to a lesser extent. Chilli is another crop grown in the area as one of the major sources of income as well as for household consumption. The other types of vegetables grown in the area are beans, peas, tomato and leafy vegetables. Mandarin and guava are the most common tree or fruit crops, though farmers very recently have reported decline in the yield of mandarin. Table 3.3 shows the cropping calendar of the area.

Table 3.3. Cropping calendar, Lobesa

Crops	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Paddy			N		T		W			H		
Wheat				H							LP&S	
Mustard		H								S		
Maize				LP&S				H				
Chilli			TP									NPS
Vegetables	Grown through out the year in a small patches of land or in kitchen garden											

N= Nursery; H= harvesting; LP &S = Land preparation and sowing; NPS = Nursery preparation & sowing; W = Weeding; TP =Transplanting

### 3.4.2 Paro

The district headquarter of Paro is about 60 kilometers to the west of Thimphu. Paro district is sub-divided into 10 blocks. It is one of the most developed districts in Bhutan and its fertile valley boasts of paddy, wheat, millet, potatoes, apple and seasonal vegetables as the main crops. The study in Paro district was carried out in areas that are in close proximity to the main town and the chosen sites are Dopshari, Shaba, Lamgong and Wangchang.

These four blocks put together make up for about 196 square kilometers and are located within 2200 to 3200 meters above mean sea level. Summers are warm and winters cold with temperature falling below zero degree Celsius during the peak winter period. Orchards and dry land dominate the sloppy areas while wetland are

mostly located in the flat valley bottoms. There are about 1178 households in these four blocks. However, not all the households are into farming as about 40 per cent of the households in Wangchang block is under the proper town area.

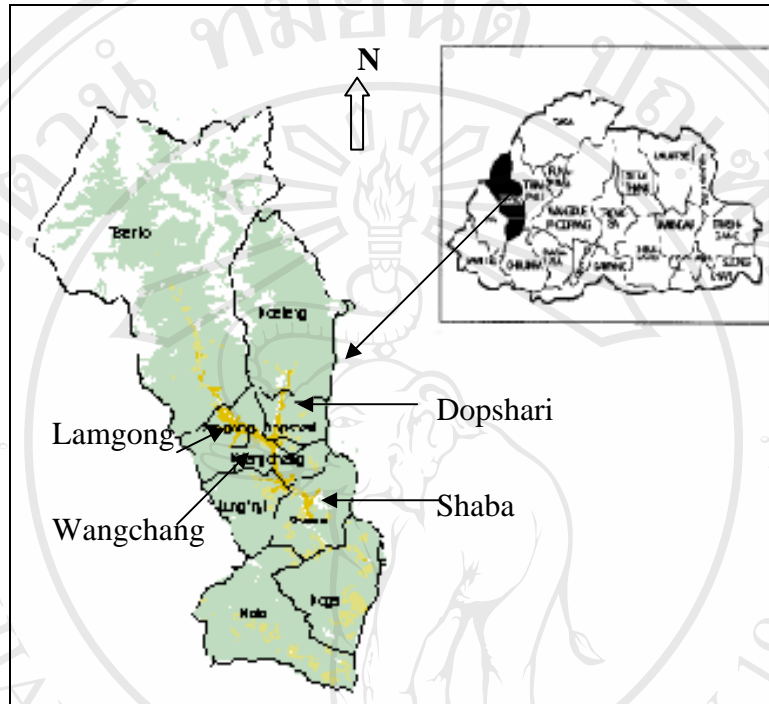


Figure 3.3. Study area in Paro district, Warm temperate zone

Almost all the households have access to electricity, telephone connections and piped drinking water. Medical facilities are availed from the General Hospital, which is within Wangchang block. All the blocks have their respective Renewable Natural Resources (RNR) Extension Centers that caters to the extension services for agriculture, livestock and forestry.

These areas are well connected by national highways and farm roads. Almost 92 percent of the households are within less than a kilometer walking distance from their homes. The existence of a good network of roads and feeder roads in the district offers ample marketing access to major markets for any surplus products from the district. Some of the farmers export apples to Bangladesh and India.

Farming in this valley is the most mechanized in the country. Mechanization however is in terms of small farm equipments like power tillers, paddle thresher, paddy transplanter and paddy weeder. Farm mechanization in this valley started with the advent of the Paro-Valley Development Project. The four blocks put together account for almost 71 percent of the power tillers available in the district.

Paddy land or wetland is the most dominant land use system with 51 percent followed by dry land with 26 percent and orchard 19 percent (Table 3.4).

Table 3.4. Land use category and area by study locations, Paro

Land use type	Unit	Study Locations in Paro			
		Dopshari	Lamgong	Shaba	Wangchang
Wetland	Ha	163	241	200	186
Dryland	Ha	128	51	150	84
Slash and burn	Ha	6.5	9	5	16
Kitchen garden	Ha	3	8.5	9	8
Orchard	Ha	58	89	68	76

Source: Renewable Natural Resources Statistics, 2000

The major cereals grown in this valley are rice, wheat and millet. Besides, wheat and millet, oil seed crops like mustard is also grown in the paddy fields after paddy (Table 3.5).

Table 3.5. Cropping calendar, Paro

Crops	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Paddy		NP&S			T			W			H	
Wheat			H									LP&S
Mustard		S			H							
Potato		LP&P			W			H				
Chilli		NP&S	T			W		H				
Vegetables	Grown through out the year in a small patches of land or in kitchen garden											

NP&S = Nursery preparation & sowing; T = Transplanting; W = Weeding; H = Harvesting; LP&S = Land preparation and sowing; LP&P = Land preparation & planting

The most favored modern rice varieties are *Chumroo* and No.11. The preferred traditional varieties are *Dumja, Themja and Naam*. Farmers also do grow potato before paddy and among the four sites Dopsahri has the maximum area under it. Besides chilli, the other vegetables grown in the area are beans, brinjal, carrot, lettuce, rajma beans, tomato and asparagus. Apple is the major fruit crop grown and is the main source of income for the farmers.

### 3.4.3 Samtse

Chengmari and Sibsoo blocks under Samtse district were chosen to represent the wet sub-tropical zone. Both Chengmari and Samtse lie to the western part of the district headquarter of Samste. Chengmari is about 14 kilometers and Sibsoo about 50 kilometers from Samtse. Both the blocks are located at the foothills bordering the Indian state of West Bengal and Sikkim. They lie in the wet sub-tropical zone with altitude ranging from 300-1200 meters above mean sea level. Being in the sub-tropic region, summers are hot and humid with high rainfall while winters are mild. These two blocks cover an area of 140 square kilometers approximately.

There are about 781 households in these two blocks. Both have their respective Renewable Natural Resources (RNR) Extension Centers to cater to the need of extension services. The areas also have schools for the educational need of the children, health facilities, and small commercial towns and with most houses connected with electricity.

The national highway from Samtse to Tendu runs through these areas and as such farmers have access to motor able roads. About 63 percent of the households in Chengmari and 93 percent of the households in Sibsoo are within a walking distance of less than an hour from motor able roads.

Farmers from these areas also have easy access to the markets in India for their basic household necessities. Irrigation canals and Water Users Association are



present in these blocks but then most of the canals have been washed away by floods or have not been maintained properly.

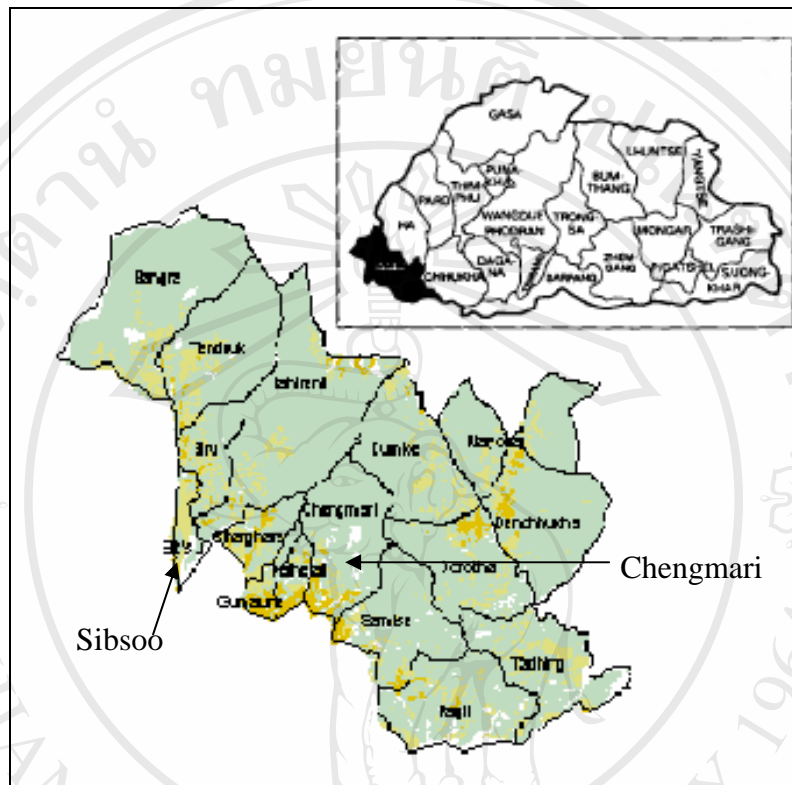


Figure 3.4. Study area in Samtse district, wet sub-tropical zone

Their main sources of income are from the sale of ginger, and tree crops like mandarin, areca nut and guava. Farmers also do sell locally grown rice and with the income earned buy cheaper rice imported from India to meet the household requirement for rice. Labour saving devices like power tillers, threshers and paddy transplanter are not available in these areas though the topography is well suited for farm mechanization.

Dry land is the dominant land use type in Chengmari while wetland system is more common in Sibsoo (Table 3.6). About 46 percent of the agricultural land in Chengmari is under dry land system while wetland system accounts for 32 percent approximately. In Sibsoo, wetland is more common, and accounts for about 46 percent of the agricultural land use followed by dry land system with approximately 37 percent. The other forms of land use system in the areas are orchard and *tseri*

(slash and burn). Approximately, 20 percent of the district's total wetland, 14 percent of dry land and 12 percent of the orchards are found in these two locations.

Paddy is the most common field crop in the wetland followed by maize in the dry land. Almost about 62 percent of the farmers in Chengmari and 76 percent of the farmers in Sibsoo grow paddy.

Table 3.6. Land use type and area by study locations, Samtse

Land use type	Unit	Study Locations in Samtse	
		Chengmari	Sibsoo
Wetland	Ha	391	266.8
Dryland	Ha	562	211
Slash and burn	Ha	47	42
Kitchen garden	Ha	1.2	1
Orchard	Ha	209	55

On the other hand maize is grown by 74 percent and 67 percent in the two blocks of Chengmari and Sibsoo respectively. Mustard and soybean are the major oil seed crops grown in these two areas while mandarin and areca nut and guava are the major tree crops. Table 3.7 illustrates the cropping calendar for Samtse.

Table 3.7. Cropping calendar, Samtse

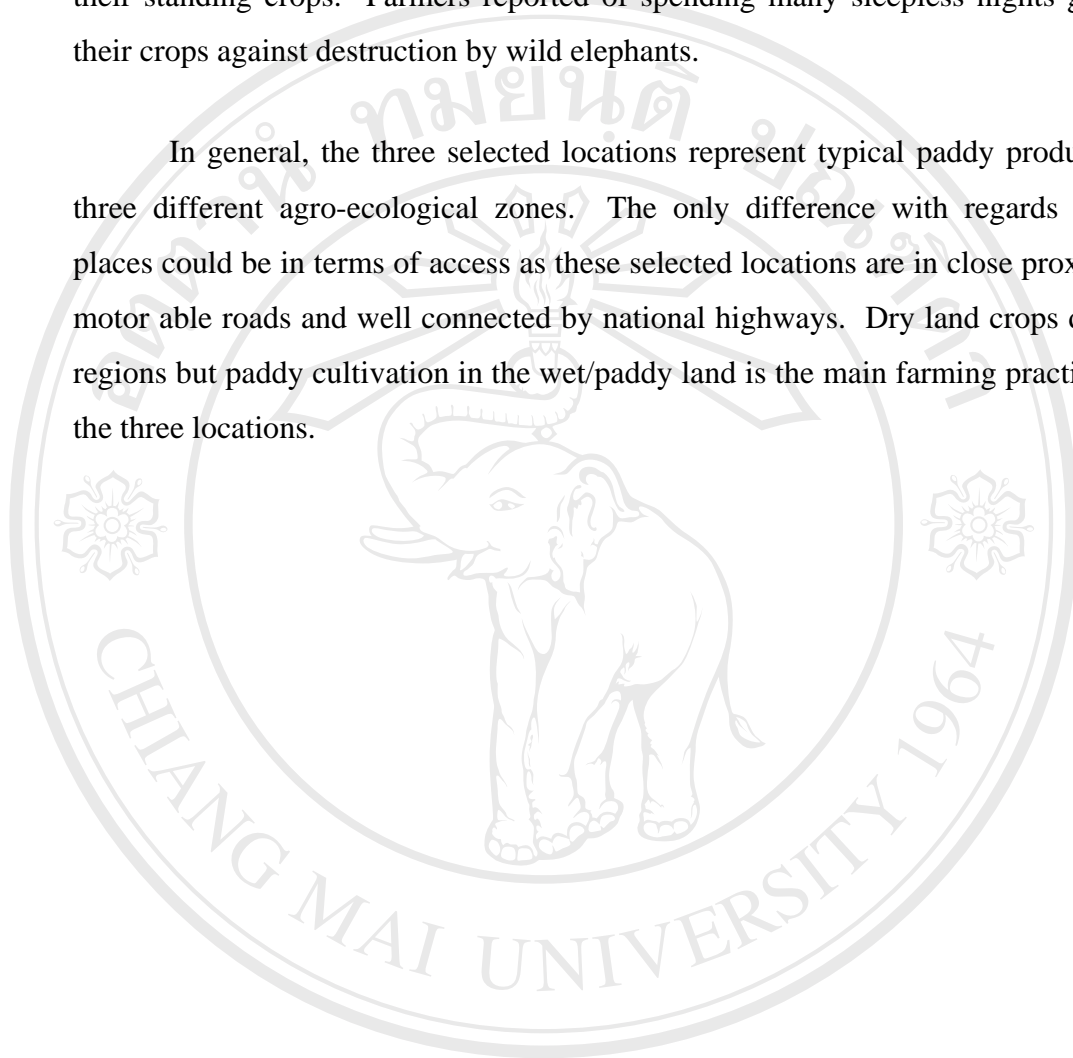
Crops	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Paddy				NP&S			T		W		H	
Maize			LP&S						H			
Ginger			LP&P									H
Millet				NP&S			T				H	

NP&S= Nursery preparation and sowing; T=Transplanting, W= Weeding, H = Harvesting; LP & S= Land preparation and sowing

Farmers reported of severe crop damage by wild animals. In Chengmari the problem of crop damage is often associated with monkeys that come in large packs

and wild boars. The problem faced by the farmers in Sibsoo is more severe. Wild elephants cause heavy destruction often destroying as much as 50 to 60 percent of their standing crops. Farmers reported of spending many sleepless nights guarding their crops against destruction by wild elephants.

In general, the three selected locations represent typical paddy production in three different agro-ecological zones. The only difference with regards to other places could be in terms of access as these selected locations are in close proximity to motor able roads and well connected by national highways. Dry land crops differ by regions but paddy cultivation in the wet/paddy land is the main farming practice in all the three locations.



ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่  
Copyright © by Chiang Mai University  
All rights reserved