

## Chapter I

### Introduction

#### 1.1 Background

The Kingdom of Bhutan is a land-locked country in the eastern Himalayas, located between latitudes  $26^{\circ}45'$  N and  $28^{\circ}10'$  N and between longitudes  $88^{\circ}45'$  E and  $92^{\circ}10'$  E. It stretches roughly 150 km north to south and 300 km east to west, with a total land area of 38,394 km<sup>2</sup>. The country is bordered by the Tibetan Region of the People's Republic of China and the Indian States of Sikkim, West Bengal, Assam and Arunachal Pradesh. The country is divided into twenty Dzongkhags (Districts) which are further sub-divided into 201 Geogs (Blocks) for administrative purposes.

The terrain is among the most rugged and mountainous in the world, as most of the country includes part of the Himalayan ranges. The land rises from an elevation of about 150 m in the south to more than 7,550 m in the north. The variations in climate are correspondingly extreme. Southern Bhutan is generally hot and humid, while the high Himalayan mountains in northern borders of Bhutan are under perpetual snow. Climatic conditions vary considerably between valleys and within valleys depending on altitude. Rainfall, in particular, can differ within relatively short distances due to rain shadow effects. Annual rainfall is concentrated in the monsoon season which falls between mid June to September. For the purpose of agricultural planning, the cropping areas have been divided into six agro ecological zones based on temperature, precipitation and altitude (Table 1.1) (MoA, 1997).

Table 1.1: Agro-ecological zones of Bhutan.

Agro-Ecological Zones	Altitudes (m)	Max. Temp ( °C)	Mini. Temp(°C)	Rainfall (mm)
Alpine	3,600-4,600	12	-0.9	<650
Temperate	2,500-3,600	22.3	0.1	650-850
Warm temperate	1,800-2,400	26.3	0.1	650-850
Dry Sub-Tropical	1,200-1,700	28.7	3.0	850-1,200
Humid Sub-Tropical	600-1,100	33.0	4.6	1,200-2,500
Wet-Subtropical	150-600	34.0	11.6	2,500-5,500

*Source: MoA, 1997.*

## 1.2 Agriculture – Its importance

Agriculture has been and is still the primary activity in the Bhutanese society. Bhutan embraced modern development activities in the early 1960s when the first five year plan was launched. Since then, the government has always accorded priority to the agriculture sector. Agricultural development was viewed as crucial in the development of the rural populace. Over 79% of the country's estimated population of 734,340 is engaged in farming. Most farming system is a subsistence and mixed type in Bhutan, involving crops, livestock, and forest components totally interdependent on one another. The Agriculture sector contributes 38% of the gross domestic product. Of this, about 50% comes from agriculture, 20% from livestock and 30% from forestry (MoA, 2003). Owing to extremely mountainous terrain, only about 11.7% of Bhutan's land area (38,394 km<sup>2</sup>) is suitable for agricultural use. However, the actual operated agricultural area is 197,972.8 ha out of which 14.5 % is wet land (28,735 ha), 48.4 % dry land (95,830.4 ha), 30 % *tseri* (59,435 ha), 6.2 % *pangshing* (12,300 ha), 0.8 % under kitchen garden (1,672.4 ha) (*Department of Survey and Land Records, 2004*). 72.5% of the total area is under forest cover while 15.6% of the land area is not at all suitable for any productive use (MoA, 2002). Rice, maize, potato, buckwheat and barley are predominant crops grown in Bhutan.

According to Central Statistical Organization (CSO) (1989) the bulk of the Bhutanese farmers operate on land holding size of 1 - 2 ha per household with only about 10% having 5 ha. As is common with the smallholder production systems, Bhutanese farmers have also adopted an integrated mix farming system that consists of three components which are crop, livestock and forestry that are intricately linked. Given the close association between these three components of the natural resources, an integrated approach has been adopted towards the development of all these three areas under the umbrella of the Renewable Natural Resources (RNR) Sector. Currently, the development of the agriculture sector is determined by the principles of triple gem i.e *production, market and access* adopted by the MoA.

Ministry of Agriculture in the current 9<sup>th</sup> Five-Year Plan (2002-2007) continues to strive towards long-term national development goals of self reliance, sustainability, preservation of culture and tradition, balanced development and national security with the over-riding objective to protect and conserve the country's fragile mountain environment and its unique flora and fauna. In keeping with these objectives, a strong emphasis has been placed on the principles of sustainable development. The agriculture sectors' strategy to achieve the RNR sector goals consist of enhancing food grain production and simultaneously raising the household income through marketable surplus and promotion of appropriate cash crops, eventually moving towards a sustainable production system. To these ends, framers' group formation, cooperatives and associations have been given the highest priority.

### **1.3 Crops and cropping systems**

A variety of cereals and horticultural crops are cultivated. Rice, maize and wheat are the three major staple crops among which rice is central in the Bhutanese culture, tradition, religion, and the livelihood itself (Ghimiray, 2001). Among the cereals, maize has the highest acreage. Potato stands fourth in line and is grown in all the twenty Dzongkhags of the country. Potato is more of a cash crop than a staple. It is estimated that 50-60% of the total potato produced is exported, 15-20% is retained as seed while the rest about 20-24% is consumed locally (Pradhan, 2000). Other

important cash crops include apples, oranges, walnut and cardamom. In addition to this barley, buckwheat, millets, oilseeds and a variety of vegetables are widely cultivated in the country.

Rice, maize and buckwheat based cropping systems are the three dominant cropping systems in Bhutan (Roder and Gurung, 1990). Potato based cropping systems have recently expanded in the dry lands in warm temperate and parts of temperate agro-ecological zones where potato is predominantly cultivated as a mono-crop. Intercropping potatoes with maize is a prevailing practice contributing bulk of potato production and are mostly confined to in the areas below 2,700 m (Gurung, 1991). In the medium and the low altitudes, the practice of growing winter potatoes prior to the transplanting of rice is increasingly gaining importance (MoA, 1997).

The time of planting of potatoes varies invariably with the altitude and the cropping system. In the rice based system potato is planted after rice harvest, usually by the end of November in the lower altitudes and in the beginning of February in the higher valleys. In the mono-crop system, planting is done in March/April, while in the maize based system where potatoes are intercropped, it starts in the beginning of February. Both planting and harvest time is crucial particularly for the rice based system as a late potato crop delays rice transplantation.

In most parts of Bhutan, potato production is favoured by high altitudes, cool temperatures and natural isolation providing an ideal condition for keeping the good quality of the seed (Hidalgo, 1999). An additional advantage for the Bhutanese potato farmers especially for those in the higher altitudes is that bulk of the crop is harvested at the initiation of the cold winter months favouring ideal storage conditions.

#### **1.4 Development of seed potato sector in Bhutan**

Markham (1879) gave the first documented account of the introduction of potato into Bhutan as cited by Roder (1991). The report stated that George Bogle planted a few tubers at each halting place while negotiating a trade route to Tibet

(1774-75) through Bhutan for the East India Company. On the other hand, it is also possible that potato may have been introduced earlier from Northern India as speculated by Roder, (1991). Although the introduction of potato took place more than 200 years ago, the modern era of Bhutanese potato production is no more than 30-40 years old (Scott, 1983).

Today, potato is one of the most important food and cash crop of the Bhutanese farmers and is cultivated in all the twenty Dzongkhags (MoA, 2003). Considerable achievements have been made in terms of physical expansion in area as well as in productivity, increase in yield per unit area. The area expanded from 3,700 ha in 1981 to 5,631 ha in 1995 which is an increase by 34% (MoA, 1999). Potato production in general has been mostly market driven resulting in varying production area over time. When there is a good market farmers tend to sell almost all their produce retaining very little quantity as seeds for next season. Consequently, with inadequate quantity of seeds available, farmers are able to cultivate only a little area in the subsequent season. Like wise, when the market price is low farmers usually do not or cannot sell the desired quantity of their produce resulting in surplus stock. The farmers are then left with little choice for disposing this stock but to plant in the next season. Under this situation the production areas happen to vary almost annually. For instance, it was reported that area under potato production in 2002 was 3,090 ha where as in 2003 the area was found to be about 4,080 ha which is an increase by 24% (MoA, 2004). Although different institutions have estimated different yields per ha, all the figures indicate an increasing trend. It is reported that as a result of using high yielding varieties, good quality seed and improved agronomic practices the average yield per unit area has tripled from 7 mt ha<sup>-1</sup> to 21 mt ha<sup>-1</sup>. Pradhan (2000) reported the rise from 4 mt ha<sup>-1</sup> in 1982 to 17.2 mt ha<sup>-1</sup> in 1999. With the increase in potato production, a substantial quantity of the domestic produce could be exported resulting in export earnings to the tune of Nu.71.910 million (DRC, 2003). The amount of potato exported has increased from 1,046 mt in 1975 to 17,911 mt in 2003 (MoA, 2003).

After 3 to 4 decades of potato cultivation in the country and despite efforts of Ministry of Agriculture the yield of potato in Bhutan is still low comparing with regional level which can be attributed to many factors. Besides that limitations imposed by climate, topography and the vagaries of nature, other factors have also contributed to this low yield. There is no factor more important in potato production than a steady supply of quality seed (Sikka *et al.*, 1997). In traditional peasant agriculture, farmers do not necessarily have specific fields for production of future seed otherwise planting material is saved from the ware crop. The commonest and slightly improved method of saving future seed was to select the best heads, big ears, specific seed size or colour, etc (Chaudhari, 1974). Such local seed selection practices have disappeared with the establishment of centralized seed systems, which have failed to make impact in many peasant low-cost farming systems in developing countries (Louwaars and Marrewijk, 1995). In the absence of a well coordinated seed potato production system, the currently produced quality seed is inadequate and expensive. Peasant farmers thus tend to recycle future planting materials from ware potato crop. The demand of seed potato formally produced greatly exceeded supply. It used to be highly subsidized basic seed, which was being wastefully used to produce ware potato. There has been also minimum involvement of farmers in the seed potato production process and failure to rationalize the price of seed potato relative to ware potato in many potato-producing areas in Bhutan. The absence of price differences between seed and ware potatoes do not offer incentives to potential seed potato growers. This has tended to encourage farmers to continuously save seed from any type of the potato crop irrespective of the health status. The result of this has been accumulation and dissemination of potato diseases leading to consequential decline in yield. Under pressure for demand of quality seed, the Department of Agriculture initiated Bhutan National Potato Program (BNPP) in 1983 which organized general and seed potato production program.

With the closure of the BNPP in 1994, National Seed and Plant Production, now Druk Seed Corporation (DSC) under the Ministry of Agriculture took over seed potato production responsibility. DSC is the only government agency responsible for seed production and marketing in Bhutan. Potato being one of the potential cash crop,

it forms a bulk of the crop handled by DSC. DSC has been employing contract farmers “Contract Seed Growers” (CSG) to produce seed in different localities. With the reorganization and change in the policy of DSC, the involvement of contract farmers has been greatly reduced. These changes are assumed to have inflicted the problem of seed potato availability in the country.

### 1.5 Production constraints

In contract farming many of the problems arise from the difficulty of coordinating the production and delivery system. The coordination problems have usually resulted from three main sources viz:

- Failure of growers to comply with DSC instructions
- DSC’s lack of physical or managerial capacity
- Exogenous variables, principally climate

One of the biggest problems identified by almost all growers is wild pig damage on potato apart from the escalating cost of inputs coupled with the marginal increase in market prices resulting in lower profit margins. Bhutanese potato price and the market is totally governed by the Indian market so, the growers most of the time do not even recover the cost for production of potato. In potato the price is not pre-fixed as in other seed crops like cereals and vegetables seed. The price for the seed potato is fixed as per the average auction price for three months (*Average of the highest average price for July, August and September every year*)

Although the average open market price of potato has been increasing for the last five years as stated by the growers, the seed potato price has more or less remained static. On the other hand, production costs have increased considerably in the same period due to hike in input cost. Lately, shortage of labour has also emerged as a major concern, more so with high rural-urban migration and potato being labour intensive crop, labour shortage can be a crucial detrimental factor leading to failure of potato development. Further, to protect the crop from wild pig, farmers reported that a

big share of labour is employed in crop protection, which aggravates the problem directly or indirectly associated of labour shortage (Figure 1.1).

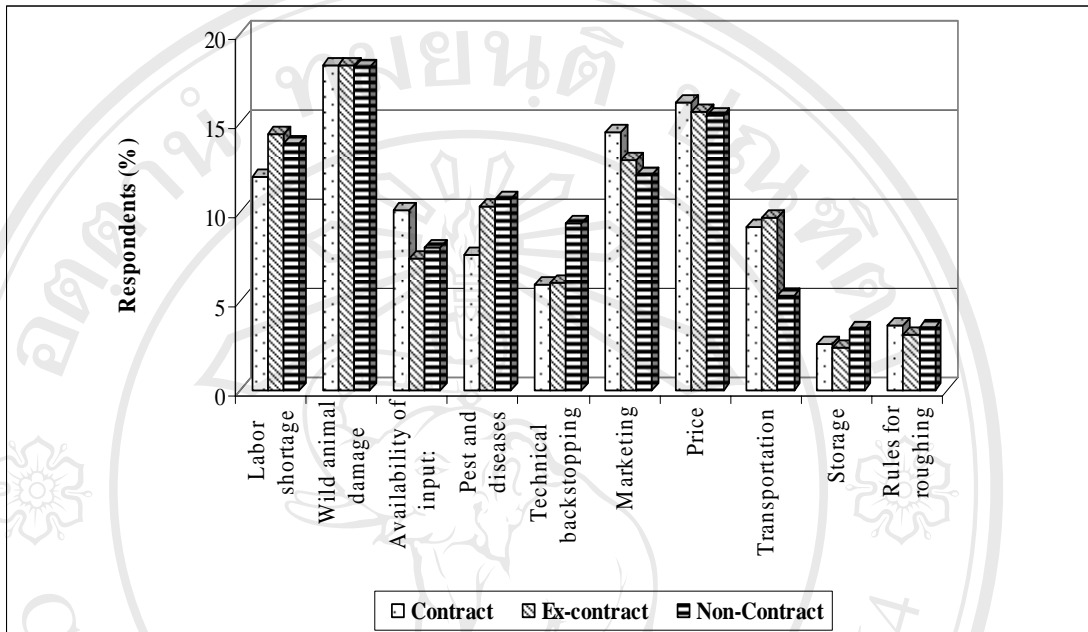


Figure 1.1: Problems in seed potato production.  
Source: Survey, 2004.

As a partner in the business, the individual growers are not satisfied with their relationship with the DSC. There seems to be a very common response from the growers to form a grower's association or co-operatives which may give them a better bargaining power in the potato business. Farmers have shown diverse interest while making attempts to enhance business through increased production. This diversity of interests among the farmers has in reality presented difficulties in the whole process. Growers perceive group formation as one of the best and viable means for attaining long-term benefits but due to the diverse interest the process seems to be difficult and time consuming. There are elements in the existing contracting situation that promote growers organization and others which impede it resulting in a situation which calls for close analysis.



## 1.6 Rationale

Although substantial progress has been made in Bhutanese agriculture sector, problems of low productivity and poor quality output are causes for concern especially in the era of globalization. These problems arise due to inadequate knowledge, high risk in input and output markets and low risk bearing ability of farmers. With about 79% of population dependant on agriculture, Bhutan has no options but to make its agriculture sector competitive and therefore explore alternatives to overcome these problems. One such alternative is agro-based industries occupying greater role in the production activities. Agro industries can get involved in agriculture through contract and corporate farming. Corporate farming has limited role to play as there are a large number of small and marginal farmers who depend primarily on small piece of land for their livelihood. Therefore greater emphasis has to be given to contract farming assuming that the company will be able to assist in reducing the price risk as well as yield risks through better technology, access to credit and extension services. Success of the contract farming can be measured by the longevity of relationship between company and farmers or by the growth rate of number of contract farmers and land area under contract farming over the years. However, there seems to be a big concern over the risk of dealing with large number of farmers by the company.

Potato is a major cash crop that plays significant role in household income and food security of high altitude farmers. It is grown on about 4,080 ha mainly as rain-fed crop producing 40,532 mt. Almost 59% of the total produce is being exported to India mostly during the period from June to November (MoA, 2004). Although various estimates of yield have been reported, the official yield reported is 11.47 mt ha<sup>-1</sup>. Currently Desiree, Kufri Jyoti, Yusikaap and Khangmakaap are four commercially grown varieties. DSC has a well-established tissue culture facility for the production of the pre-basic tuberlets. DSC multiplies and maintains its own stock of pre-basic and undertakes subsequent multiplication of Foundation I and II on its farm. The Foundation II seed is then supplied to CSGs for multiplication of certified seed. The CSGs' receive the seed premium (20%) in lieu of the certified seed

produced by them from DSC. However, the premium paid by DSC is only for about 30-33% of the total seed potato produced by the contract growers.

Considering the limited physical capacity of the DSC, contract-farming approach was initiated from the inception of seed industry in Bhutan in 1984 to enhance seed potato production. From the estimated seed demand of 4,040 mt, 80% of the seed demand is met through informal system. CSGs are vital partners to DSC; because 85-90% of seed volume of DSC is produced through the CSGs. DSC alone cannot produce the entire seed requirement in its farms due to limited land and other vital resources. Further, deployment of contract seed growers shall naturally reduce the overhead and farm maintenance cost met by the DSC.

The main draw back of DSC is that it concentrated and gave importance only to interested individual growers instead of venturing into contract farming with farmer's group. The problem with individual growers has been their scattered distribution all over which makes collection difficult and expensive. This particular situation has been a bottleneck for the corporation to monitor and provide technical back stopping on time. All these factors have undoubtedly contributed to poor quality, low production yield and to mention DSC's inefficiency as well. During the year 2003, there were about 475 CSGs across the country located at various altitudes out of which 359 CSGs were involved in seed potato multiplication. Initially, the growers were provided with all the necessary inputs for the production in credits. Later the inputs like fertilizers and chemical were withdrawn and only seed was given in credit to the growers as there was huge financial outstanding against the growers. Repeated failure of growers to repay the input cost due to poor harvest or not complying to the agreement and at the same time selling produce to open market brought negative impact on the program. In 2003 the new management of DSC introduced cash and carry system in the program with an objective to reduce accumulation of outstanding dues against the growers. The introduction of cash and carry system unfortunately reduced the numbers of contract growers. This reduction by physical number was too large for a corporation which was aiming to form farmer's groups. At present there are only 25 contract seed potato growers as compared to 359 CSGs in 2002-2003.

This particular unwelcome side effect of cash and carry system is yet a real threat for the success and credibility of the DSC, which is the only corporation in the country dealing with production and meeting seed demand in the country.

It is therefore imperative that the DSC examine closely some important issues linked with contract farming like the following:

- ✓ Company and farmers contract relationship
- ✓ Factors affecting sustainability of contract
- ✓ Policy of the company on price, quantity and quality
- ✓ Contract farming and risk sharing like production, price and quality risk.
- ✓ Factors motivating contract farming
- ✓ Maintaining the contract, mechanisms of renewing the contract and strategies to attract new contract seed growers.

At this juncture, considering the current knowledge and the over all potato production scenarios in the country, certain basic questions appear to surface, such as:

1. What is the scope of sustainability of the contract seed potato production?
2. What are the economic benefits that will be received by the contract farmers as compared to the non-contract and ex-contract farmers?
3. What are the potential areas for improvement in the contract seed production system?

### 1.7 Objectives

In coherence to the research question stated above, the objectives of the study are as follows:

1. To describe the operating mechanism of contract seed potato production system in Bhutan;
2. To assess the production, productivity, quality of seed and returns among contract, ex-contract and non-contract farmers and ;
3. To identify possible areas of intervention to enhance the role of contract seed potato growers in seed sector development.

### **1.8 Usefulness of the study**

The study attempts to enhance greater understanding of contractual seed potato production system in Bhutan. The findings will help to improve the operating mechanism for contract farming there by ensuring a healthy growth of contract system. The findings will also contribute in formulating appropriate strategies for overall seed production program in the country. At the same time other government or private enterprises could even opt for replication of the findings elsewhere within the country where appropriate and feasible.

### **1.9 Scope of the study**

The study was carried out in Wangdiphodrang and Bumthang Dzongkhags of Bhutan. Since, DSC produces seed potato through contract growers in Phobjikha and Sephu geogs of Wangdiphodrang and Ura geog of Bumthang, therefore, the farmers were interviewed from these three locations only. Areawise for potato cultivation Wangdiphodrang Dzongkhag stands in third and Bumthang in fourth place next to Tashigang and Paro Dzongkhags.

Although diverse crops are grown by the farmers but, potato is the main cash crop for the people in the study area. This study mainly focuses on seed potato production through contract seed growers. The contract, ex-contact and non- contract growers were interviewed to obtain the required information on production, productivity, seed quality and their returns. The data of production years (1999-2003) was taken up in the study to compare the economic benefits among the three categories of the farmers.