Citrus in Bhutan: Value Chain Analysis

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Ministry of Agriculture and Forests
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Note on the use of the terms: ‘Mandarin’, ‘Orange’ and ‘Citrus’
In Bhutan mandarin orange represents over 95% of Citrus fruits. Hence, in this
document mandarin, oranges and citrus are interchangeably used.
FOREWORD

Agriculture is the main foundation of the Bhutanese economy. It provides the livelihood base for 69% of Bhutan’s total population. Agricultural production accounts for 21.4% of the GDP of Bhutan, while horticulture accounts for approximately 13% of agriculture. Citrus is the most important horticultural crop in terms of area and production. The annual production of citrus is 72,071 tonnes, of which US$ 0.44 million worth of oranges are exported to India and Bangladesh. The Royal Government of Bhutan has set a production target of 100,000 tonnes for export. This is to be attained within the next 5 years.

Government policy is geared toward transforming the agriculture sector from subsistence farming to market-oriented commercial farming. The RGoB, with the support of many development agencies, has been putting great efforts into boosting the overall production of Bhutan's RNR products on a sustainable basis in order to improve their quality and competitiveness. The Ministry of Agriculture and Forests (MoAF) has launched the concept of three pillars: Production, Accessibility and Marketing to consolidate these efforts. The MoAF has established Agricultural Marketing Services (AMS) which has recently been upgraded to the Department of Agricultural Marketing & Cooperatives (DAMC) to facilitate the marketing of RNR products. Under DAMC, the Regional Agricultural Marketing Services (RAMS), which is now known as Regional Agricultural Marketing & Cooperatives Office (RAMCO), has been actively engaged in Eastern Bhutan in 6 dzongkhags, which are characterised by inaccessibility and marginality. RAMCO has a pivotal role to play in linking small cash crop holders with markets for their products.

Over the last few years, remarkable progress has been made in agricultural development. With the expansion of road networks, construction of farm and feeder roads and increased access to information and technology, farmers are gradually moving from subsistence to commercial farming. Areas under cultivation of several RNR products, like mandarin, potato and kidney beans have been rapidly increasing. Citrus, mainly the mandarin orange, is ideally suited to the topographic and climatic conditions of Bhutan and has a very high potential to contribute to increasing rural incomes and reducing poverty. It ranks first in terms of its export value.

This study on the citrus value chain has been carried out within the overall framework of the partnership agreement between DAMC, AMEPP and SNV. The main aim of the study was to identify the bottlenecks which needed to be addressed in order to improve competitiveness. The authors have adopted the Value Chain approach to map the subsector, identify gaps in support services and suggest areas of improvement. This publication provides a critical overview of the existing production system, product delivery methods, trading practices and support services. It presents a descriptive analysis of the market looking at the production trends, prices, demand and supply conditions in neighboring countries and the competitive advantage of Bhutanese citrus products.

The efforts made by the authors in collating and analysing this information and bringing out this publication are appreciated. It is hoped that this publication will be useful for development agencies, business development service providers, orange exporters and other actors and supporters in designing and implementing appropriate interventions in the orange subsector.
Tashi Delek!

Sherub Gyaltshen
SECRETARY
Ministry of Agriculture and Forests
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At the request of the Regional Agricultural Marketing and Cooperative Office (RAMCO) of the Department of Agricultural Marketing and Cooperatives, the Netherlands Development Organization (SNV) provided a Value Chain Development Specialist consultancy service to support RAMCO in carrying out a study of RNR value chains. The period of this consultancy was July 15 to December 31, 2009. As per the Assignment Agreement signed between RAMCO (formerly known as Regional Agricultural Marketing Services) and SNV, the present study was conducted to acquire a detailed profile of the Citrus Value Chain. We highly appreciate and acknowledge the financial support provided by SNV and AMEPP in carrying out the study and printing this book.

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We would like to thank our colleagues in RAMCO for providing their technical input and logistical support. We particularly thank Mr. Nima Weezer, Mr. Tek Bahadur Tamang and Mr. Ugyen Tshering for supporting us in carrying out the field survey and compiling data. We would also like to thank Mrs. Fiona Stiedl for careful editing of the manuscript and Mr.………………for his layout design and computer formatting.
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<td>ACIAR</td>
<td>Australian Centre for International Agricultural Research</td>
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<td>AMC</td>
<td>Agricultural Machinery Centre</td>
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<tr>
<td>AMEPP</td>
<td>Agriculture, Marketing &amp; Enterprise Promotion Project</td>
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<td>AMS</td>
<td>Agricultural Marketing Services</td>
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<tr>
<td>BAFRA</td>
<td>Bhutan Agriculture and Food Regulatory Authority</td>
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<td>BAIL</td>
<td>Bhutan Agro-Industry Ltd.</td>
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<tr>
<td>BCCI</td>
<td>Bhutan Chamber of Commerce and Industry</td>
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<td>BDFCL</td>
<td>Bhutan Finance Development Corporation Limited</td>
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<td>BDS</td>
<td>Business Development Services</td>
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<td>BEA</td>
<td>Bhutan Exporter Association</td>
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<td>CAs</td>
<td>Commission Agents</td>
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<td>CoRRB</td>
<td>Council of RNR Research for Bhutan</td>
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<td>CSGs</td>
<td>Contract Seed Growers</td>
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<td>DAMC</td>
<td>Department of Agricultural Marketing and Cooperatives</td>
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<td>DAO</td>
<td>Dzongkhag Agriculture Officer</td>
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<td>DoA</td>
<td>Department of Agriculture</td>
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<td>DRC</td>
<td>Department of Revenue and Customs</td>
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<td>DSC</td>
<td>Druk Seed Corporation</td>
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<td>EOs</td>
<td>Extension Officers</td>
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<td>FAO</td>
<td>Food and Agricultural Organisation</td>
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<tr>
<td>FCB</td>
<td>Food Corporation of Bhutan</td>
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<td>FNPP</td>
<td>FAO Netherlands Partnership Programme</td>
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<td>FYM</td>
<td>Farm Yard Manure</td>
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<td>GDP</td>
<td>Gross Domestic Product</td>
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<td>HH</td>
<td>Household</td>
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<td>ICIMOD</td>
<td>International Centre for Mountain Development</td>
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<td>IFAD</td>
<td>International Fund for Agriculture Development</td>
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<td>IFPP</td>
<td>Integrated Food Processing Plants</td>
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<td>IPPC</td>
<td>International Plant Protection Convention</td>
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<td>JICA</td>
<td>Japan International Cooperation Agencies</td>
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<td>Kg</td>
<td>Kilogram</td>
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<td>LC</td>
<td>Letter of Credit</td>
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<tr>
<td>M/SMES</td>
<td>Micro, Small and Medium Enterprises</td>
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<td>MIS</td>
<td>Market Information System</td>
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<td>MoAF</td>
<td>Ministry of Agriculture and Forests</td>
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<tr>
<td>MoEA</td>
<td>Ministry of Economic Affairs</td>
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<tr>
<td>MT</td>
<td>Metric Tonnne</td>
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<tr>
<td>NPHC</td>
<td>National Post Harvest Centre</td>
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<td>NPPC</td>
<td>National Plant Protection Centre</td>
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<td>NSB</td>
<td>National Statistical Bureau</td>
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<td>NSSC</td>
<td>National Soil Science Centre</td>
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<td>Nu.</td>
<td>Ngultrum</td>
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<td>PPD</td>
<td>Policy and Planning Division</td>
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<td>RAMC</td>
<td>Regional Agriculture Machinery Centre</td>
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<td>RAMS</td>
<td>Regional Agricultural Marketing Services</td>
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<td>RDA</td>
<td>Recommended Dietary Allowance</td>
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<td>RGoB</td>
<td>Royal Government of Bhutan</td>
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<td>RNR</td>
<td>Renewable Natural Resources</td>
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<tr>
<td>Acronym</td>
<td>Description</td>
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<tr>
<td>RNRRC</td>
<td>Renewable Natural Resources Research Centre</td>
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<td>RNRRDC</td>
<td>Renewable Natural Resources Development Centre</td>
</tr>
<tr>
<td>RSTA</td>
<td>Road Safety and Transport Authority</td>
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<tr>
<td>RTIO</td>
<td>Regional Trade &amp; Industry Office</td>
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<tr>
<td>SNV</td>
<td>Netherlands Development Service</td>
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<tr>
<td>SWOT</td>
<td>Strength, Weakness, Opportunity and Threat</td>
</tr>
<tr>
<td>UN</td>
<td>United Nations</td>
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<td>VC</td>
<td>Value Chain</td>
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CHAPTER ONE: INTRODUCTION

1.1 Background

Bhutan has a good potential for the production of RNR products, which include agriculture, livestock and non-wood forest products. The contribution from the agriculture sector to GDP was 21.4% in 2006, while its contribution to employment activity was 64.2% in 2007 (Wangchuck, 2008). The country has a favourable environment for the production of RNR products such as mandarin, potato, off-season vegetables, medicinal plants, mushroom, etc, which have high value chain enhancement opportunities. These products significantly contribute to national income and employment among the rural population.

Over the past few decades, the RGoB has invested heavily in human resources and infrastructure development in the RNR sector. There has been significant progress in the expansion of farm and feeder roads and the establishment of collection centres for agricultural and horticultural produce, market sheds and RNR extension offices. As a result of the high priority placed by the government on the RNR sector, the areas under cultivation vis-à-vis production of RNR products like mandarin, potatoes and kidney beans (rajma) have rapidly increased over the last few years. According to research reports, the RNR sector is expected to grow further in the coming years and it will continue to play a vital role in the national economy. The aspiration of farmers to increase production of RNR products is very high, but they are apprehensive about the delivery of their produce to the competitive market.

In its 10th Five year plan, the RGoB has placed greater emphasis on strengthening the commercialisation of agriculture and in particular, value-addition of agricultural produce. The promotion of horticulture and cash crops, including the commercial development of non-wood forest products and organic farming in suitable areas are some of the priority areas under the Tenth Plan. Major targets for the RNR sector are shown in Box 1.

### Box 1: RNR Targets of 10th Five Year Plan

- Rural Poverty less than 20%
- Mean rural household cash income above Nu. 35,000
- At least 70 farmers group established for NWFP production and commercialization
- Value of horticultural export at Nu. 150 million
- 25% of farmers engaged in horticultural export cropping
- 20% of rural population living within one hours walk from a road-head
- 15% of farmers are certified natural/organic producers
- Master Plans developed for at least two main watersheds
- 4% of forest area to be managed as community or private forestry

Recognising the importance of marketing, the RGoB developed the concept of the “Triple Gem” (now known as MAP) – strengthening Marketing, improving Accessibility and increasing Production. To facilitate the marketing of RNR products and coordinate efforts toward creating an enabling environment, the Agricultural Marketing Services
(AMS) was instituted in 2003/04. The AMS is recently upgraded to the Department of Agricultural Marketing and Cooperatives (DAMC) with the aim of facilitating and promoting the marketing of agricultural products through an efficient and effective marketing system.

The present study is conducted as a part of an ongoing collaboration between the Netherlands Development Programme (SNV) and the DAMC of the Ministry of Agriculture and Forests to address the issues of production, income and employment generation. This study looks at the full range of activities required to bring a product from its producer through processors/traders to consumers, and suggests ways of strengthening the value chain linkages. Citrus is chosen for the study since it is the main source of livelihood and cash income for rural households. Citrus is one of the largest agricultural export commodity of Bhutan in terms of volume and value of exports.

1.2 Objective:

The primary objective of the study is to provide a descriptive analysis of the citrus value chain, identify the major constraints of the subsector, understand the business service provisions, and suggest specific areas of intervention to upgrade the value chain. More specifically, the study investigates the following 3 areas through various activities:

**Value Chain**
- Develop a value chain map and identify the major players in the value chain
- Identify the constraints and opportunities faced by the value chain members
- Identify the competitive advantages/disadvantages of the subsector components: market access, technology/product development, management/organisation, input supply (raw materials), finance, policy, operating environment/infrastructure, trade regime, etc.
- Identify Strengths, Weaknesses, Opportunities and Threats (SWOT) of the subsector

**Market Conditions**
- Identify the present market conditions of the sub-sector – market size, key players, demand-supply gap, pricing trends, imports and exports, distribution networks
- Identify sector prospects and barriers to growth

**Support Services**
- Identify and prioritise business development services needed by the sub sector
- Identify existing service providers and assess the services being provided by them to the subsector and their relationship with clients
- Identify potential service providers and assess their ability and willingness to provide the needed/missing services

The study had three stages: 1) information gathering, 2) analysis of the information in the light of the subsector dynamics, and 3) presentation of key findings on effective interventions which will lead to subsector growth.
1.3 Methodology

The data compiled and analysed for the assignment was gathered under the following methodologies:

**Review of Secondary Information:** Secondary information was collected from project documents, internet data and reports of RAMCO, SNV East Portfolio, AMEPP and other government and non-government agencies. The publications of the Horticulture Division and RNRRC Wengkher, Commodity Chain Analysis report of MoAF and FNPP, Agriculture and RNR statistics, and other reports and websites were an important basis for the review of past experience and practices. The full list of publications and websites visited for understanding the citrus value chain in general, and marketing systems and support service structures in particular, is given under ‘References’.

**Primary information:** Primary data were collected (1) by observing people, places and practices and (2) by interviewing actors and supporters of the citrus value chain. Focus group discussions were organised to get a collective view from participants about what they do and do not like about existing practices and how market linkages can be improved. A number of meetings, informal discussions and interviews were conducted with professionals of different agencies providing support services, business entrepreneurs and farmers, to gain an in-depth understanding of some of the key issues which have a bearing on all the links of the value chain.

Field visits were carried out in all the major citrus producing gewogs in eastern Dzongkhags. **Observation data** were collected by watching people, production and marketing practices, storage conditions and other market infrastructures. **Questionnaire data** were collected by interviewing value chain actors (producers/groups, contractors, wholesalers, retailers) and support providers. Different sets of questions and checklists were prepared for different groups of actors/stakeholders and interviews/interactions held at the following levels:

- Citrus growers/orchard owners
- Contractors
- Traders at auction yards
- Retailers/local vendors
- Support Service providers/ VC promoters

1.4 Study Area

The main focus of the survey was Eastern Bhutan, which comprises 6 Dzongkhags: Mongar, Lhuentse, Pemagatshel, Samdrup Jonkhar, Trashigang and Trashiyangtse as indicated in the map (Figure 1). This region is one of the most rugged and under-developed in the entire Kingdom and it now forms the main focus of the RGoB’s development efforts. The population is sparse and the remote terrain poses challenges when marketing agricultural products. Citrus is the most important cash crop across all the agro-ecological zones in the region.

For the field survey almost all the major citrus growing gewogs of Eastern Bhutan were selected. In total, 107 citrus growers were surveyed along with the observation of citrus orchards, collection centres and market sheds. Apart from farmers, local fruit vendors,
traders in Samdrup Jonkhar Auction Yard, exporters and other relevant stakeholders providing support to the citrus subsector were also interviewed.

As citrus is the principal export crop, the study also looked beyond the geographic boundary of Eastern Bhutan to understand the flow of the product and price dynamics. Data collected from Eastern Bhutan were compared with national as well as regional data.

![Figure 1: Map of Bhutan Showing Eastern Dzongkhags](image-url)
CHAPTER TWO: GENERAL OVERVIEW OF THE SUBSECTOR

2. 1 Introduction

Citrus fruits are among the most important fruits grown worldwide, especially in warm temperate and humid subtropical and tropical regions. Citrus refers to a range of evergreen shrubs and tree species, which are primarily grown for their fruit. Citrus fruits rank first in the international fruit trade in terms of value, and occupy the largest area under cultivation of all horticultural crops.

Citrus originated in East Asia, from the region that includes India, China, Bhutan, Myanmar and Malaysia. Citrus was described for the first time in Chinese literature in approximately 2000 B.C. According to most researchers, it was taken from Asia to North Africa and then to the southern part of Europe, where it would have arrived in the Middle Ages. From Europe it was carried to the Americas circa 1500.

Research and experimental studies to improve orange varieties began in the 19th century in Europe, and currently, the most productive citrus groves are in regions with tropical and sub-tropical climates, especially Brazil, the United States, Spain, other Mediterranean countries, Mexico, China and South Africa.

2.1.1 Description

*Citrus* is a flowering plant belonging to the family Rutaceae and is the common name for edible fruits of this genus. The genus *Citrus* includes several species such as orange (*Citrus sinensis*), mandarins (*Citrus reticulata*) lemons (*Citrus limon*), limes (*Citrus aurantifolia*), grapefruit (*Citrus paradisi*), pummel or pommel (*Citrus grandis*). Citrus fruits are a distinctive berry with the internal parts divided into segments.

With regards to oranges, which are universally enjoyed, there are primarily two types; the sweet orange and mandarin. The "Mandarin orange" or mandarin is a small citrus tree (*Citrus reticulata* Blanco) with fruit resembling the sweet orange (*Citrus sinensis*). However, the fruit is oblate, rather than spherical, and roughly resembles a pumpkin in shape. Mandarin oranges are sometimes grouped as "loose-skinned oranges" because their skins easily slip off the fruit (Herbst 2001). Their segments also are loose and easily separate.

2.1.2 World Trend of Citrus Production

The world production of citrus fruit experienced a steady and continuous growth in the last decades of the twentieth century. Total annual citrus production was estimated by the Food and Agriculture Organisation of the United Nations (FAO), at over 105 millions in the period 2000-2004. Oranges constitute the bulk of citrus fruit production, accounting for more than half of global citrus production in 2004. According to the FAO corporate statistical database (FAOSTAT), the top ten producers of oranges are Brazil, USA, Mexico, India, China, Indonesia, Spain, Iran, Italy and Egypt (Table 1).
Table 1: Major orange producing countries of the world in 2007 (Source: faostat.fao.org; accessed in December 2009)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
<th>Production (Value in 1000$)</th>
<th>Production (Quantity in MT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Brazil</td>
<td>3283702</td>
<td>18685000</td>
</tr>
<tr>
<td>2</td>
<td>United States of America</td>
<td>1292919</td>
<td>7357000</td>
</tr>
<tr>
<td>3</td>
<td>Mexico</td>
<td>746669</td>
<td>4248715</td>
</tr>
<tr>
<td>4</td>
<td>India</td>
<td>685386</td>
<td>3900000</td>
</tr>
<tr>
<td>5</td>
<td>China</td>
<td>557607</td>
<td>3172910</td>
</tr>
<tr>
<td>6</td>
<td>Indonesia</td>
<td>461472</td>
<td>2625884</td>
</tr>
<tr>
<td>7</td>
<td>Spain</td>
<td>456818</td>
<td>2599400</td>
</tr>
<tr>
<td>8</td>
<td>Iran</td>
<td>404202</td>
<td>2300000</td>
</tr>
<tr>
<td>9</td>
<td>Italy</td>
<td>403053</td>
<td>2293466</td>
</tr>
<tr>
<td>10</td>
<td>Egypt</td>
<td>316332</td>
<td>1800000</td>
</tr>
</tbody>
</table>

In recent years, the annual growth rate of orange production remained below 1% (Figure 2). The FAO report projected orange production in 2010 as 64 million MT, approximately 10 percent greater than that realized over the 1996-98 period. The projected annual rate of growth of 0.76 percent is substantially lower than 3.9 percent which occurred from 1986-88 to 1996-98. According to FAO estimation, of the projected 64 million MT of production, 35.7 million MT is expected to be utilised as fresh and 28.3 million MT processed (Spreen, 2001).

According to FAO, orange producing countries in Asia are expected to continue to expand production, but nearly all of this production will be consumed in domestic markets. China is projected to overtake Mexico as the third largest orange producing country, and India will remain as the fifth largest producer (Spreen, 2001).
2.1.3 World’s import, export and consumption trends

The trade of oranges is global in scope. Though they are produced mainly in subtropical, semitropical to tropical regions, they are traded and consumed in all parts of the world. According to FAO, the major orange importing countries in 2007 were: Netherlands, France, Germany, Russian Federation, United Kingdom, Canada, Spain, Belgium, China and USA (Figure 3).

The world’s major orange exporting countries in 2007 were Spain, South Africa, USA, Netherlands, Greece, Australia, Morocco, Egypt, Italy and Argentina (Figure 4).

In 2007, Belgium (390,425MT), USA (360,059MT), UK (157,772MT), Canada (41,090) and the Republic of Korea (32,032) were the major importers of concentrated orange juice, whereas Brazil was the largest exporter, with an export value of US$1542.6 million and quantity of 976,364 metric tonnes (FAOSTAT). With regard to orange juice, Germany was the largest single consumer with an import value of US$ 602 million,
which was followed by France (US$ 504 million), Netherlands (US$ 370 million), UK (278 million) and Canada (US$ 229 million). Again the largest exporter of orange juice was Brazil (FAOSTAT)

2.1.4 Nutritional Aspect and Uses

**Oranges are best known for their vitamin C content.** One hundred grams of oranges contains 89% of the recommended dietary allowance (RDA) of vitamin C, 4% of vitamin A, 4% of Calcium as well as 1% iron. One hundred grams of oranges also contains 12 grams carbohydrate and 1 gram of protein. However, once cut or squeezed, the vitamin C quickly begins to dissipate, and after only eight hours at room temperature or 24 hours in a refrigerator, there is a 20 percent loss of vitamin C (Herbst 2001). In canned, bottled, or frozen concentrate form, the vitamin C content is greatly decreased (Herbst 2001). Oranges are also a good source of foliate, vitamin B1 and fiber (Bender and Bender 2005).

Oranges have many uses. The fruit is commonly peeled and eaten fresh, or squeezed for its juice. The fruits and fruit juice of orange play an important role in human nutrition and are useful for the treatment of diseases arising from vitamin deficiencies including coughs and colds (Cox, 1995). It has a thick bitter rind that is usually discarded, but can be processed into animal feed by removing water, using pressure and heat. It is also used in certain recipes as flavoring or a garnish. The products made from oranges include:

**Orange juice:** After fresh fruits, juice is the most commonly traded orange product. It is made by squeezing the fruit on a special instrument called a “juicer” or a "squeezer." Brazil is the largest producer of orange juice in the world, followed by the United States.

**Orange oil:** Essential oil is a by-product of the juice industry produced by pressing the peel. It is used as a flavoring of food and drink and for its fragrance in perfume and aromatherapy. Orange oil consists of about 90 percent d-Limonene, a solvent used in various household chemicals, such as to condition wooden furniture, and along with other citrus oils, in grease removal and as a hand-cleansing agent. It is an efficient cleaning agent, which is environmentally friendly, and much less toxic than petroleum distillates. It also smells more pleasant than other cleaning agents.

**Orange blossoms:** The orange blossom is traditionally associated with good fortune, and was popular in bridal bouquets and head wreaths for weddings for some time. The petals of orange blossom can also be made into a delicately citrus-scented version of rosewater. Orange flower water is a common part of Middle Eastern cuisine.

**Tea:** In Spain, fallen blossoms are dried and then used to make tea.

**Orange blossom honey:** Orange blossom honey, or citrus honey, is produced by putting beehives in the citrus groves when they are in bloom; The bees collect flower nectar for making honey and also pollinate the crop (seeded citrus varieties). Orange blossom honey is highly prized, and has a distinctive orange taste.

**Marmalade:** Marmalade is a conserve usually made with bitter or sour oranges, which are too sour and astringent to eat raw. All parts of the orange are used to make
marmalade: the pith and pips are separated and typically placed in a muslin bag where they are boiled in the juice (and sliced peel) to extract their pectin, aiding the setting process.

Orange peel: Orange peel is used by gardeners as a slug repellent. It is also used in traditional medicines, Ayurvedic tonics and in beauty and skin care cream.

Pickle: Pickle made from sour oranges (also lime and lemon) is commonly used in Nepal. The fruits are pickled by cutting into spirals and stuffing with salt. The pickle is usually consumed with rice and dal.

2.1.5  Citrus fruit quality standards

Fruits and vegetables are considered ‘health food’ as they are microbiologically safer than meat, poultry and other foods. However, soil selection and preparation, variety selection and other decisions influence the quality of the product. Quality is also affected by climatic conditions during the growing period, as well as irrigation, fertilisers, control of pests and diseases and other cultural practices.

Generally speaking, fruits like oranges, which are protected by peel, are relatively safe for consumption. They are not considered to be a cause of food-related illnesses. However in some cases, if fruits are ruptured and over-ripened, or treated with chemicals for ripening, then there is a possibility of contamination. It is difficult for consumers to detect whether fruits contain any dangerous substances originating from soil, water, chemical fertilisers or pesticides used on the plant and fruit. They generally assess the fruit’s quality based on taste, freshness, ripeness, colour and appearance.

Taste is usually expressed in terms of the combination of sweet and sour principles. The content of soluble solids is a good estimate of total sugar content, and mandarin should have at least 8% solids. Organic acids (citric, malic, oxalic and tartaric acid) are the other important components of taste, particularly in their relationship with soluble solids.

Freshness is the condition of being as close to harvest as possible, whereas ripeness refers to the point of maximum eatable quality. Appearance is the first impression that the consumer receives and the most important component of the decision to purchase the fruit.

In recent decades, food safety has become a significant issue. International quality standards for citrus fruits and products are normally set in Codex Alimentarius, a joint commission of WHO and FAO (Box 2). For quality testing, the fruit is squeezed from the sample fruit and the juice is tested for two main attributes, brix (total soluble solids) and acid. From these two attributes, the sugar/acid ratio, which gives the flavor of the juice, is determined.

Apart from internationally established standards or quality, buyers, supermarkets and retailers also demand quality products with third party certification. In Bhutan, BAFRA is the government authority that inspects the quality based on size (meel and keel), colour and general appearance and issues certificates for export. It has the right to reject any lots of fruits that do not meet the prescribed standards. There is strong regulation concerning the transportation of seedlings/saplings from one Dzongkhag to another. It is
prohibited to introduce plants into new areas without permission from the concerned authority. As per regulations, fruits and vegetables can be sold only in designated market places and juice and value-added products need to be labelled and packaged according to prescribed standards.

**Box 2: Minimum Quality Requirements as provisioned by Codex Alimentarius**

In all classes, subject to the special provisions for each class and the tolerances allowed, the oranges must be:

- Whole;
- Sound, produce affected by rotting or deterioration such as to make it unfit for consumption is excluded;
- Clean, practically free of any visible foreign matter;
- Practically free of pests affecting the general appearance of the produce;
- Practically free of damage caused by pests;
- Free of abnormal external moisture, excluding condensation following removal from cold storage;
- Free of any foreign smell and/or taste;
- Free of damage caused by low and/or high temperatures;
- Free of damage caused by frost;
- Free of signs of internal shriveling;
- Practically free of bruising and/or extensive healed-over cuts.

The oranges must have been carefully picked and have reached an appropriate degree of development and ripeness account being taken of the characteristics of the variety, the time of picking and the area in which they are grown.

The development and condition of the oranges must be such as to enable them:

- To withstand transport and handling; and
- To arrive in satisfactory condition at the place of destination.

**2.2 Citrus in Bhutan**

Bhutan has a wide range of climatic conditions and forms a natural resource base for the production of a wide variety of horticultural crops. Citrus is among the most important that contribute to Bhutan’s economy through generating export revenue, income and employment opportunities. Many citrus species and varieties of mandarin (*Citrus reticulata*), lime (*Citrus aurantifolia*) and lemon (*Citrus limon*) are traditionally cultivated in Bhutan. Among them, mandarins are the only type of commercial citrus grown in Bhutan (Dorjee et al, 2007; DoA, 2007) so in this report citrus and mandarin are used interchangeably.

Mandarin, locally known as *tselu* in Dzongkha, *santra* in Hindi, *suntala* in Nepali, is a native plant. Its cultivation goes back a very long time. At present about 60% of the population is directly or indirectly engaged in orange farming (Lophyal, 2008). Bhutanese mandarins are unique in their taste and origin and hence have a good potential for export as well as domestic consumption.

The systematic production of fruits started in the 1960s after the establishment of the Department of Agriculture. Prior to the inception of the Five-Year-Development Plan (1962-67), fruit production was limited to backyard cultivation only, and intended solely for family consumption (Dorji, 1990). With the beginning of the First Five-Year-
Development Plan, fruit cultivation was identified as a potential source of cash income for farmers and thus the first few commercial plantations were established. At this time the Government of Bhutan in co-operation with JICA and other development agencies launched horticultural development programmes to improve the economic and nutritional status of the population.

### 2.2.1 Areas of Citrus Cultivation and Production Trends

The major citrus growing districts are located in the subtropical southern regions of the country. Citrus (mainly mandarin) grows well in warm and humid climates where the average annual temperature is above 15°C, the frost season is less than 115 days, and the average annual rainfall is over 1,000mm. Orchards are mainly found in the foothills at altitudes between 300-1500masl (RNRRC, 2008). The six largest citrus growing Dzongkhags in terms of production are Dagana, Sarpang, Pemagatshel, Samtse, Tsirang and Chhukha. According to DoA statistics, in 2007 the total number of citrus trees was 3,252,210, of which 62% were in the fruit bearing stage with an average production of 36kg/tree. Details of the number of trees, their production and yield are given in Table 2.

**Table 2: Number of trees, production and yield of Citrus fruit in 2007**

<table>
<thead>
<tr>
<th>Dzongkhag</th>
<th>Total Trees</th>
<th>Bearing Trees</th>
<th>Production (MT)</th>
<th>Yield (Kg/tree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chhukha</td>
<td>400,890</td>
<td>277,835</td>
<td>5,264</td>
<td>19</td>
</tr>
<tr>
<td>Dagana</td>
<td>532,059</td>
<td>332,710</td>
<td>17,455</td>
<td>52</td>
</tr>
<tr>
<td>Ha</td>
<td>2,465</td>
<td>340</td>
<td>7</td>
<td>22</td>
</tr>
<tr>
<td>Lhuentse</td>
<td>22,533</td>
<td>8,999</td>
<td>325</td>
<td>36</td>
</tr>
<tr>
<td>Mongar</td>
<td>94,768</td>
<td>38,676</td>
<td>1,572</td>
<td>41</td>
</tr>
<tr>
<td>Pemagatshel</td>
<td>479,090</td>
<td>267,010</td>
<td>11,765</td>
<td>44</td>
</tr>
<tr>
<td>Punakha</td>
<td>31,752</td>
<td>21,331</td>
<td>545</td>
<td>26</td>
</tr>
<tr>
<td>Samdrup Jongkhar</td>
<td>218,659</td>
<td>100,834</td>
<td>3,117</td>
<td>31</td>
</tr>
<tr>
<td>Samtse</td>
<td>364,261</td>
<td>278,426</td>
<td>7,862</td>
<td>28</td>
</tr>
<tr>
<td>Sarpang</td>
<td>544,120</td>
<td>352,005</td>
<td>12,746</td>
<td>36</td>
</tr>
<tr>
<td>Trashiyangtse</td>
<td>21,184</td>
<td>12,566</td>
<td>420</td>
<td>33</td>
</tr>
<tr>
<td>Trashigang</td>
<td>43,911</td>
<td>22,497</td>
<td>631</td>
<td>28</td>
</tr>
<tr>
<td>Trongsa</td>
<td>18,335</td>
<td>4,615</td>
<td>258</td>
<td>56</td>
</tr>
<tr>
<td>Tsirang</td>
<td>237,998</td>
<td>154,181</td>
<td>6,494</td>
<td>42</td>
</tr>
<tr>
<td>Wangdue</td>
<td>15,804</td>
<td>10,421</td>
<td>261</td>
<td>25</td>
</tr>
<tr>
<td>Zhemgang</td>
<td>224,381</td>
<td>132,981</td>
<td>3,349</td>
<td>25</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3,252,210</strong></td>
<td><strong>2,015,426</strong></td>
<td><strong>72,071</strong></td>
<td><strong>36</strong></td>
</tr>
</tbody>
</table>

Source: Agriculture Statistics 2007, DoA (www.moa.gov.bt)

Over the last few decades, there has been a tremendous increase both in the number of trees as well in the production of citrus. In 2000, the total number of oranges trees was reported as 1,761,032 and production was recorded at 29,616 metric tonnes (ICIMOD and MoA/PPD, 2006), while in 2007 the total number of trees was estimated to be 3,252,210 and production was 72,071 metric tonnes (DoA, 2007). However, a declining yield has been observed in recent years, because of infestation (Dorjee et al, 2007).
Major citrus growing regions are reporting trees dying due to the citrus greening disease, \textit{phytophthora} rot, citrus fruit fly and powdery mildew infestations (DoA, 2008).

2.2.2 Importance for Poverty Reduction

Bhutan has a limited area of arable land for cereal production. Therefore the RGoB has realised that horticulture is a viable alternative to cereal production in achieving the national goals of self-reliance and overall economic growth. Horticulture has been accorded priority as a means of improving the cash income of farmers, generating revenues through exports and improving the nutrition of rural people.

Among all the horticultural crops in Bhutan, citrus cultivation takes up the largest area and it has over the years become one of the highest income generating fruit crops. At present, approximately 60% of Bhutan’s populations are involved in citrus production. Citrus production and marketing is an important source of income not just for farmers and traders, but it also provides seasonal employment for a large number of labourers and generates revenue for the Government. In terms of the export of cash crops, citrus ranks first in earnings (Figure 5).

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure5.png}
\caption{Major Export Commodities of Bhutan (Source: FAOSTAT)}
\end{figure}

The Citrus Commodity Chain Analysis conducted in 2006 shows that about 75% households are backyard citrus farmers and small orchard owners, whereas only 8% fall under the category of big farmers (Dorjee, 2007). Based on the national poverty line established at Nu.740.36 per month, 31.7 percent of Bhutan's population is poor. Of this, only 4.2 percent of the urban population is poor, against 38.3 percent who live in the rural areas (PAR 2004). This indicates that promotion of the citrus value chain is very relevant in the context of poverty reduction (Table 3).
Table 3: Suitability of promoting citrus in the context of poverty reduction

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Potential</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development Goal: “Equitable and Sustainable Socio-Economic Development”</td>
<td>Positive</td>
<td>Citrus ranks first among the cash crops in terms of export value and it significantly contributes to increase household income of rural poor.</td>
</tr>
<tr>
<td>Geographical context (covering locations where poor people live)</td>
<td>High</td>
<td>The soil type and climatic conditions are suitable for citrus cultivation. Highly feasible for rural poor and lowland farmers.</td>
</tr>
<tr>
<td>Breakdown of value chain into sub-chains</td>
<td>High</td>
<td>Citrus has many uses; it is consumed as fresh fruits; squeezed for juice, used to make marmalade. For each product a specific sub-chain can be developed</td>
</tr>
<tr>
<td>Value chain driven by demand</td>
<td>High</td>
<td>Citrus fruits are universally enjoyed. Bhutanese loose skinned mandarins have a good taste and are preferred in domestic markets as well as in Bangladesh and the neighbouring states of India.</td>
</tr>
<tr>
<td>Entry Barriers</td>
<td>Low</td>
<td>Citrus can be grown with low start-up costs, not requiring major capital investment, using family labour. Government support is also available for seedlings and subsidized fertilisers.</td>
</tr>
<tr>
<td>Use of local skills and raw materials</td>
<td>High</td>
<td>The species grown in Bhutan is a native plant; planting materials, other agricultural inputs and technical expertise are locally available.</td>
</tr>
<tr>
<td>Number of actors on the chain</td>
<td>High</td>
<td>About 60% of the total population are involved in citrus cultivation (either in backyards or commercial orchards). Beside this, many contractors, truckers, porters, packhorse contractors, and small and medium sized enterprises are involved in the citrus value chain.</td>
</tr>
<tr>
<td>Potential for niche market</td>
<td>High</td>
<td>A niche market can be harnessed with differences in taste, times of harvest and organic methods of cultivation.</td>
</tr>
<tr>
<td>Impact on environment</td>
<td>High</td>
<td>Contributing to food security without reducing availability of clean water and degrading soil fertility. Provide good source of nectar and pollen for honeybees and bumble bees, which are the most efficient pollinators. Intercropping is possible with annual crops.</td>
</tr>
</tbody>
</table>
2.2.3 Citrus Varieties

The mandarin that belongs to the species *Citrus reticulata* ‘Blanco’ is the most widely grown citrus in Bhutan. There are two varieties; Sikkim mandarin and Khasi mandarin. The earlier variety is concentrated in the south west districts while the latter one dominates the south-central and south-east districts (DoA, 2008). Farmers prefer these varieties due to their ease of management and availability.

2.2.4 Citrus Production in Eastern Bhutan

Eastern Bhutan includes 6 Dzongkhags; Mongar, Trashigang, Trashiyangtse, Pemagatshel, Samdrup Jongkhar and Lhuentse (Figure 1). It is a region of deep V-shaped valleys. Roads reach the major towns, but most settlements are hidden in the steep hillsides of remote valleys. The dominant language here is Sharchop and people of the East are known to be humble and soft spoken (Wangchuck, 2008). The Eastern part of Bhutan is poorer than Central and Western Bhutan and the literacy rate is below the national average. In Mongar, Trashigang, Trashiyangtse and Pemagatshel, the literacy rate is below 50% (NSB, 2007).

The survey conducted in the Eastern region clearly indicates that among all the fruits and vegetables orange, potato and chili are the most attractive crops that have high market demand and high potential to increase rural income, thereby reducing poverty (Table 4).

Table 4: Attractiveness Matrix of Fruits and Vegetables in Eastern Bhutan

<table>
<thead>
<tr>
<th>Potential to increase Rural Income</th>
<th>High</th>
<th>Medium</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential Market Demand</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential to increase Rural Income</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>Medium</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>Least Attractive:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pumpkin, Green saag</td>
<td>Ginger, Garlic, Onion</td>
<td>Pear, Persimmon, Passion fruit</td>
<td></td>
</tr>
<tr>
<td>Least Attractive:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bamboo shoot, Fern, Asparagus</td>
<td>Cauliflower, Cabbage, Broccoli, Kidney Beans (rajma)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most Attractive:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radish</td>
<td>Potato, Citrus, Chili</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The major citrus growing areas, which are quite famous in the Eastern region, are Norbugang, Chokhorling, Decheling gewogs in Pemagatshel, Gomdar and Wangphu gewogs in S/Jongkar, Shongphu and Kanglung in Trashigang, and Gongdu and Drametse in Mongar Dzongkhag (Table 5). Many households in these gewogs meet their livelihood needs solely with the cash earned from the sale of oranges. The gewog-wise production of citrus in Eastern Bhutan is given in Table 5.
<table>
<thead>
<tr>
<th>Gewog</th>
<th>Total Trees</th>
<th>Bearing Trees</th>
<th>Production (Kg)</th>
<th>Yield (Kg/tree)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mongar Dzongkhag</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tsamang</td>
<td>2,620</td>
<td>1,725</td>
<td>52,890</td>
<td>31</td>
</tr>
<tr>
<td>Tsakaling</td>
<td>4,206</td>
<td>1,705</td>
<td>39,442</td>
<td>23</td>
</tr>
<tr>
<td>Thangrong</td>
<td>4,845</td>
<td>946</td>
<td>31,756</td>
<td>34</td>
</tr>
<tr>
<td>Silambi</td>
<td>4,461</td>
<td>3,546</td>
<td>106,369</td>
<td>30</td>
</tr>
<tr>
<td>Sherimuhung</td>
<td>4,351</td>
<td>1,824</td>
<td>66,462</td>
<td>36</td>
</tr>
<tr>
<td>Saling</td>
<td>4,735</td>
<td>1,550</td>
<td>58,477</td>
<td>38</td>
</tr>
<tr>
<td>Ngatshang</td>
<td>8,937</td>
<td>1,932</td>
<td>108,523</td>
<td>56</td>
</tr>
<tr>
<td>Narang</td>
<td>1,157</td>
<td>415</td>
<td>14,132</td>
<td>34</td>
</tr>
<tr>
<td>Mongar</td>
<td>8,902</td>
<td>2,212</td>
<td>80,144</td>
<td>36</td>
</tr>
<tr>
<td>Kengkhar</td>
<td>4,900</td>
<td>2,300</td>
<td>66,700</td>
<td>29</td>
</tr>
<tr>
<td>Jurmei</td>
<td>6,609</td>
<td>2,983</td>
<td>96,560</td>
<td>32</td>
</tr>
<tr>
<td>Gongdue</td>
<td>9,000</td>
<td>5,500</td>
<td>240,396</td>
<td>44</td>
</tr>
<tr>
<td>Drepung</td>
<td>4,004</td>
<td>385</td>
<td>15,400</td>
<td>40</td>
</tr>
<tr>
<td>Drametse</td>
<td>10,915</td>
<td>5,546</td>
<td>299,176</td>
<td>54</td>
</tr>
<tr>
<td>Chashkar</td>
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Source: Agriculture Statistics 2007, Department of Agriculture, MoA, RGoB
CHAPTER THREE: VALUE CHAIN OPERATORS AND SUPPORTERS

3.1 Value Chain Operators and their Functions

The success or failure of a value chain intervention depends principally on the partnerships that are built between actors and support providers that participate in a particular chain (Lundy et al, 2004). The VC approach therefore requires that the VC operators are clearly identified and existing relations understood. This information enables the VC supporters involved in the design and implementation of strategies to increase competitiveness and to promote the fair distribution of income among the VC actors.

The citrus value chain in Bhutan is comprised of four principal players: the farmers, who perform all the production and harvesting functions, contractors, who make informal agreements or contracts with farmers to purchase oranges for onward delivery, the processors, who buy oranges to make juice, and the exporters, who buy oranges, grade and repackage and export. The importers who buy Bhutanese oranges and sell through different distribution channels in Bangladesh and India are also part of the value chain. The function of input supplier is being performed by Druk Seed Corporation (DSC) for seedlings, herbicides and fertilisers and NPPC for the import and supply of plant protection chemicals. The key actors and their roles are briefly described as below.

3.1.1 Input Suppliers

Many growers in Bhutan use their own seedlings and farmyard manure. Only a few farmers whose farms are close to the motorable roads procure planting materials from the DSC. Some growers obtain seedlings from the DSC through promotional programmes by the Dzongkhags (Dorjee et al, 2007). The distribution of seedlings and fertilisers by the DSC follows the same procedure throughout the country.

**Planting materials, fertilisers, herbicides and machinery:** The system of Commission Agents (CA) is the main channel for the sale and distribution of agricultural inputs. The CAs are identified and appointed by the Dzongkhags and are responsible for the distribution of seeds, saplings, fertilisers, herbicides, agricultural tools and small machinery. The CAs collect the full value of their inputs in advance from the farmers and pay the DSC while placing the order; the system is known as ‘cash and carry’. The cost of transport for the supply of most inputs to the farm is subsidised by the Government. The CAs receive 10% of the value of inputs distributed to the farmers as commission from the Government.

Most growers in Bhutan do not use inorganic fertilisers for orange trees. They prefer to follow traditional methods of soil fertility management and use farmyard manure. As most growers live far away from the road-head and their orchards are located in remote areas, their access to services and inputs is very limited. Also they use farmyard manure to save on the costs involved in purchasing and transporting fertilizers.

**Plant protection chemicals:** Plant protection chemicals like insecticide, fungicide rodenticide, and acaricide are imported and supplied by the National Plant Protection Centre (NPPC). These chemicals can be purchased directly from NPPC or through the Dzongkhags on a ‘cash and carry’ basis. The CAs and Extension Officers can distribute
these chemicals to growers. However, during this survey, many growers had questions about the timely supply of these inputs.

**Technical information and agri-inputs:** There are 205 gewogs in the country with RNR EOs (also called Extension Workers or Extension Agents) in every gewog. These EOs provide updated information on planting and plant protection techniques, distribute promotional planting, raise technological awareness and provide training to farmers. However, they are overloaded with different tasks, look after a large number of agricultural crops and most of them lack exposure to and knowledge about modern production and plant protection technologies (Dorjee et al, 2007).

### 3.1.2 Citrus Growers

The growers are the primary and most valued actors in the chain. Basically, two categories of producers were noticed in the East – subsistence and commercial fruit growers. Subsistence farmers generally have less than 100 citrus trees on their farm. They perform almost all production and harvesting function on their own or on a labour sharing basis. In contrast, commercial growers own larger orchards, having over 100 citrus trees, and they generally rely on hired labour to manage their orchards. Commercial farmers generally sell their whole orchard’s produce to known contractors/exporters or harvest fruits with hired labour and supply them to the export market or to the processing industry.

On average, citrus growers have 3.74 acres of agricultural land per household, ranging from 0.33 acres to 25 acres per household. Of the total respondents, 9% have less than 1 acre of land (Figure 6). According to the field survey conducted in Eastern Bhutan, citrus trees were grown on about 20% of the total agricultural land. On average, the respondents had 0.75 acres of land under citrus cultivation. Almost all respondents planted orange trees in the type of dry land known as ‘kamzing’.

![Figure 6: Agricultural Landholdings of the Citrus growers](image)

1 Subsistence farmers are grouped into 2 categories: backyard (having less than 50 trees) and small growers (having 51-100 trees). Commercial farmers are also of two types: medium (101-300 trees) and large farmers (over 300 trees).

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The average number of trees per household was found to be 80, of which 37 were in the fruit bearing stage. Of the total respondents, 55% farmers had less than 50 trees and 20% had 51-100 trees. Only 25% respondents had over 100 trees (Figure 7). This data reveals that the number of backyards and small growers dominates citrus cultivation in the Eastern Bhutan. All growers whether small or big, have to perform certain functions, which are described in the following paragraphs.

**Land Preparation and Pit Digging:** Depending on the terrain, the farm size and their access to resources, mandarin growers level the field and dig pits for planting citrus seedlings. Generally, pits are left exposed for a few days before planting. A pit of 3 feet (0.91 meters) deep is recommended by the Horticulture Division (DoA, 2008): however farmers generally do not take such measurements into consideration.

**Planting Material/Seedling:** Mandarin oranges grown in Bhutan are almost exclusively propagated from seeds. Seedlings are mostly transplanted in the month of July-August after the beginning of the monsoon. The Horticulture Division has recommended that mandarin seedlings should be planted in different layouts (square, equilateral triangle and contour) based on local topography with a spacing of 6x6 meters. However, many growers in Eastern Bhutan were found to be planting trees arbitrarily. During the survey, an average of 307 plants (262 to 375 plants) were found to be planted per hectare of land. Interestingly, all the respondents mentioned that the seedlings were grown locally or purchased from local nurseries.

**Intercropping:** Intercropping is generally recommended to utilise vacant land until the trees become productive. Once the orchards are bearing fruit, intercropping is not recommended, especially maize and chilli. However, during the present survey 29% of respondents mentioned that they grew maize, vegetables (beans and chilli), grasses and buckwheat between their trees in the orchards due to limited land availability. Of the total respondents, 19% grew maize in their mandarin orchards and 6% grew beans and chilli (Figure 8).
**Application of fertilisers and micronutrients:** Farmyard manure, chemical fertilisers (mainly nitrogenous) and micro-nutrients viz. zinc, copper, manganese, iron, boron and molybdenum are required in the right quantities for growing all plants as well as fruit bearing plants. The improper use of fertilisers and nutrients may cause serious disorders which may lead to the decline of the whole orchard (Mankad, 1994, Horticulture Division, 2008). However, in Eastern Bhutan many growers do not use inorganic fertilisers at all. As per the field survey, 12% respondents did not use any fertilisers, 8% used tethering of cattle and 80% applied FYM. The rate of FYM application varied from 10-60kg per tree.

Several reports stated that many orchards in Bhutan suffer from micro-nutrient deficiency (DoA, 2008). But surprisingly, none of the respondents were found to be applying any chemical fertilisers and micro-nutrients in their orchards. All the 107 respondents said that the nutrient value of the soil is entirely supplemented by FYM and cattle tethering.

**Irrigation:** The water requirement of citrus trees is generally higher than most of the other sub-tropical fruits due to their recurrent growth and development. Especially for young plants, adequate water is very important. However, citrus in Bhutan is almost exclusively grown under rain-fed conditions and the importance of watering is yet to be realised by growers (DoA, 2008). During the survey, none of the respondents were found to irrigate their crops.

**Care of young plants and pruning:** The young trees need to be protected against high and low temperatures and strong winds. The trunks of the trees need to be white washed to protect them against hot sun. However, in Eastern Bhutan most orchards were found to be left to defend themselves against cold, frost and strong sunlight.

As Dorjee et al (2007) mentioned in their report, pruning, removal of water shoots, whitewashing of the trunk, and covering the young trees during cold winters, all of which would enhance an orchard's productivity, are not commonly practiced. Only a few farmers remove sprouts and prune the trees after harvesting oranges, mostly during late winter or early spring when the trees are in a relatively dormant stage. Root pruning is also practiced by some growers. For mulching, growers often apply dry leaves in the basin of the tree.

**Plant Protection Measures:** During the survey, respondents listed a number of diseases and pests which afflict their mandarin orchards. The most commonly cited problems are: poor fruit set, fruit drop, both at bearing and maturity stage, trunk borer (stem tunneling), powdery mildew, drying of branches and loranthus. Fruit fly, trunk borer, shield bug, red ants and mites were cited as major pests by respondents. They however also said that insecticides and pesticides were not applied in their orchards.
Harvesting of Fruits: In Eastern Bhutan mandarin oranges are harvested from November to January. The bulk quantity is harvested in December. Small farmers harvest fruits on their own, while contractors and the big orchard owners hire labourers to harvest fruits by paying Nu. 3 per pon (1 pon = 80 numbers of citrus fruits). Fruits are plucked by hand using bamboo ladders and put into bags. When a bag is full its contents are emptied onto the ground.

During the field survey, 81% respondents said that after harvesting they immediately transported the fruits to their nearest road head collection center, whereas 19% keep the fruits on their farm for a night so as to have a larger quantity to transport at one time. 93% respondents said that fruits of bigger size and good-looking oranges fetch better prices in the market (Table 6). They also reported that fruits which are oblong, immature, puffy, blemished, deformed, deep green coloured, bruised and diseased are removed during the sorting operation.

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<tr>
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Transportation: In most places, citrus growers themselves take their fruits to the collection centre or auction yard. Small farmers carry oranges from their farms to the road head on their back or on a pack horse. Big farmers/orchard owners either supply to village contractors or hire a truck for transport to the auction yard or export depot. During the survey, 80% of respondents stated that they carry oranges to the depots on their own back or on a pack horse, whereas 11% make a deal with contractors who collect oranges from different farms and transport them to the export depot. The remaining 9% are flexible; depending upon the situation either they take their oranges to the depot or sell to contractors at their farm.
The rugged terrain as well as the distance of major production areas from roads and auction yards, makes the transport of perishable products like citrus difficult, and results in losses during transportation. In some cases, it takes over two days to walk from the orchards to the mandarin grading and packing center (Dorjee et al, 2007).

Box 3: A closer look at a mandarin grower

Mr. Shantong, Wongphu, Samdrup Jongkhar
Interviewed on 19th December 2009

I have about 2 acres of land and oranges are grown in half of the land. At present, I have 150 orange trees, of which 50 are in the fruit bearing stage. I do not apply any chemical fertilisers and irrigation to my trees. But I use farmyard manure and make a basin around each tree for water holding.

This year the yield was very poor. On average it was 10 pons per tree, whereas last year and before last year I used to harvest over 30 pons per tree. I sold my oranges in Tokorong at Nu. 70/pon. I carried my oranges on my back and with pack horses to save money. The transportation rate is Nu. 40/pon for carrying oranges from my farm to Tokorong. I sold all of my oranges to the trader without any grading.

To improve production we need good quality seedlings and timely advice and insecticides to control fruit dropping.

3.1.3 Intermediaries/Contractors

Various reports indicate that the citrus growers often lack access to critical post-harvest knowledge, technology and infrastructure. Hence, they prefer to sell the fruits to
contractors on a ‘per tree’ basis well before harvest time, no matter whether the price is above or below the break-even point.

Some big farmers/orchard owners also sell produce from their orchard as a whole to contractors one or two months in advance of harvest. The deal entirely depends on trusting each other, and such contractors are often regular buyers from a particular group of farmers in one area. According to an estimate, about 80% of the total fruits are traded through contractors. Their trading activities include: contracting for the fruiting orchards, harvesting of fruits, transporting and assembling at the nearest road-head, storing, packaging, transporting and selling to exporters or bidders at the auction yard.

Contractors play an important role in bridging the link between citrus growers and exporters/traders. They buy oranges from the farmers’ orchards and supply them to the exporters/traders. By doing this they serve the interests of exporters/traders- who do not have the time to make lots of small purchases from local markets or from scattered farmers. At the same time they also serve the interests of farmers by purchasing produce from the farm gate for sale to large traders. Since the contractors make a deal before the fruit harvest and give a certain amount of advance payment to the growers, on the growers’ side there is no risk of fruit losses that may occur from pest infestations, weather, road blocks, strikes etc. They can also avoid getting involved in harvesting and post-harvest operations. However, the price offered by the contractors is much lower than the farmers themselves would have fetched at harvest time. The contractors normally take advantage of their risk-bearing capability. Sometimes they come out at a loss due to lower market prices and other reasons like road blockades, strikes, etc.

During the present survey, 71% of respondents were found to be selling their oranges to contractors, whereas 16% sold to traders. Only 8% growers were selling fruits directly to consumers themselves and 5% said they were flexible about the way they sold their fruits (Figure 9).

![Figure 9: Whom the Growers supply their fruits](image)
Box 4: A closer look at the contractors

Mr. Tashi Chhewang, Marshala Geog, Samdrup Jongkhar Dzongkhag
Interviewed on 17th December 2009

I have been running a general shop in my village and engaged in the orange business for the last 10 years. I have a small farm with 100 orange trees, of which 60 trees are in the fruit bearing stage. I buy fruit trees from the villagers, harvest the fruits and then sort, grade and transport them to the market. The price of the orchard depends on its fruiting status and it is arrived at on the basis of visual observation. A big orchard with good fruiting costs up to Nu. 60,000, whereas a medium type of orchard costs Nu. 25,000 to 30,000 and a small orchard costs only Nu. 5,000 to 6,000. I also purchase fruits on a per pon basis and I pay Nu. 50-60 per pon at road heads. After sorting and grading I sell them at different rates; the large good quality oranges fetch up to Nu. 160 per pon, whereas the small poor quality oranges fetch as little as Nu. 30 per pon. The medium ones get 80-90 per pon.

Depending up on the quantity, I hire a pick-up van or DCM to transport my oranges from my village to Samdrup Jongkhar. One DCM will transport 6,000 pons of oranges and costs Nu. 3,500. I pay Nu. 4 per pon for plucking the fruit from the tree and Nu. 15-20 per pon for carrying them to the road head. Last year we (my friend and me) managed to sell 3 DCM, 2 pick-up vans and one truck load of oranges to Samdrup Jongkhar and we had a net profit of Nu. 60,000. This year, I took a loan amounting Nu. 100,000 from BDFCL and I have already sold 2 DCM of oranges. I am interested in investing more in this business but it is not easy to get a loan from the bank beyond the ceiling of Nu. 100,000. As I need to be able to pay in advance to get a good quantity of fruit from the orchard owner, access to finance is crucial service I am looking for.

Mr. Tshering Norbu, Lhuentse Dzongkhag
Interviewed on 17th December 2009

I am a farmer and have a family of 6. I have only 4 orange trees on my farm. For the first time I tried to collect oranges from my fellow villagers and bring them down to the Samdrup Jongkhar auction yard. I paid Nu. 500-700 for the fruit from a small tree and Nu. 1,000-1,500 for a big tree. I also bought some oranges on per pon basis @Nu. 50-60/pon. The DCM truck charged me Nu. 10,000. I reached here the day before yesterday and unloaded my oranges at the FCB auction yard but due to a strike in India, auctioning did not take place. This morning I interacted with some traders but the price they are offering is quite low. They tend to take advantage of the situation.

I am not quite sure whether I could make a profit out of this or not. I realised that the big contractors know the situation of the auction yard beforehand. If there is a glut, a strike in India or a very few traders in the auction yard they do not bring their fruits here. But people like me know the situation only after coming here. Had I been aware of the situation I would have brought my fruits 2-3 days later.
3.1.4 Exporters and Traders at the Auction Yard

Bhutanese oranges are mostly exported to Bangladesh. There are a number of registered export houses involved in the orange business. According to a Kuensel report, the number of exporters has been fluctuating over the years. In the late 80s, when there was no tax on export and instead the exporters were given monetary incentives by the government for bringing in foreign currency, there were about 100 exporters. However, in the mid-90s the number of exporters drastically fell after the government introduced the duty of Nu. 12.5 per box. The export duty was again waived in 2002 by the government to encourage cash crop export; this has again resulted in an increase in the number of exporters (www.kuenselonline.com). There is strong competition between the exporters to get hold of bulk quantities of oranges. During harvest seasons, they establish temporary offices and makeshift storage facilities in major strategic locations, like Tokorong, Gomdar, Samdrup Jongkhar, Phuentsheling, etc (Box 5).

Most exporters have their own orchards and also purchase oranges from different areas through local contractors. Most exporters prefer to buy oranges on a per box basis, while some prefer to buy on a per pon basis (Box 5). After collecting the oranges, they hire labourers to grade them as per government standards and pack them in boxes.

Traders at auction yards are mainly Indian merchants who then go on to sell their produce in the major border towns of Assam, like Barpetta, Rangia and Guwahati. These traders mostly supply the oranges to other traders in India. They buy oranges on a per pon basis but sometimes they also give a price for a whole lot on a lump-sum basis. Auctioning takes place in accordance with FCB’s standard practice: only registered traders are allowed to bid. After agreeing on the price the bidders and suppliers count the oranges piece by piece. It is a lengthy and time-consuming process but it gives the opportunity for traders to discard rotten and damaged oranges.

According to the bidders at Samdup Jongkhar auction yard, farmers and contractors generally sell low grade oranges through the FCB auction yard. First they try to sell their fruits to exporters. If they were not able to arrive at a price or meet the requirements of the exporters, only then do they bring their fruit to the auction yard.

Box 5: Units of Measurement

In Bhutan, oranges are not generally sold on a weight basis. In local retail markets, they are sold per piece, whereas a bulk quantity is sold on per box or per pon basis. Oranges are graded into two categories: meel (big) and keel (small) oranges. A box of meel normally has about 240 fruit while a box of keel has about 400 oranges. A pon means 80 oranges. Depending upon the size of the fruit, one kilogram may contain from 7 to 29 oranges. One box may contain from 2.5 pons to 5 pons of oranges.
Fruits are being displayed for auctioning at Samdrup Jongkhar auction yard.

After counting each *pon* of oranges the trader puts a mark on the seller’s wrist.
Box 6: A closer look at the traders and bidders at auction yard

Mr. Kesang Wangchuk, Khar Geog, Pemagatshel
Interviewed on 17th December 2009

I have been working as a license holding petty contractor and also engaged in the agri-business for the last 18 years. I have 5 acres of land in my village and 500 orange trees in the fruit bearing stage. I make contracts (buying and selling agreements) with orchard owners and collect oranges from different places. I purchase the oranges on a per orchard basis. The price is arrived at based on experience and on the spot judgment of the state of the fruit bearing trees. If the orchard is big and its trees are bearing good fruit, then I pay up to Nu. 20,000 for an orchard with around 200 fruit bearing trees. But if the orchard is small and its fruits are not good, then I pay Nu. 5,000 to 7,000. I generally make an advance payment prior to the peak harvesting season. I pay Nu. 3/pon for harvesting the oranges from the tree and Nu. 20-60/pon for bringing the fruits to the road head. The transport costs vary from place to place depending upon distances. For example, the cost of transportation from Pemagatshel to Samdrup Jongkhar is Nu. 4000-5000 per truckload, which comprises about 8 metric tonnes.

Last year, I was able to sell 35 truckloads of oranges and made a total profit of Nu. 400,000. This year the fruit harvest is very poor. I got only 2 truckloads of oranges from my own orchard and I am expecting to harvest 18 truckloads from the orchards that I contracted with. I am flexible about price and quality and purchase any sorts of oranges from any farmer. I supply the oranges to to whichever exporter offers the best price. Until last year, I used to sell my oranges to Phuentsholing but this year I am selling in Samdrup Jongkhar. I am also exploring the possibility of selling my oranges direct to importers in Bangladesh. I am interested in investing more in this business but the frequency of strikes in neighbouring Indian states worries me. In my opinion, the Royal Government of Bhutan should really think about a solution to this problem, which would involve allowing exporters to transport their oranges at any time of the day. Because citrus is a highly perishable product, it should not be made mandatory to wait for escort vehicles.

Mr. Sandip Das, Registered Bidder, Samdrup Jongkhar Auction Yard
Interviewed on 17th December 2009

I have been involved in bidding for oranges and potatoes at Samdrup Jongkhar auction yard since the establishment of FCB. I come to the auction yard almost every day during the peak harvesting period of potatoes (July-November) and oranges (December-February). During the rest of the year, I help my family members in running grocery shops. Unlike potato, kidney beans and soya beans, the price of oranges varies greatly depending upon the size, quality and demand conditions. It ranges from Nu. 25 – 200/pon. I generally purchase oranges from the auction yard and supply them to second parties in Rangia, Barbeta or Guwahati.

Bhutanese oranges would fetch better prices if they were properly sorted and graded. Most growers and contractors bring their oranges without sorting and grading, which gives a negative impression to the buyers. In the Indian states of Arunachal Pradesh and Assam, oranges are harvested during the same season. They are bigger in size and well graded but they do not taste as good as Bhutanese oranges. More importantly, the shelf life of Bhutanese oranges is much better than that of Indian oranges. Bhutanese oranges remain fresh even after 7-8 days but Indian oranges cannot be kept in a retail shop for more than 4-5 days.
Box 7: A closer look at the Exporters

Mr. Wangdi, Wangdi Export House, Thimphu, Bhutan
Interviewed on 17th December 2009

We are a registered export house and also a member of Bhutan Exporters Association. Oranges are one of the major products we deal with. Last year, we exported about 120 truckloads of oranges to India and Bangladesh. This year we opened up an export office here in Samdrup Jonkhar hoping to send oranges from Eastern Bhutan to Bangladesh using the Tamabil transit point. As per the report in the media during the visit of the Bangladeshi Prime Minister, this route should have been in use by this time. But it is not in operation yet. We could have saved Nu. 8000/truckload had we able to use this route. Now we are sending our trucks via West Bengal to Changband. Bhutanese trucks charge Nu. 14,000 whereas Indian trucks, which need to be hired from Guwahati, charge Nu. 21,000 to 27,000. We grade the oranges into 2 categories -Meel and Keel as per BAFRA standards and use standard boxes of 23x13x10 length, breadth and height.

Deposit established by Wangdi at Samdrup Jongkhar

This year, the minimum import price is fixed at US$ 9 per box for Meel and US$ 7 per box for Keel. Hoping to fetch a better price than that of the minimum LC value, we pay Nu. 500/box to contractors for Meel grade. One truckload comprises 270 boxes, which weigh 8640 kg including the box or 7290 kg net fruits. Bhutan has such a good potential for the export of oranges but there are so many areas that need improvement. The most important area of intervention is to build the capacity of growers. They should bring the fruits as fresh as possible. Currently they store oranges on their farm for 5-8 days to make up a truckload by plucking fruits from different trees and by the time they bring the fruits here a substantial quantity are already damaged. MoAF should provide on the spot training during the peak harvesting season in major orange growing areas. People who are involved in post-harvest handling need to be made aware of the importance of sorting and grading. In major depots and collection points, like Tikrong, BAFRA should monitor the process and give advice. As oranges are highly perishable and need to arrive at the Bangladesh market within 24 hours, Customs services should be made more flexible. At an exporter’s own risk, the gate should be opened even after 5 PM and trucks allowed to pass without escort vehicles. The frequent strikes in neighbouring states of India cause a heavy loss to the orange business. In the case of a strike, the Royal Government of Bhutan could provide subsidies and also allow exporters to send their trucks after 5 PM when the strike is lifted.

Rinchen Dorjee, Rin Yeng Tsho Jee Export
Interviewed on 19th December 2009

I have been exporting oranges to Bangladesh for the last 6-7 years. Earlier, I used to export them on the license of other exporters but this year I am exporting on my own license. Last year, I exported 30,000 boxes of oranges. One truckload comprises about 250 boxes. Wooden boxes are purchased from Cooch Bihar, in West Bengal and their size is fixed as per the standard of BAFRA. The cost of an empty box is anything up to Nu. 73/box as the transportation cost alone is Nu. 9,000/truckload. During the orange harvesting season, I build temporary depots in Tokorong and Gomdar and buy oranges from growers and contractors on a per box basis. This year I am paying around Nu. 400-
500/box to farmers. After proper grading and packing, I hire a truck and transport the oranges to Phuentsholing, where BAFRA professionals verify their standard and issue them with a certificate. Truckers charge about Nu. 16,000 for transporting oranges from Tokorong to Bangladesh. After deduction of all the costs incurred during collection, grading and delivery of the fruits to importers, I can make a profit of Nu. 10,000-15,000 per truckload. But if there is a strike or any other abnormal condition, I could also experience losses.

There are many areas that need improvement to promote the orange value chain. The most important area of intervention would be to improve the production and quality of fruits. Growers should be given training and incentives to improve orchards and plant good quality seedlings. Secondly, BAFRA professionals should provide on the spot services in major orange collection centres, like Tokorong and Gomdar to monitor quality and issue certificates. During the peak season, their services should be made available 16 hours a day. Some importers show a willingness to purchase oranges which do not meet the BAFRA standards. This issue could also be looked at. At the exporters’ and importers’ own risks, they could be allowed to export oranges on Sundays and during times of political unrest, even, when there is no escorting facility.

3.1.5 Processors
A very small quantity of orange fruits is utilised for processing. Oranges are used as raw material for producing squash, marmalade and juice. In Eastern Bhutan, there is only one fruit processing industry, the Integrated Food Processing Plant (IFPP) based in Pemagatshel. This factory consumed about 14.875 metric tonnes of oranges in 2008.

The names of major fruit processors and the approximate quantity of fruits used by them for making a value added product is given in Table 7.

<table>
<thead>
<tr>
<th>Name of fruits processing industry</th>
<th>Quantity of oranges used (Mt)</th>
<th>Value added products made</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bhutan Agro-Industry Ltd. (BAIL) Thimphu</td>
<td>136.258</td>
<td>Orange Squash Orange Juice Orange marmalade Orange Skin Orange Jam</td>
</tr>
<tr>
<td>Bhutan Fruit Products Ltd- Samtse</td>
<td>255.460</td>
<td>Orange Squash Orange Juice Orange Jam</td>
</tr>
<tr>
<td>IFPP- Pemagatshel</td>
<td>14.875</td>
<td>Pulp -7183 kg Exported 6 Mt orange</td>
</tr>
<tr>
<td>IFPP- Dagana (Daga Shingdi Tshogpa)</td>
<td>8.066</td>
<td>Pulp - 3915 kg</td>
</tr>
<tr>
<td>IFPP- Goling Zhemgang</td>
<td>8.828</td>
<td>Pulp - 5790 kg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>423.487</td>
</tr>
</tbody>
</table>

3.1.6 Local Fruit Vendors/Retailers
Local fruit vendors and retailers buy oranges from farmers and then grade, display and sell to consumers. Generally from November to February they sell Bhutanese oranges whereas from March to October, they sell either Indian oranges or other locally available fruits.

Non-storing retailing is the most prevalent practice in Eastern Bhutan. The growers themselves bring their produce to designated market places (mainly Sunday Markets)
and sell them on their own. The price is charged on a per piece basis; for big fruit it is generally Nu. 5 for two oranges and for small it is Nu. 5 for 3 oranges. In some places, oranges are also sold in grocery stores, where they put 9-12 oranges in a polythene bag and ask for Nu. 20.

As a part of a marketing trial, RAMCO has distributed a few sets of bamboo baskets, which could hold 3-5 kg oranges, to citrus growers in and around Mongar. This type of packaging has been seen as very attractive by consumers and hopefully growers and retailers will adopt this technique of marketing in years to come.

3.2 Support Service Providers in the Subsector

Along with the Department of Agricultural Marketing & Cooperatives/Regional Agricultural Marketing and Cooperatives Office, the lead organisations that provide agricultural support services in Bhutan, particularly in the Eastern region, are:

1. Druk Seed Corporation (DSC)
2. Dzongkhag Agriculture Office (DAO)
3. Food Corporation of Bhutan (FCB)
4. Horticulture Division, Department of Agriculture
5. National Post Harvest Centre (NPHC)
6. National Plant Protection Centre (NPPC)
7. Agricultural Marketing and Enterprise Promotion Project (AMEPP)
8. Bhutan Development and Finance Corporation Limited (BDFCL)
9. Regional Trade and Industry Office (RTIO)
10. Renewable Natural Resources Research Centre (RNR-RC), Wengkhar
11. Bhutan Chamber of Commerce and Industry (BCCI)
12. Agriculture Machinery Centre (AMC)
13. National Soil Services Center (NSSC)
14. Bhutan Exporters’ Association (BEA)
15. Bhutan Agriculture and Food Regulatory Authority (BAFRA)

Beside these organisations, there are many donor support programmes and RGoB departments and units that provide support in one or another way to the development of MSMEs in Bhutan.

3.2.1 Druk Seed Corporation (DSC)
The DSC is mandated to function as the national seed grid and meet the domestic demand for quality seeds and seedlings, fertilisers and herbicides to support agricultural and horticultural development in Bhutan. It is the sole agency dealing with the production and distribution of planting materials to farmers through the network of CAs, who place their order to the DSC between January and May along with full advance payment. Citrus seedlings are produced at Paro and Bhur farms. The DSC delivers the planting materials either directly to the CAs or at the distribution point as requested by the buyer. The cost of transporting the seedlings to the various Dzongkhags is borne by the MoAF.

3.2.2 Dzongkhag Agriculture Office
All the six Dzongkhags in Eastern Bhutan have an elaborate Horticultural Development Plan, which is aimed at contributing to national development and the poverty reduction objective of the 10th Five-Year Plan. The Dzongkhag Agriculture Officers work hand in hand with a vast network of Extension Officers in each gewog. Horticultural development
Interventions focus on crops that simultaneously satisfy all of the following four criteria: i) production potential; ii) proven market demand and/or prioritised in the 9th Five-Year Plan iii) proven production technologies available within RNRRCs in Bhutan and iv) farmers are interested in cultivating the crop.

Citrus fulfills all of these criteria and so is well qualified to be in the list of crops which require support from Dzongkhags.

Currently, DAO’s support to the citrus value chain is confined to (i) appointing CAs for the supply of seedlings and fertilisers, (ii) updating production profiles through EOs (iii) providing technical support to build the capacity of producers, and (iv) developing collection centers and market sheds.

3.2.3 Food Corporation of Bhutan (FCB)
The FCB was established to support agricultural marketing in 1973. The introduction of the auction yard system under FCB management in 1980 provided a mechanism for optimising interaction between producers and buyers. Details of the auctioning process are as follows:

- FCB owns the auction facility and facilitates the auction system through the management and provision of facilities like storage and truck parking.
- After arrival, each grower is given a Lot Card, as acknowledgment for the receipt of goods based on which auctioning is done. The goods are displayed at the auction yard premises.
- At the time of auctioning, buyers assess quality through visual observation as the produce is displayed on the floor for inspection.
- The lot is given to the highest bidder. Counting of fruit is done after the bidding process. Producers who are not satisfied with the bid can retain their merchandise.
- After billing is completed, goods are delivered to the bidders. FCB collects payments from the buyers against the bills. As per FCB norms a 24 hours grace period is given to the buyers for clearance of the bill amount. In the case of the Samdrup Jongkhar Auction Yard the bidders have to make a cash payment for the goods. FCB charges a service charge of 6% (3% each to growers and buyers). In addition, farmers have to pay unloading charges to labourers directly (Nu. 300 for a DCM and 600 for a truck load).

3.2.4 Horticulture Division, Department of Agriculture
The Horticulture Division supports the National Apple Programme, the National Citrus Programme, the National Potato Programme, the National Medicinal and Aromatic Plants Programme, and the National Vegetables Programme. The main responsibilities of the horticulture programme include:

- To supervise and support each Dzongkhag’s Horticultural development activities.
- To supervise and coordinate each Dzongkhag’s Horticultural production activities (including processing & marketing)
- To initiate and implement Horticultural production systems approaches
- To initiate and facilitate the work-plan preparation for each Dzongkhag’s horticultural programmes, to monitor horticultural activities and to ensure the regular flow of reports
- To support and ensure the implementation of projects relating to horticultural development in extension and participate in planning, appraisal and evaluation exercises
The National Citrus Programme is mandated to initiate and co-ordinate activities for the promotion of the citrus sub-sector in Bhutan.

3.2.5 National Post-Harvest Centre (NPHC)

The NPHC has the national mandate and works closely with Research Centres, the Dzongkhag (district) agriculture sector and other relevant agencies toward the development and promotion of proper post-production (post-harvest and food processing) technologies in the agriculture sector. The main objectives of the NPHC are:

- To develop the post-harvest facet of the agriculture sector by reducing post-harvest loss and by enhancing the market value of crops through the generation of technically and economically viable and socially acceptable post-harvest technologies.
- To develop the rural food industry through development and promotion of socially, technically and economically viable technologies and enterprises in rural areas among the private sector.

The NPHC is also responsible for providing training on the grading, packaging and handling of fruits and vegetables during storage and transportation. It has a well-equipped product development unit (pilot small-scale food processing plant), fresh produce laboratory and three small cold rooms. In addition, the NPHC also stocks improved packaging materials such as fiberboard boxes and plastic crates for promotion and research purposes.

3.2.6 National Plant Protection Centre (NPPC)

The NPPC is the sole distributor of pesticides through the Dzongkhag Agriculture Extension system. Based on demand, the NPPC procures and distributes fungicides, insecticides, and rodenticides to farmers. In addition, it is also responsible for providing technical advisory services to farmers and conducts R&D activities on the integrated management of the major pests and diseases in the country. It is also responsible for making proper diagnoses of pests and diseases and providing plant protection services on a priority basis.

3.2.7 Agricultural Marketing and Enterprise Promotion Project (AMEPP)

AMEPP was designed as a six year programme based on the experiences and lessons learnt from the IFAD-funded Second Eastern Zone Agricultural Project. This project is being implemented in six Dzongkhags of Eastern Bhutan. The goal of the Programme is to “enhance the livelihoods of about 24,337 rural households in the programme area living in conditions that suffer most from isolation due to lack of access to infrastructure.” The programme has five components: i) On-farm Production ii) Marketing and Enterprise Promotion iii) Rural Financial Services iv) Infrastructure Development and (v) Programme Management. The expected outputs of the Programme are:

- Enhanced crop and livestock production support services
- Establishment of beneficiary- and market-focused produce marketing services
- Support to income generation activities and small rural enterprises
- Provision of gender and poverty-sensitive rural financial services by BDFCL
- Improved access to infrastructure and supply of incremental irrigation infrastructure
- Decentralised economic management
3.2.8 Bhutan Development and Finance Bank Limited (BDFCL)

BDFCL is an independent development bank mandated by the Royal Government of Bhutan to provide the following services:

- Provide micro, small and medium financial services for the development of agricultural, commercial and industrial enterprises in the country
- Enhance the income of people thereby improving their standard of living through provisioning of financial services in production, investment and marketing
- Provide financial services for private sector development
- Provide technical and advisory services to enterprises
- Alleviate poverty
- Mobilise external and internal funds for investments
- Dual mandate: Sustainability and social development

The products and services offered by BDFCL are given in Figure 10. The bank has three different schemes available for group members and individual entrepreneurs: micro, small and medium enterprises (MSMEs).

3.2.9 Regional Trade and Industry Office (RTIO)

There are two regional offices in Eastern Bhutan. The Regional Trade and Industry Office (RTIO) located in Mongar was established in 2005 and it looks after four Dzongkhags: Mongar, Lhuentse, Trashiyangtse and Trashigang.
Another office is located in Samdrup Jongkhar that looks after S. Jongkhar and Pemagatshel. The RTIOs are mandated to provide the following services to micro, small and medium enterprises (MS&MEs):

- **Information services:** Provide information to MS&MEs regarding rules and regulations, procedures of business operations, market and business opportunities
- **Intermediary services:** Facilitate business match-making
- **Training service:** Provide training mainly in the areas of business management and book keeping
- **Event organising:** Organise information days, facilitate trade fairs and business match-making
- **Licensing:** Raise awareness about procedures and assist in business registration and licensing
- **Business planning support service:** Help prepare business plans/reports and project profiles for environment clearance and accessing loans

### 3.2.10 Bhutan Chamber of Commerce and Industry (BCCI)

BCCI is the apex forum for the private sector. It was established as a non-government and non-profit making service-oriented organisation in 1980 under the Royal Command of the 4th King. However, it remained dormant from 1985 until 1988 due to a weak private sector base, the lack of member's voluntarism and poor management (BCCI, 2008). Under Royal Command it was again reinvigorated in May 1988 as a potential partner for nation building. The BCCI has a broad range of functions and services on its agenda. Some of these services include:

- Representation both in national and international forums
- Networking and linkages
- Business information services
- Training/capacity building and entrepreneurship development programmes
- Organisation of/participation in trade fairs
- Business contacts and business referral services
- Facilitating the formation of sectoral business associations and taking sectoral business issues up to the relevant government agencies

The BCCI has two regional offices in the east; one in Mongar and the other in Samdrup Jongkhar. These offices were established in 2007 and are consistently striving toward creating a business-enabling environment. However, because of lack of funds they have not made any substantive achievements yet.

### 3.2.11 Renewable Natural Resource Research and Development Centre (RNRRDC)

RNRRRC has been renamed as the Renewable Natural Resource Research and Development Centre (RNRRDC). RNRRDC Wengkhar is particularly responsible for 4 commodity groups, namely citrus, pear and persimmon, vegetables and roots and tubers. Beside earlier mandates the centre will now focus its efforts on supporting the extension system for the development of agriculture. RNRRRC has been collaborating with various national and international development organisations in order to achieve the dual objectives of contributing to poverty reduction and increasing horticultural production. It has a well elaborated Horticulture Research Strategy and Plan, which is expected to deliver the following outputs (RNRRC, 2008).
- Introducing an informal and formal seed system to optimise the quality of seeds available to producers and for export
- Adopting production technologies to optimise yield and quality, increase production, reduce labour cost and preserve the production base
- Post-harvest and marketing support to reduce storage losses and increase value addition
- Expansion of the production area

3.2.12 Agricultural Machinery Centre (AMC)
The AMC is responsible for farm mechanisation through the procurement and supply of farm machinery and equipment such as power-tillers, tractors, planters, reapers, threshers, weeders, etc. AMC is also responsible for conducting R&D trials of small tools and implements, and it imparts training to farmers on the use and maintenance of farm machinery and equipment. However, the marketing and supply of small tools and implement has been privatised and private entrepreneurs and shopkeepers, for example ‘Sherab Enterprise’ now deal with these types of farm implements. Big machines like tractors and power-tillers which come to AMC through Japanese grants are subsidised, but their numbers are limited and demand far outstrips supply. The AMC has a Regional Agriculture Machinery Centre (RAMC) at Khangma, which provides services for Eastern Bhutan.

3.2.13 National Soil Services Centre (NSSC):
The objectives of NSSC are as follows:
- To provide laboratory facilities for analysis of soil, plant, animal feed & fertiliser samples
- To develop & refine fertiliser recommendations for major crops (cereals and fruits/vegetables) in collaboration with research, extension work findings or independent advice
- To carry out soil surveys and evaluate the land of high priority areas of the RNR sector
- To study soil fertility trends and the effects on soil biodiversity of the major traditional farming systems
- To provide technical support (advisory, training and information sharing) to the National Commodity Programmes that include Agriculture, Horticulture, Livestock & Forestry

3.2.14 Bhutan Exporters Association (BEA)
The BEA is mandated to make promotion services available for exporters. The main services of BEA are: to respond to exporters’ enquiries, organise trade fairs, publish and distribute an exporter’s directory, issue GSP certificates of origin, and organise trade related workshops and seminars. BEA collaborates with the BCCI, concerned Government agencies (mainly, RTIOs, MoEA) and other stakeholders to collect and disseminate trade information, organise trade missions and provide marketing assistance to exporters.
Mr. Geleg Nima has served as the President of the Bhutan Exporter Association since 1st July 2007. He represents the common interests of Bhutanese exporters to the concerned authority. He is also himself involved in the export business of oranges, and shares his observations below:

What could be the unique opportunities for Bhutanese Orange Exporters?
Orange is among the most important horticultural crops in terms of export. The subtropical land in Bhutan offers favourable climatic conditions and the natural resource base for the production of orange fruits. Bhutanese oranges have distinct seasonal advantages, and a better taste and natural quality than those produced in neighbouring countries. The orange export business generates substantial revenue for the government and hard currency for business houses. Bhutanese exporters have the potential to make high profits by providing fresh, organic and tasty fruits to high-end consumers in Bangladesh and India.

What are the major challenges faced by exporters?
In Bhutan, oranges are produced only in few pockets of subtropical areas and farmers are unlikely to produce oranges at prices that can compete with Indian Nagpur oranges. Bhutan therefore needs to focus on niche marketing of fresh oranges. However, being a highly perishable fruit, the rugged topography and inaccessibility poses high risks to transporting and marketing oranges. In particular, the following challenges are being faced by the Bhutanese orange exporters:

- Since transport is routed through Indian territory, frequent strikes in Assam and West Bengal hamper its smooth running
- Restrictions on the movement of vehicles results in delays in the delivery of oranges
- Market competition – the Chinese Orange is much cheaper than the Bhutanese Orange.
- Almost 40% of Bhutanese Oranges get rejected in the process of packing due to product defects and lack of harvesting skills

What should be the focus of development intervention?
The focus of development intervention should be to ensure timely delivery of the assured quantity and required grade of fruits to the market. For this the following support services are required from the Royal Government of Bhutan and national/international development agencies:

- RGOB should expedite the free movement of vehicles when crossing into India.
- Training labourers in the correct skills of harvesting, with the help of the Agriculture sector.
- To open additional routes for export from Central/Eastern Bhutan.
- To promote additional markets other than India and Bangladesh
3.2.15 Bhutan Agriculture and Food Regulatory Authority (BAFRA)

BAFRA is mandated to regulate standards and monitor food quality for food safety and hygiene. BAFRA works as the Government’s authority to set rules and regulations for the import and export of fresh fruits, vegetables and other food items of plant and animal origin (Box 8). In case of oranges, BAFRA inspect their quality based on size (*meel* and *keel*), colour and general appearance and issue certificates. It has a right to reject any lots of fruits that do not meet the prescribed standards. During the survey, the exporters raised the issue of timely and on the spot inspection of quality so as to minimise the risk of rejection at the point of exit. The national stakeholders workshop organized by AMS in Phuentsheling in April 2009 has also made recommendation to BAFRA for issuing certificates at the depots where inspection is done. This would minimise the burden of running to and from the BAFRA office and enable quick shipment of the fruits (AMS, 2009).
Box 8: BAFRA Rules and Regulations

General Provision

- No plants, plant products, packages, goods or soil subjected to quarantine shall be imported into Bhutan. If found or believed to be infested or a pest detected, they shall be detained at the point of entry and forwarded to an appropriate station for treatment in accordance with regulations.
- During treatment, a person who removes plants, packages, goods or soil from these places without written authority of the quarantine inspector shall be guilty of an offence.
- Once treatment of the plants, plant products, packages, goods or soil has been completed to the satisfaction of an inspector, they may be released from quarantine and removed by the owner/importer.

Import of fresh fruits and vegetables: (Chapter V)

- The Minister under the power conferred by section 5 (1) and 5(2) of the Plant Quarantine Act of Bhutan, 1993 declares that the import of fresh fruits and vegetables into Bhutan is prohibited except by permit. Fresh fruits and vegetables include all edible portions of food plants in the raw and unprocessed state.
- All imports of plant products and goods must be inspected on arrival to verify freedom from pests, and any found infested should be treated.
- Notwithstanding any prohibitions in these Regulations, fresh fruits and vegetables from India may be permitted without an import permit unless a quarantine risk is suspected or notified. However, “the quality should be maintained” and imports will undergo thorough inspection at any entry point to keep them in line under the clause 1 of General Provision.

Export Inspection Regulations (Chapter VII)

- The Minister under the power conferred by section 6 (g) of the Plant Quarantine Act authorises BAFRA Inspectors duly appointed under the Act to inspect and examine and otherwise treat plant/plant products and goods offered for export.
- After examination the inspector may issue a certificate (Phytosanitary Certificate) indicating that plants, plant products or goods are free from injurious pests according to the import regulations of the importing country.
- The permit requirements shall be in general accordance with the International Plant Protection Convention (IPPC) of 1951.
- Any agricultural products for export to India and other countries have to go through BAFRA.
- A Phytosanitary Certificate will be issued to goods from a third country only after inspection and certification of the consignment.
- Nu. 5/- (five) only will be collected as the Phytosanitary Certificate fee.
CHAPTER FOUR: VALUE CHAIN ANALYSIS

4.1 Introduction to Value Chain

A value chain is a sequence of related business activities (functions), from the provision of specific inputs for a particular product to primary production, processing, sales and distribution, to final consumption. From an institutional perspective, a value chain can be defined as the organisational arrangements linking and co-ordinating the producers, processors, traders, and distributors who perform these functions. A value chain is also synonymously referred to as a production chain or a market chain.

Value chain (VC) analysis is a method for accounting and presenting the value that is created in a product or service as it is transformed from raw inputs to a final product consumed by end users. Value addition includes simple tasks such as bulking, cleaning, grading, bagging/packaging, transporting to demand centres, processing, and promotional and marketing additions that improve the product and attract consumers. VC analysis therefore aims to assess both goods and services along the chain and the relative strengths and weaknesses in the links among various actors involved in the chain. VC analysis typically involves identifying and mapping the relationships of four types of features: (i) the activities performed during each stage of processing/product flow; (ii) the value of inputs, processing time, outputs and eventual value added; (iii) the spatial relationships, such as distance and logistics, of the activities; and, (iv) the structure of economic agents, such as suppliers, the producer, and the wholesaler (FIAS, 2007). According to Richter (2005) ‘value chain systematically takes all steps of a production process into perspective, it analyses the links and information flows, it reveals strengths and weaknesses, even losses, in the process, the boundaries between the national and the international chain, the buyer’s requirements, international standards, it allows international benchmarking, etc’. Value chain analysis helps strengthen production relationships to find solutions to the so-called critical success factors, which determine if a product meets requirements with regard to quality, price, dependability, volume, design and speed of delivery and consequently it improves competitiveness.

Value chains generally include three or more of the following: producers, processors, distributors, brokers, wholesalers, retailers and consumers. The partners within the value chain work together to identify objectives, they are willing to share risks and benefits, and invest time, energy and resources to make the relationship work. The value chain concept is therefore regarded as an actor-oriented approach and is considered very effective in tracing product flows, showing the value adding stages, identifying key actors and the relationships with other actors in the chain (Schmitz, 2005).

One of the dimensions of a value chain is its flow, which is also called its input-output structure. In this sense, a chain is a set of products and services linked together in a sequence of value-adding economic activities. In other words, a value chain is a series of participants along the entire marketing spectrum who collaborate to satisfy market demands for specific products or services to their joint and collective mutual benefit. The participants in the case of the mandarin value chain would be:

- Nursery Raisers and agri-input suppliers
- Growers/Orchard owners
- Contractors/Processors
- Bidders at auction yards/exporters
- Retailer/food service sector workers
The advantages of being a participant in a value chain would be:

- Reduction in the cost of doing business
- Increase in bargaining power
- Improved access to advanced technology, information and capital
- Streamlined transport and logistics
- Formation of alliances
- “Trueness to promise” that strengthens backward and forward linkages
- Inventory management including the quality of inventory storage

The key objective of value chain analysis is to find the most pressing bottlenecks first and address them in a systematic manner. These bottlenecks can be either issues related to functions, actors, linkages among them or even external factors such as policy and infrastructure. The mapping and analysis of the value chain help stakeholders to identify a common vision and goals, and develop intervention strategies to reach these goals.

4.2 Value Chain Map

Value chain mapping means drawing a visual representation of the chain, which involves various linkages among the mandarin growers, inputs and logistical service providers, transporters, contractors and traders. The value chain map depicts the flow of mandarin fruits in the market, activities carried out at each stage of the value chain, the structure of actors and the support involved in the value adding process (Figure 11).

Figure 11: Value Chain Map of Mandarin Orange in Eastern Bhutan

This map consists of three elements: functions, operators and promoters. There is a clear difference between operators and promoters/supporters of a value chain (Springer-
Heinz, 2007). The people or enterprises performing the basic functions of a value chain are operators (also called actors). At one stage in the value chain, they become owners of the (raw, semi-processed or finished) product. Based on this definition, the orange VC actors can be grouped by the following functions:

- **Production**: Actors whose functions are directly related to basic agricultural production, including pre-cultivation, cultivation, harvest, or extractive activities.
- **Post harvest handling and processing**: Actors whose functions are directly related to post harvest management (cleaning, sorting, packaging, etc) or processing of basic goods into value added products.
- **Trading**: Actors whose functions are related to the buying and selling of the product(s).

The associations, networks or organisations that provide support services and represent the common interests of the VC operators are known as VC promoters/supporters. They remain outsiders to the regular business process and restrict themselves to temporarily facilitating a chain upgrading strategy. Typical facilitation tasks include creating awareness, strategy building and co-ordination of support activities. Whereas the services offered by individual actors, organisations, or companies to the value chain, tangible (transport, machinery, storage, among others) or intangible (technical assistance, training, etc.), are known as business development services (BDS).

As depicted in the map, many mandarin growers in Bhutan act as integrated value chain operators and perform two or more functions. They often arrange farm inputs (FYM, seedlings etc) on their own, dig pits and plant seedlings, manage orchards, harvest the fruits, grade and pack them, and then assemble them at road heads and transport them to the auction yard for sale.

### 4.3 Market Analysis

#### 4.3.1 Market Share and Production Potentials

Bhutan’s total production of mandarin orange in 2007 was reported to be 72,071 metric tonnes (DoA, 2007). When compared with the production of neighboring countries, this is very small (Figure 12). India’s orange production in 2007 was 3,900,000 metric tonnes, while China produced 3,172,910 metric tonnes (FAOSTAT). Pakistan comes in 11th position with a total production of 1.72 million metric tonnes, worth US$ 302,448 thousands in 2007, whereas Nepal is placed in 56th position with a total production of 109,277 metric tonnes (FAOSTAT). Bhutan’s position in the orange production league in 2007 was 57th.
The trend of orange production in Bhutan is very positive. Several reports and studies have shown a tremendous increase in the production of oranges (Figure 13). The total number of trees producing mandarin oranges has remarkably increased over the last few decades, especially after the construction of access roads starting in 1961. According to the study conducted by ICIMOD and MoA/PPD (2006), the production of mandarin orange in year 2000 was 29,616 metric tonnes and the total number of trees was 1,761,005. By year 2007, the production reached to 72,071 metric tonnes and the total number of trees increased to 3,252,210 with almost 62 % being fruit bearing trees and with an average yield of 36 kg/tree (DoA, 2007). Table 7 presents the data on the total number of trees, fruit bearing trees, total production and yield for the year 2000 to 2007.

Table 7 shows that over the period of the last 9 years there has been a 2.4 fold increase in production but interestingly there has not been such a remarkable increase in the yield. In 2000, the average yield was reported as 33 kg/tree and in 2007 it was 36 kg/tree (DoA, 2007). The survey conducted by Connellan et al (2007) indicates that a high number of citrus trees (32%) were considered to be past their peak productivity stage (>20 years of age) with only 22% of trees younger than 10 years of age. Another reason for the low yield is found to be the occurrence of Huanglongbing/ex-citrus greening disease, Powdery Mildew and Chinese citrus fruit fly that cause fruit dropping.

Table 7: Number of Trees, Production and Yield

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Trees</th>
<th>Bearing Trees</th>
<th>Production (MT)</th>
<th>Yield (Kg/tree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>1,761,030</td>
<td>913240</td>
<td>29616</td>
<td>33</td>
</tr>
<tr>
<td>2002</td>
<td>2,067,581</td>
<td>1183502</td>
<td>37312</td>
<td>32</td>
</tr>
<tr>
<td>2003</td>
<td>NA</td>
<td>NA</td>
<td>36322</td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>1831312</td>
<td>983407</td>
<td>31915</td>
<td>32</td>
</tr>
<tr>
<td>2005</td>
<td>1969280</td>
<td>1310112</td>
<td>48367</td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>2297364</td>
<td>1353080</td>
<td>55558</td>
<td>41</td>
</tr>
<tr>
<td>2007</td>
<td>3,252,210</td>
<td>2,015,426</td>
<td>72,071</td>
<td>36</td>
</tr>
</tbody>
</table>

Source: Agriculture Statistics, DoA

The data available for total production, exported quantity and local consumption are inconsistent. For example in 2007, DoA reported a total production of mandarin as
72,071 metric tonnes, whereas FAOSTAT revealed a total production of 36,500 metric tonnes. Assuming, on the basis of the DoA figures the total production of Bhutan to be 72,071 metric tonnes, export quantity as 23,495 metric tonnes and post harvest loss (@20%) as 14,414 metric tonnes, a total 33,702 metric tonnes is left for domestic consumption (both fresh fruits and processing).

4.3.2 Domestic market

According to the Bhutan Living Standard Survey Report, average consumption expenditure for food is Nu. 5,423/person; of which only Nu. 224 (about 4.2%) is spent on fruits (NSB, 2007). Citrus is among the most preferred fruits in Bhutan. With changes in the standard of living and increased awareness about health, demand for fresh fruits is increasing in Bhutan. Due to changes in eating habits, demand for fresh juice, canned juice, marmalade and jam is also on the rise. Bhutan Agro Industries Ltd. at Wangchuktaba alone requires about 136.25 metric tons of orange pulp every year for producing orange juice (Lophyal, 2009). IFPP in Pemagatshel consumes about 14.87 metric tonnes of oranges. These processing industries generally use fruits which are rejected for export. According to Lophyal (2009), more than 70% of Bhutan’s annual requirement for orange pulp is imported from India.

During the field survey of citrus production areas in Eastern Bhutan it was learned that of the total production, producers sell 92% of the fruits in the market through different marketing channels as depicted in Figure 14. They keep 5% for their household consumption and 3% distribute as gifts to friends and relatives (Figure 14).

![Figure 14: Proportion of oranges sold in the market](image)

4.3.3 Export market

Annually, about 20,000 metric tonnes of fresh oranges are exported from Bhutan. Of this amount, 85% goes to Bangladesh and the rest to India (Table 8). About 75% of processed fruits (orange squash, marmalade, jam, etc) are exported (Dorjee et al, 2007). Bhutan trade statistics for year 2008 showed the value of oranges exported to Bangladesh as Nu. 226,484,864 (DRC, 2008). The statistics also reported that out of 18,570 metric tonnes of oranges, 17,482 metric tonnes (almost 94%) of oranges were exported to Bangladesh.
Exporters mentioned that there is high demand from both India, despite India being the 4th largest orange producer in the world, and Bangladesh. This is largely attributed to the large size, good colour and unique taste of Bhutanese oranges. Furthermore, Bhutanese oranges are said to have seasonal and other comparative advantages over oranges grown in neighbouring Indian states of Sikkim, Darjeeling, Kalimpong, Shillong and Nagpur (Lophyal, 2009). The demand for both fresh oranges and processed products has increased over the last decade and it is likely to grow further in the future if appropriate marketing strategies are put in place.

<table>
<thead>
<tr>
<th>Year</th>
<th>Bangladesh</th>
<th>India</th>
<th>Total Export</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>14544</td>
<td>320</td>
<td>14864</td>
</tr>
<tr>
<td>2002</td>
<td>10960</td>
<td>3237</td>
<td>14197</td>
</tr>
<tr>
<td>2003</td>
<td>18359</td>
<td>1375</td>
<td>19734</td>
</tr>
<tr>
<td>2004</td>
<td>15969</td>
<td>2609</td>
<td>18578</td>
</tr>
<tr>
<td>2005</td>
<td>20613</td>
<td>2670</td>
<td>23284</td>
</tr>
<tr>
<td>2006</td>
<td>13143</td>
<td>5442</td>
<td>18585</td>
</tr>
<tr>
<td>2007</td>
<td>20427</td>
<td>3518</td>
<td>23945</td>
</tr>
<tr>
<td>2008</td>
<td>23198</td>
<td>4296</td>
<td>27494</td>
</tr>
</tbody>
</table>

4.3.4 Marketing Channels

Marketing channels describe the routes taken by products from producers to consumers. They consist of individuals and firms involved in the process of making the fruits or value added fruit products available for consumption. Mandarin orange in Bhutan follows one of the following four routes (Figure 15):

**Channel A** is the simplest one, in which growers themselves sell their produce to the consumers in the local markets or supply their produce to local retailers. During the study it was observed that small fruit growers with only a few fruiting trees usually involved themselves in the direct marketing of their fruits because of the low volume of the produce. Mostly, they carry 500 to 600 fruits (50 – 60 kg) packed in a bamboo basket, to local markets and sell directly to consumers.

**Channel B** involves pre-harvest contractors in between growers and exporters or processors. It was noted that mostly the growers sell their orchard as a whole to contractors one or two months before harvest. The deal entirely depends on trusting each other and these contractors tend to be regular buyers of certain pockets of production or from certain groups of farmers. The contractors perform transactional functions that involve buying arrangements, harvesting, sorting, grading and transport of fruits, overseeing the auctioning etc. Generally, the contractors make a profit because of their risk-taking functions but sometimes they can also come out at a loss due to lower market prices and other reasons like road blockades, strikes, etc. According to the commodity chain analysis report, as many as 64% backyard growers, 68% small growers, 62% medium growers and 71% large growers sell their produce to contractors (Dorjee et al, 2007). Channel B also involves those actors who do not hold LC accounts but export the oranges in the name of registered exporters. In Gelephu and
Phuentsholing it was observed that there are only a few exporters with LC accounts (for example, Kimpex, Yarab, Tri R Export, etc) and the rest are only suppliers, but assume the role of exporters. These suppliers pay 3-6% commission to the export firms they are affiliated to and take their oranges to the Bangladesh market (Dorjee –pers comm.).

**Channel C** involves institutional buyers - the processing industry or export agencies or retail firms - in between growers and consumers.

**Channel D** refers to the fruits traded through the FCB auction yards. In this case, either growers themselves bring their produce to the auction yard or they sell their fruits to contractors who then bring the produce to the auction yard, where exporters or local traders can bid for them.

**Figure 15: Marketing Channels of Orange Distribution in Bhutan**
4.4 Economic Analysis

4.4.2 Price dynamics

The price of oranges varies depending upon the type of market, the buying-selling arrangements, the time of harvest and the type of oranges. Small growers generally sell their produce in designated market places in their local towns on a per piece (number) basis. During the peak harvesting season, they offer 2 pieces of large oranges @ Nu. 5. But, if oranges are small and sour then they sell 3 pieces @ Nu. 5. The price varies greatly depending upon size and colour. According to the records of the Samdrup Jongkhar auction yard in 2009, this year until the 3rd week of December, the auction price ranged from Nu. 35 to Nu. 192 per pon. One pon is equivalent to 80 oranges, and is the officially practised unit at the auction yard. One kilogram comprises 7 fruits, if they are big, 13 medium sized or 29 small fruits. For the export market, oranges are sold on a per box basis and prices are fixed based on the size and quality of the fruits. A box of oranges weighs between 15-18 kilograms (RNRRC, 2008). In recent years, the average export price varied between US$ 8-14 per box for meel sized fruit and US$ 6-12 for keel sized fruit, depending upon the exchange rate of the US Dollar (Tobgay and McCullough, 2008). In 2009, the LC floor price for keel has been fixed at US$ 7 and US$ 9 for meel. But as the fruit harvest was poor that year and demand exceeded supply, exporters fetched up to US$ 16/box for meel and US$ 14 for keel (pers. comm. with exporters).

Most growers and orchard owners sell their oranges to contractors on a per tree basis before harvest. Both parties - the orchard owner and the contractor - make their own estimates based on their observation of how the fruit is setting and then reach an agreement. After the deal the growers get some payment in advance and later the agreed amount is paid in instalments after harvesting and selling the fruits. Big orchards, which are close to road-heads generally, get a higher price than those situated far from the nearest road-head. Thus, the price that a farmer gets depends on the number of fruit bearing trees, the quantity and quality of fruits observed in the orchard, and the proximity of the production area to the nearest road-head. This system for arriving at prices has been in practice for many years. The same system happens in some parts of India and Nepal (FBC, 2008).

Among the orange growers that were interviewed during this study, opinions were divided about this pricing system: some were happy with it but some opposed it, suspecting that they were being cheated by the outside contractors and were not getting the best price for their produce. However, the majority of fruit growers were satisfied with the established contractual system that guaranteed a profit to a certain extent, and gave them relief from having to harvest fruits and doing all the post-harvest handling on their own.

4.4.3 Production costs

Production costs of citrus vary between area to area and farmer to farmer depending upon weather conditions, soil type, the level of farmers’ cultivation knowledge and other factors. According to information provided by the citrus growers, it is estimated as an average of Nu. 55.3 per pon. This year the fruit harvest was very poor: on average citrus
growers harvested only 5.3 pons/tree. On the basis of 38 plants growing in one langdo of land, growers could produce 201 pons of oranges per langdo.

A breakdown of the average production costs shows that FYM application is the largest input component (45% of total input costs), followed by seedlings (31%). Labour costs that vary from pit digging to harvesting and grading and sorting of fruits account for 24% of the total production costs. A summary of average production costs based on the survey carried out in 2009 is provided in Table 9.

Table 9: Cost of Orange Production in Eastern Bhutan

<table>
<thead>
<tr>
<th>Component</th>
<th>Cost * (Nu./pon)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seedlings</td>
<td>17.18</td>
<td>The cost is estimated based on the current price but many trees were planted 10-15 years ago</td>
</tr>
<tr>
<td>FYM</td>
<td>24.6</td>
<td>Most farmers do not buy farm yard manure, they prepare from their own livestock</td>
</tr>
<tr>
<td>Pit digging</td>
<td>2.48</td>
<td>These cost components can be grouped as labour costs. During the survey, it was noted that most citrus growers do not keep a record of the labour inputs used for citrus plantation and orchard management.</td>
</tr>
<tr>
<td>Planting</td>
<td>1.26</td>
<td></td>
</tr>
<tr>
<td>Basin making</td>
<td>2.26</td>
<td></td>
</tr>
<tr>
<td>Manuring</td>
<td>1.21</td>
<td></td>
</tr>
<tr>
<td>Weeding</td>
<td>1.19</td>
<td></td>
</tr>
<tr>
<td>Harvesting</td>
<td>3.55</td>
<td></td>
</tr>
<tr>
<td>Sorting and Grading</td>
<td>1.59</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>55.32</strong></td>
<td><strong>Total cost of orange production in Eastern Bhutan</strong></td>
</tr>
</tbody>
</table>

*Calculated based on figures provided by the respondents during the survey carried out in Nov-Dec 2009

4.4.4 Distribution of Value Addition

In Bhutan, it is not easy to estimate the actual profit made by actors at each level of the value chain, since different actors use different units of measurement, and prices vary greatly depending upon the size of the fruits, colour, shape and shine, and distance of the orchard from the road-head. Unlike potato, which is mostly sold through FCB auction yard and has mainly two sets of prices (for red and white potatoes), over 85% of oranges are exported through different export houses. Mostly rejected and low quality oranges are sold through auction yards. Though oranges are broadly categorized into 3 groups; meel, keel and salakhala (all shapes and sizes of oranges mixed together). Within each category the price varies greatly and it keeps on fluctuating depending upon the situation with regard to vehicle movement and weather conditions. During the time of our visit to Samdrup Jonkhar, the auction price of oranges was ranging from Nu. 35/pon to Nu. 192/pon. Moreover, most farmers sell their trees to contractors when fruits are still on the trees. Fruits are generally harvested, packed and transported by the contractors. Hence, it is near-impossible to estimate the farm-gate price of oranges on a per-kilogram basis.

Figure 16 presents the value addition at different levels that has been estimated based on our interactions, field surveys, and the physical observation of farms, collection
centres, export depots and auction yards. According to our estimate, the citrus growers’ value addition makes up 45.2% of the total value addition. The contractors’ value addition is 16.5% and the exporters’ is 38.2%.

The price differential between citrus growers’ and importers’ prices is 54.8%, which is much higher than that of the potato value chain in Bhutan. In the case of potato, the growers are the major players who add 67% of the total value and the price differential is only 33% (Joshi and Gurung, 2009).

**Figure 16: Distribution of Value Addition among the VC Actors**

<table>
<thead>
<tr>
<th>Sales Price#</th>
<th>Nu 20</th>
<th>Nu 27.3</th>
<th>Nu 44.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of Raw Materials</td>
<td>Nu 0*</td>
<td>Nu 20</td>
<td>Nu 27.3</td>
</tr>
<tr>
<td>Gross Value Added</td>
<td>Nu 20</td>
<td>Nu 7.3</td>
<td>Nu 16.9</td>
</tr>
<tr>
<td>% Value Added</td>
<td>45.2%</td>
<td>16.5%</td>
<td>38.2%</td>
</tr>
</tbody>
</table>

*Price is estimated for good quality big sized (meel) oranges while interviewing VC Actors during 2nd week of December 2009. The LC floor price for meel in Bangladesh is US$ 6/box but exporters generally get about Nu 730 /box, which has approximately 18.5 kg oranges. *Cost of Planting materials, labour and inputs for orchard management.

**4.4.5 Comparative Advantage of Bhutanese Oranges**

Bhutanese oranges have some unique qualities that originate from the specific conditions of the country. The following attributes make them more competitive in the export market:

**Bhutan’s clean image:** As a result of its relatively unspoiled natural environment and geographic seclusion, Bhutan is positioned very well with regard to the concept of “high value, low volume” niche commodities. Owing to the RGoB’s concern for nature conservation and its sincere efforts toward socially and ecologically balanced economic development, Bhutanese agricultural products are considered ‘nearly organic’ or “natural” with minimal external inputs and fetch a good price as a result of this.

**Unique taste:** According to traders and exporters, who export oranges to Bangladesh and/or supply bulk quantity to nearby Indian cities, Bhutanese oranges taste better and are juicier than Indian oranges.

**Short availability:** Another comparative advantage of Bhutanese orange is its surplus demand over supply. Having been grown only in a few pockets of sub-tropical hilly areas
in Bhutan, the quantity of fruits produced is relatively small and fruits are available only from November to February.

**Seasonal differences:** The loose skinned oranges produced in Bhutan have distinct seasonal advantages over Nagpur oranges. India produces a large quantity of oranges but they are mostly harvested during April-June.

**Fair trade:** Most orange growers are small farmers, owning less than 4 acres of landholdings. For many of them the cash earned from the sale of oranges is the major source of their livelihood. Therefore, the RGoB has been giving high priority to the development of the horticulture sector. Well established and functional auction facilities and market information systems being developed by DAMC/MoAF provide an opportunity for direct interactions between producers and traders so that fair and transparent deals can be struck. The fruits produced by small farmers in a nearly-organic way and traded through this system offer the potential for fair trade certification.

### 4.5 SWOT Analysis

Strengths, Weaknesses, Opportunities and Threats (SWOT) is a powerful tool used in developing strategies for intervention. The tool provides a framework for understanding controllable and non-controllable factors that any interventions should address if they are to benefit the entire value-chain. The critical issues of the SWOT analysis come under the following four broad categories:

- **S** - What are the subsector’s internal Strengths?
- **W** - What are the subsector’s internal Weaknesses?
- **O** - What external Opportunities might move the subsector forward?
- **T** - What external Threats might hold the subsector back?

After giving consideration to each of the subsector’s strengths and weaknesses as well as the opportunities and threats specific to each of the proposed interventions, the following issues stand out:

- Production system and delivery of products in the value chain
- Quality of business service provisions
- Competitive advantages of the value chain members
- Market access, infrastructure, management information and financial systems and the policy environment

When designing interventions, the focus is on the exploitation of strengths rather than simply addressing the weaknesses. In other words, interventions are not only about addressing constraints, but also nurturing the strength of the subsector. Similarly the opportunities and threats - the external trends that influence the subsector - are also analysed. The external opportunities and threats are usually divided into political, economic, social, ecological, demographic and legal forces. These external forces include such circumstances as changing business trends, increased competition, changing regulations, and so on. They can either help the subsector move forward (opportunities) or hold the subsector back (threats) -- but opportunities that are ignored can become threats, and threats that are dealt with appropriately can be turned into
opportunities. The non-controllable factors are generally dealt with through advocacy and networking to bring about changes in the policy framework.

<table>
<thead>
<tr>
<th>Strength</th>
<th>Weakness</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Internal Factors</strong></td>
<td></td>
</tr>
<tr>
<td>• Highly suitable climatic condition for citrus cultivation</td>
<td>• Low yield due to both abiotic and biotic stress, mainly due to limited use of external inputs, pests and diseases. Quality inputs are not available in time; many citrus farmers are either unaware of control measures or do not have access to chemicals for the control of pest</td>
</tr>
<tr>
<td>• Unique quality and seasonal advantage</td>
<td>• Short availability of Bhutanese oranges; lack of appropriate variety of orange to prolong harvesting season.</td>
</tr>
<tr>
<td>• Saplings and other agri-inputs are locally available and farmers are interested to increase the area under citrus cultivation.</td>
<td>• Extensive losses caused by fruit damage during post harvest handling and transportation.</td>
</tr>
<tr>
<td>• Bhutan’s clean image- as a result of its relatively unspoiled natural environment and RGoB’s concern towards organic agriculture</td>
<td>• Collection centres are not properly organised and supported by necessary infrastructure</td>
</tr>
<tr>
<td>• Well established and functional auction facilities and infrastructure.</td>
<td>• Growers are scattered and yield is low.</td>
</tr>
<tr>
<td>• Trucks generally supply goods from urban to the rural areas. While travelling back they are empty and hence they prefer to carry oranges if farmers pay reasonable rate.</td>
<td>• Shortage of labour, unavailability of vehicles during peak marketing season and high transportation cost make product price high</td>
</tr>
<tr>
<td>• Government has categorised orange as a high value crop and policy supports are available to provide facilities to the farmers and traders</td>
<td>• Limited number of buyers at the FCB auction yard</td>
</tr>
<tr>
<td>• Under Horticulture Division, DoA has set up Citrus Development Program to promote citrus cultivation in the country</td>
<td></td>
</tr>
<tr>
<td>• Department of Agricultural Marketing and Cooperative is in place to facilitate marketing and provide marketing information services to the producers and traders.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>External Factors</strong></td>
<td></td>
</tr>
<tr>
<td>• Demand for Bhutanese oranges is very high in Bangladesh and neighbouring Indian states of Assam and West Bengal</td>
<td>• High incidence of pest problems, mainly citrus greening.</td>
</tr>
<tr>
<td>• The taste of Bhutanese orange is better and timing of harvest is different than that of Indian Nagpur orange, which is grown in large quantity</td>
<td>• Frequent strikes and security problems in neighbouring states of India</td>
</tr>
<tr>
<td>• Free trade and non-tariff barrier provides easy access for Bhutanese oranges to Bangladeshi market where there is huge demand</td>
<td>• Increased supply of oranges from Nagpur and of late from China (locally called Baby orange in Bangladesh), which are quite cheap compared to Bhutanese oranges</td>
</tr>
<tr>
<td>• Rapid increase in the number of middle class families demanding organic foods in India offers good potential for Bhutanese oranges</td>
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</tbody>
</table>
4.6 Constraints

The most important constraints in the citrus value chain are: (i) heavy pressure of pests and diseases, (ii) low yields, (iii) poor input supply (seedlings, fertilizer, irrigation, agricultural chemicals), (iv) inadequate knowledge and skills that result in poor management of orchards, untimely harvesting of the fruits, poor handling and inappropriate packing, (v) poor infrastructure (road networks, collection centers/packinghouses/grading facilities), (vi) limited access to credit facilities, (vii) high losses during post-harvest handling.

Most of these constraints are inter-linked. For example low yields are linked to the insects and disease problem, which is further linked to poor input supply and inadequate skills and knowledge. Similarly, poor infrastructure and untimely harvest of fruits and poor handling lead to high post-harvest losses.

Insect and diseases problems: According to farmers, production in general is falling every year. Many citrus trees are dying and facing huge loss of fruits due to citrus greening disease, phytophthora rot, citrus fruit fly and powdery mildew infestations.

Weak input/service market: The input/service market is very weak in Bhutan. A shortage of good quality saplings has been cited as the principal constraint in many reports. The timely availability of fertilisers and chemicals for the control of pests is also a major problem cited by the growers.

Inadequate knowledge and skills: Extension officers posted in almost all gewogs are supposed to make regular field visits and transfer skills and knowledge through training and demonstrations. However, the survey reports indicate that the training and visit approach, on which the role of the extension officer is based, seems to have failed (Dorjee et al, 2007). Most of the extension officers have little experience of citrus orchard management and lack motivation. Furthermore, the villages are scattered and many orchards are far away from road-heads, so it is not possible for a single Extension Officer to cover all the villages. Therefore, there is a need to strengthen the capacity and motivation of the existing extension officers, while also there is a need for additional officers in gewogs where the villages are scattered over a large area.

Lack of access to and high cost of transportation: Production areas are not only small but highly scattered. Access to transport has featured as the major marketing constraint, because the rugged terrain between the orchard and the market place makes transporting produce extremely difficult. The lack of link roads connecting production pockets to road-heads is cited as a major constraint by almost all the respondents. Producers and traders have both expressed their dissatisfaction regarding the availability of transport particularly in rural areas. The price of transport is significant and the quality of service is generally poor. In some places, for example from Lhuentse to Samdrup Jongkhar, the transport cost is about Nu. 10,000 for a DCM truck, which carries about 800 pons of oranges. Furthermore, the cost of carrying oranges from farm to road -head is also very high. In most cases, one third of the price fetched in the auction yard is spent on transport. (Lophyal, 2009).

Post harvest losses: Post harvest losses resulting from poor general management of the orchard prior to harvest and later during post harvest handling (including transport)
Lack of proper storage: Lack of storage facilities is a problem at farms and at depots. Contractors also have difficulty in finding a good place where sorting, grading and packing can be done. Storage facilities are also lacking at the auction yard. Growers or contractors have to unload their oranges in the premises of the auction yard and put them straight onto the asphalt floor under the open sky. The fruits get heated during daytime and cool down in the night, which caused heavy damage. Furthermore, if there is rain or any other abnormal conditions (strike in India, low number of bidders), further losses are incurred. Hence, improvement in this situation is seen as one of the critical factors in the overall profitability of citrus production and trading.

An excess supply of citrus during the peak season could be stored, and when the market price increases the products could be sold at a relatively higher price. Mandarin oranges in cellar stores can be stored for 60 to 90 days at 8–10°C and 90% relative humidity with a 20–25% loss (Adhikari, 2006). A simple cellar store with shelves for keeping oranges can be replicated in Bhutan.

Marketing information: Marketing information is a powerful tool for helping producers and traders decide on whether to buy or sell goods. It includes prices in the destination markets and the cost of marketing margins (that is the cost of transportation, cost charged by the contractor, cost of the market, and cost of handling and so on). It also includes information that would affect supply and demand, such as weather conditions in the growing areas, changing market regulations and road-blockages, political strikes or other conditions that might affect price and access to markets. DAMC/RAMCO in cooperation with FCB, national media and other relevant agencies has been developing this system. But so far it has not been effectively implemented. Many farmers do not know the prices and other conditions until they actually reach the auction yard.
Interestingly, a few farmers were even found to be unaware of the FCB commission’s and loading/unloading charges.

**Limited access to credit facilities:** Lack of working capital is one of the major constraints that have hampered the farming business, particularly for the farmers’ marketing groups. Some contractors and local traders have appreciated the services of BDFC, but many farmers involved in citrus production and delivery of their produce to the auction yard were found to be unaware about the credit schemes that BDFC offers. There is a need to increase awareness about BDFC’s services and to cater to the needs of farmers through mobile banking and other schemes.

**Buyers’ monopoly:** Many farmers suspected that the buyers of oranges have formed some sort of syndicate leading to very low prices, which sometimes hardly reach break-even level. Being highly perishable fruit, once oranges have been brought down from farms to the auction yard the farmers/contractors have no other choice than to sell them at whatever price - sometimes a throwaway price – the bidders at auction yard offer.

**Frequent strikes in Indian border towns**

Growers, contractors and exporters in the Eastern region face problems in exporting citrus, since transporting them to Phuentsholing is too expensive and reduces the shelf life of the fruits. Frequent strikes in neighbouring states of India (mainly in Assam) force them to transport the produce via the lateral highways, which proves to be more expensive.
CHAPTER FIVE: VALUE CHAIN PROMOTION STRATEGY

5.1 Development of Vision, Goal and Strategy

A ‘Value Chain Promotion Strategy’ is a set of activities that are planned and carried out to increase the competitiveness of the subsector, with the active participation of a value chain’s diverse actors, to achieve common objectives, around which one or more business organisations and/or interest groups are linked. VC promotion strategy basically focuses on two areas: 1) market orientation, which aims for a greater volume sold and/or a better end price gained and 2) income distribution - the poor benefit at least equally or more from the income generated (the poor get their “share of the cake”).

A VC promotion strategy for the orange subsector of Bhutan has been developed based on mapping and a detailed analysis of (i) the comparative advantages of the subsector and (ii) the most pressing bottlenecks that are hindering growth. A review of the literature and RNR statistics, studies of value chains and discussions with various key informants have shown that Bhutan’s RNR sector has both great potential and significant challenges. To tap into the opportunities and to address the challenges in a systematic manner it is essential to work jointly with various stakeholders including government departments, the private sector and the operators of this particular value chain.

RAMCO in close cooperation with the Dzongkhag Agriculture Office and other concerned Government departments/units and development agencies, has carried out a survey on the orange value chain in Eastern Bhutan. Based on the field surveys of Eastern Bhutan, interactions and meetings with a wide range of stakeholders and a literature review, the following vision, goals and areas of interventions are suggested for promoting the orange subsector. As there are many similarities in orange growing areas throughout the country, so the vision, goal and strategies recommended in this chapter may be applicable not only to Eastern Bhutan but also to the whole country.

Vision: To increase production volume and yield and maintain the position of the orange subsector at the top of Bhutanese export commodities

Goal: To reduce the cost of production and improve market linkages through better provision and use of business development services

Strategies: In order to achieve the goal described above, strong collaboration between the public sector, development agencies and the private sector (business associations) is a precondition. From the public side, investments in transport and other basic infrastructure (irrigation, cold stores etc), regulation of trade and support for technology development are required. From the private sector, greater linkages are needed to structure value chains, create scale effects, and explore post-harvest processing and marketing opportunities. VC operators performing different functions (vertical relation) and the firms and companies engaged in a particular level of value chain (horizontal relation) need to put collective efforts into upgrading the value chain. Small producers could benefit through co-operatives or links with large companies as suppliers. Particularly with regard to delivery of the produce from farm to the auction yard/export depots, the amounts grown by farmers are often too small to meet the needs of big traders. Therefore, small producers need to join hands and form a group/co-operative to be able to supply the required quantity to big traders/bulk buyers. Farmers’ capacity
need to be strengthened so that they can improve their management practices and adopt new technologies (use of grafted planting materials, use of external inputs such as inorganic fertilisers, timely and regular control of pests/diseases, irrigation, better post harvest handling operations/equipment, etc.) to increase production volume and improve the quality of fruits.

It is obvious that no one single organisation can overcome all the problems, nor it is advisable to have a huge crowd of actors at a particular level of the value chain when there is no-one working at another level. The first pre-requisite is therefore to clarify roles among the support service providers as to which organisation can best provide which services. Based on the analysis of functional flow, mapping of actors and supporters and market analysis, we suggest the following model (Figure 17):

**Figure 17: Supporting Agencies and Services for VC Analysis**
As depicted in the figure, various efforts are needed at different levels of the value chain to improve the competitiveness of the orange subsector:

- At input supply level, private agro-input firms need to be attracted into the business to enhance farmers’ access to quality seedlings, fertilisers and chemicals. Improvement in planting materials and timely availability are the crucial areas that need support services from various organisations.
- At production level, there is a need to provide training and on-the-spot advice on how to manage orchards properly and how to control diseases and pests.
- As for the delivery of fruits from the farm to the auction yard/export depots, there is a need to develop and strengthen farmers groups/co-operatives on the one hand and improve post-harvest handling facilities on the other.
- For export of the fruits, there is a need to improve the inspection and certification process, LC procedures and transportation.

Table 17 below provides a list of the major areas of interventions and activities to promote the orange value chain:

Table 17: Major areas of interventions and activities suggested for VC promotion

<table>
<thead>
<tr>
<th>Strategic Areas of Intervention</th>
<th>Specific Activities</th>
<th>Expected Outputs</th>
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</table>
| Provision of Quality Inputs (Supply of seedlings, fertilisers and chemicals)                  | ✓ Develop suitable disease resistant rootstocks and cultivars for different areas  
✓ Raise awareness about the importance of quality seedlings through the use of national media and other means  
✓ Support private nurseries to ensure an adequate supply of quality materials  
✓ Review the present ‘cash and carry’ system of seedling and fertiliser supply and strengthen the delivery mechanism  
✓ Private firms or farmers co-operatives may be encouraged to function as Agri-input suppliers  
✓ Conduct regular monitoring of diseases and pests and keep enough stock of chemicals at Geog extension office  
✓ Promote suitable IPM technique for prevention and control of pest and diseases | Planting materials, fertilisers and chemicals are locally available and yield increased due to timely application of these inputs                                                                                  |
| Training and technical backstopping for proper management of orchards                        | ✓ Provide a subject matter specialist in major citrus growing areas for training and technical backstopping  
✓ Enhance the capacity of EOs and encourage them to make regular monitoring of orchards and provide on the spot advice to the farmers  
✓ Develop a training and follow-up plan in line with the phenology of the plant (planting, flowering, fruit setting, harvesting)  
✓ Encourage growers to test and analyse soil nutrients and make proper use of fertilisers to supplement the nutrient requirements of their trees  
✓ Conduct exposure visits for growers to show well managed citrus orchards | Trained growers practice improved management techniques resulting into healthy orchard                                                                                                                                  |
| Post harvest handling of fruits and processing | ✓ Promote the use of clippers instead of handpicking the fruits (PH)  
✓ Raise awareness about when and how to harvest fruits (maturity of the fruits, weather conditions), use of cushion baskets with appropriate material instead of hard bamboo splinters/baskets, and storage techniques  
✓ Promote the use of the Fibre Box as preferred by buyers in place of wooden boxes.  
✓ Train farmers regarding proper sorting and grading and look at the feasibility of grading oranges using a grading machine  
✓ Establish cellar stores and depots in major fruit growing areas  
✓ Explore possibility of establishing low cost processing units to be owned and operated by producer's groups and co-operatives  
✓ Strengthen the fruit processing industry in line with the concept of public-private partnership | Shelf life of oranges increased with minimal post harvest losses |
| Group and Cooperative | ✓ Raise awareness about the benefits of working in a group and cooperative  
✓ Strengthen the existing citrus growers groups and support to form a co-operative  
✓ Build the capacity of EOs in Dzongkhags to enable them to form groups and co-operatives  
✓ Organise exposure visits for EOs and actors of citrus value chain to understand the functioning of some successful co-operatives in Nepal and India  
✓ Support co-operative in development of working modality, book keeping and accounting system | Growers have better bargaining powers and traders get assured supply of bulk quantity at one place |
| Marketing and strengthening of VC linkages | ✓ Collection and dissemination of information on market prices, demand-supply conditions, destinations etc  
✓ Standardisation of LC terms and conditions in line with exporters' requirements  
✓ Bring all actors of value chains closer through organising regular meetings and facilitating dialogue, joint decision making and commitment to act on decisions  
✓ Support traders to display stalls in trade fairs and strengthen their network and business relations with importers in Bangladesh and other countries  
✓ Conduct regular marketing and analytical studies to promote citrus marketing chains | Better relation between producers-processers and traders resulting fair distribution of income |
| Quality assurance policy and conducive business environment | ✓ Stationing of BAFRA offices (may be temporary offices during the peak harvesting season) at depots to inspect quality and to issue certificates at the depot  
✓ Explore the fair trade and organic market and introduce trade marks once quality guidelines are strictly followed by the VC actors  
✓ Movement of trucks through Assam state is presently restricted to five days a week, which may be extended to 6 or 7 days a week.  
✓ Develop measures to implement the recommendations made in the various publications of the Ministry of Agriculture and Forest | Favorable government policy for assuring quality and tapping niche market |
5.2 Recommendations

Based on the above analysis, the following recommendations are proposed under these broad categories:

5.2.1 Establishment of Commodity Specific VC Forum

To improve mandarin production and strengthen market linkages many suggestions have already been offered in various reports and publications. Most of those suggestions (e.g. improvement in planting materials, orchard management, capacity building of citrus growers and better connection to roads) are still valid. Our first recommendation is therefore to develop a mechanism that can monitor and facilitate the implementation of recommendations. To have co-ordinated efforts for reducing the per unit production costs and post-harvest losses, and for improving export volume and value we suggest developing a ‘Citrus VC Forum’ by means of which all the supporters can sit in one place and visualise the chain from beginning to end. They should start at the point of production - the raising of seedlings – thence to plantation and orchard management, and then follow backward linkages to assess the provision of inputs, before working forwards to look where and how (post -harvest management, processing, selling on, up to retailing) the produce moves from the farm to the final consumers. At each point in the process, the names of the organisations involved, with clear roles and responsibilities (who can do what by when) should be worked out. Such a mechanism will help not only to develop a common understanding but also create synergy for the growth of the subsector and avoid duplication of efforts.

5.2.2 Improvement in Mandarin Production

This is a crucial area of intervention, which requires co-ordinated efforts from research, extension and development organisations. As identified in the ACIAR report, the following strategic areas are suggested for improving mandarin production in Bhutan (Hardy et al, 2005):

- Improvement in planting material through the development of a commercial citrus nursery to provide high quality, disease-free and true-to-type trees for the industry.
- Development and implementation of a sustainable pest management programme for control of Chinese Citrus Fruit Fly and the psyllid vector that transmits the citrus greening disease organism.
- Demonstration of improved management practices such as the use of certified seedlings budded onto improved rootstocks, tree training and pruning, control strategies for major pests/diseases (fruit fly and psyllid), basic tree nutrition, irrigation and crop management principles.
- Capacity building of research and extension staff, especially of extension officials by demonstration and training in commercial citrus production practices.

The Citrus production manual prepared by the Horticulture Division of DoA provides very good information on this subject. This information needs to be disseminated to farmers by whatever means they can make use of, since a large number of growers are not in a position to read and follow such manuals.
5.2.3 Developing and Strengthening of Input/Service Market

This is a critical intervention that can result in increased access of farmers to farm inputs and services leading to higher profits. Both physical products such as planting materials (seedlings), irrigation, fertiliser, chemicals and packaging materials as well as market services such as pest management, technical information on orchard management, storage, transportation and market information services need to be developed and strengthened to enhance the growth of the subsector. Government departments need to revisit the existing input delivery mechanism and explore alternative ways to provide these inputs and services. With their help producers could operate on a more commercial basis and make sustainable profits.

Some of the areas which need to be looked at carefully are:

**Availability of quality seedlings:** Provision of quality seedlings is a key factor to ensure higher productivity. DSC is supposed to provide this input to farmers through the CAs but their outreach is quite limited. A vast majority of farmers cannot acquire good quality seedlings; they rely on their own seedlings grown locally without proper technical understanding. It is therefore recommended that private nurseries need to be supported to function on a commercial basis.

**Timely availability of fertilisers:** At present, fertilisers are also provided through CAs but many farmers do not apply chemical fertilisers on their agricultural crops; instead they prefer to use farmyard manure. This means that the customer base is very weak for private enterprises to sell fertilisers, and also that farmers who want to use fertilisers cannot get them at the right time. Hence, awareness needs to be created among growers about the positive effects of fertilisers on yield and quality. This will increase demand leading to expansion of the customer base, which will encourage the private sector to get into this business.

**Collection centres:** Most of the citrus growers in Bhutan are smallholder farmers, their farms are scattered and far from the road-head. To bring their citrus down to the auction yard, first they need to assemble them in a location where they can get a vehicle. For this purpose collection centres need to be established at strategic locations. These centres to be developed not only to store oranges but also their applicability to other crops should be considered when designing them.

**Cellar store:** Bhutanese oranges are available for about 3 months (from mid of November to mid February) of the year. During the peak harvesting time the price gets as low as Nu. 35/pon; whereas after February the Bhutanese market is eclipsed by Indian oranges, which cost more and do not taste as good as Bhutanese oranges. Given the short time of availability of Bhutanese
oranges and the high demand for them, it is worth investing money in low cost cellar stores. Based on the experience of Nepal, oranges can be stored in such cellar stores for 3 months with about 20-25% loss (Adhikari, 2006).

**Transportation:** The mountainous terrain of the country presents a major obstacle for marketing agricultural products. Though farm roads now connect many villages, the majority of villages still remain isolated without access to markets. There are two basic reasons for this: the movement of vehicles on the road is very low and the quantity of agro-produce in many places is not even a full truckload. To address this issue, farmers need to be organised into groups/co-operatives so that they can amass a bulk quantity in one place, which is attractive to transport companies. It is also worth looking at the possibility of building gravity ropeways from major citrus (as well as other agro-products) growing villages to their road-heads.

5.2.4 Raising Awareness and Capacity Development

During the field survey it was observed that inadequate knowledge and awareness is one of the critical constraints that results in low yield and high post-harvest losses. More efforts are needed toward capacity development in planting of good quality seedlings, use of appropriate amounts of fertiliser, control of diseases and pests, and improved harvesting and post-harvesting techniques (including sorting, grading, packing and arrangement for safe transportation). VC operators have not even been following simple practices that make big differences in pricing and reducing post-harvest losses. This can be easily avoided by focusing on the following areas:

- Provide training to growers about the appropriate size of pits, planting materials and techniques of orchard management
- Create awareness and provide on-the-spot advice on sorting and correct grading, and requirements of buyers in terms of colour, size and type, and market demands (where they should bring their fruit, what grade, and at what time).
- Develop capacity of EOs and assign them to collect and forward information on quantity, price and demand conditions along with technical information on cultivation techniques, sorting, grading, packing etc.
- Provide transporters with simple pamphlets about correct handling of fruits.
- Explore the possibility of making use of orange peels, pulp and other byproducts in industry
- Strengthen capacity by providing training and technical assistance for product diversification and facilitate linkages for marketing of value added products

5.2.5 Improvement of marketing systems and market information

**Farmer perspectives:** Farmer’s perspectives need to change according to price and market dynamics. Farmers should always focus on production: how they can produce the desired quality and more yield per unit of land. They need to be made aware that the price can vary significantly depending up on demand-supply conditions and whether producers in other parts of the region can supply similar oranges at lower price. It is natural to hope for a good price but as they are not the only players in the market, they have to be ready to compete with others in terms of price and quality.
Establishment of MIS: Market information is the system of conveying a message to the actors in the value chain. The system includes a channel of communication, a message or information (price, demand and supply situation) and a receiver (name and address of service providers and other value chain actors). DAMC/MoAF has already been working to establish the MIS system. It is suggested that the MIS system could not only provide information on price but it should also provide information on critical current issues affecting the production and sale of fruits, such as backlog of produce at the auction yards, the security situation and road conditions, pest infestation and measures to take, etc. Dissemination of market information through IVR and SMS can be an effective way to reach a large number of farmers at a low cost. This can be highly effective in remote areas. The national media can be used and a farmer’s newsletter can be produced by DAMC and distributed to farmers through Geog Extension Offices to provide similar information and knowledge on a weekly basis.

Auction Facilities, Minimum Price: As mandarin is a highly perishable fruit, it needs proper handling and good storage facilities. At present, growers and contractors have to unload their fruits and put them in a heap on the floor of the auction yard, which is black topped and without a roof. Sometimes auctioning does not take place and they have to keep the fruits for days in the auction yard. Strong sun in the day time and frost at night causes big losses. Furthermore, there is no minimum price fixed for the fruits, so if there are few traders and a glut of fruits, the price goes below the cost of production. After auctioning, the traders ask the growers to count all the fruits one by one and pay the money on per pon basis. While counting fruits, the traders get the chance to sort out the damaged and undesirable fruits. So we recommend improving the facilities at auction yards and setting a minimum price. As counting fruits is a very lengthy process, instead of pon we recommend to use the standard size box for auctioning of the fruits.

Organic Production: With the world increasingly becoming conscious of the health aspects of food, using organic methods of production in diverse agro-climatic conditions is important because it leads to agricultural diversification. The RGoB policy is already geared toward this, but work is needed to make organic farming practices more popular and to develop an organic certification system. Some pocket areas could be developed as organic farms and the sticker ‘Bhutan Brand’ could be put on each of the fruits, targeting high-end consumers.

Proper Use of Cushion and Rotten Fruits: During field visits to the auction yards and export depots, we observed that a large number of fruits had become damaged during transportation. They are simply thrown away along with a large quantity of rice straw, which is used as a cushion while transporting oranges from farms to the auction yards. Instead of throwing the fruits and straw away together as garbage, these could be separately collected and used to make compost.
5.2.6 Development of farmer’s institutions (Groups/co-operatives)

In line with the RGoB 10th 5 year plan, which highlighted the need to strengthen existing farm co-operatives with technical backstopping and extend assistance with material support, we suggest the establishment of a citrus producers’ group or a co-operative. RAMCO in cooperation with the Dzongkhag Agriculture Office and Geog Extension Officials could provide incentives for a farmers’ group/co-operative to develop some basic marketing infrastructure and put efforts into strengthening their marketing capacity. This will help farmers to get organised, share knowledge and information and become entrepreneurs. The co-operative could function as a part of a commercial business, such as "co-operative+enterprise+household", under joint profit-sharing mechanisms guided by a business contract, co-operation, and share-holding.

5.3 Conclusions

The Royal Government of Bhutan is very committed to improving nutrition and increasing rural income through enhancing the overall productivity and competitiveness of RNR products. RGoB policy is geared toward transforming the agriculture sector from subsistence farming to market-oriented commercial farming. During the period of the 10th five-year plan (2008-2013), the RGoB wishes to increase the value of horticultural exports from 474 to 900 million. To achieve this ambitious target, the Ministry of Agriculture and Forest (MoAF) has utilised the concept of three pillars- Marketing, Accessibility and Production.

Over the past few decades, the RGoB has invested considerably in transforming agricultural production from subsistence farming to the production of high value cash crops. Many development agencies have supported the Government’s initiative by providing grants, loans and technical assistance. As a result of these efforts and with the expansion of road networks and increased access to information and technology, the areas cultivating several RNR products, like mandarins, potatoes and kidney beans have rapidly grown. According to all reports, citrus comprises the largest area under cultivation of all the horticultural crops. Over 60% of Bhutan’s population are involved in citrus production. For many households in the subtropical region, citrus is an important source of income. The production and marketing of citrus also provides seasonal employment for large number of labourers and transporters. In terms of export of cash crops, citrus ranks first in earnings.

The citrus subsector is potentially of great importance for pro-poor growth in Bhutan since it is the best option for many households who want to generate a cash income. It is highly suited to Bhutan’s agro-climatic conditions and fits in well with the development goals of RGoB. The taste of Bhutanese oranges is superior and demand is very high in Bangladesh and neighbouring states in India. However, at present the value chain is under-developed and the yields are quite low. Most orange farmers are now working as both growers and marketers, but with poor access to market information and inadequate resources to compete with large producers. Moreover, inferior communication and transport conditions and inadequate financial and information services also make it difficult to deliver the fruits efficiently to consumers. Though contractors play a very important role in fruit marketing they have some negative impacts on the fruit market. For example, they try to lower the buying price from farmers and to raise the selling price to buyers so as to maximise their profits, which might be several times more than the
farmer’s receive. Citrus growers who live in remote areas far from road-heads have
great difficulty in transporting their produce, especially bulk agricultural products, to the
auction yards and export depots. Because the period of harvest of mandarins is quite
short, mainly December and January (it starts in November and ceases in February), it
is hard to maintain a supply throughout the whole year. This creates an opportunity for
citrus fruit grown overseas, mainly the Indian Nagpur oranges, to capture Bhutan’s local
market.

Citrus growers in Bhutan face a number of challenges. They have to bear huge post-
harvest losses because of poor marketing infrastructure and lack of awareness and
knowledge, while their stock of citrus trees is declining due to a myriad factors
(nutritional deficiencies, pests and diseases, inadequate care and maintenance of
orchards, etc.) The yield per tree is very low due to the orchards not being properly
managed, quality seedlings being hard to obtain, and limited access to aids such as
fertilisers and chemicals.

In the years to come, more efforts will be needed to improve the economic returns on
Bhutan’s citrus value chain, based on the principle of “improving variety and quality,
establishing the ‘Bhutan Brand’ and reducing post-harvest losses”. Efforts will also be
needed to strengthen existing farmers’ groups and form specialised groups of citrus
growers. These groups and co-operatives could function as the major player in the
market place, which would help to reduce the difference in scale between individual
farmers with small orchards and the huge market place. Support will also be needed to
strengthen links between farmers’ groups and fruit processing companies. Under
contractual norms, farmers’ groups may act as the fruit products supplier, and the
company provides farmers with the pre/post-harvest support services.

To maintain, develop and enhance the comparative advantage of the citrus value chain,
the following broad issues need to be addressed by the value chain supporting
agencies:

(1) to improve planting materials and plant protection services
(2) to reduce post-harvest losses, and cut down the cost of transport
(3) to strengthen market linkages.

To address the first issue, efforts are needed to develop disease-resistant varieties and
encourage farmers to plant only high quality seedlings. There is a strong need to build
farmers’ capacity in proper orchard management and to enhance their access to
extension services and inputs like chemicals for pest control, fertilisers and technical
advice. Such capacity includes training and financially empowering farmers through
credit facilities.

To reduce post-harvest losses and cut down on the cost of transport, the improvement of
the road network, establishment of collection centres/cellar stores, and advice on the
proper handling of fruits seems necessary.

To strengthen market linkages, assistance is needed to organise citrus growers into
groups/co-operatives so that they can assure a bulk supply of the required grade of
oranges to exporters. Development and enforcement of a set of regulations and
contractual norms may be needed to assure transparency and corporate social
responsibility. Standardisation of the measurement system is also necessary to maintain uniformity in business practices.

Based on the findings of the current study, this set of recommendations is made both for improving production practices and the process of delivery to market. For effective implementation of these recommendations, it is suggested that significant investment is made in developing infrastructure, varietal improvement, capacity building of growers and promoting value chain linkages through partnership with various government departments/units and concerned private sector organisations, for example BCCI and BEA.
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**Bhutan’s Statistical Publications**

Poverty Analysis Report 2007
RNR Statistics 2000 (Volume-I)
Agriculture Statistics 2004 (Volume-I)
Agriculture Statistics 2005 (Volume-I)
RNR Statistics 2000 (Volume II) EC Region
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Compendium of RNR Statistics 2008
RNR Statistics 2002
RNR Statistics 2003