

Chapter 3

Research Methods

The previous chapter concisely presented the complexity of the issue and need for detail study of the problem of seed potato production system. This chapter contextualizes the issue into a conceptual framework helping to focus the study. The analytical tools used in the study are also described in detail.

3.1 Conceptual framework

The research follows the conceptual framework as shown in Figure 3.1. The study was to examine the operating mechanisms of seed potato production system in Bhutan. Through these investigations, it is hoped to better understand the existing mechanisms of seed potato production and distribution system, and to develop appropriate seed production mechanisms to be used in Bhutan.

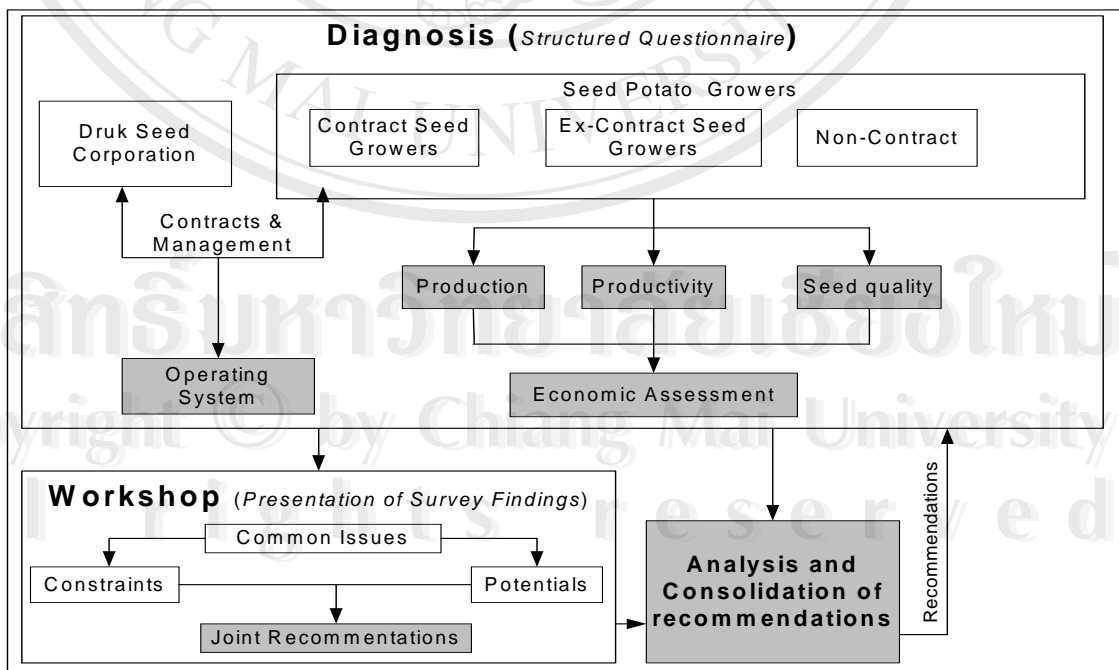


Figure 3.1: Conceptual framework.

As per the objectives of study the structured questionnaire were designed to adequately address the pertinent issues in the seed potato production in Bhutan. Since the inception of seed industry in Bhutan the production of seed potato was done through contract growers but the system did not grow as expected; in fact the system was breaking down due to the change in the management, policy and introduction of cash and carry system in the program. The DSC contract arrangement and management system for quality seed production was reviewed thoroughly and SWOT analysis was carried out to have better understanding regarding the potentials and constraints of DSC in order to improve the management and contract arrangement system.

The three categories of farmer contract, ex-contract and non-contract were interviewed for the economic assessment. The details information on seed potato production and constraints were also obtained from the growers. The result of the economic assessment, contract management and the constraints in seed potato production were discussed during the consultative workshop with the farmers. The recommendations of the consultative workshop and the SWOT analysis of DSC were further discuss in the stake holders workshop for the recommendation for the seed sector development.

3.2 Site selection

The study was carried out in Wangdiphodrang Dzongkhag (West Central Region) and Bumthang Dzongkhag (Eastern Central Region of Bhutan), which are the major seed potato growing area in Bhutan. In Wangdiphodrang Dzongkhag, Phobjikha and Sephu Geogs were selected for the survey as DSC has its basic seed multiplication farm in Phobjikha valley and its contract seed growers. The seed potato produced from Phobjikha valley is considered as best seed source by all potato growers in Bhutan. More over, these two Geogs were involved in seed production since BNPP era and maximum numbers of contract growers are from these two geogs in the past. In Bumthang Dzongkhag DSC has its seed potato production farm but it has been lease out to the private person. Bumthang, the Ura geog was selected for

interviewing as most of the contract growers in the past were from the Ura geog and the village is targeted to form seed grower group in the near future due to the localized settlement in the valley. Some of the farmers from Chumei and Chokar geogs were also interviewed to get overview of potato production in Bumthang. The

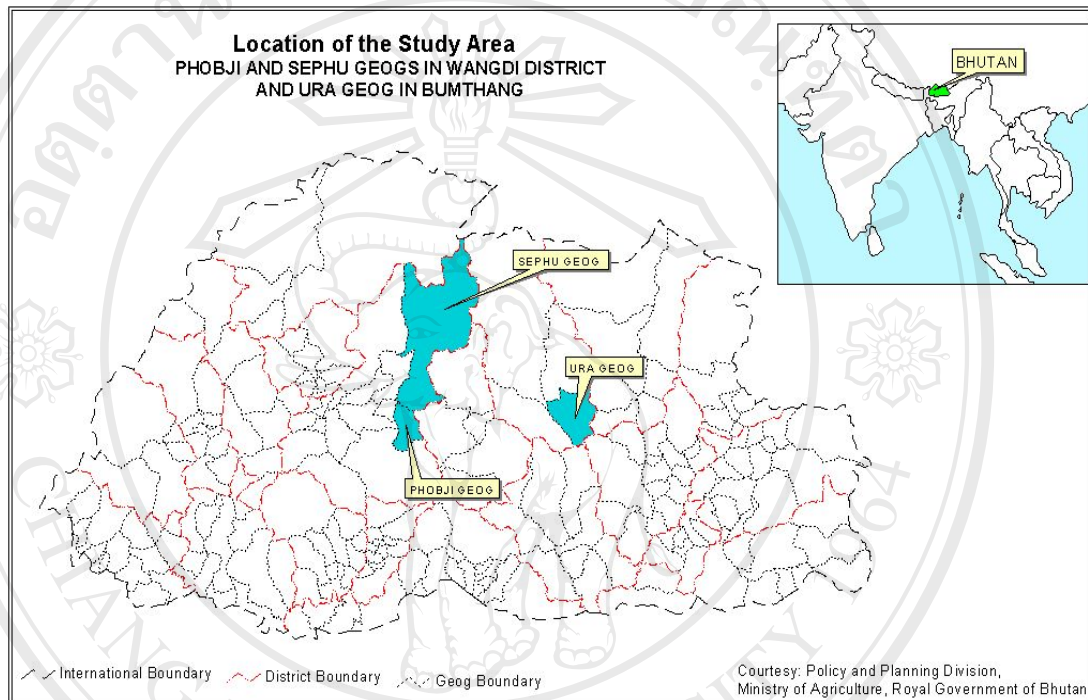


Figure 3.2: Location of Study Area.

Source: MoA, 2004.

3.3 Contextual setting

Profile of the potato growers

The age of the respondents in the survey ranges from 47 – 50 years. The male respondents constitute 72% in contract, 64% in ex- contract and 48% in non- contract which is given in Table 3.1.

Table 3.1: Age of the growers.

Category	N	Mean	SD	Male (%)	Female (%)
Contract	25	50	7.9	72	28
Ex-Contract	55	48	8.6	64	36
Non Contract Farmers	60	47	8.3	48	52

Source: Survey, 2004.

Average household size

The average household size in the study area are 5.00 in contract, 4.87 in ex-contract, and 5.76 in non-contact farmers (Table 3.2). The family sizes also greatly influence the production of potato as potato being labour intensive crop.

Table 3.2: Average household size of the farmer interviewed.

Farmers' Category	Male members	Female members	Total Family size
Contract (25)	2.92	2.08	5.00
Ex-Contract (55)	2.38	2.49	4.87
Non-contract(60)	2.98	2.88	5.76

Source: Survey, 2004.

Land holding

The land holding size among the three categories of the growers from the sampled area are given in Table 3.3. The maximum land holding is by ex-contract farmers which is 2.55 ha and the minimum is 0.26 ha by the non contract farmers. As different types of crops are grown in the area, so the growers use their available land as per their requirements.

Table 3.3: Land holding of the sampled farmers.

Category	Sum	Mean	SD	Max	Min
	-----ha-----				
Contract	23.58	0.90	0.37	1.61	0.40
Ex-Contract	53.87	0.98	0.37	2.55	0.40
Non Contract Farmers	42.90	0.72	0.22	1.17	0.26

Source: Survey, 2004.

Types of crops grown

The farmers of the study area grow different crops but potato is their main crop for cash income. The other crops are grown for home consumption only. Table 3.4 shows the gross margin of different crops grown by the farmers of study areas.

Table 3.4: Gross Margin obtained from different crops of sampled farmers.

Crops	Yield	Price	Revenue	Expenditure	Gross Margin
	mt ha ⁻¹	Nu./kg	-----Nu./ha-----		
Potato	14.286	5	83,384	63,900	46,248
Barley	1.128	12	13,534	3,750	9,000
Vegetable	3.759	5	18,797	9,000	7,000
Wheat	0.902	12	10,827	6,000	5,500
Buckwheat	0.752	15	11,278	7,500	3,700

Source: Survey 2004.

3.4 Sampling technique and sample size

The study site selection was done through purposive sampling as three categories of growers were taken up for the study. In total 140 farmers were interviewed which comprises of 25 contract grower, 55 ex-contract grower and 60 non-contract farmers shown in Table 3.5. Out of 25 contract growers participating in the program all the 25 growers were interviewed. Out of 334 ex-contract growers 55

farmers (16%) were interviewed 25 growers from Bumthang and 30 growers from Wangdiphodrang. In case of non-contract farmers 20 farmers from Bumthang and 40 from Wangdiphodrang were interviewed respectively. The main reason for selecting 16% of ex-contract was due to time constraint as the households were scattered and unavailability of the main respondent. All the three categories of growers were interviewed to assess the production, productivity, seed quality and the returns. The growers were interviewed in depth and the potentials and constraints were also discussed in length to come up with suitable solution for the improvement of present management and contract arrangement system. To assess seed potato production activities in the study sites, respective Extension Agents, Gup (village head man) and Commission Agents (CAs) who are fully involved in the developmental activities of the villages are consulted to obtain information about the current operating mechanisms and their suggestion for the improvement in relation to seed potato production and distribution in the country.

Table 3.5: Number of farmers interviewed.

Farmer Category	Bumthang	Wangdiphodrang	Total
Contract	12	13	25
Ex-Contract	25	30	55
Non-Contract	20	40	60
Total	57	83	140

Source: Survey 2004.

Definitions

Contract grower: Contract growers mean producers who holds a legal interest in a contract operation and who produces a commodity under a production contract.

Ex-contract: Ex-Contract growers are the producers who have already left the production contract but still produce the commodity for their own use and for the market.

Non-contract: Non-Contract growers are that producer who does not have any contract operation but produces the commodity for their own use and for the market.

3.5 Data collection

Primary data were collected using formal and informal methods. The basic purpose of the primary data collection was to identify the operating mechanism of seed potato production system of Bhutan. Initially informal visits to the site and discussions were held with the contract seed grower coordinator of DSC, extension staff, community leaders, and the growers. These discussions greatly helped to understand the problem and conceptualize the study.

A formal household survey was conducted using a structured questionnaire. The questionnaire was pre-tested in Phobjikha, Wangdiphodrang, followed by a survey of 140 households from the three study sites. The household survey was targeted to collect data in two major areas: economic of seed potato production and potential and constraints of the contract seed production system adopted by DSC.

The finding presented in this paper is based on the data that were collected from a field survey conducted during the month of March to May and November to December 2004. Primary data were collected from 140 farmers, randomly selected from three Geogs. Ura in Bumthang and Phobjikha and Sephu Geogs in Wangdiphodrang. A structured questionnaire was used to interview the growers. In addition, information was also obtained from discussion with key informants (i.e. village leaders, village extension officers) and other farmers outside the formal sample to supplement field data. Secondary data was obtained from various published and unpublished reports, journals, literatures, proceedings, personal communications, key informants and observations. Analysis of secondary data helped to focus this research process. Institutions like, Druk Seed, Food Corporation of Bhutan, Research Center, Bhutan Potato Development Program, Agricultural Marketing Division, Commission Agents, Dzongkhag and geog Agriculture Office and Planning and

Policy Division (PPD) of the Ministry of Agriculture provided both formal and informal information.

3.5 Data analysis

Descriptive statistic was used to analyze data generated from the field surveys to accomplish the objective 1 and 2. To get a relative importance of the criteria under study, the criteria are ranked as 1 being the least and 10 being the most important.

Further Economic Analysis of each farm was done to make comparative studies among the three categories of the farmers to address objective 2. The Gross Margin of each category of farmers was obtained by using the formula as below. The returns to land, returns to labour and cost of production was also computed to see whether the farmers are making profit while producing potato.

- | | |
|--|--|
| a. Total Revenue | = Total yield X Price |
| b. Total costs | = Total Variable Cost + Total Fixed Cost |
| c. Net income | = Total Revenue – Total Direct Cost |
| d. Gross Margin | = Total Revenue – Total Variable Cost |
| e. Returns to land | = Gross Margin – Total Variable Cost |
| f. Returns to labour | = (Gross Margin + Hire Labour Cost) /
Total Labour Days |
| g. Returns to family labour | = Gross margin/ Total Family labour
days |
| h. Average Cost of production (Nu/kg) | = Total Cost/ yield |

To achieve the objective 2, multiple linear regression was used to find out the most dominant factors among the 5 which would affect the seed potato quality. This identification is aimed at helping in focusing the intervention for improvement in the future as prescribed in objective 3. The seed quality model can be written as:

$$SQ = \beta_0 + \beta_1 \text{ Contract} + \beta_2 \text{ Seedrep} + \beta_3 \text{ Chemi} + \beta_4 \text{ Weedicide} + \beta_5 \text{ SSP} + \varepsilon$$

Where:

SQ	= Seed Quality produced in %
Contract	= If Contract farmers =1, otherwise =0
Seedrep	= If seed replaced at least once in three year = 1, other wise =0
Chemi	= Amount of fungicide used
Weedicide	= Amount of weedicide used
SSP	= Amount of single super phosphate used
ε	= Error term

Seed Quality means seeds possessing genetic purity, good germination, good vigour and freedom from diseases and pest. The variable is measured in percentage of the quality seed to total seed output.

3.6 Relationship of variables to the seed quality

The contract farmers are responsible for the production of quality seed. They were suppose to follow all the recommended practice for the seed production like crop rotation, roughing, replacement of seed and application of weedicide and fertilizers.

Seed replacement at least once in three year: The quality of seed production depends upon the seed replacement. In the high altitude the virus infection are very less so the seed quality deterioration are also very low rate. It is recommended in

Bhutan that seed need to be changed every three years interval to have a quality produce.

Chemical: Chemical mainly fungicides are used to protect the crop from early blight disease. The seed quality can be improved if the chemical are applied in appropriate time otherwise the early blight disease will damage the crop so the tubers formation will be introverted, which will lead to poor quality of tubers.

Weedicide: It helps to keep the potato field free from weeds so that the crops will not have competitor for nutrients and the lights. When the fields are clean the crop can grow vigorously which helps to produce quality tubers.

Single super phosphate (SSP): In general fertilizers SSP is important for seed formation. In case of potato it will help to form good tuber quality.

Further to achieve the objective 1 present operating systems and objective 3 to identify the possible areas of intervention, SWOT analyses was done with DSC staffs and consultative workshop was carried with the farmers to have better understanding of the systems and to suggest some possible intervention to improve the system for the development of seed sector in Bhutan.

3.7 Strengths, Weaknesses, Opportunities and Threats (SWOT)

Concept of SWOT analysis was applied to the three DSC farms to have a better understanding with regards to the present operating mechanism of contract arrangement and the management system.

Consultative workshop with the growers was carried out to find out the implication of the new policy of cash and carry system in the program. The growers' perception of contract seed production was also discussed to come up with appropriate solution to over come the problems.