The Operation and Effectiveness of Formal and Informal Supply Chains for Fresh Produce in the Papua New Guinea Highlands

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The research aim was to gain a more detailed understanding of the operation of different key segments for fresh produce supply chains originating in the Highlands Provinces in Papua New Guinea (PNG). The research investigates a number of supply chain dimensions of effectiveness which include, value creation and integration of processes, logistics, quality, information, relationship/vertical integration and overall effectiveness. These were linked together in SC framework.

Two potato chains were investigated, one formal, the other informal. The informal potato chain involves small holder farmers, input suppliers and local markets including kai bars and the urban market. The chain originates and ends within the Western Highlands Province. The formal potato chain has farmers, input suppliers, wholesaler/marker, transport companies (trucking and coastal shipping agents), supermarkets, hotels and kai bars. This chain originates in Mt Hagen, Western Highlands Province and ends in Port Moresby, National Capital District.

The effectiveness of both the formal and informal chains was identified, and comparisons were made to see how each chain differed. The informal chain was found to have different problems to the formal chains. However, participants to both chains demonstrate a high entrepreneurial behavior. A key finding of the study was that the chains spread their risk by operating in multiple market segments and this can help to solve issues with variable quality. The marketers in each chain position themselves in these different market segments.
It was clear from this work that focusing on functions and not the whole chain can lead to a distorted view of chain performance. For example, for the informal chain, a focus on logistics issues, particularly poor roads and problems with availability of seeds, can misrepresent the effectiveness this chain. Therefore, it was concluded that it is important to look at the overall performance of each chain rather than looking specifically at particular chain functions in isolation.

Key words: Supply Chain management, Papua New Guinea supply chains, formal chains, informal chains, case study, smallholder farmer.
Dedication

To my late brother Freddy and nephew Nathaniel

__________________________________
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## Acronyms

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<tr>
<td>ACIAR</td>
<td>Australian Centre for International Agriculture Research</td>
</tr>
<tr>
<td>ADB</td>
<td>Asian Development Bank</td>
</tr>
<tr>
<td>DAL</td>
<td>Department of Agriculture and Livestock</td>
</tr>
<tr>
<td>FAO</td>
<td>Food and Agriculture Organisation</td>
</tr>
<tr>
<td>FPDA</td>
<td>Fresh Produce Development Agency</td>
</tr>
<tr>
<td>FPDC</td>
<td>Fresh Produce Development Company</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>MTDS</td>
<td>Medium Term Development Strategy 2005-2010</td>
</tr>
<tr>
<td>NADP</td>
<td>National Agriculture Development Plan 2006-2011</td>
</tr>
<tr>
<td>NAQIA</td>
<td>National Agriculture Quarantine and Inspection Authority</td>
</tr>
<tr>
<td>NARI</td>
<td>National Agriculture Research Institute</td>
</tr>
<tr>
<td>PLB</td>
<td>Potato Late Blight</td>
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<td>SSSPP</td>
<td>Smallholder Support Services Pilot Project</td>
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Chapter 1  Introduction

1.1 Rationale

Fresh produce marketing originating in the Highlands is important to the Papua New Guinea (PNG) economy and the livelihoods of its people. The production and sale of fresh produce in this region is one of the few sources of income for many rural families that can be used to provide basic services, such as education for their children, health, as well as other immediate needs. The region is home to more than half of PNG’s total population, where rural poverty is widespread (Spriggs, Chambers, Kayrooz, Natera, Omot & Vatnabar (2003, p. 69).

The traditional fresh produce grown in the PNG Highlands are sweet potato (kaukau) and taro. However, farmers have been increasingly turning to introduced vegetables such as cabbage, potatoes, broccoli, cauliflower, spring onions, capsicum, carrots, tomatoes and others (Spriggs et al, 2003, p. 70).

The PNG Government recognizes the importance of the production and marketing of fresh produce and has placed a lot of emphasis in this area. This is evident in policy initiatives it has introduced, setting up key infrastructure and making budgetary allocations for the agriculture sector (Atkins and Scott, 1987; Spriggs, Omot and Anjen, 2004, P.2; McGregor, Lutulele and Wapi, 2003, p. 35; NADP, 2004).

Despite these efforts, there are a number of constraints to the development of marketing systems that have been identified. These constraints provide a challenge to smallholders, marketers and other players in the fresh produce industry. However, there are also possible opportunities to be captured and recommendations have been made on how to do this (McGregor et al, 2003).

Although reference is often made to the marketing system in general, there are many different market segments, such as supermarkets, hotels, mining camps, institutions, restaurants and fast food outlets (kai bars) as well as urban (municipal) and road side
markets (McGregor et al, 2003). It is possible that these different segments have different needs, and each segment performing at different levels (Martin and Jagadish, 2006). Often the segments are broadly categorized into the two main marketing systems in formal and informal markets (Spiggs, et al, 2003, p.71).

Although many constraints have been identified in PNG, it is not clear whether different market segments have different constraints to performance (Martin and Jagadish, 2006). It is important to understand this because any interventions to improve the marketing system need to be appropriate for the specific market segment under consideration. For example, it is often said that quality improvements need to be made, but while quality improvement may benefit some formal chains, perhaps not so much the informal chains.

The performance of the marketing system is very important for the livelihoods of farmers in the Highlands. Many farmers operate within the informal segment. However, there has been a shift from subsistence to semi-commercial or commercial farming, which indicates a need for farmers to understand the marketing systems and issues associated with marketing of product, which will have a considerable effect on the return of a farmer (FAO, 2004, p. 71). Martin and Jagadish (2006, p. 9) further note that smallholder farmers need to gain adequate return for their efforts so that they compensate themselves, support their family and meet community and social obligations. Furthermore, they argue that with increased returns, the farming business can be expanded, and the shift of subsistence to commercial operation will be continued.

Analyzing the marketing system through a Supply Chain (SC) approach is becoming more common. This approach links farmers to markets through a range of intermediaries. One simple way to view this is that it involves each party participating in the process to meet the needs of the final consumers through a value creation processes including logistics, quality processes, supported by information flows and achieved through relationship management (Martin and Jagadish (2006, p. 7).

The performance of the supply chain is measured in terms of effectiveness and efficiency. Effectiveness refers to how well the supply chain meets the requirements of the customers of the chain, while efficiency describes the needs of customers being met at the lowest possible cost. Much of the literature on PNG fresh produce chains have been focused on the
effectiveness. Given the importance of the marketing system for fresh produce originating from the Highlands there is a need for more detailed understanding of the supply chains which can be done through examining the performance of each chain in terms of their effectiveness.

1.2 Aims and objectives

The research aim is to gain a more detailed understanding of the operation and effectiveness of different key segments for fresh produce supply chains originating in the Highlands Provinces in Papua New Guinea.

The research objectives are:

a) To gain a detailed understanding of the operations of supply chains for fresh produce from the PNG Highlands in the formal sector
b) To have a detailed understanding of the operation of supply chains for fresh produce from the PNG Highlands in the informal sector
c) Having understood how these chains operate, evaluate their performance
d) To compare the features of these formal and informal chains

1.3 Organization of the Thesis

This thesis contains seven chapters. Chapter 1 introduces the problem statement and outlines the research objective. Fresh produce marketing in PNG is presented in Chapter 2, and this chapter covers a range of areas which include history and development of fresh produce in PNG, production and trade, fresh produce in the wider agriculture sector, role of government, constraints and future prospects and opportunities as well as the importance of fresh produce to the livelihoods of the farmers.
A theoretical review of literature is provided in Chapter 3. This chapter is divided into two parts. The first part is the theoretical review of Supply Chain Management and the second is Supply Chain Management in developing economies. In the first part, value creation and supply chain functions which include logistics and quality management, information management as well as integration of processes and relationships are covered. Issues for agribusiness chains which include interrelationships between functions and special features of agriculture are other areas covered. The general supply chain performance and agribusiness supply chain performance completes the discussions in part one. In the second part, several key areas are discussed. These areas include logistics and quality, infrastructure, information, relationship, power and distribution and margin along the chain. Chapter 4 describes the research framework and case study method used to answer the research question. Two potato chains are presented in this chapter; one formal, and the other informal. Discussion of interview strategies used in the research completes Chapter 4.

In Chapter 5, the results obtained from the field research is area presented. The presentation is done under the two main case study headings viz., Case 1 for informal short potato chain, and Case 2 for long formal potato chain. In Case 1, the areas that will be covered include overall chain description, input suppliers, farmer/marketer and market segments. Case 2 presents overall chain description, input suppliers, farmers, wholesaler/marketer, transport companies and buyers.

Chapter 6 presents the analysis. The performance indicators will be used in the analysis for both chains include resources, availability of inputs, logistics, quality, information and relationships. These functions will analysis farmers, marketers, input suppliers, transport operators and different markets. The chapter also compares the chains and provides the overall effectiveness of both chains.

In Chapter 7 discussions of the findings are made in comparison with the literature. Research limitations are highlighted and the contributions of the study area outlined.
Chapter 2  Fresh Produce Marketing in PNG

This chapter discusses the history, development and marketing of fresh produce in PNG. Section 2.1 outlines the history and development of fresh produce. Section 2.2 looks at production and trade of fresh produce. Section 2.3 identifies fresh produce in context of the wider agriculture sector. Section 2.4 highlights the role of the government. Section 2.5 identifies constraints to the performance of the marketing system for fresh produce. Opportunities for future development are outlined in Chapter 2.6. This is followed by constraints and opportunities for different market segments in Chapter 2.7. Before the conclusion, Chapter 2.8 explains the importance of fresh produce in the livelihood of farmers.

2.1 History and Development of Fresh Produce

The term ‘fresh produce’ can refer to a wide array of horticultural crops which include fruits and nuts, as well as vegetables. However, in the context of this thesis, this discussion will be confined to root crops, brassicas and other vegetables that are grown in temperate regions.

Countries located in the tropics, which are characterized by moderate temperatures, at higher, altitudes, provide a favourable climate for growing “European vegetables” (Abbot and Makehem 1990, p. 2). The PNG Highlands present an ideal environment for successful cultivation of fresh produce. The common European–style vegetables grown all year round in the mild and rich volcanic soils include carrot, head cabbage, broccoli, cauliflower, zucchini, pumpkin, potato, sweet potato, taro, beans, pak choy, peas, asparagus, eggplant, tomatoes and capsicum (Spriggs et al, 2003, p. 70; McGregor et al, 2003, p. 11). This listing is only indicative of vegetables that can be grown and is not exhaustive.

The early missionaries and plantation owners introduced temperate crops to PNG in the nineteenth century, and were supported by the Australian colonial administration in establishing research stations and substations around the country as demand for the fresh produce was mainly from the expatriates (Kanua, 2000, p. 554; Atkinson and Scott, 1987, cited in sprigs et al, 2004, p. 2). Furthermore, during the 1970s, the growth of the formal market for fresh produce in the cities (especially Port Moresby and Lae) was characterized by competition between local and imported produce. At the same time the national
government tried to support the development of local fresh produce because of the increasing dependency on imports (Kanua, 2000, p. 554; Spriggs et al, 2004, p. 2). However, due to the inconsistency of quality and reliability of the local supply, the supermarkets preferred imports over the local produce (Atkinson and Scott, 1987, cited in Spriggs et al, 2004, p. 2).

In the highlands, in particular, the introduction of the potato, brassicas and other vegetables has greatly changed the livelihood of the rural farmers. Between 1960s and 1970s Enga was the leading province in vegetable produce followed by Western and Eastern Highlands Provinces. Due to urbanization and development in infrastructure in the early 1970s, the demand for vegetables forced people to cultivate the unused valleys. As development of mining sites occurred in the 1980s, the farmers in the highlands shifted from subsistence to semi-commercial and commercial vegetable production to meet the market demand (Kanua, 2000).

Many marketing arrangements for vegetables are based on transactions between individual farmers and wholesalers. Some of the leading wholesalers in the highlands in the fresh produce industry include Alele, VegMark and Ganbolo, which are all Mount Hagen based, as well as Kelta which specializes in potatoes. There are also other smaller wholesalers who are based in Mt Hagen and serve the mine sites in the Highlands. Other wholesalers including MGB enterprise are located in Lae and purchase produce from the Highlands as well as other parts of PNG to sell in Port Moresby and other local markets. Individual smallholder marketing is also noticeable, especially in the case of sweet potato (kaukau) and potato. These smallholders production either Goroka or Mt Hagen sell in Lae or Port Moresby. In addition, small individual participation in marketing of other vegetables from the highlands is seen in these coastal cities (McGregor et al, 2003, p. 9). Therefore, there are a number of marketing different arrangements between farmers and wholesalers.

Generally, the marketing system in PNG is grouped into two types: the open market and direct market. The open market is usually referred to as the ‘informal’ market. Farmers sell their produce in small stalls to buyers, but they do not have any long-term relationships (Spiggs et al, 2003, p.71). The municipal markets are informal and controlled by the local level governments (FPDC 1993, cited in Cahn, 2003, p. 33). Direct marketing is represented by final buyers who buy direct from the suppliers, rather than buying in open market. Direct marketing is also called ‘formal marketing’ where there is some form of relationship built

Informal markets offer a wide array fruits and vegetables and are mainly supplied by the ‘self marketers’ (Ehmig, 2004, p. 13). The formal markets in coastal towns and cities, are usually lucrative, are supplied by middlemen and traders and a few self marketers through more complex supply chains.

The informal markets display an extensive network in both urban and peri-urban areas all around PNG. Some PNG urban markets such as Mt Hagen (and Rabual before the volcanic eruptions) are regarded as some of best in the Pacific region in terms of the variety and quality of produce sold (McGregor et al, 2003, p. 18). It was estimated that annual trade at the Port Moresby markets accessed 15, 000 tonnes and per annum, this volume has increased substantially over the last decade with the increasing shipments of produce from the Highlands. The vendors are generally farmers and are mostly women. The produce market has been described as the “commercial and social epicenter of any Pacific community, and it is from here that most micro and small enterprises activities emanate” (McGregor et al, 2003, p. 18).

2.2 Production and Trade of Fresh Produce

An average of 5,000 to 6,000 tonnes of fresh produce from the Highlands is shipped to coastal cities, especially Port Moresby, annually. Generating value of K10 million to K12 million, with sweet potato being the highest income earner followed by English Potato (McGregor et al, 2003, p. 4). However, according to Spriggs et al (2004), about 4,000 tonnes of fresh produce valued at almost K14 million are shipped every year from the Highlands to Port Moresby alone. The overall volume of shipments has increased recently especially in the non-traditional areas, but such figures are unable to be reliably captured in available statistics (Peter, 2001 cited in McGregor et al, 2003, p. 4).
Another estimate base on a projection for 2005 was that informal and formal market demand for fresh vegetables in PNG exceeds 60,000 tonnes and is valued at K100 million annually (Ehmig 2004, p. 13). It was suggested that imports of fruits and vegetables account for 42% of the total. PNG Highlands supplies around 34% of the total and 24% come from other domestic sources. It was estimated that most formal market demand for Port Moresby and Lae, and are directly competing against imports. It was noted that the recorded import volume was 9,000 tonnes valued at K39 million (51%) in 2003. It is suggested that increasing imports only indicate that, for Port Moresby and Lae, the existing domestic arrangements for demand of fruits and vegetables cannot meet the current demand (Ehmig 2004, p. 13).

In general, it is difficult to get accurate statistics on production and trade of fresh vegetables in total, but it is clear that it is significant. However, the available information on particular fresh vegetables will be summarized next.

Sweet potato (kaukau) is thought to be the most import product. Sweet potato shipments from the Highlands to Port Moresby in recent times have been recorded at between 1,500 to 3,500 tonnes annually, which fetched between K2 to K5 million, but this is not indicative of the total volume of potato sales since a lot of trade is not recorded (McGregor et al, 2003 p. 3). Bourke (2003), estimates annual marketing of sweet potato is around 75,000 to 125,000 tonnes with estimated revenue of K60 million associated with it.

English potato, the next most important product from the Highlands, has reportedly exceeded shipment of sweet potato to Port Moresby markets in some periods. Commercial production actively started in mid-1980s (Senat, 2002), and in the mid- 1990s, potato production was estimated to have peaked at 14,000 tonnes and had a market value of K7 million annually (Daysh, 1995). According to Fresh Produce Development Company (FPDC) statistics, the shipment of potatoes from the Highlands rose to 29 tonnes in 1989 and further increased to 1,724 tonnes in 2000. Prior to the arrival of Potato late blight (PLB) disease in 2002, potatoes were valued at K3 million annually selling at K1.80/kg at Port Moresby markets (McGregor et al, 2003, p. 5). The product attracted significant attention from wholesalers (especially Mt Hagen based). Despite this growth in production, PNG imports a significant amount of processed potatoes and did so even before the out break of PLB. In 2000, 1,300 tonnes were imported (McGregor et al, 2003, p. 5).
Brassica vegetables (English or head cabbage, broccoli, cauliflower) have been grown by farmers. The head cabbage production has been estimated at 10,000 tonnes (Daysh, 1995). Following the late 1990s the annual shipments was at 250 tonnes. Because of the dramatic increase in the local production and supply of the head cabbage recently, it is now competitive with the imports.

Small quantities of highly perishable broccoli and cauliflower are also grown and are usually air freighted to Port Moresby from the Highlands. Due to the high cost, freight shipments have been declining over recent years (McGregor et al, 2003, p. 6). According to Daysh (1995), an estimation of 250 tonnes of broccoli and 100 tonnes of cauliflower are produced annually.

Carrots and other root crops such as parsnips are cultivated in the region. An average of 1,000 to 2,000 tonnes of carrots is produced annually. It was reported that 92 tonnes of carrots were imported in 2002 (Daysh, 1995).

Farmers in the Highlands have demonstrated that they are able to grow exotic high value vegetables such as asparagus and snow peas, although, very small quantities enter the market. On the other hand about 6 tonnes of asparagus was imported valued at K58,200 (cif) (McGregor et al, 2003, p.6).

Tomatoes and capsicum are widely grown around the country and it has been suggested that this could be expanded. According to Daysh (1995), 1,000 tonnes of capsicum could be produced. He adds that most of the supplies in Port Moresby are coming from the Highlands and Sogeri Hydroponics, which also produces other products such as lettuce and herbs.

Fresh produce production in the Highlands is significant. Some products such as sweet potato (kaukau) and English potato are very important. These products are able to support the growing population in the urban cities, and at the same time enable farmers and marketer to generate income through the sales in urban markets. There is scope for increased production for theses products as well as others. Some products have the potential to replace the imports, and with continued increase in production and marketing other products can do the same (Spriggs, et al, 2003, p. 70).
2.3 Fresh Produce in the Context of the Wider Agriculture Sector

The agriculture sector in PNG is comprised of several major sub-sectors: food crops, which primarily are made up of semi-subsistence production for household use and domestic markets; industrial tree commodities, grown for export; and livestock and other cash crops (ADB, 2004, p. 1). According to NADP (2006, p.14), the agriculture sector’s contribution to GDP since independence declined from 36% in 1977 to 23.9% in 1999 but marginally rose to 26% between 2004 and 2005. The report further pointed out that one of the key factors contributing to the decline in agricultural productivity and production was the lack of knowledge.

Food crop production mainly involves smaller semi-subsistence or semi-commercial farm households. Tree crops are grown by both smallholder farmers, who are semi-subsistence farmers, producing food crops, and commercial plantation owners who have their own production base as well as buying from the smallholders. In terms of the livestock sector, poultry and cattle are produced both by the smallholders and in large scale (ADB, 2004, p. 2).

Because of differing agro-climatic zones, PNG provides a good environment for a wide array of tropical and temperate crops. While tree crop production and marketing has a long history of commercialization, the food crop sector is much less so (ADB, 2004, p. 2).

The favorable food security situation in PNG is due to the fact that rural communities have the ability to grow staples, especially sweet potato (kaukau), and are able to buy rice and other foods generated by producing cash crops (ADB, 2004). However, in the urban areas, some low income earners have problems accessing adequate quality food at affordable prices. This has been attributed to inadequate produce marketing system and insufficient cash income rather than food shortage (ADB, 2004).

Exports of agricultural commodities are dominated by a few tree crops that have a competitive advantage. These export commodities include coffee, palm oil, cocoa, copra and coconut oil, rubber and tea. The major tree crops are spread within the four regions (Highlands, Momase, Southern and New Guinea Islands). Oil palm, a leader in terms of export value is grown in only four provinces, in the New Guinea Islands and Southern
regions, but there have been some developments in other coastal provinces over the last few years, while 75% of the coffee is grown in two provinces in the Highlands region and three provinces (East New Britain, North Solomon and Morobe) account for cocoa (ADB, 2004).

While tree crops have traditionally been grown for cash and fresh produce for subsistence in some parts of the country (such as the Highlands provinces), fresh produce is now recognised as a good source of cash. Many farmers, especially in the PNG Highlands have recently moved into farming fresh produce as a result. As well as tree crops, fresh produce has also become very important for the economy.

2.4 The Role of Government

Given the importance of the fresh produce marketing in the Highlands, the Government has given this sector a lot of support. This support began with introducing a policy on import quotas and embargoes in 1983, which resulted in a further increase in production from the Highlands and interest in technical research to improve quality of local produce (Atkinson and Scott, 1987, cited in Spriggs et al, 2004, p. 2). It continued this support by establishing agencies under the Companies Act in 1989. These agencies include the Fresh Produce Development Company (FPDC) ¹, the National Agriculture Quarantine and Inspection Authority (NAQIA) and the National Agriculture Research Institute (NARI). The aim of FPDC is to provide support services for the fresh produce industry, while NAQIA was responsible for quality control for all imports and exports, and NARI was to provide the research needs of the agricultural sector, including the fresh produce industry (McGregor et al, 2003, p. 35).

A further range of initiatives that impact on the marketing of fresh produce from the Highlands were put in place by the government. These include the Food and Nutrition Conference 2000 (Bourke et al, 2000, p. 1), the Medium Term Development Strategy (MTDS, 2004:13-14), the Smallholder Support Services Pilot Project (SSSPP) through the Department of Agriculture and Livestock (DAL, 2004) and the development of municipal markets at Mt Hagen, Kundiawa, Goroka as well as non-Highlands markets at Koki, Rabaul and Kokopo (McGregor et al, 2003, p. 35).

¹ FPDC has changed its name to Fresh Produce Development Agency (FPDA)
An important policy initiative instituted by the government recently is the National Agriculture Development Plan 2006-2011 (NADP). Within this framework, efforts have been made to realize sustainable growth in the agriculture sector. One of the goals is to promote a sustainable horticulture industry in PNG in the next five years. Objectives include increasing production of fruits, nuts, staple roots and vegetables; developing post harvest handling, processing and preservation technologies for fruits, nuts and vegetables for cottage and commercial industries; developing market access for fruits, nuts staples and vegetable industry; creating an enabling environment to assist the development of food and horticulture sub-sector and developing floriculture industry in PNG (NADP, 2006).

The total financial allocation for the horticulture industry for the five year plan is K85.05 million. The National newspaper (2007) reported that during the recent launching of the NADP, the government has announced it will provide annual budget support of K100 million for 10 years totaling K1 billion for the programme. The government recognizes the importance of fresh produce and has initiated policies to establish key institutions and infrastructure and develop plans to make budgetary allocations for future development of the sector.

2.5 Constraints to the Performance of the Marketing System for Fresh Produce

Constraints to the performance of the marketing system for fresh produce in PNG have been extensively documented. These have been reported in the comprehensive work done by McGregor, et al (2003) and ADB report (2004). Unless otherwise indicated, the material presented in this section has been distilled from these reports.

In the following section some of the key constraints to good marketing are listed and discussed.
2.5.1 High Price Expectation of Growers

Many smallholder farmers have high expectations on price for their produce as a reward for their efforts. Such expectations are often not met, which further constrains market development, particularly when imported products are cheaper than local produce. However, more commercially oriented farmers will accept lower prices if their total return can be raised through increased productivity. Some farmers in the Western Highlands, who are oriented to commercial vegetable growing, fall into this category.

2.5.2 Individual Farmer Involvement in Marketing

A lot of individual farmers are involved in the marketing of fresh produce in PNG. Much sweet potato (kaukau) marketing is done by growers. It is thought that this is due to a combination of factors such as underdeveloped produce marketing, the perception of higher returns without involving middlemen, poor telecommunications, and lack of confidence in the existing marketing chain (McGregor et al, 2003, p. 14).

Due to this high level of farmer involvement in the produce marketing, adverse results can be experienced. These include high cost of marketing, decreased returns for the farmers, poor quality product, labour resources diverted from production to marketing activities, inconsistency in supply, limited market outlets and increased consumer prices (McGregor et al, 2003, p. 14).

2.5.3 Marketing Enterprises: Produce Wholesalers

There are few wholesalers operating in PNG. As reported by Lutulele (2003), there are only six wholesalers in PNG, and these are all based in the Highlands. He further claims that this indicates that produce marketing and their coverage is inadequate. However, he pointed out that credit should be given to these existing companies for the contribution to the produce industry especially in an adverse business environment.
2.5.4 Urban Markets

Some urban markets in PNG are reported to be the best in the Pacific region as they present variety and high quality produce (McGregor et al, 2003). However, many of these markets are not able to stimulate the produce trade. This is due to quality deterioration because of exposure directly to the harsh tropical weather conditions, thereby resulting in a decline in income for farmers and traders, while produce is wasted or consumers buy inferior quality. Affluent consumers, therefore, turn to ‘congenial’ environments such as supermarkets, where it is highly likely that they will buy imported produce (McGregor et al, 2003).

2.5.5 Formal Markets

Supermarkets, hotels, mining camps and institutions such as universities, high schools and colleges as well as government departments, represent major formal markets for fresh produce. The ADB report claims that the scope for increase in local produce will be significantly realized if top market segments such as supermarkets promote local produce over imported produce. It is argued that the key factors considered in purchasing local produce include quality, consistency, comparative price, convenience and customer preferences (McGregor et al, 2003).

2.5.6 Product Quality

It is argued that much PNG produce has an inherent good quality, which is superior to that of imported produce from Australia. However, it has been noted that this quality is not seen by urban consumers and it is thought that the problem appears to be in the supply chain from the farm to the final consumer (McGregor et al, 2003).

2.5.7 Transportation Infrastructure

Good transport infrastructure is essential for effective and efficient produce marketing. Inadequate road maintenance, especially the Highlands Highway, and other feeder roads in the region has been a major concern. In terms of airfreight, capacity is limited and freight rates are high, and therefore expensive if produce had to be transported by air. However, sea transport is not seen as a deterrent to fresh produce marketing (McGregor et al (2003).
2.5.8 Storage and Consolidation/ ‘Bulk Break’ Infrastructure

Storage and consolidation/ bulk break’ Infrastructure to establish a network of depots has been proposed by DAL for donor funding. The sustainability of such a program is uncertain because of the direct involvement of state, despite their good intentions. However, it has been suggested that such facilities could be leased to private wholesalers (McGregor et al, 2003). While it is thought that marketing facilities in Lae and Port Moresby needs minimal produce marketing development, it is argued that the Highlands require priority in terms of consolidation facilities so as to have the cool chain maintained through to wholesaler facilities in Port Moresby. Currently, attempts are being made by donor agencies to address these issues (McGregor et al, 2003).

2.5.9 Telecommunications Infrastructure

In produce marketing, communication between different participants such as growers, marketers, wholesalers, retailers, transport providers and end-consumers is seen as a key element. It is said that the fresh produce farmers and traders in the PNG Highlands have not been able to adequately benefit from telecommunication innovations, as there is inadequate network coverage by the service provider (PNG Telikom).

A free flow of information and in timely manner between the growers and buyers will help to improve the marketing system. FPDC provides market information through quarterly report based on weekly market surveys for main urban markets including Mt Hagen, Goroka, Lae, Port Moresby, Kokopo, Madang and Popondetta. However, the information is not widely disseminated, which in some cases results in farmers thinking that middlemen are exploiting them, so they want to do their own marketing (McGregor et al, 2003).

2.5.10 Marketing Finance

The rural sector including fresh produce marketing with its particular needs is thought to have a problem in sourcing credit and finance. Over the last decade, there seems to have rapid decline in levels of financing for rural enterprises, which seriously weakened traditional sources of financing.
Collateral is a key determinant for any loan in the risky environment within which PNG commercial banks operate. These commercial banks will not easily purchase equipment such as plastic crates, collapsible bulk bins and cooler containers as well as working capital. An even greater problem is the lack of working capital. Farmers expect cash payment on delivery, which they often think is more important for their operations than the price they are offered. Therefore, wholesaling companies have to operate with overdraft facility. This makes it difficult for small wholesaling companies since sever cash flow problems can be experienced by smallholder if payment is delayed by the buyers. This can then lead to lost trust and loyalty, and the farmer will look for other potential buyers. If buyers are not able to receive supplies from the farmers, there is no income for them. In such circumstances, an overdraft facility is a necessary cushion for a small wholesaling business (ADB, 2004, p. 42).

Many constraints have been identified in this section that impedes the performance of the marketing system in the country. The impediments are related to high farmer expectations, direct involvement of growers in marketing, a lack of key facilities and infrastructure, limited involvement of produce wholesalers and support for locally produce by existing formal markets, and the difficulty in sourcing financial support.

### 2.6 Opportunities for Future Development

Horticultural crops for export marketing for the most part do not in themselves posses sufficient competitive advantage. Rather, the best market opportunities for PNG’s fresh produce appear to exist in the domestic markets for traditional root crops and staples, non traditional root crops, and fruit and vegetables.

Population growth in urban centers in PNG has increased dramatically over the last few decades. Approximately a million people are now living in the urban areas and expected to double by 2030 (McGregor et al, 2003). This means that traditional staples like sweet potato (kaukau) will become under-supplied to these markets (ADB, 2004, p. 39). Sweet potato could be a substitute for imported rice and wheat products and this saves foreign exchange. Sweet potato is consumed in many urban centers in the country (Gibson, 1995) and is an important part of the diet for dietary of Papua New Guineans (Gibson, 2001).
Non-traditional root crops also have domestic market potential. The potato has a good future with new varieties available after the PBL crises. Total annual imports for frozen chips is about 1,200 tonnes and is valued at about K4 million (ADB, 2004, p. 42). Onion imports are about 1,400 tonnes and is projected reach K2.5 million. The ADB reported that domestic onions have more market potential to that of the imports if readily available at market price. With peanuts, there are thought to be good market prospects (ADB, 2004, p. 42).

While fleshy fruits and vegetables have export limitations due to their host for fruit fly, they have potential in domestic markets, that are currently underdeveloped. Around K17 million is spent annually on imports of these products. Except for apples, all other products could be replaced by domestically produced products, and it is argued that this could be realized through efficient marketing systems (ADB, 2004, p. 43).

Substantial potential has been identified for expansion in fresh produce trade, and it is estimated that it is realistically achievable (ADB, 2004, p. 43). The wholesale value of this expanded trade is estimated at K65 million. Value added and multiplier benefits could also be realized from this industry due to the involvement of large number of households and micro businesses (ADB, 2004, p. 43).

2.7 Recommendations for Improvements in Fresh Produce Marketing

Many recommendations have been made by individuals and organizations about the future development of fresh produce in the country. McGregor et al (2003) suggested that, in order for a significant expansion in the commercial horticultural industry, greater specialization by farmers is needed in growing and marketing. He argues that his could be facilitated by a range of initiatives such as; farmer groups could be formed that can provide the linkage with marketing businesses. He also suggests that training programs and activities by FPDC be directed to developing wholesalers/marketers. Arrangements can also be made to provide financial assistance to wholesalers and marketers, and marketing information for costs and product prices could be continuously provided by PFDC. In addition, awareness of the importance of middlemen for efficient marketing of farm produce could be provided by FPDC and communication linkage between farmers and marketers to be improved.
They further recommend that wholesaler enterprises need to be supported with significant financial assistance to counterbalance the difficult environment to which they operate. They argue that assistance could be made to providing affordable finance for both investment and working capital. Telecommunication networks could also be installed in the production areas and the road system could be upgraded and maintained.

While appreciating that developments have been made in some urban markets, there are areas for further improvement to urban markets. These include providing shelter for vendors who sell outside the main market, promoting the use of plastic crates/bins for produce, providing courses on post-harvest handling for the vendors to the market, and information on supply and price can be posted on market notice boards that could be used by farmers and vendors.

As noted previously formal markets including top market segments such as supermarkets, hotels and institutions, represent major markets for fresh produce. McGregor et al (2003) claim that considerable amount of scope exists for improvement. These include explaining the benefits of increased labor productivity and reducing high price expectations of the farmers, promoting development of wholesale marketing, and facilitating and encouraging both public and private investments in market infrastructure.

McGregor et al (2003) further argued that for consumers at urban centers to realize the inherent quality of PNG produce, which is much superior to imports, certain actions need to occur. These include the dissemination of information and training, research, the introduction of grading systems, and private and public investment in market infrastructure.

Because a lack of consistency in terms of supply and volume has been identified as sales expand, improvements have been suggested, such as; increasing the number of commercial fruit and vegetable growers, ensuring that an adequate number of wholesalers with well resourced marketing facilities and working capital are operating, establishing a communication network infrastructure linking wholesalers and growers, retailers and wholesalers, and providing a road system and security that is able to allow free movement of produce (ADB, 2004). Amongst many other recommendations for non-traditional root crops,
there has also been identified a need for production and distribution of potato seeds resistant to PLB (ADB, 2004).

The recommendations made by individuals and organizations cover a range of areas that are aimed at expanding and commercializing the horticultural industry. They emphasize that farmers should practice a high degree of specialization that can be supported by training, linking market with business, financial assistance, good information network infrastructural investments and marketing facilities.

2.8 Constraints and Opportunities for Different Market Segments

There are many market segments for fresh produce in PNG. While many constraints to the performance of fresh produce marketing have been identified, there is very little information on whether and how these differ by market segments. As well, it is not clear how opportunities differ by market segment.

Within the formal markets, the lucrative top-end market segments are thought to remain a big challenge for much local produce. McGregor et al (2003, p. 20) argued that the hotels and supermarket outside the Highlands are supplied with only small amount of local produce such as tomatoes, lettuce, papaya (yellow fleshed blend) and water melon. FAO (2004, p. 72) claimed that the supermarkets import fresh produce mainly from New Zealand and Australia that are consistent in supply and can be purchased at a competitive price and of high quality. Martin and Jagadish (2006, p. 19) add that supermarkets import products that are readily available on demand and transported to the supermarket without a broken cool chain, which guarantees an extended life span on the shelf. Moreover, they claim that for local produce the suppliers the marketers have an opportunistic way of operating, and so farmer suppliers cannot be sure of on-going sales. They argue that local brassicas are not able to enter this market segment, but other local products, such as carrots tomatoes and lettuce can penetrate this market segment.

Besides supermarkets, other market segments represent major buyers of local produce. These market segments include institutions, restaurants, kai bars and mining sites. Institutions such as universities, schools and mining camps have formal arrangements with catering
companies and source produce from wholesalers and retailers as well as from open markets. Also, restaurants and kai bars buy local produce, but in small volumes (McGregor et al, 2003, p. 21). Martin and Jagadish (2000, p. 15) argue that in some of these market segments quality does not become a strict requirement, especially for educational institutions and kai bars, and or in open markets, any quality is accepted and supply is not an issue. They claimed that the marketing system especially for these lower-level segments is doing well given the infrastructure constraints and level of development of the economy.

The above claims suggest that the top-end market segments are underdeveloped as the supply chain is poorly organized while middle to bottom-end segments are likely to perform well, considering quality, supply and quantity and related market issues. Therefore, while smallholders and marketers involved in the top-end market segments have many issues to contend with when competing against outsiders and only get a small portion of the top market segments, they can get a large share of other market segments. Therefore, it is fair to claim that it is unclear how the whole marketing system is performing. There needs to be a better understanding of the marketing system for the highlands fresh produce.

2.9 The Importance of Fresh Produce in the Livelihood of Farmers

As well as being important to the national economy which is recognized by the government, fresh produce is important for the livelihoods of farmers. The concept ‘livelihood’ will be briefly discussed before addressing this issue. The livelihoods concept has been used widely in recent times to understand poverty and rural development, but is not restricted to this perception and has been applied differently by different sources. Chambers and Conway (1992) provide a definition that argues ‘livelihoods’ comprise the capabilities, assets (stores resources, claims and access) and activities required for a means of living. Several researchers have used modifications of this in rural livelihood strategies (Carswell, 1997; Hussein and Nelson, 1998; Scoones, 1998; Farington, Carney, Ashley and Turton, 1999).

Livelihood approaches and discussions have holistically place emphasis on the poorest in the societies. This is due to the fact that more than 70% of the world’s poor live in the rural areas. As well as being isolated from economic activities, these rural people also have less access to key services such as education, health, sanitation, water supply, electricity, telephone and
other infrastructures (Carney, 1999, p. 3). Carney (1999), further states that the word ‘rural’
is synonymous with ‘agriculture’ since many empirical studies show that, in the rural areas,
the poor are the small farmers and agriculture is seen as a pillar of their livelihood, and acts
as engine for growth in these areas. Creating sustainable livelihoods has been identified as an
important issue for PNG (Bourke, Allen & Salisbury, 2001, p. 13). Many associated issues
have also been identified, such as diseases, culture and ethnicity, land tenure and population
growth as well as poor agricultural and rural development. Baxter (2001, p. 34) adds that
limited economic activity and few services with a weak government system, among other
issues are areas of significant challenges.

Agriculture activities seem to be a predominant feature that serves the rural communities for
their livelihoods. The priority for rural development through agricultural activities is seen
important because more than 80% of the total population PNG live in the rural communities
(Ghodake, 2002, p. 1; Gwaiseuk, 2000, p. 31; MTDS 2005-2010, 2000). Thus agriculture
remains the mainstay of sustainable rural development in PNG. NADP (2006, p. 14) points
out that 82 per cent of citizens over 10 years of age and above engage in agriculture for a
living, and it provides income and employment opportunities to the vast rural populace.
Gohodake (2000, p. 1 ), further argues that for people to come out of the vicious cycle of
population growth, social conflicts, increasing poverty and environmental degradation,
development of rural areas are crucial. Hence, the sector is seen as a “basic source of
economic growth, sustainable development and wellbeing of people and nation” (Gohodake
2000, p. 2). NADP (2006, p. 1) emphasizes that a more coordinated agriculture sector will
enable rural people to participate to meet family needs and commitments (e.g. schools fees,
children and family health expenses and nutrition requirements). It points out that this can
contribute to reducing unemployment, poverty, law and order, and urban drift problems
facing the country at the moment.

The endowment of natural resources together with a social network that provides protection
or safety nets within kinship does not mean that PNG is able to contain the prevalence of
poverty. The key social indicators show that PNG is on the same trend as less well-endowed
countries, and are well below other Pacific Island countries (Anderson and Parker, 2002, p.
79). The rural areas of PNG are worse and it is reported that rural per capita income is
between US$300-350 per annum, while the urban income averages at US$3,500 per annum
(Anderson and Parker, 2002, p. 80). Gwaiseuk (2000, p. 31) further argues that some of the
gains since independence, such as infrastructure have been under threat due to deterioration. He further states that the population growth rate of 2.3 per year (2000) also threatens agricultural productivity. NADP (2006, p. 1) supports this view, noting that the current population growth rate of 2.7% is well above the estimated agriculture growth of 1%, which places many rural families that depend entirely on agriculture for livelihood in a difficult position. According to MTDS 2005-2010 (2000, p. 3), there was a marked deterioration in economic management of the government in the 1990s, which was due to breakdown in fiscal discipline and poor expenditure choices, and it was estimated that about 38% of PNG’s population lived in poverty in 1996.

Therefore, much has not been achieved in the rural areas in that farming families have been struggling to meet their needs. The need for providing support services such as rural infrastructure and income generating activities are fundamental needs that would contribute significantly to enhancing the livelihoods of the small farmers. It has been noted that the incidence of rural poverty is connected to the inability of households to earn cash (ADB, 2000a, cited in Cahn, 2003, p. 26).

In particular, the PNG Highlands, which has more than half of the country’s population, experiences widespread poverty. Income generating opportunities are established by families to provide basic services, such as education for their children, and health, as well as other immediate needs. The production and sale of fresh produce in the area is becoming a significant activity for raising such cash income (Spriggs et al, 2003, p. 69).

FAO (2004, p. 72), observed that, due to the shift in farming to cash crops, marketing issues are increasingly becoming important for the farmers in that they need to become skilled, and to understand how the market systems work. Moreover, they argued that the farmers’ financial viability depends on their business acumen and marketing skills. Martin and Jagadish (2006, p. 9) further note that smallholder farmers need to get adequate return for their efforts so that they compensate themselves, support their family and meet community and social obligations. Furthermore, they argue that with increased returns, the farming business can be expanded, and the shift of subsistence to commercial operation will be continued.
In order for PNG to achieve broad based economic growth, development in the rural sector through increased semi-commercial or commercial agriculture is essential. Therefore, marketing of agricultural products is important at national, farmer and consumer levels. Efficient local marketing of fresh produce can decrease reliance on imports while at the same time improve the country’s economy. At the farmer level, well-organized marketing can improve income for the rural households, reduce poverty and slow urban drift. Consumers at urban areas will not benefit much if marketing services are inefficient. This means that they have to pay more, and cannot have a variety of products, good quality or consistent supply (Cahn, 2003, p. 27).

2.10 Conclusion

Fresh produce produced in the Highlands is important for the PNG economy. Government is actively involved through polices, decisions and infrastructure developments. However, it has been argued that the marketing system is performing poorly. Many constraints have been identified and many solutions suggested. However, these have been very general and different market segments and may have different problems and constraints. Also farmers operate at a very micro-level and are concerned about how to better market their products and so improve their livelihoods. Therefore, there is a need to take a more micro-look at the marketing of individual products to different market segments to see if these products meet the market requirements while at the same time seeing if farmers are able to get a return for their effort, and so improve their livelihoods.
Chapter 3  Theoretical Framework

3.1  Introduction

This Chapter discusses the supply chain concepts and issues, which help to understand the research problem. The chapter is divided into two main sections excluding the introduction. A theoretical review of Supply Chain Management is presented in section 3.2 and section 3.3 discusses Supply Chain Management issues in developing economies. Section 3.2 covers value creation and supply chain functions which include logistics and quality management, information management as well as integration of processes and relationships. Issues for agribusiness chains which include interrelationships between functions and special features of agriculture are other areas covered. General supply chain performance and agribusiness supply chain performance completes the discussions in part one. In Section 3.2 the areas covered include logistics and quality, infrastructure, information, relationship, power and distribution and margin along the chain. These sections have separate conclusions.

3.2  Supply Chain Management

Traditionally supply chains in general were seen in terms of logistic, that is, as a link in the physical flow of goods and services which comprised transportation, warehousing and inventories. Customer service and order management have emerged more recently as vital components of supply chains. These depicted the outbound flows from the firm to the consumer or customer. Materials management and purchasing were added to this model in the 1980s. In the 1990s, managers started to realize how a company takes its product or services to the market. This was seen by managers as a manifestation of a firm’s operational business model into a fully supply chain (Cavinato, Flynn and Kaufman 2006, p. 9).

The term Supply Chain Management (SCM) seems to have emerged in the late 1980s and is presently the dominate paradigm (Cooper and Pagh, 1998, p. 2; Hugos, 2003, p. 2; Lambert, Cooper and Pagh, 1998, p. 1; Ross, 1998, p. 5; Hines, 2004, p. 71). According to Hugos (2003), before this period, businesses were familiar with terms such as ‘operations
management’ and ‘logistics’ but rarely were they linked. Another term used in journals during the 1970s and 1980s is ‘pipeline’ referring to the manufacturing process that involved movement of materials to the customers (Hunter, 1990; Hunter, King, Nuttle and Wilson 1993 cited in Hines, 2004), and ‘supply networks’ became prominent in the 1990s (Christopher, 1996 cited in Hines, 2004). The term ‘supply chain was first used in an US Outlook article in 1982.

Taylor (1997, p. 2) states that SCM and logistics are synonymous terms, and describe “logistics management as a systematic and holistic approach to managing the flow of the materials and information across the whole supply chain from raw materials sources to end-user consumption.” Copacino (1997, p. 7) pointed out that, while he opts to use the term supply chain to explain the broader context of chain activities, there are many professionals who tend to use the wider term ‘supply chain’ when they want to relate ‘logistics’ activities such as transportation, warehousing and inventory management. This point was also strongly summed up by Ross (1998, p. 6) as stating that SCM is “purely an extension of the integrated logistics concept.”

However, it must be noted that that there is a difference between the concept of logistics and supply chain management. While logistics often describes the activities taking place within the ‘boundaries’ of a single organization, supply chain refers to ‘networks’ of organizations or businesses working as a team, coordinating their activities to present the product to the market. Supply chain management accommodates the activities of traditional logistics, and at the same time views companies in it as a single entity. This provides an understanding of a systems approach and management of different activities required to coordinate flow of products and services to meet the ultimate customer’s requirements (Hugos, 2003, p. 2).

The idea is to blend supply chain management with the field of business. Supply chain and the subsequent definition of supply chain management, refers to “systemic, strategic coordination of the traditional business functions and tactics across these business functions within the supply chain for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole” (Menzter, et al., cited in Hugos 2003, p. 3). The modified definition for SCM extracted from The Global Supply Chain forum by Lambert et al (1998, p. 1) can be revisited. This states that “supply chain management is the integration of key business processes from end user through original suppliers that provides
products, services, and information that add value for customers and other stakeholders.” Omta, Trienekens and Beers’ (2002, p. 16) provides a similar definition: “Supply Chain Management is the integrated planning, co-ordination and control of all logistical business process and activities in the SC to deliver superior consumer value…..”, However, there are many other definitions for the Supply Chain Management but the above definitions provide sufficient explanation.

The primary distinction is the idea of incorporating marketing concepts within the supply chain management approach. Supply chains and marketing channels, despite being defined in different ways, can be interchangeably used. Marketing channels or supply chains involve a wide range of activities. These involve physical transformation of the product which includes processing, storage and transferring. There are functions that enable exchange assortment, display, packaging and support services such as finance, risk-bearing, information sharing and marketing activities (Martin, Zwart, Gardener and Parker, 2005, p. 9).

The supply chain management approach is a strategy used by producers, agents and marketers to ensure the product moves seamlessly from the producer to the consumer. Martin & Jagadish (2005, p. 3) suggest that consumer needs drive the chain, and they are mainly related to product attributes such as product form, quality, quantity, its continuity and timing of supply, price and conditions of payment. The span of the supply chain covers input supply, production, processing, distribution, marketing and retailing.

3.2.1 Value Creation

In linking different parts of the chain, there are many activities taking place along the chain. Porter (1985, p. 6) explains that each business has a collection of activities and each activity is discrete, creating value and contributing to the relative cost position of the business. He notes that different firms have different value chains that reflect their histories, strategies and success at implementation. These businesses serve specific market segments using lower cost or differentiated strategies that give them competitive advantage over competitors.

Porter (1985) states that the value chains of individual firms are linked into a channel value chain. Martin and Jagadish (2005) draw on this concept stating that, through value creation, a firm creates profit by using its capabilities and resources to transform and enhance the
product, linking suppliers and consumers through purchases, sales, logistics, product maintenance and interlinking firms and process.

In creating value, the customer’s needs and expectations must be understood as value is perceived by the consumer. Nix (2001, p. 62) argues that it is necessary for the firm to identify customer needs and deliver the value to the customer for the benefit of its long-term success. As each part of the chain is aligned to the needs of the final consumer, intermediate customers and suppliers begin meeting the needs of their own immediate customers, thus creating value for their customer along the chain. In turn they expect their suppliers to create value for them (Martin & Jagadish, 2005). Omta, et al., (2002, p. 16) add that value creation is an integral part of the supply chain that is being supported by integration or attuning of operational processes such as logistics and quality management with back up of information flows so that it enables businesses to co-operate across markets and industries.

A chain that effectively creates value is thought to be rooted in the development of ‘trust’ relationships and the sharing of information, costs and benefits. The chain structure is linked by means of interactive information systems and data sharing that are vital to each chain in responding to customer preferences in the immediate term and more importantly, market change over the long term (Bouma, 2000, p. 333).

In today’s fast changing and volatile competitive environment, successful companies do not just add value, they reinvent it. This is realised through a reconfiguration of responsibilities and relationships which involve the ‘constellation of actors’ which mobilizes the creation of value in new forms and by new participants. The essential idea is that of working together as alliances, and business partners to co-produce value (Normann and Ramirez, 2000, p. 186). Furthermore, they state that “…the secret of value creating is building a better and better fit between relationships and knowledge”. That is, knowledge is developed through relationships and integrated to various disciplines in the company so as to offer new services to the existing customer base.

With the continuous and increasing perception of value by customers, it is argued that companies have to be flexible to provide the right mixture of products and services that meet their needs (Ross, 1998, p. 40). Hines (2004, p. 3) adds that it is imperative for the suppliers to anticipate and identify what customers value so that they should be able to supply goods and services that match the value when exchanged with money. Ross, (1998, p. 40) points
out that unlike, “the era of mass production where customers were provided with already configured products and services, it is thought that the customers of today are searching for tailored mixture of products, services and information that gives them inherent value as well as providing an answer to their buying needs”. Treacy and Wiersema (1995, cited in Ross, 1998, p. 40) make this point forcefully:

“Customers of today want more of the things they value. If they value low cost, they want it lower. If they value convenience or speed when they buy, they want it easier and faster. If they look for state-of-the-art design, they want to see the art push forward. If they need expert advice, they want companies to give them more depth, more time, and more of a feeling that they’re the only customer.”

The emphasis is on customer response. In order to meet the customer’s requirements, the supply chain functions should be aligned and coordinated to deliver the value proposition.

3.2.2 Supply Chain Functions

The value creation process is supported by a number of supply chain functions which include logistics and produce management, quality management, information management and integration of processes through relationships (Martin and Jagadish (2005). Westgren (1998, p. 519) states that the successful elements in the supply chain management that indicate performance are; production flows, information flows and governance structures.

3.2.2.1 Logistics and Quality Management

Supply chains perform a logistics function in that products are moved from one point to another within the chain in a cost effective and timely manner (Taylor, 1997, p. 2). Hobbs, Cooney & Fulton, (2000, p. 21.) and Martin and Jagadish, (2005, p. 7) add that demands logical planning and organization to achieve two key objectives: improved customer service and reduced supply chain costs. Erickson, Akridge, Barnard and Downery (2002, p.7), while agreeing to the above argue that effective logistics management enables shorter product development cycles and rapid recovery after service problems. Burt, Dobler and Starling (2003: 48), add that logistics is usually “responsible for both incoming goods and the distribution of goods to the next member of the supply chain and frequently the end customer
itself.” Supply chain management also involves fleet management, warehousing, order fulfillment, logistic network design, inventory management, supply-and-demand planning as well as management of third party logistics providers.” To some extent logistics functions cover sourcing and procurement, production planning and scheduling (Cavinato, Flynn and Kaufman 2006, p. 629). What is more, logistics has an integrating function that enables coordination and optimization of all activities as well as integration of logistics activities with other functions such as sales and marketing, manufacturing, finance, and information technology. Taylor (1997, p. 9), adds that logistics is essential to developing an integrated approach to management of the entire supply chain. Moreover, the pre-existing structures, functions and attitudes that support the prevailing supply chain need to be recognized both at individual level, and supply chain as a whole.

As much as the focus is on logistics, quality issues have been challenging for many companies. Copacino (1997, p. 136) suggests that within the logistics function, a quality philosophy is rapidly gaining prominence. He highlights many founders such as Deming, Juan, Crosby and others that have idealized distinctive approaches to quality management.

However, the term quality has different connotations when used in different contexts. While there are many different perceptions to the term, with regards to quality of a product, it is specifically related to the expectations of the consumer. Different products have different quality dimensions that are specific to the product characteristics that show the worthiness of the product in satisfying customers needs. The International Standards Organisation (1994) provides a definition of product quality “quality is the totality of features and characteristics of product or service that bear on its ability to satisfy stated or implied needs”. Sumner (1995, p. 18) suggests that quality management is “managing of all functions and activities necessary to determine and achieve quality.” According to Erickson et al., (2002, p. 446), consumers perceive quality as fitness for use. They add that recently many companies interpret fitness as “meeting or exceeding customer expectations.”
3.2.2.2 Information Management

Information management is critical as it plays an integral role in the movement of the product from the producer to end consumer in a supply chain. Information flows in both directions of the chain, linking the suppliers and intermediate customers with features of market demand (e.g. quality and quantity, product form) and market supply (e.g. quality and quantity available). Hence, information flows underpin logistics and support the flow of materials covering the whole supply chain from the point of origin (raw materials) to the finished product where final consumption takes place (Martin and Jagadish 2005, p. 7).

Many businesses develop powerful information systems that equip them with complex database that enable them to exploit market trends and to promote specific activity of interest. With vast amount of information, firms can think ahead for new forms of innovation and creativity that supports their business in the competitive environment (Hines, 2004, p. 19). Hugos (2003, p. 121), adds that through the use of information technology firms can leverage operations for both internal and external collaborations in supply chain. Moreover, the high speed networks enable companies to share data and to effectively manage their supply chain. Ross (1998, p. 26) adds that information technology has provided the impetus for increased competition that results in shrinking order cycle times, reducing stocks and in-transit inventories as well as enabling planning and operational activities in the supply chain. Schary and Skjott-Larsen, (2001, p. 300) recognizes that information technology brings visibility to the entire chain. Moreover, through the use of the information technology systems, it has enabled managers to make well informed decisions for their operations, which were previously lacking, thus enlarging the scope of management.

Information flows in both directions. Martin and Jagadish (2005) explain that information flows up and down the chain. Furthermore, it links suppliers and intermediate customers with market demand in terms of product form, quality and quantity, and markets with supply, such as quantity and quality available. Information is also vital for detailed coordination of supply chain activities and operations.
3.2.2.3 Integration of Processes and Relationships

Supply chains have co-ordination mechanisms between the entities of the chain. These mechanisms align direction and control across segments of a production or marketing system (Peterson & Wysocki, 1998). The coordination process can be done either through vertical integration (such as production, processing and distribution) where the chain leader retains the ownership of the product, or through management relationships between parties as the product moves along the chain. Such relationship arrangements usually involve the change of the ownership of product along the chain. Supply chain relationships cover a range of categories of coordination from open market to contracts such as joint ventures, and strategic alliance and to complete vertical integration (Peterson & Wysocki 1998, p. 2; Martin and Jagadish 2005, p. 7). Hines (2004, p. 81) adds that an integration process occurs where an organization moves from being functional to integrated, and in the process improves customer service levels. Furthermore, he states the process of integration starts by focusing on better customer service, then to smooth flow of material with decreasing inventory holding, then on to optimizing material flows and removal of blockages along the supply chain. On the whole supply chain integration effectively strips out costs and time, and as a consequence value to the customer at the final stage.

New collaborative and integrative supply chain activities enable organizations to work together to design, plan and analyze their strategies and operations. This results in low cost savings, process efficiencies, lower inventories and low product costs. (Hines, 2004, p. 94) Ross (1998, p. 316) adds that integration eliminates ideas, strategies and barriers to performance that are entrenched in the old hierarchy of the organization. Furthermore, the organization becomes a learning organisation by integrating its supply chain. This integration also leads to creating visibility within the organization and between organizations through the use of standard computer systems that multiple organizations can use to share information (Hines, 2004, p. 94). Ross (1998, p. 178) cited that close relationships “accelerate technology transfer” and expand the available resources allowing for competition and innovation to ‘foster information sharing’ for mutual benefit. While agreeing to the notion of sharing information through integration, Cannon and Perreault, Jr. (1999) argue that this expectation will only be realized when both parties are willing work operate together.
Closed and integrated supply chain relationships enables value creation as product moves along the chain. Gattorna and Walters (1996 p.14) argue that establishing solid working relationships with customers and suppliers through communication links will result in the successful flow of materials from one end of the chain to the other. Furthermore, the interdependence between firms results in benefit sharing and adding more value to the product. As supported by Hobbs, Cooney and Fulton (2000, p. 12), through forming co-operative alliances in the value chain, firms can assist each other in reaching their goals that could not be reached on their own.

3.2.3 Issues for Agribusiness Chains

3.2.3.1 Interrelationships between Functions

The functions of the supply chain are interrelated to support the value creation process. The functions include logistics and produce maintenance, quality management, information management and integration of processes through relationship. Martin and Jagadish (2005) have integrated these features of supply chains into a framework that is applicable for agribusiness supply chains. They suggest that value is created through the operations of individual firms in the chain.

Value is further created through logistics and maintenance of quality along the chain, and the integration of process between businesses. This value creation is supported by information flows and achieved through vertical integration and relationship management (Omta et al, 2002, p. 16; Martin and Jagadish, 2005). Omta et al., (2002, p. 16), further adds that it enables business to co-operate across markets and industries.

Woods (2004, p. 20) claims that functional parts of the chain are recognized for how they contribute in developing customer value. Furthermore, to improve customer value and competitiveness through integrated management, one or more members of the chain need to initiate active participation in the chain. Through customer intimacy, effective business can be realized in that the product fits well with the needs of the customer, thus creating value for the specific market segments. Customer loyalty and amicable communication about the product are achieved through collaboration of managers, customers and suppliers (Martin and Jagadish, 2005).
Hobbs and Young (2000: 132) argue that the supply chain vertical co-ordination is characterized by; uncertainty for the buyer and seller, frequency of transactions, relationship specific investment and complexity of transaction. Furthermore, the product characteristics such as perishability, differentiation and quality can affect the transaction characteristics. These dimensions help firms to categorized their supply chains and subsequently allow better management.

Norman and Ramirez (2000) claim that the interdependence between firms results in benefit sharing and adding more value to the product. As supported by Hobbs, Cooney & Fulton (2000, p. 12), through forming strategic alliances in the value chain, firms assist each other to reach their goals that could not be reached on their own.

The robustness and availability of intrachannel and interchannel information resources “unifies the firms business functions into a single competitive unit and links each node in the supply channel, providing data concerning customers and market opportunities…” It supports local forecasting systems and logistics capacity for external customers (Ross, 1999, p. 103). Van der Vost; Beulens and van Beek (1998 p. 377), point out that all participants should work together through integrated logistics management for the entire chain in the competitive business environment so as to fulfill the needs of the customers.

**3.2.3.2 Special Features of Agribusiness Chains**

Products in agribusiness differ in terms of investment cycles and production uncertainties. For example, cabbage and broccoli have shorter business cycles while banana or avocado cycles extend over longer periods. Investments in agribusiness can be frustrated due to longer time frames from initial investment to realizing the outcome of the production (Woodford, 2002). What is more, production uncertainties stem from climate, pests, diseases and vulnerabilities to natural disasters such drought, cyclones, earthquake and tsunami etc.

Agricultural products are bulkier and perishable. The bulkiness of the product can affect the marketing functions involved with physical handling. Products take up a lot of space and are expensive to transport and store in respect to their value. Vegetables, fruits, grain and meat are usually bulky (Kolhs and Uhl, 1990, p. 46). They add that agricultural products are likely to deteriorate quickly and loose value. McLauglin (1995) while agreeing, adds that fresh
produce have high level of fragility in that need special packaging. The authors stressed that agricultural produce requires large storage capacities with special refrigeration and careful handling when moving the products to the customers.

The quality of agricultural commodities differs widely due to its biological nature of production. The attributes that combine to provide quality for each product include color, size, aroma, shape, tenderness, texture, moisture and taste (Kohls and Uhl, 1990, p. 46). However, they point out that there are quality variations due to seasonal changes. Furthermore, quality can change every year or season where during favorable conditions, quality is high, but during unfavorable conditions, quality can be lower. As well as the inherent availability of quality that results from the nature of agricultural productions. Hobbs et al (2000, p. 21) claim that quality is maintained through packing, transporting and cool chain methods while meeting customer expectation through cutting out unnecessary links to improve customer service.

Given the uncertainty, Concepcion et al., (p. 2006, p.125) argue that the farmers and marketers need to ascertain what the requirements of the end consumers. Given the perishability nature of the crops, there is a need for placing of orders before planting and harvesting. Information regarding what to grow, when to harvest, and to which markets the produce is to be supplied needs to be made known to the farmers to optimize the supply chain. Jayamangkala (2006, p. 46) illustrates that a vegetable supply chain starts with growing, harvesting, sorting, packaging and then storing which are all basic elements for assuring quality and safety as well as increasing market opportunities.

Hobbs and Young (2000, p. 132) argue that unique characteristics of the fresh produce affect the transactions which influences the vertical coordination outcome. They claim that perishability leads to uncertainty for the product quality and quantity as well as locating a buyer. This means the products need to be moved quickly and frequently to buyers in order to avoid deterioration. The transaction becomes complex due to perishable nature of the produce. While some agricultural products are differentiated, adding more value, others are difficult to obtain from many different suppliers. This adds to the difficulty in managing uncertainty of quality and reliability of supply. The supply chain management mechanisms can also be affected when produce is channeled through as a commodity product (Hobbs and Young (2000, p.132).
3.2.4 Supply Chain Performance

The previous discussion of supply chains and their functions provides the framework within which supply chains performance can be measured. According to Keebler (2001, p. 414), there various types of dimensions in the literature that can be used to measure performance which include effectiveness, efficiency, productivity, quality, innovation, quality of work life, budgetability and profitability. Taylor (1997) argues that performance is assessed at three different levels which include; overall performance, relative performance, and performance of individual logistics functions. He explains that the overall performance has two components, including customer service and logistics that can be used as a benchmark to evaluate the performance of intended changes. Woods (2004, p. 20) adds that best practice and quality systems and outsourcing were commonly used in the last 20 years are other tools for operation effectiveness.

Companies are using performance dimensions to measure the success of the whole enterprise as well as networking to meeting customer needs at the same time creating new competitive space. The main characteristics in their performance matrix centres on customer satisfaction, asset utilization, operating cost, and quality and cycle time (Ross, 1999, p. 103).

Through efficiency (lower cost) or effectiveness (added benefits), customer satisfaction can be achieved. Customers are satisfied with the value created which influences their behaviors and purchase choices that subsequently improve financial performance of the chain and across other firms (Nix, 2001, p. 63).

Chain performance can be improved through operational effectiveness. Key aspects of supply chain improvement include improved logistics, shared information systems and better information flows, reduce transaction costs, preservation of product quality, standards and integrity through out the chain (Woods 2004, p. 20). With such approaches it enables matching competitors and is set as conditions to penetrate other markets such as export markets or supplying to super markets.

Riggs and Robbins (1998, p. 180), while acknowledging difficulties in measuring performance of a supply chain, they argue that business are increasingly balancing performance in relation to quality and time, and the cost involved . Furthermore, they warn
that costs have to correspond with the performance, otherwise there is going to be a problem if performance is slipping while cost is increasing. Therefore, understanding the time involved and cost position is critical for effectiveness in material or service oriented chains.

Many companies aim to “provide the best service in the industry at a lower cost than competitors” (Copacino, 1997, p. 81). Hugos (2003, p. 141) stresses that regardless of what ever is being served, the chain should be able to meet the expectations of the customers in the market. Lambert et al., (1998, p. 531) adds that in order to achieve a good customer system, information should be processed with accuracy and timeliness as it helps in responding to fluctuation in customer demand. Hines (2004: p. 246), suggests that a supply chain matrix can be used to measure efficiency which involves on-time deliveries, complete orders, throughput times, lead times (production time to market).

Hugos (2003, p. 140), points out that efficiency is one of key characteristics that describe supply chain performance. Moreover, the ability of a supply chain can be measured in terms of meeting customer expectations through the services provided to the customers, level of profitability, response to uncertainty in levels of product demand, and its capacity to develop within the markets it serves. Van der Vost, Beulens and van Beek (1998, p. 377) argue that in today’s world of business, the successful winner seems to have the ability to respond to customer demand. The authors add that all actors in the supply chain should work ‘seamlessly’ to maximize competitive advantage, which in the end, should benefit the final customers.

Given the special characteristics of agribusiness in terms biological uncertainty and perishability, supply chains can provide challenges for their performance. Martin and Jagadish (2005) propose a set of performance indicators that they argue are appropriate for agribusiness supply chains. These recognized both the effectiveness and efficiency dimensions of performance and build on the attributes and functions of SC’s discussed previously. They divide the performance into macro and micro level indicators as outlined below (Martin and Jagadish, 2005, p. 10);
Macro level performance indicators;

- Having the whole chain as customer driven meeting the requirements of the intermediate customers.
- Being cost effective over the entire span of the chain
- Being more effective and efficient than the other competing chains
- Chain stability over a long period of time

Micro level performance indicators;

- Effective and efficient value creation through product transformation and enhancement at each point of the chain
- Efficient transport and logistics arrangements and effective product quality maintenance
- Free flow of information up and down the chain
- Seamless integration process through effective relationship management.”

Westgren (1998, p. 521) argues that to have a well performing supply chain, product flow is monitored and quality of the inherent perishable products is maintained along the chain; information flow is received at the consumer end; and a governance structure that is able to provide good return for quality and production schedules.

3.2.5 Conclusion

Key concepts about Supply Chain Management have been discussed. These are related to theory and definition, value creation, supply chain functions, issues for agribusiness chains, special features of agribusiness chains and supply chains performance. These provide a framework to understand the research problem. This study will next use these dimensions to analyse the performance of the chain in Chapter 6, and will be further considered in Chapter 7. This will broaden the understanding of supply chain performance, especially effectiveness of the chains.
3.3 Supply Chain Management in Developing Economies

The previous sections identified and discussed the different aspects of supply chains and their management. This section looks at issues in the context of developing economies. The areas that will be covered in this section include logistics and quality, infrastructure, information, relationships and power and distribution of margin along the chain, as well as other issues, and a conclusion.

3.3.1 Logistics and Quality

Zhang, Fu and Yang (2006, p. 511) found that Vegetable Supply Chains for supermarkets in Sichuan, China, have their logistics arrangements for the following day based on that day’s sale. The sorting and packing of vegetables is done either by the wholesaler or professional supplier depending on the delivery time. Most of the professional suppliers have private trucks but few have cooling systems. When the procurement is done by the supermarket, they use their own cooling systems. However, not all supermarkets have cooling systems (Zhang, et al., 2006, p. 511). Zhang, et al., (2006, p. 512) also noted that logistics can be quite efficient. They found that supermarkets in Chengtu have efficient logistics for its vegetable chain. This is attributed to a short and responsive market demand. The supermarket indicated that the time it had taken for the vegetables to be moved from the farm gate to the selves of the supermarket is 18 hours.

These authors found that convenience in terms of location of the supermarkets was a one of the key factors in many consumers not shopping in supermarkets in the big cities as opposed to open markets. Many customers living out of the cities have to travel long distance to shop in supermarkets. Many of the cities located inland have a relatively poor infrastructure and public transport system that compounds the problem of inconvenience (Zhang, et al., 2006).

Dispersed production was also identified as a logistics issue. Farina and Machado (2000, p. 184) while describing the Brazilian Fresh Fruit and Vegetable Chain, pointed out that geographically widespread and diversified vegetable demand can be met if production is aggregated from few key spots, divided and reorganized on the basis of requirements of each retail segment. Batt (2004, p. 41) also noted that quality cannot be guaranteed when the bulk
of the supply is sourced from dispersed producers. The author found in that the Red River Delta in Vietnam, where most of the potato is harvested, that there was unlikely to be consistency in supply of both quality and quantity of tubers supplied by over 2,000 small farmers. These quality issues were related to immature harvests. It was perceived that farmers would not be able to deliver adequate quantities of tubers that would be free from pest and disease, physical injury and preferred size that can last the desired shelf life. Another impediment as indicated by the traders was poor packing by farmers, and farmers agreed this constraint prevents them from meeting the needs of their downstream customers (Batt, 2004, p. 37). This study concluded that farmers would have to improve their knowledge in potato agronomy in order to benefit most whereas traders needed to have adequate knowledge of the different varieties, to be able to identify infected tubers, and to know the methods of storage, as well as understand the market dynamics (Batt, 2004: p. 39).

A lack of cooling facilities has been identified as having an effect on the quality of produce in other studies. In East Nusa Tenggara, Indonesia, about twenty percent of the post harvest losses for Keprok Soe (mandarin) are due mainly to lack of proper cold storage. Keprok Soe is grown above 800-1000 meters above sea level which is in the cooler part of the region. As the fruit is transported to the humid lowland regions during the daytime, the ambient conditions caused the fruit to ripe at a fast rate resulting in large deterioration losses. Also, refrigerated containers were not used for fruits sold to other islands as limited refrigerated containers were used to store high-value products like meat and seafood (Wei, Adar Woods and Suheri, 2004, p. 98).

Farmers’ perceptions of quality can impact on the performance of supply chains. The vegetable supply chain in Southern Mindanao, Philippines, demonstrates that farmers have divergent views regarding the vegetable quality and the market, which can lead to waste and inefficiency in the supply chain. It was identified that many quality related issues of vegetables relate mainly to agronomic practices and inadequate knowledge of market demands (Concepcion, 2004, p. 124).

Improved quality and traceability initiatives have been utilized as a strategy to help the farmers. A comprehensive supply chain approach was used to approach quality improvement for the farm level production activities and empowerment of village self-group through its Quality Upgrading Program (QUP) for its poor quality tea. The strategy was used by
smallholder Tea Producers in Southern India to empower women’s groups and provide intensive smallholder extension services. Leaf plucking among other variables was seen as a factor that influences quality, so the strategy used was to perform better plucking at the farm level (Neilson, Pritchard and Spriggs, 2006, p. 327).

Brousseau & Codron (1997, cited in Farina and Machado, 2000, p. 184), argue that in the Brazilian Fresh Fruit and Vegetable chains, it is difficult to standardize quality for the same group of produce for a varied customer composition. Moreover, produce is highly perishable and responsive to weather which creates uncertainty in quality. This will lead to reduced product value, production losses and shortages.

3.3.2 Infrastructure

Good infrastructure is critical to efficient logistics and effective quality management. It is acknowledged that in all developing economies infrastructure development is one of the critical areas that impact the supply chains. A 2004 workshop in Indonesia on ‘Chain Practice in Developing Countries’ found that lack of infrastructure such as transport system, storage and communication network, impeded efficient access to market (Wheatly, Woods and Setyadjit, 2004, p. 189).

The East Nusa Tengara mandarin supply chain in Indonesia has poor road infrastructure and transport system. Farmers transport their fruits to the market on foot using public transport or traders’ own trucks. If transported via the public vehicles, passengers and fruits are transported together. The public transport system operates during the daytime and each passenger is allowed to take with them only two bags. Passengers sitting on the fruit coupled with daytime heat causes fruits to deteriorate quickly. The traders’ trucks provide transport for the farmers but only allow a maximum of 10 bags at 400 kg per bag. All these make the transport system for the mandarin supply chain for the farmers less than ideal (Wei et al, 2004, p. 98).

Similarly, the vegetable supply chain in Kapatagan, Dogos City, Philippines had poor road conditions and rough terrains. Many of the roads within the farming areas were unpaved before 2002, and electricity was not accessible until 2000. There was no access to irrigation on the farms and plumbing to homes (Conception et al, 2004, p. 127). The 2004 workshop
concluded that since infrastructure constitutes a major barrier to small farmers participating in high-value chains, it is important to ensure adequate storage, handling, good communication networks and transport facilities to enhance chain competitiveness (Wei et al, 2004, p. 98).

3.3.3 Information

Research has shown that the length of the distance of the supply chain can affect the communication flow. In a study carried out on Banana supply chains in Indonesia by Singgih and Woods (2004, p. 45), it was noted that the long and complex chain suppresses effective information flow between the chain participants. Information sharing was good only with the next or previous level, and suppliers (farmers and collectors) were unaware in that they did not want to search for up-to-date market information. They perceived that the price they receive from the wholesalers is always fair and the same as market prices in the city, and they trust their buyers (Singgih and Woods, 2004, p. 45). In another study it was found that wholesalers in the Supply chain for potato cultivation in the Red River Delta, Vietnam had more control over information (Batt, 2004, p. 27).

A further study found that Kapatagan farmers in Digos City Philippines had poor information links. They said that information linkage about market preferences is not direct and intermediaries in the chain provide them with information. Farmers themselves have limited knowledge of market information and they rely heavily on what the immediate trading partners say regarding the market. Most farmers expressed the view that they hardly ever bother to look beyond their buyers (Conception et al., 2006, p. 124). In this case it was suggested that a better information network be established so that correct information is provided for the farmers who are mainly dependant on buyers and traders for information. It was argued that this would enable them to access direct market information on quality standards and price fluctuations as well as other characteristics of the market (Conception et al, p. 123).

In attempting to manage the uncertainty of high marketing risks in terms of price fluctuations in vegetable marketing, farmers and market operators in Senegal identified information as a key dimension for coordination of their supply chains (Benz David-Benz, Wade and Egg 2006, p. 137). In this case, MANOBI, a privately operated communications business,
provided an information service to users. The farmers’ negotiating capacity with bana-banas (mobile middlemen) is strengthened with this information network. The fascinating feature of this system is it takes less processing and transmission time and is flexible. Operators are able to have access to accurate and updated information (David-Benz et al, 2006, p, 137).

Wheatly, Woods and Setyadjit (2004, p. 189) argued that in the developing countries if farmers want to benefit from supply chains, reliable timely information about consumer needs is required. They emphasized that farmers need to be market-oriented, and to ‘produce what they are able to sell’, instead of trying to ‘sell what they produce.’

3.3.4 Relationships

The adequacy of relationships in chains in developing economies has also received a lot of attention in literature. A detailed study by Batt (2004, p.27) showed that there were a mix of relationships for potato cultivation in Red River Delta, Vietnam, where some were based on satisfaction and trust and others on power and dependence.

Some farmers were dependant on their preferred trading partners and appreciated the relationship they had with them. This was because the trading partners were honest and kept their promises. Some traders indicated that they had a strong relationship with both the farmers and collector agents and their downstream customers. However, the wholesalers were less satisfied in their relationship with both traders and retailers. On the other hand, the retailer customers express high satisfaction and trust with the wholesalers (Batt, 2004, p. 27)

Effects of culture can have some bearing on relationships in supply chains. Two case studies carried out by Singgih and Woods (2004, p. 44) on banana supply chains in both Indonesia and Australia illustrates this. While both studies indicated strong long term relationship for each chain activities, there were differences mainly at the upstream (farmer and village) levels, which was due mainly to the cultural dynamics of each chain.

The authors found that villages in Indonesia were dominated by traditional value systems that have support mechanism for the buyers and sellers. The underlying trust and respect ensures that each has equal right to earn money and this has entrenched in the chain, especially at the village level. The Australian case study indicates more different approach.
However, relationships in the two chains are suited to their own needs within their own cultural environment (Singgih and Woods, 2004, p. 44).

The authors argue that the creation of western-style supply chains to serve in large supermarkets in Indonesia would have possible implications in Indonesia, since it may challenge social and cultural norms of the society. The current Indonesian Banana Supply chain is underpinned by a culture that has deeply-rooted values. This may result in many smallholders losing some of benefits they enjoy in the informal system (Singgih and Woods, 2004, p. 44). As a result, in order for the Western Supply Chain practices to perform well, it is critical for the supply chain to fit the societal needs and able to meet the needs of supermarkets and their customers.

One of the strategies adopted by traders to improve marketing of mandarins in East Nusa Tengara in Indonesia is horizontal integration. This was aimed at the farmer level to strengthen relationships with the farmers. The many informal social groups come together during harvest seasons and are involved in different activities. Tuckman (1975), cited in Wei et al., (2004, p. 105), stressed that, to improve the efficiency of the supply chain, social groups need to be effectively developed and integrated within the context of the norms. He adds that groups go through four stages: forming, storming, norming and the-task performing. Banet (1976, cited in Wei et al., 2004, p. 105) support the argument that key farmers and extension officers provide support and production techniques until the members of the group and the leader have covered the dependent, counter-dependant and independent stages. Wei et al., (2004, p. 105) argue that strong relationships between farmers and traders can enhance business skills and foresight where farmers see themselves as crucial to the linkage between production and marketing agents, and ultimately the success of the supply chain.

In a vegetable supply chain in Southern Mindanao in the Philippines it was found that stakeholders had divergent views on quality, and saw others in the chain as persons to be watched, not as partners. While several farmers and buyers enjoyed some degree of trust between them, many of the farmers had resentment that the traders may be providing them with incorrect prices (Conception et al, 2004, p. 127). In this case, it was suggested that, in order to have a sustainable supply chain, it is essential to promote cooperation and partnerships, which could lead to improvement in chain efficiencies. It was argued that this
could be realized through reorientation for all stakeholders and capacity building for farmers so that production levels and market orientation are raised (Conception et al, 2004, p. 31).

Another study on vegetable supply chains of supermarkets in Sichuan, China, found that one of the supermarkets got its vegetable supplies from a vegetable growers’ association, which comprised local vegetable farmers and traders. The leading traders play a key role in ensuring the supermarkets are contacted and products are delivered. With such arrangements, supermarkets are responsive to market demands and deliver products to customers. At the farmers end, they are pleased to have guaranteed market access and stable price (Zang, Yang and Fu, 2006, p. 510). These authors argue that, while this small case study provides insight on how smallholder farmers are able to organize themselves and capture opportunities in rapidly growing supermarkets in Sichuan, the Chinese government promotes farmers at all levels to organize themselves in one way or another.

The literature on developing economies discussed in previous sections has highlighted the challenges facing supply chains in fruit and vegetable industries in such countries. The issues are wide ranging, covering logistics, quality, infrastructure, information and relationships. Other issue related to power and distribution of margin as well as cross-cutting issues in transition economies will be highlighted in the following section.

3.3.5 Power and Distribution of Margin along the Chain

An increasing number of studies in transition economics focus on asymmetrical power that exist in the business-to-business (B2B) relationships between smallholder farmers and traders along the supply chain (Cadilhon, Fearne, Tam, Moustier and Poole 2006, p. 113). For example, in vegetable supply chains in Ho Chi Minh City (Vietnam), it was found that traders are likely to abuse the use of power over the uniformed small farmers in a market that is characterized by high price volatility. The farmers who operate in traditional supply chains were thought to lose significantly at the expense of traders making regular margin on the big volumes of low-value produce (Cadilhon et al, 2006, p. 113). Farina and Machado (2000, p. 184), state that wholesalers are well placed in terms of bargaining power due to high perishability, fragmented supply and imperfect and asymmetric information
when referring to Brazilian Fruit and Vegetable chains. Furthermore, they argue that supermarkets take advantage when growers are faced with price fluctuation and products standards are absent.

However, one study highlights an exceptional case in a tomato chain where one trader has been doing well by responding to customer incentives by committing to quality and investment in selected growers, and has developed a fair deal for trade for upstream participants for this chain to Ho Chi Minh City in Vietnam. In another study, a potato trader showed a strong ability to meet specific market demands focusing on quality and grade, which earned herself the reputation as someone having power in the interdependent business relationship with modern-wholesaler customer (Cadilhon et al., 2006, p.113).

In other situations, there are many farmers who have little control and power, and are dependent on other members of the chain. Farmers in the banana supply chains in Indonesia are price-takers and exercise less power than other participants which creates dependency (Singgih and Woods, 2004, p. 45). The authors argue that the farmers do not complain about prices or delays, and think that what they are offered provides security for their families. The farmers are only mindful about the long-term sustainability of their relationships with the buyers.

In an international workshop in Bali, Indonesia looking at supply chain practice in developing countries, one of the key issues identified is the distribution of benefits that emerge from SCM approaches, and how smallholder farmers and traders can share these benefits (Wheatly, Woods and Setyadjit, 2004, p. 189). The workshop concluded that a lot more should be done to action these issues through informing the government and agencies involved within the communities and agri-food retailing sector about the implications and incorporate strategic plans for improvement in supply chains.

### 3.3.6 Other Supply Chain Issues

There are other issues facing supply chains in transition economies. For, example, production issues are important. The mandarin supply chain in the East Nusa Tenggara in Indonesia reported that at the farm level, there was lack of proper cultural skills and that farmers did not use farm inputs to cultivate fruit. Using inappropriate harvesting methods such as pulling
fruit from the tree exposes flesh and can cause stress to the tree. Prolonged drought can affect production as it was the case in 2000. The mandarin industry had been threatened with serious diseases (Wei et al, 2004, p. 104).

One of the key issues identified in the vegetable supply chain in Kapatagan in Philippines is land ownership. It was reported that the farms in Kapatagan were unsustainable for commercial production due to insecurity in land ownership. Farmers only had to pay tax for the land use but could not claim title to the land as the farming fields are within the boundaries of a National Park (Conception et al, 2004, p. 127).

While recognizing quality and traceability initiatives being developed to engage smallholder tea producers at the farmer level in Southern India, it has been pointed out that an effective understanding of smallholders’ social and economic dynamics can provide a wider dynamic of agrarian systems than actually looking at the “supply chain itself as the object of inquiry” (Neilon, Pritchard and Spriggs, 2006).

3.3.7 Conclusion

A range of issues have been identified in developing countries. These are related to quality and logistics, infrastructure, information, relationships, power and distribution of margin along the chain as well as other issues. However, it is difficult to see how all of these issues are interrelated. This study aims to explore these interrelationships. In the discussion (Chapter 7), the literature discussed above will be related to the findings of this research. This will add to the understanding of supply chain performance, especially effectiveness, in fresh produce industries in transitional economies.
Chapter 4  Methodology

4.1  Introduction

The last chapter discussed Supply Chain Management concepts with attributes of well-functioning and highly integrated chains. Also discussed were possible impediments to the chain performance. In this chapter, these concepts will be operationalized and a methodology for analysing agribusiness supply chains in this study is presented.

There are six sections including the introduction in this Chapter. Section 4.2 presents the framework that will be used to analyse the chains. Section 4.3 discusses the selection of chains and a description of the research area. Data collections and collation approaches are then discussed and justified, and covered in 4.4. Section 4.6 discusses data analysis and the chain report structure.

4.2  Research Framework

In order to justify a suitable framework to analyse chains, the research objectives will be restated. The research aim is to gain a more detailed understanding of the operation and effectiveness of different key segments for fresh produce supply chains originating in the Highlands Provinces in PNG.

Specifically, these objectives are;

a)  To gain a detailed understanding of the operations of supply chains for fresh produce from the PNG Highlands in the formal sector
b)  To have a detailed understanding of the operation of supply chains for fresh produce from the PNG Highlands in the informal sector
c)  Having understood how these operate, evaluate their performance
d)  To compare the features of these formal and informal chains.
These objectives require a framework that brings together conceptual material in Chapter 3. A framework developed by Martin and Jagadish (2006) meets these requirements and used in a similar research setting and environment as this research to analyse the effectiveness and efficiencies of particular fresh produce supply chains.

Martin and Jagadish (2006) envisage a supply chain as a value-creation process that has links between firms creating value for the supply chain. Their conceptual view of the framework is shown in Figure 1. Value creation takes place through firm operations, integration of processes which involve logistics and quality control (product maintenance). These are supported by two-way information flow up and down the chain, and achieved through vertical integration and relationship management (Martin and Jagadish, 2006).

**Figure 1  Functional Representation of a Supply Chain**

Value creation through operations:

![Value Creation Diagram](image)

Value Creation through Integration of Processes and Logistics/Quality Control:

![Integration Diagram](image)

Supported by:

![Support Diagram](image)

Achieved through:

![Achievement Diagram](image)

Through vertical integration and relationship management, value creation is achieved. Vertical integration takes place when one actor, usually the chain leader, integrates some functions into its operations rather than outsourcing these to other businesses. This vertical integration linkage between processes is indicated by the solid line in Figure 1. Similarly, through management of relationships between various participants as the product moves along the chain, value creation can be achieved. This is depicted with dotted lines with double headed arrows in Figure 1. Martin and Jagadish (2006) note that chain relationships are found in different forms, ranging from arms-length (open market) to some involvement (contracts), to exclusively controlled arrangements such as strategic alliances or even joint ventures.

Measures of supply chain performance were developed by Martin and Jagadish (2006). These measures of effectiveness of chains are presented in Table 1. The first column lists dimensions of performance, the second column outlines the key questions that guide the observations of the dimensions, and the final column outlines how these dimensions will be elicited. In section 4.4, the approaches used to elicit this information are covered.

Table 1  Performance Measurement Matrix

<table>
<thead>
<tr>
<th>Dimensions of Performance</th>
<th>How to observe dimensions</th>
<th>How to elicit dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micro-dimensions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Value creation</td>
<td>Are needs of intermediate customers being met along the chain?</td>
<td>Questionnaire</td>
</tr>
<tr>
<td>Logistics</td>
<td>Are products being moved in a time effective manner?</td>
<td>Questionnaire</td>
</tr>
<tr>
<td>Quality</td>
<td>Is the quality of product being maintained to the level required by the intermediate customer?</td>
<td>Questionnaire</td>
</tr>
<tr>
<td>Information</td>
<td>Does information flow along the chain in a way that supports the value creation?</td>
<td>Questionnaire + analysis of other questions</td>
</tr>
<tr>
<td>Relationships/vertical integration</td>
<td>Do relationship structures/vertical integration support value creation?</td>
<td>Questionnaire + analysis of other questions</td>
</tr>
<tr>
<td>Integration of Processes</td>
<td>Are processes along the chain well integrated</td>
<td>Analysis of other questions</td>
</tr>
<tr>
<td>Macro-dimensions</td>
<td>How well are consumer needs being met?</td>
<td>Analysis of other questions</td>
</tr>
</tbody>
</table>

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4.3 Selection of Chains and Description of Research Area

The selection of appropriate supply chains needs to be done so as to achieve the objectives of the research. In selecting the chains, critical decisions had to be made considering time and resources as limiting factors. Conducting micro-analysis of the chains is time consuming, and a considerable amount of resources would be required, which seemed unfeasible for this project. Therefore, the decision was made to restrict the number of chains to two, one formal and one informal.

The next decision was to choose a product. It was decided to choose one representative product for both chains so as to make comparisons between the chains easier. Potato presents a representative product as it has elements of perishability, and sits between traditional and new horticultural crops. Potato has a variety of chain links from local and national level through formal and informal marketing systems. It uses different modes of transport which include road and sea.

The PNG Highlands, which accounts for most of the fresh produce in the country, is geographically located miles away from the main coastal cities of Lae and Port Moresby, thus providing a good backdrop for researching the supply chains under a variety of conditions. The Highlands is unique in the sense that produce marketing, including potato, is developing and has a lot of potential. With a combination of widespread poverty, active participation of rural farmers and wholesalers, lack of communication, the dilemma of infrastructure and logistics, it provides an ideal location for the investigation of supply chain effectiveness.

4.4 Data Gathering

The data gathering section comprised of two components. The first part describes the theoretical justification for the approach, and the second part describes the actual data collection.
4.4.1 Theoretical Approach

Martin and Jagadish (2006) use in-depth case studies of key representative businesses along the chain in their study and this approach has been followed for this research.

Case studies are a common strategy used in this type of research. Yin (2003, p. 13-14), explains that a case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident. He further states (p. 13-14) that “the case study inquiry copes with the technically distinctive situation in which there will be many more variables of interest than data points, and as a result, relies on multiple sources of evidence, with data needing to converge in a triangulation fashion.” Huberman and Miles (2002, p. 8) also note that a case study strategy “focuses on understanding the dynamics present within the single settings.” Thus, case studies can yield useful information and contribute uniquely to the pool of knowledge in individuals, organisations or social phenomena. It allows an “investigation to retain the holistic and meaningful characteristic of real-life events” (Yin, 1984, p. 14).

Huberman and Miles (2002, p. 9) further explain that case studies usually involve all data collection methods such as archives, interviews, questionnaires, and observations. The evidence may either be qualitative involving words or quantitative dealing with numbers or both. The case study approach can be employed to describe, or even to generate theory, in any intended research area (Huberman and Miles, 2002, p. 9).

A research design is needed in any plan of investigation. In a case study there are four designs: single-case designs, single-case embedded designs, multiple-case designs and multiple-case designs (Yin, 1984, p. 41). The unit of analysis is related to how the research questions have been identified. This means the primary unit of analysis is the organisation, system or phenomenon under investigation (Yin, 1984, p. 31). In this study the unit of analysis is the chain, with sub-units of analysis being the organisations in the chain. This makes it an embedded design. Because two case chains were studied, it is a multiple-case embedded design.
There are many ways to sample, such as theoretical sampling (Glaser and Strauss, 1967). This is also called purpose sampling (Mcintyre, 2005, p. 227). In this study, representative sampling was used to choose businesses in the chain under investigation.

Pilot case studies are useful for case study research. Yin (1994, p. 4) argues that “a pilot case study helps the investigation to refine their data collection plans with respect to both the content of the data and procedures to be followed.” Some of the features that are considered in selecting pilot cases include convenience, access and geographic proximity. Wilson and Sapsford (2006, p. 102) add that a ‘small-scale trial’ is important. Pilot sampling needs to be representative in the dimensions that needed to be covered in the intended investigation.

There are various ways of doing interviews. According to Fowler Jr. (1984, p. 49), interviews can be done through postal, telephone and personal. However, he pointed out that they differ in terms of their bias relating to nonresponse.

Yin (1984, p. 83) explains that open-ended questions are common in case study interviews whereby the researcher asks the respondent for factual information as well as opinions. A combination of open-ended and closed questions can be constructed to ask for factual information. As described by May (2001, p. 102), with factual questions, the interviewer has more latitude to probe, explain and go beyond by having dialogue with the interviewee. Open questions provide interviewees with greater freedom to answer questions that suits their interpretations and perspectives. The interviewer can record as much as possible and provide depth when the interview is analysed. On the other hand, closed questions limit the scope of possible answers, but it is quicker and cheaper when analysed (May, 2001, p. 102).

In the face-to-face interview, the interviewer can record context of the interview and non-verbal gestures of the respondents. This results in visual interactional component between the interviewer and interviewee (May, 2001.p.99). Jupp and Sapsford (2006, p. 93), add that this type of interview employs either an interview schedule or free formatting, depending on how the interviewer would like to conduct their interview.

While collecting information may be daunting or overwhelming, there is a need to have the data appropriately stored and processed for public consumption. Huberman and Miles (1994, p. 428 ) state that information collected in the field is not immediately readily available but
requires processing because raw field notes can be “indecipherable scribbles” to anyone. It needs to be corrected, transcribed, extended, edited and typed up by the researcher through using a coherent system.

Analysis is done to make sense of the data gathered in the field. Yin (1984, p. 99), describes that data analysis is mainly done to examine, categorise, tabulate or otherwise combine the evidence to address the research objectives. One of the strategies of analytical techniques is dealing with special cases such as a case study involving embedded units of analysis or where there are several case studies being analysed. However, these special techniques are to be combined with three dominant techniques that include pattern-matching, explanation building and time series analysis (Yin, 1984, p. 99).

4.4.2 Field Work Phase

4.4.2.1 The Approach

An in-depth case study analysis was used with key businesses in each fresh produce chain. The businesses interviewed ranged from small farmers, to hotels and supermarkets. Most of the interviews were carried out at the premises of the businesses concerned.

The interviews were mostly conducted in person. It was found that interviewing in person gave the best outcome in this environment where there are poor phone and postal services, and poor levels of literacy at some levels of the chain. The respondents were either owners or senior people in the business, and provided insights into the operations of their businesses, which would not have been achieved if other means of interviewing had been employed. Also, the researcher had the opportunity to ensure that all questions were answered, and to observe the daily activities in the business on a first hand basis.

Structured questionnaires were used for the interviews. The approach used was to take the questionnaire to the interviewees to have a personal interview. The next option was to leave the questionnaire with the respondent. This approach was used for only two respondents for the formal chain. This approach had to be used when the respondents did not have the time to have the meeting when the researcher showed up at the meeting place. This allowed the respondent to answer the questionnaire in their own time. When the answered
questionnaires were collected, further discussion was had to clarify any misunderstood questions, and to gather any other information on business.

The face to face interviews were based on open and closed questions. Closed questions were sued for factual information and open questions to gain depth on various issues. Such questions gave rich information from these people, who are the experts in their work. It also provided some flexibility where adjustments had to be made where necessary to the questioning to reflect their particular situation.

Direct participatory observation is another case study technique. The ‘sit and watch’ approach was used, especially in municipal markets where buyers freely moved around to meet their vendors and negotiate for better price.

During the field work, secondary information was also collected from leading agencies and organisations. This material was in addition to interviews. The secondary data was helpful in that it strengthened the findings by triangulating the phenomena of concern.

A trial interview was conducted to validate the method and questionnaire. This helped to make adjustments where necessary especially with the sampling plan. Pilot interviews provided a good understanding of the different chains that operated within the fresh produce sector for both formal and informal marketing systems. A vegetable farmer was interviewed as part of the pilot case study. This helped to get to know other farmers and most importantly establish trust and confidence in the researcher.

The interviewees were selected through their contacts with FPDA. FPDA has a network with smallholder farmers, wholesalers, retailers, suppliers, marketer and other key players in the fresh produce industry. Messages were sent to them, especially the smallholder farmers through the lead agency prior to the researcher’s visit, so they were informed of the interview schedules and they were generally well prepared for them. Interviews with other key members of chain such as kai bars, supermarkets, hotels, institutions were made through personal contacts and appointments.

Data collected from 22 interviews were carefully stored for later analysis. All interviews were considered successful, and provided sufficient information for this research. Other
interviews also carried with secondary members of the supply chain that provided good background information for understanding the context of the two case studies.

4.4.2.2 Questionnaire Development

Prior to going to PNG, a questionnaire was constructed for each participant in the supply chains to be investigated. The questionnaires were constructed to cover production, input supply, wholesaling, transporting and retailing as well as catering, and were adapted from the questionnaires used by Martin and Jagadish (2006). The key features in each of chain questionnaire include chain operation, resources, quality, logistics, information and relationships. The questions were to provide enough information to answer the research objectives. Questionnaires were modified further where need be to fit the situation of the interviewer. See Appendix I for an example of questionnaire for a marketer.

4.4.2.3 Conduct of Interviews

The field research commenced on October 30, 2006, and finished on January 2, 2007. It comprised of approximately ten weeks of making appointments, travelling and carrying out interviews with different stakeholders starting in the highlands and ending in the coastal regions.

Participants were contacted for appointments through telephone or if necessary, mail. Most of the interviews with the smallholder farmers were organised by FPDA, a government lead agency responsible for production and marketing of fresh produce in PNG. This agency was informed of the research and gave its approval prior to travel to PNG by the researcher.

The research was largely based in Western Highlands Province as it leads the production and sales of fresh produce including potatoes in the Highlands region. The chains originated in one province, so that a range of variables and activities (e.g. climate and culture) were kept constant.

Two trips were made to Goroka, Eastern Highlands Province. The first trip was during the first week of November to seek support from FPDA (which is headquartered in Goroka) and Smallholder Support Services Pilot Project (SSSPP), an Asian Development Bank supported project, and the second one was in early December to have further discussions with these
lead agencies. Visits were also made to Lae, Morobe Province to conduct interviews with supermarkets, hotels, institutions, municipal markets and transport companies. A trip was made to Port Moresby, National Capital District in mid December. Interviews in Port Moresby were with supermarkets, hotels, vendors and buyers in the municipal markets, and also warehouses were visited and various market segments observed.

Interviews were generally conducted in the native Tok Pisin language and were simultaneously translated in English by the researcher, who quotes in English as the interviewee was speaking in Tok Pisin. Tok pisin is very wordy, which allowed adequate time to write the spirit of the English. Each personal interviewed took about 60-70 minutes. Questionnaires that were answered in the respondents’ own time were collected after a maximum of one week, and a short interview conducted at this time. Tapes were used for some interviews where possible. These tapes were labelled with the name of the respondent and date of interview.

**4.4.2.4 Research Limitations and Constraints**

There were some difficulties faced with the conduct of the field research, which forced the research to be delayed. The flight out of New Zealand in the first week was delayed for one week due to visa reasons. The project had to be delayed for another week when equipment, including digital camera and flash drive, as well as documents were stolen in Mt Hagen around mid November. Scheduled interviews at mining sites including Porgera, Enga Province and Kutubu, in Southern Highlands Province were not possible due to tribal fights along the Highlands Highway. Travel along the Highlands Highway from Mt Hagen to Goroka was also held up due to poor road conditions resulting from heavy rain and floods that washed away a section of the Highway.

Another constraint that had to be dealt with was that some interviews did not eventuate due to unavailability of interviewees. Some meetings in Mt Hagen, Lae and Port Moresby had to be cancelled as people did not show up on time. Some individuals were reluctant to participate as they claimed that some questions were sensitive to their business. In particular some interviewees had a relationship with FPDA. Since FPDA helped to arrange some interviews, some farmers in particular were reluctant to discuss their business operations as they perceived that information of commercial sensitivity might be disclosed to its
competitors. Such interviewees were informed of the confidentiality and neutrality of the research and its academic purpose.

4.5 Data Analysis and Report

The first step in the analysis was to describe the chain. For each case study, the unit of analysis is the chain, and the sub-units include farmers at the farm gate level, wholesalers and the other middle-men supporting and businesses in various end user segments.

These sub-units are intrinsically linked to each other. The smallholder farmers are responsible for production, and supply the product to wholesalers and marketers who then supply to retailers, where the product is sold as a commodity to the final consumers. Farmers also linked directly with the final customers, where there are no middlemen involved. Transportation companies play a critical role in providing logistical support for the movement of product from the farm gate to the end consumer. The operation and linkage between the suppliers and consumers for both chains was written up as a case study report. The operations of each business in the chain were described along with the linkages between businesses. This is reported in Chapter 5.

The case descriptions were then used to analyse the effectiveness of each chain according to the performance dimensions identified in the framework. Cross case comparisons for both chains was done in terms of performance chain function, and overall chain effectiveness, and is reported in Chapter 6. The synthesis of both case studies provides a better understanding of fresh produce marketing in Papua New Guinea. Finally, in Chapter 7, the results are synthesised and discussed.

4.6 Conclusion

A comparative case study approach was adopted for this research which was determined by the objectives. The study focused on fresh produce marketing in the PNG Highlands, but concentrated on a product, potatoes. Two different chains were studied representing formal
and informal market segments. Comparisons are made between each chain in terms of their performance.
Chapter 5       Description: Case 1 and Case 2

5.1    Introduction

This chapter describes two potato chains originating from Western Highlands Province. The
short chain ends within the province, while the long chain ends in the National Capital
District, Papua New Guinea.

This chapter consists of three main sections which include the introduction. Section 5.2
introduces Case 1, which covers the short potato chain. This covers several subsections
which include overall chain description, three input suppliers namely IS1, IS2 and IS3,
farmer/marketer and market segments including kai bar\(^2\) A, kai bar B and urban market.

Section 5.3 presents the long formal chain as Case 2. This section has subsections that cover
several areas which include overall chain description, three input suppliers, which were
covered in the previous section, farmers, described as F1 and F2, wholesaler/marketer, two
transport companies, namely T1 and T2 as well as three buyers namely SA, SB and Hotel.

5.2    Case 1: Informal Potato Supply Chain within Western Highlands

In agribusiness the term ‘informal chain’ refers to chains that are less structured, have fewer
channel members, price based, looser coordination mechanisms and cover shorter
geographical distances. Generally, these chains comprise smallholder farmers with possibly
one or two intermediaries with access to the final consumers. Farmers selling to local or near
distance markets is a good example of an informal chain.

\(^2\) A kai bar is a generic local term used for a fast food outlet. These can range from temporary street stalls to
restaurants.
5.2.1 Overall Chain Description

This is a short within chain which comprises of a smallholder farmer with three different input suppliers and two types of market segments.

The farmer is a certified potato seed grower from a village about 15 kilometres from Mt Hagen, in Western Highlands Province. He is an entrepreneurial farmer who also grows other vegetables such as broccoli, cabbage, capsicum and carrot, and sells them at the local urban market and kai bars (fast food outlets), but also prefers selling at other distant markets when he produces larger volumes.

Two input suppliers (IS2 & IS3) provide fertilizers, chemicals, tools and equipment to smallholder farmers, individuals and plantations, and another (IS1) supplies potato seeds. Suppliers 1 & 2 have their head office in Goroka while supplier 3 in Port Moresby

The two market segments include the kai bars and urban municipal market in Mt Hagen. In the kai bars, the farmer sells potatoes directly while in the urban market the product is sold to several buyers who either consume directly or re-sell to other clients.

Several people were interviewed, for this chain including the farmer, senior seed inspector for IS1, two Agriculture Supervisors respectively for IS1 and IS2, as well as two managers for the two kai bars. Also interviewed were five end consumers who buy potatoes from these markets.
5.2.2 Input Suppliers (IS)

5.2.2.1 Input Supplier One (IS₁)

This supplier is a state agency which is mandated to provide technical support in the production and marketing of horticultural crops including roots, fruits and vegetables in PNG. This agency is tasked to supply potato seeds to smallholder farmers, a responsibility entrusted to control the Potato Late Blight (PLB) epidemic which broke out in 2001. The
organisation ensures that high quality seeds are provided to the smallholder farmers. The agency then trains the farmers to become certified seed growers.

The agency acquires mini-tubers from a partner government arm, a research institute which imports from Australia and generates at its tissue culture facility in Aiyura, Eastern Highlands Province. Under the agreement between the two organisations, IS1 is to be supplied with 1000 potato plants (Sequoia) every month. Mini-tubers are usually generated from micro tubers developed from tissue culture plantlets. Average size of a single mini-tuber is 10-25 grams. Also, the IS1 imports directly seed tubers from seed growers in Australia and multiply again and distributes to smallholder farmers. It provides seeds to the farmers on quarterly basis. In the Highlands region, the Mt Hagen office takes care of farmers from the Western and Southern Highlands and some parts of Simbu provinces. The farmers buy from this supplier in 25 kilogram bags for K75.00 per bag, and arrange own transport for delivery to their farm. However, the supply is not always constant.

“We have some difficulties with the imports though. Sometimes farmers in Australia cannot produce or supply the quantity we require on time because it's seasonal, the farmers in Australia harvest in November through to January the following year, and the seeds are available from February to June ever year, but seeds can be imported after this period through arrangement with certified seed growers in Australia. We receive quarterly supply from them.'" IS1

Most seed imports for IS1 come via the sea transport routes. However, the mini-tubers are best transported by air. Trucking companies are hired for transportation from the wharf in Lae, Morobe Province, and stored in hired storage sheds. It takes three months to receive one shipment. In each shipment an average of 50-60 tonne of seed materials is received.

IS1, in collaboration with National Agriculture Research Institute (NARI), has gone into tissue culture project with support from donors. However, due to technical and management inefficiencies, the project has slowed down.

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3 $1 PNG Kina = 0.3195 USD as at October 2007. For example K77.00 = US24.00.
“With constraints in tissue culture project, it’s all not looking good for us at the moment. It will take a while to get the tissue culture project up and running but surely it \( IS_1 \) will have its own lab in full swing at some stage and will be able to meet the growing demand. The National Government through the Finance and Planning Department with support from donors will fund the tissue culture lab.” \( IS_1 \)

The seed tubers supplied by Australian growers are disease free and have proven to be of high quality that due to the strict quarantine protocols. The Sequoia, a good high yielding variety is most commonly used by the farmers. The tubers are stored in well ventilated bags and are not exposed to sunlight, with temperature between 5-18 degrees centigrade. The seed tubers have to be gently handled to avoid bruises.

“The imports are generally of high quality but it is our responsibility to ensure that these quality seeds are made good use of. It is quite a task for the organisation. We make sure that farmers know how to grow quality seeds themselves. This is to revive the industry; the industry has been destroyed by Late Blight.” \( IS_1 \)

The aim of this supplier is not to make money out of the seed sales, but rather to revive and protect the industry. This is done through farmer training and field visits emphasising on growing quality seeds.

“There is not much competition in the business. As a lead government agency, we are trying to revive the potato industry which was destroyed by Potato Late Blight. We sell the tubers at only break even point. We don’t want to be seen to be making profit out of it.” \( IS_1 \)

The input supplier establishes contacts with the overseas suppliers. It provides their suppliers information on their requirements based on the customer’s needs.

“We contact the suppliers through telephone, facsimile or email and get the quotation and make payment through bank cheques, and as soon as they receive it they send the products.” \( IS_1 \)
The customers are supplied with the information on type, availability, price, timing and use of different inputs. This information is disseminated when the small farmers and individuals make their own effort to visit the sales depot, or through other means of communication.

The farmers are expected to meet the seed supplier (IS₁) every week to collect information on potato seeds, and arrangement to have officers to visit their farm for the monitoring for the use of different fertilizers and chemicals.

As it is the main distributor of potato seeds in the country, IS₁ has a close association with the local growers and their overseas suppliers. It works with the farmers and promotes those that are able to use different chemical and fertiliser applications to become certified seed growers. There are many farmers, but only those that are committed and able to meet the requirements are recommended by the IS₁ to become certified growers.

5.2.2.2 Input Supplier Two (IS₂)

This is a privately owned national company that supplies all agricultural supplies including fertilizers, chemicals, and machinery as well as equipment and vegetables seeds. Apart from agricultural supplies, other products the company distributes include freezers, audio visual equipments, electrical appliance, generators and Colman brands as well as hardware products. The supplier has a quarter of its business supplying agricultural products. This means agricultural supplies is not this supplier’s main competency.

IS₂ gets its supplies both locally and overseas. The company places orders every two months, and receives its inbound freight via trucking companies based in Lae. Payment is made through bank cheque. IS₂’s main customers are smallholder farmers and plantations in the region.

The company provides fertilizers and chemicals as well as tools and equipment that are of high quality. It is observed that many farmers choose to come to this input supplier because they think it provides high quality items including vegetable seeds.

With respect to information, the input supplier obtains information from its suppliers while the customers (farmers) discuss their needs with the input supplier. This is done when the farmers visit the supplier from Monday to Saturday. At this point, key information the
farmers need include price, availability and quantity of regular inputs such as fertilisers and chemicals.

This supplier generally has an opportunistic relationship with the smallholder farmers. There are many smallholder farmers who are unable to be monitored, as they come in anytime and buy what they want with no interaction, and come back sometime later to buy more. However, some farmers who are regular customers are contacted when new supplies arrive and given discounts as well.

5.2.2.3 Input Supplier Three (IS3)

This is also a privately owned national company that supplies all agricultural supplies including fertilizers, chemicals, machinery, equipment and vegetables seeds. It largely caters for farming supplies with 65%, but there are other products it provides.

IS3 primarily gets its products from overseas. The shipments arrive on quarterly basis (3-4 months). It hires transport companies based in Lae to transport the consignments to Mt Hagen. Sometimes, there are delays due to poor road conditions.

“The customers are ready every day, but we have to wait for some time before receiving the shipment. We can’t do much, that’s the arrangement at the moment.” IS3

Inputs provided by this supplier are usually of high quality and preferred by almost the entire farming community in the region. Important inputs like fertilizers and chemical serve well not only with potato farming but other vegetable crops as well. Equipment and tools are durable.

Similar to supplier IS2, information is provided to the customers upon request. Key information such as quantity, price and availability or timing of arrival is obtained when customers approach this supplier.

This supplier operates the same way as IS2. While the relationship with its suppliers is through greater understanding and support, there is usually a simple arm’s length relationship with its customers.
5.2.3 Farmer/Marketer

The farmer interviewed for this chain currently produces 120 bags at an average of 90-100 kilograms per bag per season per year (he harvests twice a year). However, he used to produce 500-600 bags before the Potato Late Blight. The high cost of chemicals and cost of labour required to control the disease contributed to the reduction in production. The farmer also produces an average of 15-20 bags of different vegetables each day per season but, this varies over the year.

The farmer buys his potato seeds from the seed supplier (IS₁), and other inputs (chemicals, fertilizers and tool) are bought from other suppliers including IS₂ and IS₃. Seeds are transported using his own truck to the prepared site, the tubers are planted without delay. The IS₁ officers visit the farm 5-6 times per season to inspect the performance of the crop starting from sprouting to flowering stage, and at the time of harvest. Fertilizers such as potato-mix are applied during planting. Sprays are done repeatedly every three to seven days to control PLB. Fungicides such as Copper-Nodox and Kocide are applied with agents such as Eko 720 and Elect 720 to make these fungicides work effectively.

Harvesting takes place after about 15-16 weeks from planting when the stems and leaves dry up and die. After harvest, the potatoes are dried and stored in a cool dry store for at least two weeks as part of the curing process. He then grades them and packs them into bags ready to be sold. The bags with holes are used to provide aeration. It is ensured that potatoes are stored in the storehouse.

The farmer has outbound links with kai bars in town where he sells most of his potatoes, the go to the Mt Hagen urban market. The kai bars are operated both by Asians and local people, and there are about 50 of them in Mt Hagen alone. He also sells his other products in these two market segments. For kai bars, the potatoes are sold in old coffee bags, but are sold loose to the urban market.

After the harvest he approaches the kai bar owners in town. Occasionally when there is a shortage in supply, they contact him if he has some ready. He uses his truck (Nissan-open back) to transport his potatoes and other products to the market. However, sometimes private
trucks are hired when his vehicle has a mechanical fault, is not able to carry large volumes, or for longer distances.

It takes an approximately four to eight weeks from the time of harvest to when the potatoes are handed over to the buyers. However, it varies.

“Yes, it takes sometime, because I have to firstly look for the market, know how much will be sold to each market and arrange transport if I am not using my vehicle. Sometimes I have to leave the potato in the ground and harvest until the market is available.” Farmer

If the farmer is using his own truck or other smaller vehicles, an average of 20-30 bags of potatoes are transported in one trip but with hiring bigger vehicles everything including other vegetables can be transported in one load. The trucks are covered with canvas to protect the potatoes from rain and sunlight. When unloading, potato bags are removed one at a time and two people carry them on their shoulders with much care to avoid any bruises. Casual labours are hired to unload at the point of sale where inspection is done by the shop owners for quality. During unloading it was reported that little damage occurred.

Regarding the proportion of potato sold to each market segment each week, kai bars receive ten bags, and five bags are sold at the urban market. Often bags of potatoes are not sold because there are no secured markets, but it is difficult to get a clear estimate of this, though it appears to be significant.

The kai bars generally require potatoes that are of good shape and with medium to large size but not strict on variety. When the potatoes are brought to the buyers’ yard, a random selection is done to inspect on quality. This is done by the shop owner or employee in front of the farmer.

In the case of open urban market, quality and form becomes a secondary issue as buyers would like to buy at discount price and in large quantity. Also, many of the buyers are low income earners.
Overall, the farmer is satisfied with the products and support he gets from the suppliers, but would like to see more inspections done to his farm especially by ISI. This would help him to control the PBL effectively, thereby would give him good quality potato when harvested.

“I am happy with the input suppliers as they provide quality seeds, fertilizers, chemicals etc. With the seed supplier (IS1), the seeds are Ok, but I am a bit concerned that some times they don’t come to my farm for inspection.” Farmer

Generally, the buyers are satisfied with the farmer’s product, but occasionally they complain of quality. Sometimes, it is not under the farmer’s control, but the inevitable result of searching for better price for his potatoes causes quality to deteriorate.

“Sometimes the shop owners are not satisfied with what I provide because of the deteriorating quality of the potatoes. I take the potatoes around to many shops hoping to fetch a good price. Sometimes I have no choice but to give away at low prices on credit basis, come and pick up the payment after two or three weeks.” Farmer

5.2.4 Buyers

As mentioned above there were two major market segments observed in this chain which include the kai bars and urban municipal market. These markets are based in Mt Hagen, but products can be sent to Lae or Port Moresby if not sold locally.

In the kai bars, the farmer sell potatoes directly while in the urban market, there are several buyers; firstly for home consumption, or sold to other clients such as mine sites, institutions, guest houses and other kai bars and restaurants.

The two kai bars are privately owned and operated by locals. Both rent the buildings in town and employ local staff. The two businesses have their own trucks (open back Mazada ute and a Toyota Dyna) used for their operations.

The kai bars buy potatoes and other vegetables directly from the farmers. The kai bars usually make arrangement with the farmers when approached to buy from them. Kai bars
make potato chips and stew as well as selling whole potatoes. Kai bars try to respond quickly to customer demands.

5.2.4.1 Kai bar A

Kai bar A employs four people. It diverted funds from its bus service business to set up this enterprise. It operates on the edge of the main city centre.

Arrangements are made with the farmers to sell on credit basis and pick up payment after two weeks. If there is insufficient supply from the local contract farmers then the kai bar owner source from urban market. He usually buys six bags of potatoes per week and during peak times like coffee season purchase increases to eight to ten bags per week. There are other kai bars in town which makes it more competitive for his business.

“So many kai bars are operating here; in fact there are about fifty kai bars and restaurants within the vicinity of the town. I started my business in 2004, and realise that there is fierce competition here. I will have to do a lot more in terms of attracting customers to keep my business. One thing clicking in my mind is to provide complements to customers like giving a little bit of salad and may be lower the price a little bit. This incentive will work and will be tried out soon.” Owner and Manager

He has some plans for the future and is keen to see this ideas implemented. This will help him to lift his current status.

“I want to move my location to the centre of the town because I am not doing well at the moment as there are many other kai bars in town and mine is located at the far end. Others sell more than 6 bags of potato per week which is more than I do, so I would like to buy more and sell more than what I am providing now. The other thing is I want to have my own vegetable farm. I know I can do it because I have a big area of land, but firstly I have to move the location of the shop.” Owner and Manager

In terms of logistics, the farmers arrange their own transport and bring their produce to the buyer’s yard. Quality inspection is done upon arrival, and the buyer purchases only the
required quantity. The potatoes are usually packed in 60kg stock feed (white) bags by the farmers.

It takes at least two weeks from the harvest to when the product is handed over to the outlets. However, it varies depending on the availability of transport, price and road conditions, and can take up to more than a month if it is stored in a proper store house.

Measures are taken to control the quality. Potato supplies usually come from different farmers, but are put together and ensured that they are of reasonable quality. The kai bar prefers potatoes that are fully mature and big in size and that they are properly packaged. The chicken stock feed bags are used as packing materials which have holes on sides for aeration, and are found to be suitable.

The farmers are usually advised of requirements of the kai bar when they approach the buyers. This helps in cutting wastage, both for farmer and buyer because only the required amount is brought to the buyer’s yard. The kai bar takes responsibility from the farmers upon payment of product.

In order to maintain condition and avoid damage, the bags of potatoes are put in a room. Advice is given to the farmers not to bring all the produce at once, but supply one at a time only to meet the current requirements. After the potatoes have been bought they have a two to three day shelf life.

“I have to advise them of what my requirements are, they have to supply what I need, and it goes to all the suppliers; this in a way makes it easier for me and themselves as well in terms of controlling quality.” Owner and Manager

There is communication linkage between the kai bar and farmers in the chain. Information on quantity, quality and price are collected from the kai bars by the farmers. The kai bar has its own way of dealing with customer requirements. It focuses on the interest of the customers.

“If I see that the boiled potatoes (whole ones) that go with greens and boiled chicken are selling fast then I concentrate on it until such time when the demand drops and I pick up another style, if I see that the sales for whole fried potato picks up then I
concentrate on it. I just watch the customers and go by their interest, and sometimes I ask them if they like what I provide, most say they are happy.” Owner and Manager

The kai bar and the farmers know each other’s needs, which assist the farmers to liaise and sell their product to the kai bar. The kai bar provides them information on quantity, quality and time for supply. It is aware that different suppliers sell to other buyers. It does not buy much of the product as many other similar shops in the town do.

The kai bar points out that some farmers are more important than the others. These suppliers are on the kai bar’s priority list in terms of providing market and incentives.

“Those suppliers that provide good quality, right quantity and regular supply are very important to me as far as my business is concerned. Sometimes I give them discount. If they make me happy I have to make them happy too. I also have good contacts with suppliers that sell frozen meat and live chickens especially poultry farmers from nearby villages.” Owner and Manager

Although this shop is located at the far end of the town and may be small in operation and its one of the many in the town, it draws a good number of customers every day, partly due to the shop owner’s amicable social network.

5.2.4.2 Kai bar B

Kai bar B employs seven people, most of them are young women. Apart from the Kai bar operations, this business has other investments ranging from real estate to retail shops operations. Other business often subsidise the kai bar.

The kai bar usually buys 12 bags of potato per week from the local farmers and pays them cash on delivery. Sometimes, when there is a short fall in supply, the owner goes to the main urban market and buys there. Other vegetables are usually bought at the main market but he occasionally buys from farmers who bring to him when he needs them. During peak periods like coffee season or election times he needs more supply to meet the high demand, so about 17 bags of potato are bought every week. He feels that he could sell more.
“Yes, I want to acquire two more shops in here, buy and sell more, expanding the business, of course.” **Kai bar Owner**

Since farmers arrange their own transport to take their product to the market, the kai bar only organises itself to sell the product. Other responsibilities including maintaining quality and using own transport to collect other materials and goods. Sometimes they will transport product directly from farms when the supply in the shop is critically low.

There are quality issues faced by this kai bar. Given the continuous supply, the kai bar has a daunting task of maintaining quality at the same time trying to maintain a high turnover of product.

> “On average a quarter of a bag is wasted due to deterioration as I am not able to clear it before the new ones come in. I think this is worse off than the other produce which I normally buy at the urban market every day. I think in order to improve on this, the suppliers have to harvest the potatoes that are fully matured and I guess, we have to sell fast.” **Kai bar Owner**

The flow of information is approximately the as kai bar A. Kai bar B disseminates information on its requirements when requested by the farmers.

The kai bar has its own way of finding out what the customers want. It tries to meet the expectation through providing best service.

> “I think as well as providing quality food, you can see from people who want stay at a comfortable place to enjoy their food. I tend to realise that many people come to my shop because they want to sit down with their families and enjoy their food in a clean and tidy environment, so essentially, people are looking at such things too. Also, many customers say that they like our potato chips.” **Kai bar Owner**

Through an understanding of the kai bar’s needs, the farmers able to provide for their requirements. However, there is no contract agreement as is the case for many other buyers including kai bar A. The kai bar is aware that different farmers sell to other buyers. It gets
more supplies for his shop than many other similar shops in the town due to good price if offers to the farmers.

While the kai bar is not obligated to meet the marketing needs of any supplier, it treats every farmer the same way to keep his business going.

“I don’t rely heavily on one particular supplier because I don’t have full trust for anyone. I have to keep my options open every time; any farmer that comes with the supply at the right time, I just buy them, and also, I don’t promise them anything; but that does not keep them way, they just keep coming to me because I pay them good money.” Kai bar Owner

This kai bar draws good customer turn out as it is located in the heart of the city centre. Many customers are attracted to the good facilities provided and variety of food it provides.

5.2.4.3 Urban Market

There are several buyers from the urban market which include small marketers and household buyers. Small marketers who sell their produce to mine sites buy potatoes in the urban market if they are not able to collect enough supply from their preferred (contract) farmers. Educational institutions usually buy in bulk from the main market for catering for student dining halls.

It is observed at the Mt Hagen urban market that small marketers who usually buy in bulk come to the market early and wait for the supplies to arrive. This is gives them enough time to pack them and transport late in the evening.

It was observed that the urban markets sell considerable quantities of temperate vegetables such as cabbage, sweet potatoes, potatoes, carrots, oranges, tomatoes, broccoli and cauliflower which are mostly grown in the PNG Highlands. Mt Hagen and Goroka urban markets are popular markets in the Highlands region where most of these temperate vegetables are found. These produce are also sold in coastal urban markets such as Lae, Madang and Port Moresby. While non-perishable products such as, sweet potato and potato are transported by road Lae and followed by sea freight to Port Moresby, perishable products such as tomato, broccoli and capsicum are air freighted on passenger flights.
The analysis and conclusion to this informal chain will be presented in Chapter 6, and will be further considered in the final chapter.

5.3 Case 2: Formal Potato Supply Chain - Originates in Western Highlands and ends in Port Moresby

5.3.1 Overall Chain Description

This is a long formal chain, which starts in Mt Hagen and ends in Port Moresby. It comprises of several input suppliers, farmers, wholesaler/marketer and a seed supplier as well as several buyers including supermarkets, hotels and kai bars. This chain is depicted in Figure 2.

There are three input suppliers (IS$_1$, IS$_2$ and IS$_3$), a wholesaler and a (timber marketing) company that imports potato seeds from Australia for some local farmers in this chain. The wholesaler has backwards integrated its operation and provides seeds and extension services for its contract farmers. It was not possible to interview the seed supplier but the other three input suppliers were interviewed for this research.

The two farmers interviewed are from neighbouring villages. They are denoted as farmer 1 ($F_1$) and farmer 2 ($F_2$). $F_1$ is a young and entrepreneurial farmer. Besides potatoes, his other farming activities include coffee and vegetables such as broccoli, capsicum, cabbage, carrot, zucchini and tomato. $F_2$ is middle-aged and can also be described as an entrepreneurial farmer. He has recently gone into the potato business, but he is also an established smallholder coffee producer.

The wholesaler is locally owned. It operates out of Mt Hagen and sells its product mainly in Port Moresby markets, where it also has a depot. One of the owners reports that their business started with potato farming in 1992 and then grew to include the marketing company in 2001.

The wholesaler buys for the smallholder farmers and then operates as a wholesaler, selling the product to market segments in Port Moresby. Its buyers include two supermarkets and a
hotel as well as kai bars. The purpose of investigating this chain was to look at formal markets, so it does not cover the kai bars.

There are two transport companies that play an important logistics role in the transportation of the product from Mt Hagen to Port Moresby. The trucking company is responsible for the Mt Hagen/Lae road movement segment and the shipping company covers the Lae/Port Moresby coastal shipping route.

This Chain is indicated with two diagrams in the following pages. Figure 5.2 represents the formal chain starting from input suppliers to the end consumers, and figure 5.3 shows the product being moved from the PNG highlands to coastal regions of the country using two different modes of transport systems.

There were several people interviewed in the chain. These are a senior seed inspector from IS₁, two agriculture supervisors from IS₂ and IS₃ (the same people that were interviewed for the first chain), two farmers and a person from each of the transport companies. Also, interviewed were the operations manager of the wholesaler, section supervisors for each of the two supermarkets and the purchasing manager for the hotel.
Figure 3  Formal Potato Supply Chain
5.3.2 Input Suppliers

Input Suppliers 1, 2 and 3 (IS₁, IS₂ and IS₃) were covered previously in the informal potato chain. The material presented for that chain is reproduced for this chain. Although this is repetitious, it is necessary to give a full picture of this formal chain.

5.3.2.1 Input Supplier One (IS₁)

This supplier is a state agency which is mandated to provide technical support in the production and marketing of horticultural crops including roots, fruits and vegetables in PNG. The agency is tasked to supply potato seeds to smallholder farmers, a responsibility entrusted to control the Potato Late Blight (PLB) epidemic which broke out in 2003. The organisation ensures that high quality seeds are provided to the smallholder farmers. The agency trains them to become certified seed growers.

The agency gets mini-tubers from a partner government arm, a research institute which imports from Australia and generates at its tissue culture facility in Aiyura. Under the
agreement between the two organisations, IS₁ is to be supplied with 1000 potato plants (Sequoia) every month. Mini-tubers are usually generated from micro tubers developed from tissue culture plantlets. Average size of a single mini-tuber is 10-25 grams. Also, the IS₁ imports directly generation four and five seed tubers from seed growers in Australia and multiply again and distributes to smallholder farmers. It provides seeds to the farmers on quarterly basis. In the highlands region, the Mt Hagen office takes care of farmers from the Western and Southern Highlands and some parts of Simbu provinces. The farmers buy from this supplier in 25 kilograms bags for K75.00 per bag, and arrange own transport for delivery to their farm.

Most seed imports for IS₁ come through the sea transport. The mini-tubers are best transported by air. Trucking companies are hired for transportation from the wharf and stored in hired storage sheds. It takes three months to receive one shipment. In each shipment an average of 50-60 tonnes of seed materials are received.

The organisation, in collaboration with the research institute, has gone into tissue culture project with support from donors. However, due to technical and management inefficiencies, the project has slowed down.

The seed tubers supplied by Australian growers are disease free and have proven to be of high quality that comes with strict quarantine protocols. The Sequoia variety is commonly used by the farmers. The tubers are stored in well ventilated bags with not much exposure to sunlight with temperature between 5-18 degrees centigrade. The seed tubers have to be gently handled to avoid bruises.

The aim of this supplier is not to make money out of the seed sales but would like revive and protect the industry. This is done through farmer training and field visits emphasising on growing quality seeds.

The input supplier establishes contacts with the overseas suppliers. It provides their suppliers information on their requirements basing on the customer needs.

The customers are supplied with the information on type, availability, price, timing and use of different inputs. This information is disseminated when the small farmers and individuals
make their own efforts visiting the sales depot or contacting through other means of communication. The farmers are expected to meet the seed supplier (IS₁) every week to collect information on potato seeds and arrangement to have officers to visit their farm for the monitoring for the use of different fertilizers and chemicals.

As it is a main distributor of potato seeds in the country, IS₁ has a close association with the growers and overseas suppliers. It works with the farmers and promotes those that are able to use different chemical and fertiliser applications and makes them become certified seed growers. There are many farmers, but only those that are committed and able to meet the requirements are only recommended by the IS₁ to become certified growers.

5.3.2.2 Input Supplier Two (IS₂)

This is a nationally owned company that supplies all agricultural supplies including fertilizers, chemicals, and machinery as well as equipment and vegetables seeds. Apart from agricultural supplies, there are other supplies the company distributes which include freezers, audio visual equipment, electrical appliance as well as hardware products. The supplier has a quarter of its business supplying agricultural products. This means agricultural supplies is not the major component of its operation.

The company gets its supplies both locally and overseas. The company places order every two months and receive through transport courtesy of trucking companies based in Lae. Payment is made through bank cheque. The main customers are smallholder farmers and plantations in the region.

The company provides fertilizers and chemicals as well as tools and equipment that are of high quality. It is claimed by the input supplier two that many farmers choose to come to them because they think it provides high quality items including vegetable seeds.

With respect to information, the input supplier obtains information from its suppliers while the customers (farmers) discuss their needs with the input supplier. This is done when the farmers visit the supplier from Monday to Saturday. At this point, key information the farmers need include price, availability and quantity of regular inputs such as fertilisers and chemicals.
This supplier has an opportunistic way of relationship with the smallholder farmers. There are many smallholder farmers who are unable to be monitored, as they come in anytime and buy what they want and go away with no contact and come back sometime later to buy more. However, some farmers who are regular customers are contacted when new supplies arrive and given discounts as well.

5.3.2.3 Input Supplier Three (IS₃)

This is also a nationally owned company that supplies all agricultural supplies including fertilizers, chemicals, machinery, equipment and vegetables seeds. It largely caters for farming supplies with 65% but there are other supplies it provides.

The company gets its supplies overseas. The shipments arrive on quarterly basis (3-4 months). It hires transport companies based in Lae to transport the consignments to Mt Hagen. Sometimes, there are delays due to poor road conditions.

Inputs provided by this supplier are usually of high quality and preferred by almost the entire farming community in the region. Important inputs like fertilizers and chemical serve well not only with potato farming but other vegetable crops as well. Equipment and tools are durable.

Like the above supplier IS₂, information is provided to the customers upon request. Key information such as quantity, price and availability or timing of arrival is obtained when customers approach the supplier.

This supplier operates the same way as IS₂. While the relationship with its suppliers is through greater understanding and support, there is no relationship with its customers.

5.3.2.4 Others

There are other seed suppliers to the farmers such as wholesaler/marketer (WM) and a timber marketing company (TC). WM provides seeds to its contact farmers and this is covered in the next section, while TC imports seeds overseas through its contacts in Australia for a small number of farmers but will not be covered in this discussion as it is not a key
participant. Both companies meet quarantine and other regulatory requirements imposed by the potato industry before supplying potato seeds to the farmers.

5.3.3 Farmers

5.3.3.1 Farmer One (F1)

Farmer one’s village is about 15 minutes drive from Mt Hagen. The farmer owns approximately ten hectares of customary land, part of which is used for farming while another component is not used. About three hectares is used for potato farming. He has an ownership stake in this land since it was actually bought from a tribesman for K15,000 which was witnessed by community and tribal leaders.

He has a new PMV (15 seater bus) which was bought from the income generated from his farming business. It is used to take passengers from Mt Hagen to Lae and Madang and back. The vehicle can be used to come to town to see buyers and to collect input supplies. The farmer has a storage house in the village where he stores all his potatoes that are harvested. This house also used to store other vegetables and inputs.

Family members provide labour for the business. However, he employs seven permanent labours, of which three are males and four females. In addition, he has community support for his projects when needed.

Potatoes account for approximately 30% of his business. That is, out of the two seasons per year, he harvests 400-500 bags of potatoes per season. This means that he supplies about an average of 800-900 bags per year. It is estimated that there are 80 kilograms per bag.

He sells most of his potatoes to a major wholesaler (WM) based in Mt Hagen and rest to kai bars in Mt Hagen. He sells his other produce to another wholesaler, and to the same kai bars in town.

“I sell most of my potatoes to this wholesaler and kai bars in town because they are good buyers. For the kai bars I have never experienced products being neglected. All
are accepted because the sell out is fast due to influx of people from other centres in the region.” Farmer 1

Income from potato growing is approximately between K15,000 and K20,000 per season. This means he makes K30,000 to K40,000 per year. However, it reported that there is slight drop or increase within these ranges. The farmer also stated that he has never experienced a situation where his potatoes have been rejected by kai bars in Mt Hagen. Mt Hagen being the central location for the highlands region and the demand for potato is high.

With input supplies, the farmer gets seeds from a local timber marketing company (TC) and chemicals and fertilizers from IS₂. The seeds are ordered by this company on behalf of several farmers including F₁ within the Mt Hagen area. The arrangement with this timber company is special, based on personal understanding and relationship to support these farmers. F₁ appears to have good public relations skills which have helped him to get support from such companies which do not normally deal with farming supplies. Not only that, but he does not rely too much on main key input suppliers like IS₁ and WM.

Applications of sprays are done every two weeks for rainy seasons and at one week intervals during dry periods. Weeding, covering with soil as well as spraying goes on for nine weeks, and the harvest can be done during the twelfth week.

Post harvest activities include drying, curing, grading, packing and loading on to the truck for transport to the market. The post harvest activities can be done within three weeks, but storage can take about four months before selling it, but he starts selling his potatoes after two weeks from harvesting. During the storage period, the potatoes are allowed to recover from skin brushes and for the skin to be firm and in good condition ready for transporting and marketing.

Transport is arranged by the farmer and he delivers in potatoes to the buyers. However, he does not take the whole harvest in one season to the markets at the same time. The farmer makes weekly sales. He occasionally uses his bus especially not more than ten bags, but most of the time uses hired transport. For WM, payment is made on fortnightly basis to the farmer, but other buyers pay cash on delivery.
When transporting potatoes to market, other products are not taken at the same time. Each crop is sold on a different day depending on the order from different buyers. This arrangement is suitable for the farmer so that he has enough time to market his products.

“The current transport arrangement of my product is the best. I don’t see that there should be things that could be done by others to make easier for the transportation of my product to the buying point.” Farmer 1

The responsibility of the farmer ends as soon as when the product has been unloaded and inspected by the staff of the buyer. Inspection is done at the time of harvest and again when unloading at the buying point.

Quality appears to be important for this farmer. Quality seeds are used with continuous spraying during growth period. When the potatoes are harvested from the farm, it is ensured that the appropriate time is given for drying, grading and packing. Many buyers require potatoes to be in bags and in big sizes with no bruises that will not rot.

“I have been able to meet quality standards, but the initial part of my operation was difficult, I had to collect information regarding their requirements, a bit of a struggle but over time I have managed to overcome it. Now it just goes straight through without having to go through inspection. Inspection may be done by only looking at one or two samples. There are removals or wastage at inspection but very minor, say less than a quarter of one bag full, but generally speaking, there is no wastage. I think the markets are quite satisfied with what I supply, to date I have not heard any complaints from them.” Farmer 1

Information flows from the farmers to the different input suppliers and buyers. The seed supplier understands the needs of the farmer well, and that it communicates regularly. The farmer is aware of when the seeds will arrive and available for pick up. Other technical advice is sought from IS1. However, with other input suppliers, the farmer has to go to their office to find out.
“I have a good understanding with the suppliers. After the buying the inputs from them, I keep on going to them, and they have realised my interest and support me. When they have a new supply they quickly inform me through my cell phone.” Farmer 1

Market information becomes a shared responsibility especially for the WM and farmer. The wholesaler provides the farmer with its requirements and at the same time the farmer collects information on price and quantity, delivery time and other needs.

“It is an everyday business, and we are aware of their requirements and they are aware of our needs. They support us and we support them. Since I have had a good links with the markets, the buyers inform me through phone. Also, we have a close association (keeping in touch every day), so I understand what the requirements and they know my production capacity. It’s kind of every day business.” Farmer 1

The farmer does not have any information on who else supplies to these markets. He knows others do supply but says that there is inconsistency in their supply.

“There may be many other suppliers to these markets, but not as regularly as I do, so I don’t have any information about them. I think I contribute more than the other farmers in terms of supply to the wholesaler.” Farmer 1

The relationship with the markets and suppliers was initiated by the farmer and then built on over the years. It has set the pace for a linkage that would enable easy communication flow.

“My relationship with one wholesaler is a lot closer so I sell most of my product to them. With them, I have a secured market and sell the leftover ones to the other buyers. It is good too because during high or low periods, they still give me same price, and sometimes they give me incentive, a marginal increase to make me happy, you know. It’s a two way thing, isn’t it? I am always there for them, so I guess, I feel I have a special place in their operation.” Farmer 1

While the farmer has the capacity to increase its supply, he thinks that the market can not cater if he wants to sell more. He has the potential with his reserve land to scale up production. Unfortunately it is not currently being used.
"I would like to produce and sell more but due to limited market am not able to sell more. I am looking at opportunities especially obtaining contract agreements.

"I am waiting to hear from buyers only. At the moment I have situation where I can sell just enough to the local markets. If there is new mining or major project going on in the new future I will use my other half of my land to produce more to meet the needs." **Farmer 1**

The farmer has been in business for five years and hopes to keep his business in future despite the competition. However, the competition is not as stiff as it used to be before the PBL.

"Due to high cost of chemicals and fertilizers as well as labour, there is less number of farmers in the market now than before the disease broke out. But there are ways that I want to look at to supply my markets better such as planting crops on time. Timing is very important in production and marketing.

I am highly confident to keep my business but as long as there is constant market it may last for the next 10-20 years.

"At the moment I don’t think anyone could do anything to make marketing easier for me. All is well planned, secured market, good road, effective communication network and transport with support from the family and community." **Farmer 1**

5.3.3.2 Farmer Two (F2)

This farmer has his farm near the Highlands Highway, and is about ten minutes drive into the town. He has approximately five hectares of established coffee trees, and has 3.5 hectares for potato farming out of his 11 hectare of customary land. He uses some portion of the land for other crops for home consumption and occasional sale at nearby urban markets.

He has six full time employees apart from family support, and hires casual labour during high seasons. He allocates most of this labour to work in his coffee enterprise, but now that
he has a potato farm, he would like to redeploy two and employ two more to work on the potato farm in near future. Half of the labour force is female.

The farmer has a permanent home and a vented storage shed made of local bush materials, where he stores all his farm produce. The shed is supplied with electricity and it is close to the main road.

F2 has been in the potato business since 2003. He supplies 300 bags in a season to one major wholesaler in Mt Hagen. That means for the two seasons per year, he supplies 600 bags in total. He is one of the few farmers in the region that has direct contact with a wholesaler and that has a guaranteed market and he is a preferred supplier (contact farmer) to the wholesaler. The income averages between K11,000 to K22,000 per season, and for the whole year, double these figures. During sales in a season there are minor losses (approximately less than one bag of potatoes or less than 0.33%) due to grading, but generally no losses during handling.

F2 collects his potato seeds from either the wholesaler that he sells his potatoes to, or IS1. Other standard inputs are purchased from IS2 and IS3. The wholesaler ensures that the farmer gets the necessary support in terms of transport and technical advice on how to plant, grow and manage the crop and harvest it when fully matured. The farmer thinks that getting support from a local buyer is the best he can get.

“I realised that they were able to support me with seeds and technical knowledge as well as providing market for my product when I first approached them. I decided to stick with them. I want to continue supplying my product to them. The idea of seeking a market to sell bulk of the produce is a daunting task, but I am lucky because they take care of this burden, so why bother looking for markets when they are ready to help you. I don’t face a lot of risk like other farmers do because they want to take their product and sell it at the other centres like Lae, Madang and Port Moresby.” Farmer 2

While he has an intention to continue his business in future, like other farmers, he is concerned with the high cost of chemicals and fertilizers as well as limited market opportunities.
“I have just started this business at a time when many farmers give up due to the PLB, but I find there is reward in it and I won’t give up. But what annoys me is the fact that the chemicals and fertilizers I am buying are quite expensive, also, there should be many marketing opportunities here so that we should have a choice. Maybe in future when I am OK, I should look into seeking other avenues for market but in the meantime am happy with what is offered.” Farmer 2

Transport arrangements are done with the support of the wholesaler. The wholesaler is aware of when the farmer will harvest, which makes a lot easier for both parties to collectively look at addressing the post harvest issues as well as transportation. It takes only two weeks for the farmer to deal with harvesting and post harvest activities before delivering it to the buyer. The buyer negotiates for private vehicles and some times uses the wholesaler’s vehicle (Toyota Land Cruiser) to move the product to the depot from the farmers storage shed. F2 collects his payment after 2-3 weeks from the wholesaler.

Like F1, quality control measures are put in place right from the time when the seeds are taken from the input suppliers, through the growth stage, harvest and to the time of selling to the buyer. Regular application of chemicals (spray), weeding, and harvest at full maturity, followed by post-harvest activities such as drying, grading, packing and storage and using right material for packing are observed. It is ensured that there is careful handling to avoid bruises. With a lot of support from the buyer, the farmer seems to have no problem in controlling quality.

“I don’t have any problem with quality. These people have been quite helpful to me right from the beginning, so I know how to handle it. The seeds they provide are great. They pay regular visit to the farm. You know, it’s their product that am preparing so they make sure all is well.” Farmer 2

While the farmer has a good understanding with the wholesaler, who is its seed supplier that shares information, like other farmers, he has to collect information from other input suppliers and buyers on his needs and their requirements by visiting them.
5.3.4 Wholesaler/Marketer (WM)

This company is a fully integrated operation that supplies seed, grows potatoes (and other vegetables) and markets potatoes. By local standards, the company has significant resources for its operation. It rents a warehouse at the Mt Hagen municipal market which caters for storage, grading, packing and is also used as a buying point. As it is a local company, it has seed houses at the owners’ village which is about 25 kilometres from the town. The enterprise also has a warehouse in Port Moresby that receives supplies that are shipped from Mt Hagen. The company also has two vehicles, a Toyota land cruiser (open back) which is based in Mt Hagen, and a new Toyota Dyna in Port Moresby.

The wholesale company is owned and managed by two brothers who are well educated with the eldest a graduate economist being the General Manager, while the younger brother is the Operations and Marketing manager. They have ten other people working with them at both Mt Hagen and Port Moresby depots. Casual labour is hired from time to time for load and unloads as well as other activities.

The brothers started small with their own funds and sought assistance from banks and also used funds generated from the business. They have been expanding from their initial operation in Mt Hagen to Port Moresby. They rent a kai bar in Mt Hagen, which it sells potato chips and other vegetables that are grown in the company farms.

The wholesaler is the main supplier and potato grower in Papua New Guinea. They also buy from contact farmers (their preferred suppliers) and others within the province and parts of some highlands provinces. They also provide technical advice to their contact farmers.

“We are holding the market and controlling the seed production in PNG. We are mother seed growers in the country and therefore, we are the recognised seed potato grower and suppliers.” Operations and Marketing Manager

The company also grows other vegetables such sweet potato (kaukau), broccoli, zucchini, carrot, english cabbage. Except for kaukau these vegetables are sold at the local Mt Hagen urban market. Kaukau accompanies potatoes to Moresby markets and are usually sold in urban markets in bulk and in kai bars. However, potato makes up 95% of their business. The
company sends about 100 bags (60 kg per bag) of potato in a 20 foot dry container per fortnight or 12 tonne per month by a hired trucking company to Lae, then transhipped to Port Moresby via coastal shipping. This appears to make up just over half their sales by volume. However, this quantity varies during the year.

Since the buying point in Mt Hagen (located within the perimeters of urban municipal market) is at the depot/shed, it is convenient for unloading and storage as well as transportation. As the trucks bring in potatoes from farmers, company employees, with the support of the farmers, do the unloading. Two people hold on each end of the bag, or one person carries a bag on their shoulders, and lines them up at the shed. After the unloading other activities proceed as described below.

“We have to unpack, cure, grade and repack them into sack bags. The coffee bags are used to allow air circulation and keep them in good condition, and these bags are readily available.” When packing them, we either put them in 60 or 80 kg bags.”

Operations and Marketing Manager

In terms of product supply, about 375 bags (22.5 tonnes) of potato are supplied by different farmers per month. Individual farmers can supply 20-30 bags to the marketer per day. Suppliers that are loyal to the wholesaler get the best treatment from the marketer.

“We give special prices to special customers, for example 10 to 50 toea [cents] extra. When supply decrease and they have supply at the time, we offer special prices to them. This is the hidden price which is above the set price, but with no protection and fierce market competition, sometimes there are dramatic falls in the price and that we do not do well. Other times we can do well. All depends on the market forces.”

Operations and Marketing Manager

Contact with suppliers is through advertisements (notice, radio, friends and tribal lines) and farmers approach the marketer. However, farmers can be quite demanding when they realise that the marketer is running low in supply and is looking for the farmers.

“The farmers are clever and picky at times, they try to increase the price when buyers go look for them. That’s when there is a decrease in supply; that’s a good time for
farmers to look for better price and is the only time when they will sell to others; we know who these other buyers are, otherwise, most of the time they sell to us.”

Operations and Marketing Manager

Farmers are provided with the basic product requirements of the company and they have to meet these requirements. As the depot is located at the Mt Hagen urban market, many farmers have easy access to the information. Some farmers are more important to the wholesalers than the other farmers. These are mainly the contract farmers. These are preferred farmers that the wholesaler is closely associated with and from whom he gets most of his supplies.

“Our contract farmers supply constantly with good quality and they are important to us as they are more experienced and reliable. Many are from the neighbouring village and from my clan so they feel it’s better to sell to me than other buyers.” Operations and marketing manager

Cultural links are important part of this supply chain. Many preferred (contract) farmers come from the same clan and tribe to that of the owners of the company. The clan provides support and ensures that the enterprise grows because of the benefits they get from the company. The company in turn provides income generating opportunities through providing marketing opportunity for farmers and at the same time its owners’ contribute to the well being of the community in terms of participating in social obligations as well as church activities.

For transporting the product to Port Moresby, arrangements are made with private trucking companies that operate in Mt Hagen and shipping agents in Lae. It is their schedules that the wholesaler has to follow. The wholesaler has a responsibility to find out from transport and shipping companies what their schedules are. The marketer has to confirm the dates and make bookings. The wholesaler notes that it is not possible to get insurance cover, which exposes them to risk.

“The transport companies have been very supportive of our products, we pay them and they are always willing to transport our products to Lae and Port Moresby. Currently we have a shipment per fortnight. I think the most important thing is for our products
to arrive at the final destination on time; we need to observe the trucking and shipping schedules and follow their programme. This I think is the most challenging part and we take a lot of risks as there is no insurance cover.” Operations and Marketing Manager

The trucks leave Mt Hagen in the evenings and arrive in the early hours of the next day in Lae just in time for the afternoon ships. This is the situation if there is no hold up from the poor road conditions or bandits. Occasionally, freight carriers or bus service with passengers travelling along the Highlands Highway are held up by armed gangs, who can steal their goods and properties. It can take up to two days or more for the consignment to reach Lae and be loaded onto the ship. The potatoes are not unloaded from the container with the same full container going through to Port Moresby. It takes about 3 to 4 days, going through two other ports before reaching the final destination in Port Moresby.

Once the consignment arrives at the Port Moresby wharf, clearance has to be done by the wharf authorities. Generally, there are no difficulties in clearing the consignment from the wharf authorities. The full containers are moved to the yard (warehouse) with transport from trucking companies, but, if the load is half full, the company truck (a new Toyota Dyna) is used. It takes at least ten hours to transport the product from the wharf to warehouse, and another day to supply to the markets. To make it easier and save time, fork lifts are used if possible to get the load off the trucks. When loading into the market, it is done manually.

Quantity supplied and the time for supply depends on how much each market segment needs. The markets that need urgent supply, and those with large quantity are sorted out first. Buyers from each market segment have to inspect the potatoes before agreeing to pay. After they have been delivered to the buyers, it is no longer the responsibility of the wholesaler.

It was observed by the wholesaler that about two to three bags of potato are wasted during loads in Port Moresby due to careless handling, and also by transporting the product around quite often in the humid weather when not quite sure of how much the lower market segments such as kai bars are going to buy. If they decide to get less than previously agreed, this may cause loss of some potatoes.

As this is a physically long chain, starting from the western end of the mainland PNG to the southeast coast by road transport and moving on to southern part of the country through
coastal shipping under uncertain conditions, it could be difficult to maintain quality and consistency of the product. However, it was reported that the marketer, who was the leader meets this challenge but recognises the need to maintain quality in order to control the market.

Quality control measures begin with farmers during the time of harvest, and continue right through to the time of sale to the final consumers. The company has responsibility in educating its preferred farmers on quality issues as part of its training programme. Training includes storage, curing, grading, packing and loading as well as unloading from trucks.

When they are brought from the farms, the potato bags are opened and potatoes piled on the concrete floor in the warehouse to be repacked after grading has been done. Supplies from different farmers are mixed after inspection. It is ensured that the place for storage is dry and, as much as possible, isolated from direct sunlight or heat. If exposed to the light potatoes will turn a greenish colour and lose quality and may become poisonous for consumption.

The customers do an assessment of quality to ensure that it meets their requirements. When the product is delivered to the customers’ yard, they inspect them by opening the bags, but sometimes they only look at samples. Most customers prefer medium and large sizes in bags with good, round shapes that have no bruises.

When packed into the truck, bags are lined in rows, one on top of the other until about 280 bags (each bag weighs 60kg) can fill a container (20ft). It is ensured that the bags are tightly packed because if packed loosely, it would cause bruises during transportation. Without any unloading at Lae wharf, the same container load goes through to Port Moresby. When ferried, the vented containers in cargo chambers are not exposed to sun and bad weather.

The major logistics concern is the bad road condition of the Highlands Highway where pot holes and landslides can occur, and these have been quite frequent in the region for the last few years. Although this can cause bruises, most of the time the consignment arrives safely at the Lae wharf.

The market segments that the wholesaler sells to range from top to lower commodity segments, with top segments such as supermarkets (Supermarket A and Supermarket B) and
a hotel, buying less quantity but paying at high prices, while the lower segment buys more but pays lower prices. On average the weekly sales include supermarket B with 600 kilograms (10 bags), supermarket A 250 kilograms (4 bags), and a hotel that receives 350 kilograms (6 bags). These upper end segments accounted for approximately 40% of the potato sales to Port Moresby. However, end segments, such as kai bars take the remainder.

The market demand is monitored to ensure that what is available for sale can be sold before getting new supplies. This helps the wholesaler to rationalise its costs and minimise wastage of product. However, it was observed that it is difficult to forecast due to uncertainty in some market segments.

“We have to clear the stock before buying new ones. If what we have in Port Moresby sells fast then we have to buy quickly but if not, we can’t buy more in Hagen. So we have to be observant and monitor the market situation closely. This is really a challenging job for us given unpredictable market situation. You need to plan, coordinate sell and move the stock on time.” Operations and Marketing Manager

With the customers, the marketer contacts them through telephone or facsimile or visit to their premises enquiring about their needs. Buyers, however, at times contact the marketer when they are short of supply. Buyers place order and delivery is done by the marketer. They have a good understanding between each other due to regular contact. The company is also aware of its competitors and knows how much it supplies compared to these others supplies to the same markets.

“We sell more than them. But they may have hidden or specialist markets we do not know, and I am sure each of the market that we supply is happy with what we offer.” Operations and Marketing Manager

However, the demand from kai bars, especially the Asian owned ones, can be unpredictable at times. It was reported that the wholesaler is not informed of their requirements until the last minute, which can create problems. It was reported that the Asian kai bar owners act in this manner to get the best deal for the price of potatoes. However, nationally owned kai bars seem to have better communication links as they inform the wholesalers of their requirements in advance.
“Some of these operators are cunning. They don’t want to let you know of their requirements first, even if they have few in stock. They would like to hold on until you make a call. That’s when they will bargain hard so we could sell cheaply to them. Man, you will really have to know how to bargain with them, they know it all well, but you know, sometimes I make them fall into my trap (laughter). I don’t call them first, even I have supplies waiting. You know, you have to be very smart to deal with these people, they know their stuff well.” Operations and Marketing Manager

Because they are competing with imports and local suppliers for the top market segments, certain measures are taken to attract customers, and at the same time out competing small local suppliers. This means the wholesaler lowers the price which is a risky move but is good in the long run.

“We sometimes deliberately lower the price of potato to attract all customers from buying imported ones. By doing this we make losses in the short term, but in the long run we know that we will make more. Small suppliers that compete with us are suppressed and that they can’t survive. However, we can’t go down too low, for example below K1.00 because the farmers can’t survive. Other competitors even find it hard to come down to this level. That’s how we control the market and keep our business going.” Operations and Marketing Manager

Before the PLB, the supply was at four full containers carrying 1120 bags of potatoes or 68 tonnes per shipment to Moresby per fortnight. When the disease struck supply reduced dramatically and sales did not reach targets, which far exceeds the 100 bags per fortnight that is currently shipped. This is approximately 90% of supply.

“Sales reduced to almost nothing, no container was shipped to Moresby as there was no supply of seeds at the time. With import of seeds from Australia, things started to pick up but not at a higher scale as we used to enjoy.” Operations and Marketing Manager

Although, volume has increased from the low point during the height of the PLB problems, the wholesaler/marketer still experiences problems associated with supply availability. When supply falls, sales targets cannot be met and the business makes losses.
“There are losses recorded when sales are not on target and I can say it is a complicated business. It depends on how fast we move the potato from Mt Hagen to Port Moresby but sometimes by just supplying only 20-30 bags per container it chews up all our profits.” Operations and Marketing Manager

Despite enduring the difficult environment, the WM is content with the supply to its markets. The Operations and Marketing manager suggests that it would be much better if small farmers stopped becoming marketers themselves. He argues that instead they should leave it with the marketers and concentrate on production.

“So far so good, the best we can supply at the moment; we always supply good quality, so that we can continue to do so but it would be appropriate if we were the only marketer. We do not want to operate like it is practiced in the developed nations where every farmer wants to be a marketer. It causes disturbance, waste of time, lose of income, losing interest and importantly weakening the industry.” Operations and Marketing Manager

The owners of the business think that potato farming is quite important to them as it contributes most of the revenue than other products. In addition, they argue that it contributes to making people self reliant and meeting their needs.

“Potato business is more profitable than others, that’s why we grow potatoes. We saw there was a potential in growing potato and realised that the market for potato was good. It is also easy to grow all year round. It makes ordinary farmers or villagers to support their livelihoods, makes lazy people to work hard, turns unproductive people to become productive and become shelf-reliant and able to meet family and community needs. A rascal [a youth troublemaker and or criminal] on the streets goes into potato farming finds twelve hours is not sufficient for him. It is a worthwhile business.” Operations and Marketing Manager

With fifteen years of potato farming and marketing experience, the company is confident of keeping its business in future. There are other future plans and visions for the business and the potato industry as revealed by the owners:
“We always believe in ourselves, we are hard workers, so we are confident of keeping our business in future. We want to know more about tissue culture aspects of potato farming, and we want to know more about processing potato into fine products, example crisps and so forth, but we have disturbances in the market by small growers. As there is no protection, anybody can go in.

There should be more awareness done to educate farmers on how to grow and sell potato. There should be book keeping course that should complement their efforts. Time is a critical commodity that should be well managed so that farmers can be productive. This will enable them to produce continuously and sell to us. We make sure that they don’t end up with break even but at least get a profit margin for their efforts. Therefore, we would like to see the potato industry in the country improved at the same time farmers make a living out of it.” Operations and Marketing Manager

5.3.5 Transport

There were two transport companies responsible for this chain, one being a trucking business and the other operating cargo and passenger shipping.

5.3.5.1 Trucking company (T1)

This is a small business with only a few trucks compared to the seven other trucking companies in the region. They own a depot in Mt Hagen which is their base. They have a total of 25 staff, with the management consisting of depot manager assisted by his deputy and workshop manager. The business is facing strong competition from other bigger trucking companies despite having been in the business for over 30 years.

This company charges different rates for different clients. For smallholders/marketers they charge a flat rate of K11 per bag for all types of produce including potato. However, it was stated that due to the deteriorating road condition the rate will increase in the not too distant future. Regardless of whether or not the container is full, the rates remain the same as charges made on a per bag basis. Rates for other items are at K195 per tonne. The proportion
of business coming from smallholder/marketers is very small compared to other major clients in merchandizing and grocery services.

With regard to scheduling, the truck has a regular schedule which mainly serves the Mt Hagen, Chimbu, Goroka and Lae routes. Their schedule is permanent and clients have to fit in with. The daily trips make it convenient for the clients to meet their transport needs, and the schedule is reasonably reliable.

There are two main types of containers used. The dry standard containers (20ft) are used for vegetables especially potato, kaukau and cabbage. Freezer containers are used to load frozen products. These containers are not owned by the trucking companies but by agents, and are carried by the trucking company.

Sometimes there are full container loads, but not at other times. Some marketers, especially leading potato dealers, use full containers. The truck with an empty dry container is taken to the yard of the marketer for loading, which takes a day. The load is transported to Lae very early next day. It was observed that the depot for WM is built with concrete slab that is about one and half meters, which high makes it easy to move the potatoes from the shed to the container. For smallholder farmers, the product is brought to the depot and they load them on to the container and ensure that all is intact.

The trucking company can take between 10-200 bags, but small farmers do not come regularly. The company has no rules on quantity and type of produce and so small farmers can come with any produce.

“The marketers or farmers have the responsibility of packing and loading their produce nicely and make sure that it’s safe. We are not responsible for any damage and they know that well. I must say that there is much risk involved in it. You know, there is no insurance cover for the product, but clients just hope that all is well during the movement; but I’m happy that there has not been a big problem yet.” Assistant Depot Manager (T1)

It was revealed that potato wholesaler (WM) is the most reliable business. Other smallholder farmers are not reliable as they do not supply constantly with large volumes.
5.3.5.2 Shipping Company (T2)

This shipping company is the largest coastal (locally owned) shipping in company PNG. It has branches in the main ports and agents in small ports. The company has eight vessels and has its headquarters in Lae. It is estimated that 3,000 people are employed, which include crews, stevedoring workers, office staff and management.

Even though there are six competitors, three that operate locally and another three that operate internationally, the company is the market leader. It has been in operation for over 30 years and is highly confident of keeping its business in future.

Different ports have different rates depending on cargo and whether it is a chiller or dry container. A chiller container from Lae to Port Moresby is K151 per tonne including wharf charges, handling and other charges. However, a dry container is a bit less than this. If less than a tonne is shipped, a minimum rate which is less than K151 is given.

There is a weekly schedule to all parts of PNG and a monthly service overseas. However, there are difficulties faced especially at the wharf when many other ships berthing at the wharf at the same time. The berthing space is very limited and can cater for only few ships. As a result, sometimes it affects schedules.

At the end of weekdays (Thursday and Friday) the southern ports are serviced which include Oro Bay in Oro Province, Alotau in Milne Bay Province and Port Moresby in the National Capital District. Clients go to the main office or ring to find out about the schedules and make arrangement for the shipment of their products.

“Most of the clients are reliable because they come with their produce on time and bring what they have told us. When they bring the produce to our yard, we only arrange everything for them at the Lae main wharf.” Shipping Operations Clerk (T2)

Different containers are used depending on the type of produce. Vegetables such as greens, carrots, melon, capsicum, cabbage and broccoli are packed in chiller containers that control temperature to certain levels. Dry and vented (cuts on the sides) containers are used for potato and kaukau. Most of the time containers are filled to capacity but on a few occasions,
half-full containers are sent. Even if the container is not full, no charges are made for the space available, but instead, other clients can fill up the remaining space.

“Many customers come with produce in bulk and can take up the whole space in a container. A few clients can fill their produce in one single container with labels of their produce on them. The tally clerk takes note of how many bags of produce of each client in one container. It is well monitored and carefully controlled.” *Shipping Operations Clerk (T2)*

There is no criteria set that restricts carrying some produce. All produce are allowed but will have to follow the shipping schedules.

“As long as produce arrive on time, we are always willing to transport them to the next port. We don’t want to put a barrier to anyone trying to transport anything.” *Shipping Operations Clerk*

It is the responsibility of the clients to do the loading and unloading of the produce. Usually, casual labour is organised by the client to load the produce into the container. The client has to pay for the labour costs. However, the shipping company uses its cranes or ship derricks to take on board the full container. It was reported that there is not much damage due to the impact.

The shipping company is responsible for the condition of the cargo from one point to the next under certain conditions. These conditions include delays in ship schedules, theft after product has been loaded on to the container, fire, not properly cooled and ship perils at sea. Each consignment is insured by the shipping company after the freight charges have been paid by the clients.

**5.3.6 Buyers**

The wholesaler/marketer, who is the chain leader in this chain, operates in several market segments, ranging from top-end segments to the middle-end segments. The top-end ones are supermarkets and hotels while the middle-end segments are kai bars. The markets are all in Port Moresby.
Because the purpose of this research was to investigate top-end segments, the kai bars were not interviewed. While it could be argued that it would have been useful to interview buyers in this segment to provide a comparison with the informal potato chain, this was not possible in the time available for field work.

5.3.6.1 Supermarket A (SA)

This is a well established supermarket with branches in some of the major centres in PNG. It is a retailer that has several departments including fresh vegetables and others such as groceries, butchery and freezer, liquor, bakery, mini postal service, stationary, internet café and coffee shop. Fresh produce makes up about 25% of the business sales while other categories make up the remaining 75% of sales.

With regard to potatoes, the supermarket buys from local marketers each week. The supermarket contacts its suppliers through telephone conversation or facsimile or even meeting in person, and explains their requirements to them. The marketers do the delivery using their own or hired trucks. The local potatoes come from the Highlands especially in the Eastern and Western Highlands Provinces through different sources.

When supplies are brought in, inspection is done on quality and then weighed, before raising a cheque for payment. The product is put straight into the storage room before putting them out on to the shelves. On the shelves, the local section is labelled differently to that of imported ones, which gives the people a choice.

The product has an average shelf life of one week. However, the supermarket reports that there is wastage within a week due mainly to the handling of product during its long movement from the Highlands.

“The suppliers are to be blamed for the wastage, as they don’t maintain the quality. When they bring in the product, there are already deteriorating ones in it that can’t enjoy a longer shelf life. We do have cooling facilities though, but because of poor quality before coming in, the product can’t be kept long in here.” Supervisor-Fruit and Vegetable Department
An average volume of 3,000 - 4,000 kilograms of potatoes in total is sold every week. At the time of the interview, it was sold for K8.99 per kilogram for imports and K4.70 per kilogram for the locally produced potatoes. About 120 kilograms of potatoes from the weekly sales are not cleared, which are then sold the following week on special price. It was reported that wastage is at an average of 10-15 kilograms per week.

The supermarket was not aware of the volume of potatoes sold by other sellers in the Port Moresby market place. It reported that the customers are satisfied with what is provided due mainly to high quality of the product and product arrangement on the shelves, especially locally grown potatoes being displayed separately from the imported ones.

SA attracts many expatriates and local professionals as well as ordinary people. Also, mining and construction companies as well as hoteliers sometimes buy from the supermarket. However, these organisations do not have any form of contract with SA.

With well over 20 years of operation, the company is confident of maintaining its business in future.

5.3.6.2 Supermarket B (SB)

Supermarket B is equally well established and is has only one branch in Port Moresby. It has similar departments as SA, but no internet café. About 40% of the proportion of the sales is fresh produce. The supermarket reported that much of the fresh produce is imported, especially from Australia and New Zealand, but did not give an actual figure. The fresh produce business section is seen as important part of the whole operation.

“Fresh produce business with the supermarket is an integral part of the operation. We ensure that it is fully stocked all the time. We have a good mixture of both imports and local produce.” Supervisor - Produce Section

Like SA, local marketers supply their produce, including potatoes using their own transport. Orders are placed every week and suppliers have to do the delivery at the buyers’ storage yard. The supermarket is only concerned about the timely arrival of the supplies especially from the locals. It is not concerned about how the marketers or farmers organise and
coordinate transportation of the product from the Highlands to their doorstep in Port Moresby.

After the inspection has been done, the product supplies are brought into the cooler. Supplies from different sources are mixed together and packed into trays. However, when put on the shelves, like SA, local supplies are labelled differently to imported ones.

The buyer knows that its different suppliers sell the same product to the other market outlets, but is not sure how much each of these outlets buys from their suppliers.

“There are so many other buyers in the market. I don’t have any idea how much we buy; maybe less maybe more than others, but what they supply is generally good.”

Supervisor - Produce Section

SB has an open door policy. This means it does not favour any one supplier regardless of size or capability. It buys from any supplier that meets its requirements. The supermarket does not have preferred suppliers because of concerns about continuity of supply. The company feels it is important to maintain this strategy, as it serves higher level clientele, and so continuity of supply is very important to them.

“We don’t focus on one or few suppliers. Any supplier sells to us as long as they meet our requirements. We keep our doors open for everyone to sell their product.

“Many local farmers especially in the Highlands come direct to us, sell their produce and get good price directly instead of selling to wholesalers or marketers. Many come with good quality produce.

“The small farmers tell us that the marketers pay them less. These farmers come to Port Moresby and do the survey and look out for marketing opportunities. We realise that since all these farmers wanting to sell their produce to us, in the process some have to miss out because we can only afford to buy what we need at any one time, but that’s how we operate.”
“The reason why we don’t stick to one particular supplier is that we don’t believe that there will be continuity in supply. This is also the reason why we import potato overseas, you know, we have customers who are expatriates and professionals and many working class people, so as a business, we got to make sure that everything is available every time.” 

Supervisor - Produce Section

While it is difficult to determine how much revenue from fresh produce comes from this product, at the time of interview, potatoes were sold at K 8.75 per kilogram for imports and K4.50 per kilogram for the local supply. SB sells an average of 3,500-4,500 kilograms of potatoes including both imports and local potatoes per week. The company would like to sell more of this product as it is significant portion for the produce section.

The product has an average shelf life of one week. The supermarket noted that there is obviously less sold than what is bought, and noted that sometimes, when there is slow sales, old stocks are not cleared when the new ones arrive which can contribute to wastage.

The customers’ requirements are observed through the supermarket choosing the quality aspects of the product. For example, they look for product that is fresh with no damage or bruises and with medium to large sizes. The supermarket says that it attracts customers primarily through its good security service and friendly staff and, most importantly, high quality products to which many people are attracted.

Customers’ needs and problems are addressed through providing an inquiry section where those who are not happy about the product can lodge their quires. These comments help the management to address customer needs.

“Comments and criticisms that we get from our customers are much appreciated. These are important as it helps to addressing customer needs. “Customer satisfaction is the key thing. We make sure that they get the good quality. We want to maintain that.”

Supervisor - Produce Section

The supermarket knows its customers shop for the same product elsewhere. It thinks that they sell more than other buyers. SB has been in operation for about seven years and would like to continue in future. One of its future plans is to expand and dominate the market in PNG.
5.3.6.3 Hotel

This is a five star hotel in the country that has all modern facilities and adequately staffed. It is part of a multinational hotel group that attracts the elite people. The hotel provides accommodation, functions and banqueting, food and beverages as well as security services.

The hotel obtains most of its produce locally, including potatoes, which usually come from Goroka and Mt Hagen. It receives 3 bags of potato every week but sometimes this increases as business increases.

While buying regularly from marketers, occasionally the hotel buys directly from local farmers when they bring the supplies to the premises. This happens when product is of high quality, and at the same time when there is demand.

The hotel looks for potatoes that are medium to larger sizes that are fully mature and have good shelf life. The same product attributes are expected from different suppliers. The company would like to see continuity in quality and timing of supply.

The product has an average shelf life for two days before going into the menu/kitchen, but can take up to a maximum of one week. There is wastage of other products in a week, but generally no wastage for potato. However, it was observed that the wastage for potato is usually part of the prepared meal, which may account for less than one percent.

“Sometimes when the quality goes bad, we just record them and chuck them into the bin. We don’t measure them though.” Purchasing Officer

With the regular suppliers, hotel keeps them informed of their requirements. Since all the marketers are based in Port Moresby, it is easy to contact them.

“We call them up and ask if they have the required products, write a purchase order. Sometimes send email or fax asking for quotation, and sometimes they come to use with new products. They leave samples with us.” Purchasing Officer
Some suppliers are more important to the hotel than others. This means there are different prices and/or buying policies from different suppliers. The average buying price is K3.00 per kilogram, and there are standard payment procedures.

“Surely, we have standing orders with certain suppliers. This means that it remains steady despite the changes in the process. For example, we have a good business relationship with SA (named) because they are good operators themselves and they understand us well. We pay cash on delivery or purchase first and supply later.”   

Purchasing Officer

There is no difference in the way that buying prices are set for this product to the way prices are set for the other fresh produce that the company buys. When setting the buying price, the standard price list is used to set the price for different products including potato. The important aspects considered in setting the buying price include costs, mark-up and profit margin.

“There is no difference. During the dry season when the supply is low suppliers come up with their own price, which we have no choice but to have to buy.” Purchasing Officer

The normal way of buying from the suppliers is that the hotel places an order and the marketers bring the product to its premises. The cut-off time is 11 am, Monday, Wednesday and Friday. However, a very few suppliers that are regarded as business partners can deliver at 3pm on these days. There are no formal contracts with any suppliers. However, they operate on “open orders” only.

The hotel knows its different suppliers sell to other buyers. However, it does not know how much it buys from these suppliers compared to these other buyers because there are many buyers in market.

The hotel is quite satisfied with general quality of the product but from time to time there are a few quality problems. It was reported that there some things others could do to make it easier for itself to do the buying of this product easier. These are generally related to quality.
With regard to the customers, the hotel receives professionals, business executives, long staying clients and corporate groups who want to use the facilities for functions. These customers are informed through newspaper advertisements, TV and Radio commercials as well as flyers usually put outside the foyer and lift.

“Most of these customers want to enjoy high quality products. They want to get their money’s worth of services, so we offer different ranges of quality and people have to make their choice. Many customers are satisfied with our products. We have not received any complaint yet from a customer yet. So far so good.” Purchasing Officer

With 30 years of business, the hotelier is highly confident of keeping its business in the future. The company is mindful of the fact that there are other similar businesses in the market and would like to consolidate its position to continue its leadership.

The detailed analysis and a conclusion to this formal chain will be presented in next chapter. The implications will be considered in the discussion and conclusion chapter.
Chapter 6  Analysis

6.1  Introduction

The previous chapter looked at two potato supply chains, and described them by using key supply chain functions to detail how farmers, marketers, input suppliers and transport operators organise themselves to link up with different market segments. In this chapter, a set of performance dimensions will be used to analyse the performance of the chain. The objective of this chain assessment will be to determine its effectiveness.

The chain will be evaluated under the following performance indicators.

Resources

Availability of Inputs

Logistics

Quality

Information

Relationships

Advantages and impediments in the chain will be discussed according to these dimensions.

There are four sections in this chapter. Section 6.1 presents Case One. Section 2 covers Case Two followed by section 6.3 which looks at comparisons between the two chains. These three sections are discussed in line with the performance dimensions as sub-sections. This chapter concludes with comparisons between chain chains of their overall effectiveness.
6.2 Analysis of Case 1: Informal Potato Chain

6.2.1 Chain Resources

In general, there appears to be adequate resources at various levels across the chain that keeps each participant operational. These resources include capital investments, land, labour, buildings, vehicle and other facilities and equipment. However, there are some problems with resources at different levels in the chain.

Buyers, especially kai bars, have the capacity to draw on resources to keep their operations going. They have other investments that generate capital which can be used in this business. The resources of the urban market are also good with a newly built urban market increasing opportunities for farmers.

However, there are resource inadequacies that seem to be impeding the effectiveness of the chain. It was observed that the farmer did not have a reliable vehicle. Sometimes he had to hire a vehicle in order to transport the potatoes to the market and his aging vehicle was unreliable.

There also appear to be organisational problems in IS1 with seed supplies especially with tissue culture. IS1 does not have a tissue culture laboratory and relies on other organisations, which contributes partly to a delay in seed supply to the farmers. Therefore, IS1 does not fully meet the needs of the farmers in this regard.

It was also pointed out that the IS1 does not provide enough advisory field visits to the farms. There does not seem to be adequate staffing in IS1 to support their operations in dealing with inputs and technical advice and extension for the farmers. As a result the control of PBL was perceived to be less effective than it could be by the interviewed farmer. Kai bar A indicated that it has plans to use its available land to grow and supply own potato and other vegetables. If this happens, the business will be vertically integrated.
6.2.2 Availability of Inputs

Potato seeds, a key input, are sometimes not available when required. Generating mini-tubers through tissue culture and multiplication of seed tubers takes considerable amount of time before seeds can be freely given out to farmers. Another complicating factor is the seasonality in Australia where potatoes are supplied on quarterly basis. These problems with the availability of a key input, seed, can cause the farmers to delay their planting programs.

Other input supplies, such as fertilizers and chemicals, seem to be readily available due to sourcing the supplies both locally and overseas. Sometimes IS2 experiences problems getting inputs up from Lae, and likewise IS3 experiences some problems due to transportation.

Generally, however, the availability of the inputs seems satisfactory in this chain.

6.2.3 Logistics

Given the short distance from the farmer’s village to the markets in town, coupled with a product that is less perishable and targeting the lower end market segment, there are not many logistics issues. However, the unreliable vehicle of the farmer means he may not be able to transport product in a timely manner.

As noted in 5.3 poor infrastructures, especially roads, means there may be delays with customers getting inputs in a timely manner. The Highlands Highway is in a very poor condition, and so this impedes logistics.

Since buyers have their own vehicles, they can transport product from the urban market to the shops, which support their operations well. Also, they are able to meet with smallholder farmers and other local input suppliers daily operating within the town.

6.2.4 Quality

All input supplies received both externally and locally appear to be of acceptable quality.

The potato seeds specifically adhere to strict quarantine protocols supported by careful handling during transportation.

Farmers seem to do well with post harvest activities such as drying, grading, storage and packing, loading and unloading as well as avoiding bruises when handling. Potato is also a
less perishable product and this chain is targeted to a lower market segment, which makes quality issues manageable. Buyers can also select from a number of farmers which makes it easier to maintain quality.

However, there are some areas that are of concern. It was observed that while good quality seeds are received by the farmers, they are worried that there was lack of regular inspection on their farms by IS1 during growth period and harvest times. Since the mother seed growers and certified seed growers are key people responsible in generating and/or multiplying seeds for other farmers, these farmers require good support in terms of advice on quality control.

Kai bars report reasonably significant losses of potato stock. This is not clear whether it is because their storage facilities are inadequate, or the potatoes do not have a good shelf life for agronomic reasons or transport reasons. There seems to be little shelf life left by the time the kai bars get the potatoes, which makes it difficult to manage this with unpredictable demand.

Farmers can also face the dilemma of seeing their product deteriorate when they are not able to secure markets in a timely manner. As a result, sometimes they are forced to leave their potatoes in the ground until markets can be secured.

6.2.5 Information

Input suppliers have a good communication link with their suppliers both overseas and locally, especially for IS2. However, information links between input supplies and farmers are not so strong.

While IS1 has a responsibility to provide technical advice to the farmers, the other two release information when farmers enquire at their sales depot or when they are in town. This sometimes results in farmers not being up to date with latest information. The farmer interviewed noted that technical information on how to effectively control PLB was not available to many farmers. Therefore, the information flows between input suppliers and farmers is not particularly strong.
At the market end, some kai bars seem to have good strong information flows with their preferred suppliers, whereas others do not rely on any particular supplier, and so information flows between them and their farmer suppliers are not strong.

The key information issue at the market end of this chain relates to the unpredictability of market demand. Because kai bars find it difficult to predict market demand, it is then difficult for this market information to flow back up the chain.

6.2.6 Relationships

There are strong relationships between input suppliers and their own suppliers, which appear to have been built over many years. While the relationship with their suppliers is relatively stable, input suppliers, especially IS2 and IS3, have more opportunistic relationships with their farmers. IS1 tries to develop closer relationships with farmers, but this seems to be hampered by lack of resources.

The input suppliers (except for IS1) provide standardized products to many small farmers so there does not appear to be need for them to develop a close relationship, and that does not seem to be a problem for the other party. The relationship between IS1 and farmers would be done if issues such as extension could be adequately addressed.

At the market end, the relationship between some kai bars and their preferred suppliers seems strong which gives security to both parties. However, the relationship between other kai bars and their suppliers are more opportunistic. Since kai bar operators know that they can buy from any farmer suppliers anytime, there is low uncertainty, thus they do no need to create a strong relationship with farmers.

Because he does not have a strong relationship with buyers, the farmer spends time looking for buyers, which can result in potatoes losing quality and value, and he may find that he has to sell cheaply. Some small marketers may also increase the risk to their business of not meeting customer demands when they are not able to acquire what they require at the urban market at certain times.
6.2.7 Summary of Case 1

The investigation found out that the chain was mostly well resourced but a few resourcing problems were experienced especially by small players such as farmers. Also noted were organisational issues experienced in government agencies where facilities did not cater adequately to the needs of the farmers in terms of seed requirements. There were some problems with seasonal unavailability of seed due basically to quarterly supply. However, this did not seem to be an overwhelming problem. There were not many logistical issues for this chain, though farmer’s vehicle was unreliable. The roads appear to be a problem, but given the short distances, the produce were able to be transported to the market meeting customer needs. While there is some room for improvement, the input supplies including seeds are of good quality.

Kai bars reported stock losses due to shorter shelf life, which may be a result of either unreliable storage or agronomy reasons, or too much running around looking for buyers. It was noted that product can be wasted since there is no secured market.

There is good information links between input suppliers and their suppliers. Links between input suppliers and farmers were not so strong. Some kai bars have good information flows with preferred suppliers, and others do not rely on particular suppliers so information flows is not strong.

The input suppliers and their suppliers have strong relationships. The government agency tries to develop strong relationships with the farmers, but struggles as a result of inadequate resources. Input suppliers do not bother to develop relationships with farmers. The relationships between some kai bars and preferred suppliers appear to be strengthening but, quite opportunistic with others.

A key problem in this chain is the unpredictability of market demand. Because kai bars cannot guarantee sales, they do not forge close links with farmers. Farmers then have to look around for different buyers. This can cause potatoes to lose quality, which can cause wastage and lower returns.
6.3 Analysis of Case 2: Formal Potato Chain

6.3.1 Chain Resources

Each point along the chain seems to have adequate resources. This conclusion is reached because inadequate resourcing was not mentioned by any participants as an impediment to their operations, nor was it observed by the researcher.

The suppliers of key inputs appear to have the capacity to support their operations. They have access to storage facilities, labour and either own or hired transport. The hired transport is used especially for transporting standard supplies, and key inputs coming from Lae, but their own transport is used for other activities.

The marketer, who is also a seed supplier, is the main player in the chain (chain leader) and uses its assets to support its preferred (contact) farmers. It has access to land, a seed house at the company farm and transport both at the supply and demand end. It has no problems accessing labour, and also has other related businesses that can complement the potato marketing business.

At the production level, the farmers interviewed can use their resources and cash generated by their other businesses to support this business. F1 seems to be able to access resources needed because he has built up his wealth, and so has access to land, storage facilities, labour and his own transport. Farmer 2 hires transport but does not seem to have resourcing problems.

Transport Companies seem well resourced. The trucking company is small but has a fleet of trucks. The shipping company is the largest in PNG. However, there are problems with infrastructure such as roads in poor condition and out-dated port facilities.

Buyers, such as supermarket and hotels, are well resourced. Both supermarkets (SA and SB) are significant operators with expansion plans, and the hotel is well established.
6.3.2 Availability of Inputs

In general, inputs appear to be available at supply and production levels of the chain. Farmer F1 can access all inputs easily. F2 also can access inputs through the use different sources. Although there are some problems with access to seeds from IS1, there are other seed supplies which can compensate for this problem. Packing materials, such as bags, are readily available. Further down the chain, containers are provided by the trucking companies.

PBL caused severe disruption to the whole potato industry. However, the industry has been revived steadily through the efforts of F1 and other key players like MW.

6.3.3 Logistics

There are no real logistics issues for input supplies. Inputs suppliers receive supplies from overseas through standard arrangements. Farmers then have the choice of input suppliers. There do not appear to be any logistics issues for F1 as his farm is close to town and he has his own transport. F2 sometimes hires transport, but does not report any logistics problems because of this.

The inbound logistics for WM seems to be good. Product is brought into the yard either through hire vehicles or use of WM’s transport. For its outbound logistics, it has to follow schedules of transporters. The poor road conditions or bandits on the Highlands Highway can delay the road trip to Lae. The product can not get insurance cover which creates risk and uncertainty for WM. The product takes a week to get to Port Moresby, and once the ship is in Port Moresby, it takes one and half days to supply to markets. This relatively long time to transport the product reduces its shelf life.

The Trucking Company has a reliable trucking schedule. However, they report that the deteriorating road conditions of the Highlands Highway will soon lead to rate increases. On the other hand, shipping schedules can be unreliable due to Port congestion. It sometimes affects schedules which could mean that the product may not be able to reach the final destination in a timely manner and this can contribute quality deterioration. This can also mean that sales targets for the given period may not be met, which can reduce revenue for WM.
At the market end, there seem to be no problems with logistics for SA, SB and the Hotel. This is due mainly to marketers coming to their gate. The marketers (including WM) use their own or hired transport to take product supermarkets and hotels, and arrival of product to these markets seems to be reliable.

6.3.4 Quality

No serious quality issues were raised, but there were some concerns raised by some participants along the chain. Disease free seeds are imported from Australia, which ensures access to good quality seeds, but there are occasional problems with seed supply. IS1 ensures that quality issues are addressed through inspection, certification and tissue culture work. Other inputs such as fertilizer, chemicals and tools seem to be good quality.

Farmers have alternative sources of supply, which allows them to meet their quality needs. F1 obtains his seeds from TC, which does not deal with farming supplies, while F2 gets his seeds from either WM or IS1. F1 pays great attention to quality. He maintains the quality of his potatoes through regular spraying and care with harvesting and packing. F2 also does not seem to have quality issues, which may be helped by regular visits by WM.

F1 can further deal with quality issues because he has multiple buyers. These buyers operate in different market segments. This means that if he has any potatoes that do not meet the quality standards demanded by WM, then he can sell these to buyers in lower quality market segments. This reduces his wastage and deals with problems of uneven quality.

Inbound potatoes are carefully handled by WM. It ensures good quality by working with contact farmers with whom they have close relationships, which means good information flows. WM educates its contact farmers on quality. The key areas covered in the awareness include spraying, harvesting, grading, packaging, storage and transportation.

WM has good quality checking processes, but the Highlands Highways can cause bruises and delays when moving the product from Mt Hagen to Lae for shipment to Port Moresby. Unreliable shipping schedules can also affect quality by causing delays and reduce shelf life. As a result, WM reports that they can get about 5-10% of wastage.
WM sells 40% of their potatoes to top-end segments such as supermarkets and the hotel. They sell their lower quality potatoes to lower-end segments such as kai bars. The top-end segments buy high quality, but some are not reliable, such as SB. Unlike SA, SB’s opportunistic way of buying can sometimes make it difficult for suppliers like WM to predict market demand. WM actively monitors market demand which reduces wastage. The market situation in Port Moresby is closely monitored so product does not spend too much time in warehouse. However, due to market uncertainty, there are likely to be some losses.

SA does quality inspection when the produce arrives. It has good processes for storage, which maintains shelf life of one week, but there may be some wastage in that time. SA reports that this is due partly to handling problems when the product is moved from Highlands, but it seems to be minor. It was reported that customers are satisfied with quality.

SB also does product inspection, then puts the potatoes (and other produce) into coolers. There is some wastage if stock is not cleared in a week. Quality is a primary requirement for its customers. For the hotel, it needs a shelf life of 2 days, but sometimes this can be extended to a week. There is not much wastage for the hotel. Customers are satisfied with quality, but the hotel is always striving for improvements in quality.

6.3.5 Information

The information link appears to be strong between some participants while other links are not so strong. There is a good information flow between some farmers and their seed suppliers. This can be seen in F₁ and F₂, who have strong linkages with their respective seed suppliers, TC and WM. F₂ is a preferred (contract) farmer of the wholesaler, so good information links would be expected. On the other hand, there is a disconnected information flow from the general input suppliers (IS₂ and IS₃) to the farmers. Farmers gain information by physically going to the input suppliers.

As noted above, the information flow between preferred farmers and the wholesaler is good. This is due to WM’s close relationships with contract farmers. However, information flows with non-preferred supplies are mostly through media and word-of-mouth.
WM monitors market demand in Port Moresby before bringing down new supplies from Mt Hagen. WM seems to have a good information flow with formal outlets such as SA and H. The flow between WM and SB is not so good. However, there is a disconnected information flow, due to unpredictable demand from kaibars, especially with those that are Asian owned. As a result, it is difficult for information to flow back down this chain. However, kaibars that have preferred suppliers have stronger information flows, and WM indicated that this is the case with nationally owned kaibars.

Information flows with transport companies appears to be good, though there are some difficulties. Trucking schedules for Transport Companies are well known. This helps the wholesaler to plan ahead and coordinate movement of product to meet market demand in Port Moresby. However, shipping schedules are less reliable, which places a burden on coordination.

With regard to the top-end segments, the information flow between suppliers and SA and the hotel are good, but is disconnected for SB. SA contacts its suppliers when needed, which indicates a networking with suppliers. SB places orders each week, but also buys from people who just turn up. The hotel keeps its regular suppliers informed of its needs.

6.3.6 Supply Chain Relationships

Relationships between some participants appear to be close, but there is also evidence of opportunistic behaviour along the chain. Input suppliers such as IS2, IS3 and their suppliers overseas appear to have a close relationship. They have known each other over a longer period of time, and so have established close contacts.

While relationships between suppliers for seed such as IS1, WM, TC and farmers are strong, suppliers of standardized products (IS2 and IS3) seem to have opportunistic relationship with farmers. IS1 has a close contact with the farmers through its training and inspections for seed certification programs for growers. WM through its backwards integration has a close relationship with its contract farmers, such as F2. TC, a non-agricultural company has a special relationship with farmers including F1.
As part of his risk management, F₁ sells to different buyers for his different products including potato. He has a very good relationship with the wholesaler, which takes the bulk of his potatoes at the same price despite market fluctuations. He feels it is secure selling to WM, since there is a guarantee for the sale of his potatoes. It is not clear what his relationships with other sellers are like. With this buyer, F₁ is now looking to build new relationships so he can expand his supply to outlets such as the mining companies.

F₂ also has good relationships with the wholesaler. This helps with quality assurance through support provided by WM. F₂ is thinking about building new relationships and expanding the business in the not too distant future.

WM has preferred suppliers who are loyal, and they pay those preferred suppliers better prices in return. However, there are some other non-preferred suppliers who are more opportunistic, increasing the price when they realise WM is looking for supply.

WM sells to a number of outlets in Port Moresby. Out of their sales, only 40% goes to top-end segments. This is a deliberate risk management strategy, since it allows it to manage unpredictable demand and variable quality.

The lack of a close relationship with one buyer makes it difficult for WM to predict demand from them. That could result in delays or overestimation of movement of stock can subsequently cause quality to deteriorate. It places them in a difficult situation, when moving product from one end of the country to the other when the exact demand is not known.

WM is prepared to lower price to top-end segments to outbid other local suppliers and imports. This deliberate move is for the long-term benefit at the expense of short terms losses.

There appears to be good relationships between the transport companies and their clients which include the smallholder farmers and marketers. It was observed that T₁ has a good relationship with WM. It provides reliable transport service to the wholesaler and other farmers. T₂, the shipping company, supports marketers and farmers including WM meeting transport needs, but there are some problems in terms of schedules.

SA seems to have on-going relationships with suppliers, because they, regularly place orders with them. Local marketers are contacted when the supermarket requires it. SB also places
orders, but also buys from farmers who turn up with right quality at the right time. Its fear about the continuity of supply seems to act as barrier to closer relationships with the suppliers.

The hotel has regular relationships with marketers, but occasionally operates opportunistically when farmers arrive with product that is of high quality and their demand is high. Its key concern is to maintain continuity of supply. The hotel has different prices and buying policies for different suppliers. It regards regular supplies as more important and gives them special preferences.

6.3.7 Summary of Case 2

The study found that resources in the chain were adequate. There were no problems with the availability of inputs. Farmers were able to access seeds from other sources as well.

There does not appear to be any logistics issues with input suppliers. The inbound logistics was good, but with the outbound logistics there were more difficulties which relates to schedules of transport companies that have to be followed by the wholesaler. The poor road conditions lengthen the journey and contributes to the shortening of shelf-life for the product. Shipping schedules were unreliable, which partly contributes to reducing quality. However, logistics arrangements in Port Moresby appear to be good.

In terms of quality, generally there are no serious quality issues. Farmers are able to source their seed supply from alternative sources, which seems to be working well for them. While the product is undifferentiated and sold as a commodity, the chain operates in different market segments ranging from lower to high levels. Product that deteriorates during transportation and can be sold to the lower end segments. The product is sold with half going to the top end segments that want high quality. One buyer is opportunistic, so it is difficult to predict market demand in that market.

There is good information flow between farmers and seed suppliers. Also, the information flow between wholesalers and preferred suppliers is good, as it is between the wholesaler and formal market outlets, but there is poor information with kai bars. However, some kai bars
have now moved to preferred suppliers, probably as a way to address continuity and quality issues.

There is a strong relationship between farmers and seed suppliers. Also, there are good relationships between preferred farmers, suppliers and wholesalers. As part of risk management, one farmer sells to different buyers.

An opportunistic relationship is predominant with non-preferred suppliers. WM sells only 40% of the product to top-end segments and sells the rest to the other segments. It can manage unpredictable demand and variable quality. Relationships with one buyer is not close, and could make it difficult to predict demand. Risk management strategies are used to manage the demand unpredictability. The wholesaler works hard at maintaining relationships. It has good relationship with transport companies.

One supermarket has good relationships with its suppliers, while the other supermarket operates opportunistically due to its concern about supply continuity. The hotel has good relationships with marketers but can do some buying opportunistically.

### 6.4 Comparison of Chains in terms of Functions

A cross-case comparison will be made comparing the chain functions. This is to show how one chain differs from the other in terms of their effectiveness in each dimension.

#### 6.4.1 Resources and Availability of Inputs

Both chains have adequate resources and input needs are similar especially at the production level. However, Chain 2 has additional resources along the chain given its orientation. The strategic positioning of Chain 2’s resources in two separate locations enables coordination of its operations, thus meeting customers’ needs at various market levels.

Chain 2 has the wholesaler/marketer as one of the seed suppliers, thus the chain leader using its resources to link different producers and markets in other regions. However, Chain 1 has its resources mobilized to serve local markets, with production based on seeds obtained.
through a government agency. It faces minor issues in terms of organisational arrangement and timely availability of seeds.

However, generally, both chains are supported by their respective resource bases to varying extents and inputs, including seeds are accessible, and keep their business operational. Chains could be more effective with minor improvements in resource capacity, and sourcing of input supplies, including seeds.

6.4.2 Logistics

While there may not be any real issues for both chains with respect to logistics, there are notable differences between them due to their basically to their orientation. Chain 2, for its out bound logistics, needs closer logistical coordination due to the distance it takes, and different transport modes it uses, which are tightly scheduled, as well as linking up with different market segments in another part of the country.

Both chains use hired transport, but also use their own trucks when convenient. Chain 2 has a risky business of transporting its products with uncertainty as it cannot get any insurance cover. Transhipments have to be arranged at various points and arrangement for pick ups and deliveries to various market segments. Thus, the longer formal chain is logistically considerably more complex with multimodal transportation nodes and much greater logistics challenges than Chain 1 which is short and so much closer to its markets.

However, it can be said that both chains have similar concerns in terms of road conditions, with this creating much greater uncertainty for Chain 2. The comments were expressed by many of participants of both chains that impact of the road conditions can cause delays in getting the product to the market.

6.4.3 Product Quality

Both chains are able to source quality seeds and inputs from input suppliers and address quality issues at the production and post harvest level. The product is undifferentiated but sold to different market segments as a commodity with quality aspects being more closely observed at the top market segments than the bottom segments.
Both chains manage variable quality by spreading the sales into different segments, with ones that are not able to be sold at the top segments being sold to the bottom segments. Apart from kai bars as its main market, Chain 1 targets urban markets to cope with quality management issues, while Chain 2 looks at kai bars and its own fast-food shop as an option for lower quality product.

Since Chain 2 involves a long distance and different modes of transport systems, coupled with product moving from the cooler region to a warmer part of the country, quality maintenance efforts are more critical for this chain. However, potato, unlike other vegetables is a less perishable product, which means it is less likely to face quality management and wastage issues, especially since the marketer is well positioned to transmit the needs of the market back down the chain.

Chain 1 has quality issues within the kai bar sectors with short shelf life of the product. Chain 2 does not have quality issues at the market end, through it has to compete with other suppliers to top-end market segments and some of the buyers in these segments behave opportunistically.

Both chains still have elements of uncertainty relating to quality issues and the timely securing of market in their respective markets. However, generally both chains are able to cope with quality issues using risk management strategies.

6.4.4 Information

Information flow is strong at some stages of each chain, but not so strong in other parts of the two chains. Input suppliers and their own suppliers have a strong communication link for both chains, but this is not the case between farmers and input suppliers for Chain 1. Chain 2, on the other hand, enjoys an effective communication link between farmers and seed suppliers.

The government agency that is responsible for seeds is able to provide information for the farmers in Chain 1, but is not that effective as its outreach program is irregular, which leads to occasional visits by farmers to the office. On the other hand, in Chain 2, the wholesaler has preferred farmers, which provides a strong communication link.
Information management for Chain 2 is more complex than for Chain 1. The market situation is monitored and communicated through regularly so as to have products from the buying point to reach the market in a timely manner. This indicates a bi-directional flow of information within the chain. With such information management, it provides support for the marketer to hold back supplies when there is disruption in transport schedules, and also helps preserve the product quality.

For Chain 1, while preferred farmers have strong communication links with their buyers, there is element of disconnection of information flow at the market end of the chain due to the opportunistic nature of the buyers.

**6.4.5 Chain Relationships**

Relationships between actors for each chain are closer at the some stage, but are opportunistic at other stages along the chain. Both chains have close relationships between the input suppliers and their own suppliers. While farmers in Chain 2 have close relationships with their seed suppliers, the wholesaler, the farmers in Chain 1 operate opportunistically with their input suppliers. This could be attributed to the wholesaler in Chain 1 having a relationship with some of its preferred farmers.

It can be said that having preferred farmers provide close relationships for both chains, either at production or marketing level, which subsequently gives security to both parties. This could provide support for information flow and logistics.

Chain 2 has a close relationship with the transport companies, which provides good logistical support for the transportation of the product. On the other hand, Chain 1 has no close relationships.

Both chains experience opportunistic behaviour of some buyers, but there appear to be different reasons for this. The reason for Chain 1 could be related to kai bars being able to source from many other suppliers, and also the unpredictable nature of demand from consumers of kai bar products. Chain 2 seems to have some opportunistic behaviour that may be associated with uncertainty in supply.
6.5 Comparisons of Chains for Overall effectiveness

In general the supply chains examined in this research performed well in a number of key indicators considering the prevailing conditions they were operating in. The effectiveness of the chains were realised in their capacity to be able to meet the needs of the customers for various market segments for each chains, but both need improvement in some parts of the respective chains.

Notwithstanding the ability demonstrated by some farmers and other participants in both chains, issues relating to sourcing of key input such as seeds and road conditions remain key challenges for the two chains.

Free entry into all levels of market segments in Papua New Guinea makes fresh produce marketing highly competitive. Potato in particular was hit by biological set back in early 2003, but has been revived with the support of some thriving operators and farmers in the industry. While some have exited, other marketers and operators manage to survive and have been successful and strive to continue on in the future. Farmers can enter the marketing system as self marketers and make their way up to marketers and become fully commercial marketers in the industry.

In summary, the supply chains analysed in this study were found to have performed relatively well in terms of its effectiveness as indicated by a number of performance dimensions. While operating under difficult conditions, which at times forces delays in the movement of the product from one end of the chain to the other, they are able to meet the needs of the consumers in different market segments at reasonable levels. These are done through adopting risk management strategies to absorb the inevitable shocks. Value creation enables product to enter into competitive market segments, and encourages participants in the industry to be disciplined and innovative.
Chapter 7  Discussion and Conclusion

7.1  Introduction

This last chapter presents the discussion and conclusion. The chapter consists of three sections including the introduction. Section 7.2 will provide the discussion of the findings in comparison with the literature. This section also covers limitations and recommendations for further research. Conclusions and contributions are presented in section 7.3.

7. 2  Discussion of Findings in Comparison with Literature

The supply chain management approach was found to be a useful way to analyse the performance of the marketing system for PNG fresh produce supply chains. It allowed the various parts of the systems to be disaggregated. The approach recognises the importance of value creation. Value creation takes place through functions which include logistics, quality, information and relationships (Porter 1985; Omta et al, 2002, p.16; Martin and Jagadish, 2006, p. 7). Using this approach allowed the key issues affecting two chains under investigation to be clearly identified. The findings of this study are consistent with some of the findings of fresh produce and fruit production and marketing in developing economies, but differ in some key areas.

Supermarkets in Sichuan, China recognise the significance of logistics in ensuring that vegetable produce brought into the supermarkets are arranged through suppliers with private trucking companies or by wholesalers themselves. Logistics can be quite efficient through short chains (Zang et al, 2006, p. 511). They also acknowledge that distant location of supermarkets coupled with poor infrastructure in transport system made it inconvenient for customers, but recognise that open markets were easily accessible as they were located in small towns and rural areas. This is consistent with this study, which identified farmers, marketers and wholesalers either hiring private transport or used their own vehicles to move products from one point to another in the chain. The short (informal) chain in this study was able to have reasonably efficient logistics. However, this research differs from the Chinese
study in that, the poor road system remains a challenge to logistics particularly in the formal chain. Also, the chain customers appear to be conveniently accessible to supermarkets and other lower end market segments.

Dispersed production was seen as a logistics issue in the Brazilian Fresh Fruit and Vegetable Chain as observed by Farina and Machado (2000, p. 184). It was identified also that geographically widespread and diversified vegetable demand can be met if production can be aggregated from key spots and organised to meet each market segment. In this study, dispersed production was not identified as a key logistics issue. The issue, instead, was poor road conditions especially for Chain 2. Through the wholesaler/marketer’s approach with its preferred farmers, and having a buying point and warehouses located in strategic points in the chain, aggregation of supplies were able to occur, logistics challenges overcome, and the chain was able to meet the needs of various market segments.

Quality cannot be guaranteed when the bulk of the supply is sourced from dispersed producers as observed in the Red River Delta potato chain (Batt, 2004, p. 41). Immature harvest and poor packing were other quality issues realised in this chain. Similar sentiments can be shared for this study, where quality can not be guaranteed due to dispersed producers. However, advisory practises by lead agencies and measures by the chain leader in Chain 2 to link back to the production level contribute to improving quality control.

Cooling systems are regarded as important for both the mandarin chain in East Nusa Tennggara, Indonesia (Wei et al, 2004, p. 98) and the Sichuan vegetable chain in China (Zang et al, 2006, p. 511). It was found that inadequate support for cooling facilities in these two chains can have adverse effect on the quality of produce. This research recognises that cooling systems may be relevant for the other more perishable products but, with potato, no cooling system is needed, only ventilated containers during the shipment from the cooler regional to the coastal areas. Therefore, an inadequate cool chain was not an issue in this research.

This study looked at uncertainty which derived mainly from quality and transport systems. Quality deteriorates due to unpredictability in some market segments for both chains, and, due to agronomic reasons as well as weather conditions. The movement of the product from a long distance coupled with an unreliable transport schedules and especially for coastal
shipping makes it difficult to maintain quality. This could be far worse for highly perishable products. The work done by Brousseau and Codron, (cited in Farina and Machado, 2000, p. 184) pin points this. Highly perishable produce are responsive to weather which creates uncertainty in quality, which leads to reduced product value, production losses and shortages.

The Banana supply chains in Indonesia showed that distance of supply chain can affect information flow. Communication was good only with the next or previous level, and also suppliers were unaware of how to search for up-to-date market information (Singgih and Woods, 2004, p. 45). Farmers in Kapatagan in Digos City, Philippines relied heavily on what the immediate trading partners say regarding the market as they had limited knowledge of market information as recognised by Conceptional et al., (2006, p. 123). In this research, distance was not a major issue to communication linkage. Poor information was realised in several participants in both chains especially between some farmers and input suppliers, between producers and buyers at lower market segments, and between marketers and buyers some in the upper market segments.

The study’s findings are consistent with supply chain for potato cultivation in the Red River Delta, Vietnam where wholesalers had control over information (Batt, 2004, P. 27). The research found that the chain leader in the long potato chain had some control over information. Whatever market information provided to its preferred farmers seem to be accepted. This also means that price offered at any prevailing market rate for the product was accepted.

In Senegal farmers and market operators, in attempting to manage the uncertainty of high marketing risks in terms of price fluctuations in vegetable market, adopted the MANOBI communications system that is used to provide information services to the users. The system takes less processing and transmission time and is flexible. Operators were able to have access to accurate and updated information (David-Benz, Wade and Egg, 2006, p. 137). While no such communication systems were in place as noted in this study, there was good communication linkage between the farmers and lead agency with its advisory practice, and the chain leader with its preferred farmers through integrating back to production level.

Woods and Setyadjit (2004, p. 189), suggested that in developing countries, reliable and timely information about consumer needs is required by the farmers so that they can become
market oriented to ‘produce what they are able to sell, instead of trying to sell what they produce’. This study recognises this suggestion in the informal chain. Farmers with inadequate market information produce excessively, and have difficulty in trying to sell everything at the same time. With opportunistic behaviour of some buyers and unpredictable market demand, there is no guarantee of a secured market, and this can result in losses. However, because the chain leader provides good information flows in the formal chain, the recommendation by Woods and Setyadjit (2004) did not apply for this chain.

The adequacy of relationships in chains in developing economies has also received a lot of attention in literature. A study by Batt (2004, p. 27) showed that there is a mix of relationships for potato cultivation in Red River Delta, Vietnam, where some relationships were based on satisfaction and trust and others on power and dependence. The author found that farmers were dependant on their preferred trading partners and appreciated the relationship they had with them. It was also discovered in the research that traders indicated that they had a strong relationship with both the farmers and collector agents and their downstream customers. However, the wholesalers were less satisfied in their relationship with both traders and retailers. On the other hand, the retailer customers express high satisfaction and trust with the wholesalers (Batt 2004, p.27). This research recognises the point that preferred farmers are dependant on preferred trading partners. In Case 2, farmers sell their product to the preferred wholesaler and have expressed satisfaction with for their relationship with the buyer. This indicates some elements of satisfaction and trust with their trading partner. While chains in this research had fewer intermediaries as opposed to the Vietnam study, some farmers had strong relationships with their downstream customers and others not. The not so strong relationships resulted in opportunistic behaviour by either party. The wholesaler in Chain 2 had close relationships with its retail customers that have some elements of trust but there are retailers especially SB and some kai bars that provide less satisfactory services. Retailers, by using risk management strategies, were satisfied with the services of wholesaler, marketers and farmers. This means that these retailers spread their dependency in that they did not rely heavily on one particular supplier.

The horizontal integration at farmer level is important strategy to improve the marketing of mandarins in East Nusa Tengara, Indonesia. The relationship was strengthened through getting informal social groups together during harvest times and involved in other activities (Tuckman, 1975). Extension and production techniques are provided by key farmers and
extension officers (Banet, 1976). This research slightly differs from the Indonesian study. It has a vertical integration process where the chain leader who is a wholesaler has integrated back into input supply and then works with preferred farmers. These farmers are key suppliers of the potatoes to the wholesaler. However, it is in line with the Indonesian study in that farmers are provided extension services and post harvest techniques.

Stakeholders in the vegetable supply chain in Southern Mindanao, Philippines have divergent views on quality, and saw others in the chain as persons to be watched and not as partners. While there was some degree of trust, many had resentments about traders providing incorrect prices (Conception et al, p.127). There are some similarities found in this study. Some market segments in both chains have different views about quality, and so they operate opportunistically in order to maintain consistency in supply for quality and quantity. Thus they seem to have less trust with some of their suppliers. However, this was not always the case in this research.

Sourcing supply from the vegetable growers’ association on contract basis by the supermarkets was seen as a good practice in one study. This helped to make supermarkets more responsive to market demand and deliver products to customers while pleasing farmers with guaranteed market (Zang et al, 2006, p.510). In this study, contract arrangements were not seen as tight buyers-seller relationships. Instead, this study found that supermarkets and other middle to top market segments were able to meet customer needs through their risk management strategies by sourcing from many suppliers. However, this study showed the preferred farmers in Chain 2 expressing gratitude for having a guaranteed market, which meant that they were content with what was offered, and customer needs were able to be met.

Culture can have a large impact on supply relationships in different countries. The study carried out by Singgih and Woods (2004, p. 44) in banana supply chains in both Australia and Indonesia acknowledged the differences in cultural dynamics especially at the upstream (farmer and village) levels. The authors found that villages in Indonesia were dominated by traditional value systems that have support mechanism for the buyers and sellers while in the Australian case study indicated a different approach. This project acknowledges cultural links. Many of the preferred farmers come from the same clan and tribe of owners of wholesaler who is the chain leader. They provide support and ensure that the enterprise grows because of the benefits they get from the company.
In this study, it was found that general effectiveness of both chains was good. The chains were characterised by the chain participants’ ability to meet customers’ needs in the multiple market segments by adapting risk management strategies. In spreading the risk, farmers and marketers were able to sell to several buyers, and buyers, similarly able to source supplies from various suppliers. This was done under difficult conditions. However, more work need to be done on the effectiveness of both chains.

7.2.1 Limitations of the Research

This study has some limitations derived from the sampling and research method employed. While a range of fresh produce crops are grown in the PNG Highlands, the number of products in this study had to be restricted to only one. Potato was chosen because it is a representative product as it has elements of perishability, and sits between traditional and new horticultural crops. However, studying a more perishable crop, such as broccoli may capture extreme time issues associated with perishability.

The two chains originate out of only one province despite focus on the whole of the Highlands region. The research was largely based in Western Highlands Province because it is leading in production and sales of fresh produce in the Highlands region. Also it is beneficial for this project to have chains originating in one province so that it keeps a range of activities (e.g. climate and culture) constant. However, studying chains originating in other provinces may yield a broader picture.

This research only looked two supply chains representing the formal and informal chains. It could be argued that there is inadequate representation given the variety of fresh produce production and marketing systems in the PNG Highlands. However, given the time limitations it was appropriate to make the decision to study two representative yet comparable supply chains. Potato has a variety of chain links from local and national level through formal and informal marketing systems. It uses different modes of transport, which include road and sea.

The chain performance only focused on effectiveness. It was not feasible to include efficiency in the investigation. This was due mainly to time, and resource limitations and
sensitivity of some businesses who felt reluctant to discuss their financial matters business with others.

The researcher had some difficulties during the course of the field work, which contributed to the outcome not being as expected. Flight delays due to visa issues, and theft of project documents and equipment delayed the project by two weeks. The poor road conditions further delayed scheduled meetings, and tribal fights along the Highlands Highway did not allow interviews to proceed at the mine sites. Scheduled meetings were also sometimes cancelled as possible interviewees just did not turn up or were reluctant to participate as they thought some questions were sensitive for their businesses and they did not want to disclose information for public consumption. Despite these circumstances, as much as possible, in-depth interviews were carried out with those that were able to make time available for the project. Much of the support was obtained from FPDA in terms of organising key farmers and providing transport services.

7.2.2 Recommendation for Further Research

This research has shown that SC tools are useful in analysing the performance, especially the effectiveness, of the informal and formal fresh produce production and marketing in PNG Highlands. It looked at only one product with two chains originating in same the province.

There is a need for more products to be considered which should have a balance, representing highly perishable and less perishables, traditional and non-traditional crops. Research should look also at both effectiveness and efficiency. This can provide depth and clear understanding of chain performance for fresh produce industry in the PNG Highlands. Also more market segments should be explored and included in a study to understand the uniqueness and vastness of the fresh produce sector that is able to cater for consumers at every fresh produce market available in PNG.
7.3 Conclusions and Contributions

The aim of this research was to have a detailed understanding of the key marketing segments of the fresh produce supply chains originating in the Highlands Provinces of PNG. The literature of relevant concepts in supply chain management and its functions including value creation, and fresh produce development including production and trade as well as marketing systems in PNG provide a scope for this project.

Production and marketing of fresh produce in the PNG Highlands is important as it is one of the few significant sources for generating income for the many rural families, who strive to meet basic needs. The region is home to more than half of PNG’s total population where poverty is widespread. Many families are involved in informal marketing systems but some entrepreneurial farmers have shifted to formal market segments.

The supply chain management approach was found to be an appropriate tool in analysing marketing systems. It links farmers to market through a range of intermediaries. It involves each party participating in the process to meet the needs of the final consumers supported through value creation process which include information flow, logistics and product maintenance backed up by integration of processes through relationships. In this model these supply chain dimensions were adopted to determine the performance of each chain. Complimenting this is the literature on developing economies. This gives some similar case scenarios, which are useful to the discussion for this project’s findings.

The effectiveness of both the formal and informal chains was identified, and comparisons were made to see how each chain differed. Informal chains can have different problems to the formal chains. Participants, including smallholder farmers, marketers and middle men, demonstrate a high level of entrepreneurial behaviour. They spread their risk by operating in multiple market segments, and this can help to solve issues with variable quality. The marketers in each chain position themselves in these different market segments.

It was clear from this work that focussing on functions and not the whole chain can lead to a distorted view of chain performance. For example, for the informal chain, a focus on logistics issues, particularly poor roads and problems with availability of seeds, can misrepresent the effectiveness this chain. Therefore, it is important to look at the overall
performance of each chain rather than looking specifically at particular chain functions in isolation.

This study contributes to the literature in this area in the fresh produce sector by using a broader and detailed perspective, and by analysing two key marketing systems in the formal and informal chains. The analysis of two chains through a conceptual framework using key supply chain functions allowed overall chain performance, particularly effectiveness to be identified.
References


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Appendices

Appendix 1

Case Study Small marketer Interview Questionnaire

A Operations

1. Describe your overall operation
   a. What ‘proportion’ of your business is growing and what ‘proportion’ is marketing?
   b. What crops do you grow (and what is the ‘proportion’ of each of these products?)
   c. Describe the marketing that you do:
      • What products do you sell?
      • How much of --------- do you sell in a week?
      • Does this vary over the year? By how much?
      • Where do you sell your ---------?
      • How much of your --------- is not sold each week and why?

2. Describe your ………………. marketing
   a. What is the volume of ……………………. that you market each week?
   b. Does this vary over the year? How?
   c. What would be the total revenue that you get each week from your ……………………..?
   d. What proportion of your total revenue from all products that your market does this represent?
   e. Does this vary over the year? How?
   f. What outlets are these ……………………… sold to?
   g. What proportion of ……………………. is sold to each outlet?
   h. What proportion of ……………………. is not sold and why?
   i. Would you like to sell more (or less) ……………………. to each of these outlets?
   j. How could you increase the proportion of ……………………. that you sell to your preferred outlet (if you have one)?
   k. What volume of ……………………. do you expect to get from ……………………. growers each week?
   l. Does this vary over the year? How?
   m. What volume of ……………………. do you expect to get from other growers each week?
   n. Does this vary over the year? How?
   o. What volume of ……………………. do you expect to get from your own gardens each week?
   p. Does this vary over the year? How?
   q. Do you put the ……………………. from all suppliers together or do you keep yours separate? If you keep some separate, why do you do this?
   r. How do you decide what volume of ……………………. to take to ……………………. to sell?
B  Marketing Resources and Assets

a. Describe your marketing resources and assets (will need to get what they are)
b. Physical
c. Capital
d. People

C  Competition/Efficiency

a. How many other competitors do you compete with?
b. How long have you been in business?
c. How confident are you of keeping your business in the future?

D  Customers

1. How did you make the link with each of your markets for ……………………?
2. What do each of your markets want?
a. Product form and quality
   • loose?
   • size?
   • shape?
   • colour?
   • shelf life?
   • No marks and bruises
   • Variety
   • Other?
b. Quantity
c. Continuity and timing of supply

3. How do they assess your quality?
4. How do you find out what your markets want from you?
5. What is the order of importance to you of each of your markets?
6. How do you decide how much to send to each market?
7. Are your own ……………………….. going to a specific market?
8. How are prices set in each of the markets?
9. For each market, can you give an average price for:
a. High season
b. Low season

10. What was the price you got in each market this week?
11. Describe how you do business with the buyers in each market.
12. How do they buy off you?
13. Do they have a relationship of any sort with you?
14. Do you have contracts with them?
15. How do you find out what the buyers in each of the markets wants?
16. Do you know who else supplies these markets?
17. Do you know how much you supply compared to these other suppliers?
18. Do you think that each of your markets is satisfied with what you supply them?
19. Is there anything different in the way that you sell your …………………. to the way that you sell your other products?
20. Is there anything that you think you could do to supply your markets better?
21. Is there anything that could be done by others to make it easier for you to do your marketing?

E  Suppliers

1. Who do you buy your ……………………….. from?
2. How did/do you make contact with your suppliers?
3. Are some suppliers more important to you than other suppliers?
4. How important is the ………………………. group to you?
5. Do you have different prices and/or buying policies from different suppliers?
6. What are you looking for from your suppliers?
   a. Product form and quality
      • loose?
      • size?
      • shape?
      • colour?
      • variety
      • shelf life?
      • other?
   b. Quantity
   c. Continuity and timing of supply
7. Do you look for the same from all suppliers?
8. How do your suppliers know what you want from them?
9. How do you set your buying price for your ……………………?
10. Does this vary over the season, and what would be an average buying price for
    a. Wet season
    b. Dry season
11. What would your average buying price have been last week?
12. Is the way that you set your buying price for …………………. different to the way you set your prices for the other products that you buy?
13. Describe how you do business with your ………………….suppliers
    a. How do you buy off them?
    b. Do you have a relationship of any sort with them?
    c. Do you have contracts with them?
14. Is the way that you do business different for different …………. suppliers?
15. Do you know if your suppliers sell to other buyers?
16. Do you know how much you buy from your suppliers compared to these other buyers?
17. Are you satisfied with what you get from your suppliers?
18. Is there anything different in the way that you buy your …………………. to the way that you buy your other products?
19. Is there anything that you think you could do to get better ………………….. from your suppliers?
20. Is there anything that could be done by others to make it easier for you to do your buying?

F Logistics

1. Describe how you pick up the …………………… from your suppliers
   a. Where?
   b. How do they bring them to you?
   c. Do you know what the farmers do after they harvest the ………
   d. How are they packed?
   e. What quantities?
   b. What would be the average time from harvest to when the farmers hand the …………………… over to you?
   c. Is this likely to vary by farmer? How?

2. Describe the movement from the buying point to your shed/depot
   a. How are they moved from the buying point to your shed/depot?
   b. Do you put all the …………………… from the different suppliers together?
   c. How many ……………………. on top of each other?
   d. What do you do to avoid bruising?
   e. Do you transport other products to your shed at the same time?
   f. If so, how do you load these up with the ……………………?
   g. If so, what proportion would the ……………………. be in each load?

3. Describe what happens at the shed/depot
   a. Is there any unloading and repacking?
   b. How long do the …………………… stay in the shed before going down to ……………………?
   c. How are they packed while they are there?
   d. What is done to avoid damage?
   e. What packing materials do you use?
   f. Are packing materials easily available?

4. Describe how you transport the ……………………. from your shed/depot to …
   a. Do you use your own transport or do you hire transport?
   b. How are the ……………………. packed in the truck? How many deep?
   c. What do you do to avoid damage?
   d. When do you leave for ……………………
   e. What time does it take to get to ……………………?
   f. How long do you have to wait in ……………………. before you can ……………………. and tranship?

5. Describe how you unload the …………………… before transhipping?
6. What else happens from the time it reaches ……………………. until the time it gets transshipped?
7. Describe how you transport the … from … to …
8. How are the ………………… packed in the containers? How many deep? What do you do to avoid damage? Cool containers – details?
   a. When do they leave for ……………………?
   b. What time does it take to get to ……………………?
   c. How long do you have to wait in …………………… before you can unload the carrots?
9. Describe how you unload the ……………………?
10. Describe how you load onto your trucks?
11. Which order do you go to the markets in?
12. How do you get them off the truck?
13. How are they loaded into the market?
14. What do you do to maintain their condition when unloading (bruising etc)?
15. At what point does the buyer inspect them?
16. When do you stop being responsible for the …………………… and the buyer takes over?
17. On average, how much wastage of …………………… occurs on each load?
18. Is this better or worse than other products that you market?
19. How many loads do you transport each week?
20. Do you have any backloads?
21. Is there anything that you could do to improve the transporting of your products, particularly your ……………………?
22. Is there anything that could be done to lower your costs?
23. Is there anything that could be done by others to make it easier for you to transport your products, particularly your ……………………?

G Your background

1. Can you tell us when you started marketing?
2. Why did you do this?
3. What are your plans for the future?
Appendix II

Case Study wholesaler Interview Questionnaire

A Operations

1. Describe your overall operation
   
   b. General
   c. What ‘proportion’ of your business is ‘wholesaling’?
   d. Describe the marketing that you do:
      
      • What products do you sell?
      • How much of ----------- do you sell in a week?
      • Does this vary over the year? By how much?
      • Where do you sell your----------?
      • How much of ----------- is not sold each week and why?
   
   e. What volume of your -----------do you get from your suppliers each week?
   f. Does this vary over the year? How?

2. How important is ----------- to you (e.g. What does it contribute to your revenue?)
3. Is----------- more profitable to you than others? Describe

B Competition/Efficiency

1. How many other competitors do you compete with?
2. How long have you been in business?
3. How confident are you of keeping your business in the future?

C Suppliers

1. Where do you get you produce from (each of the products)?
   
   • Large
   • Small
   • Marketers
   • Individual farmers
   • Region

2. Does this vary over the year? How?
   
   a. How did/do you make contact with your suppliers?
   b. Are some suppliers more important to you than other suppliers?
   c. Do you have different prices and/or buying policies from different suppliers?
   d. What are you looking for from your suppliers?
   e. Product form and quality
      
      • loose?
      • size?


- shape?
- colour?
- variety
- shelf life?
- other?

f. Quantity

g. Continuity and timing of supply

3. Do you look for the same from all suppliers?
4. How do your suppliers know what you want from them?
5. How do you set your buying price for your products?
6. Does this vary over the season, and what would be an average buying price for
   a. High season
   b. Low season

7. What would your average buying price have been last week?
8. Describe how you do business with your suppliers
   a. How do you buy off them?
   b. Do you have a relationship of any sort with them?
   c. Do you have contracts with them?

9. Is the way that you do business different for different suppliers?
10. Do you know if your suppliers sell to other buyers?
11. Do you know how much you buy from your suppliers compared to these other buyers?
12. Are you satisfied with what you get from your suppliers?
13. Is there anything that you think you could do to get better products from your suppliers?
14. Is there anything that could be done by others to make it easier for you to do your buying?

D Customers

1. How did you make the link with each of your markets for your-------------?
2. What do each of your markets want for each of your ------------?

3. a. Product form and quality
   - loose?
   - size?
   - shape?
   - colour?
   - shelf life?
   - No marks and bruises
   - Variety
   - Other?

   b. Quantity

   c. Continuity and timing of supply

4. How do they assess your quality?
5. How do you find out what your markets want from you?
6. What is the order of importance to you of each of your markets?
7. How do you decide how much to send to each market?
8. How are prices set in each of the markets?

9. For each market, can you give an average price for:
   a. High (wet) season
   b. Low (dry) season

10. What was the price you got in each market this week?
11. Describe how you do business with the buyers in each market.
   a. How do they buy off you?
   b. Do they have a relationship of any sort with you?
   c. Do you have contracts with them?

12. How do you find out what the buyers in each of the markets wants?
13. Do you know who else supplies these markets?
14. Do you know how much you supply compared to these other suppliers?
15. Do you think that each of your markets is satisfied with what you supply them?
16. Is there anything that you think you could do to supply your markets better?
17. Is there anything that could be done by others to make it easier for you to do your marketing?

E Logistics

1. Describe how you pick up your products from your suppliers
   a. Where?
   b. How do they bring them to you?
   c. Do you know what the farmers do after they harvest their products?
   d. How are they packed?
   e. What quantities?
   f. What would be the average time from harvest to when the farmers hand the products over to you?
   g. Is this likely to vary by farmer? How?

2. Describe the movement from the buying point to your shed/depot
   d. How are they moved from the buying point to your shed/depot?
   e. Do you put all the products from the different suppliers together?
   f. How do you maintain condition?

3. Describe what happens at the shed/depot
   g. Is there any unloading and repacking?
   h. How long do the products stay in the shed before going to the market?
   i. How are they packed while they are there?
   j. What is done to avoid damage?
   k. What packing materials do you use?
   l. Are packing materials easily available?

4. Describe how you transport the products from your shed/depot to market?
m. Do you use your own transport or do you hire transport?

n. How are the products packed in the truck? How many deep? What do you do to avoid damage?

o. When do you leave for the market?

p. What time does it take to get to market?

q. Is there any transhipping?

5. Describe how you unload the products before transhipping?

6. What else happens from the time it reaches the port until the time it gets transhipped?

7. How are the products packed in the containers? How many deep? What do you do to avoid damage? Cool containers – details?
   r. Schedules?
   s. What time does it take to get to the transhipments points / final market?
   t. How long do you have to wait at this transhipments points before you can unload the --------?

8. Describe how you unload…?

9. Describe how you load?

10. Which order do you go to the markets in?

11. How do you get them off the truck?

12. How are they loaded into the market?

13. What do you do to maintain their condition when unloading (bruising etc)?

14. At what point does the buyer inspect them?

15. When do you stop being responsible for the products and the buyer takes over?

16. On average, how much wastage of products occurs on each load?

17. How many loads do you transport each week?

18. Do you have any backloads?

19. Is there anything that you could do to improve the transporting of your products?

20. Is there anything that could be done to lower your costs?

21. Is there anything that could be done by others to make it easier for you to transport your --------?

F Your background

a. Can you tell us when you started marketing?

b. Why did you do this?

c. What are your plans for the future?
Appendix III

Case Study Supermarket Interview Questionnaire

A Operations

1. Describe your overall operation
   a. What ‘proportion’ of your business is fresh produce and what ‘proportion’ is other supermarket business?
   b. How important is fresh produce to your business?
   c. Describe the fresh produce side of your business: What products do you sell?

2. Describe your ........................................ sales of...........
   a. What is the volume of this product that you sell each week?
   b. Does this vary over the year? How?
   c. What would be the total revenue that you get each week from this product?
   d. What proportion of your total revenue from fresh produce comes from this product?
   e. Does this total revenue for this product vary?
   f. Would you like to sell more of this product?
   g. What price does your sell this product for?
   h. Does this price vary over the year? How?
   i. How could you increase the volume of this product that you sell?

B Customers for the product

1. Can you describe who your customers are?
2. What do your customers want?
   Product form and quality
   • loose?
   • size?
   • shape?
   • colour?
   • shelf life?
   • No marks and bruises
   • Variety
   • Other?

3. How do you find out what your customers want from you?
4. How much unsold product would you have each week?
5. How much wastage would you have each week?
6. Does this vary for local or imported produce?
7. Do you know where else your customers would shop for this product?
8. Do you know how much you sell compared to other sellers of this product?
9. Do you think that your customers are satisfied with what you supply them?
10. Is there anything that you think you could do to supply your customers better?
11. Is there anything that could be done by others to make it easier for you to meet the needs of your customers?
C Suppliers

1. Who are your suppliers of this product?
2. What proportion of this product do you get from your different sources of supply?
3. How did/do you make contact with your different suppliers?
4. Are some suppliers more important to you than other suppliers (preferred or residual suppliers)?
5. Do you have different prices and/or buying policies from different suppliers?
6. What are you looking for from your different suppliers?
   a. Product form and quality
      • loose?
      • size?
      • shape?
      • colour?
      • variety
      • shelf life?
      • other?
   b. Quantity
   c. Continuity and timing of supply

7. Do you look for the same from all suppliers?
8. How do your different suppliers know what you want from them?
9. Do your market this product as coming from different sources? If so, how?

D Pricing

1. How do you set your buying price for your product?
2. Is this different for your different suppliers?
3. Does this vary over the season?
4. What would be an average buying price for ………………. from your different suppliers?
5. Is the way that you set your buying price for this product different to the way you set your prices for the other fresh produce that you buy?

E Describing business relationships with different suppliers of this product

1. How do you buy off them?
2. Do you have a relationship of any sort with them?
3. Do you have contracts with them?
4. Do you know if your different suppliers sell to other buyers?
5. Do you know how much you buy from your suppliers compared to these other buyers?
6. Are you satisfied with what you get from your suppliers?
7. Is there anything different in the way that you buy this product to the way that you buy your other products?
8. Is there anything that you think you could do to get better (this product) from your suppliers?
9. Is there anything that could be done by others to make it easier for you to do your buying of this product?
F  Competition/Efficiency

1. Is there a lot of competition in the market place?
2. How long have you been in business?
3. How confident are you of keeping your business in the future?

G  Logistics

1. Describe how you pick up the …………………… from your suppliers
   a. Where?
   b. How do they bring them to you?
   c. How are they packed?
   d. What quantities?
   e. What would be the average time from harvest to when the product is handed over to you?
   f. Is this likely to vary by supplier? How?

2. Are there any quarantine procedures for imported…………………..?

3. Describe the movement of the product from your buying point
   g. Do you put the product from the different suppliers together?
   h. What do you do to maintain their condition and avoid damage?
   i. What is their maximum shelf life once you get them into your store?
   j. What packing materials do you use?
   k. Are packing materials easily available?

4. At what point do you inspect them?
5. When do you assume responsibility for them?
6. On average, how much wastage of ……………………. occurs on each load?
7. Is this better or worse than other fresh products that you market?
8. Is there anything that your suppliers could do to improve this product for you?
9. Is there anything that you could do with this product to lower your costs?
10. What would have to happen for you to consider buying more local ……. rather than imported ……………?

H  The background of the business

1. Can you tell us when your business started?
2. What are your plans for the future?