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The Pipfruit Export Season at the Port of Napier Container Terminal: an Exploratory Case Study

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Abstract

This is an exploratory study seeking to gain a better understanding of seasonality at the Port of Napier container terminal. It seeks to explore the motives behind the actions of the pipfruit exporters, and analyse the impact seasonal reefer (refrigerated containers) volumes have on terminal operations. The case study method is employed because it reflects the interpretive assumptions adopted for the study, and has the tools to analyse the qualitative and quantitative data collected.

The study revealed the exporters source most of their fruit from their own and leased orchards. The guaranteed volumes justify the investments made in fruit handling facilities. The balance of their fruit comes from contract growers where the exporters seek to establish long term relationships to minimise supply uncertainty. The exporters look to using their own fruit handling facilities, before passing any fruit to third parties, because of the greater flexibility afforded by prioritising shipments in their own facilities.

The exporters have invested in information systems that have automated most of the previously manual processes, and assist with managing the complexity of compliance, improving visibility in their operations, and satisfying the traceability requirements of their customers. The exporters have retail programs in place with customers in their traditional markets (US and Europe) that enable them to manage their work load for the entire season. The exporters have increasingly directed marketing efforts to the fixed price markets in mostly Asia, the Middle East and Russia, because the upfront payments, shorter transit times and fixed prices, reduce the risk of serving the markets. The fixed price sales are very much on short notice and present unique challenges on logistic systems, as the emphasis is on expediting shipments to get the best prices. The success of exclusive varieties and licensed orchards give the exporters much hope, particularly with the latter, as they are able to maintain fresh supplies all year round.

The exporters select shipping lines on the basis of transit times and port calls but are in reality, at the mercy of the powerful shipping lines. They have to base their marketing plans on the schedules of the lines. Chartering offers a way around the rigid schedules of the shipping lines, though only one exporter currently exercises this option.

The impact of the pipfruit export season in the terminal is evident on its impact on several aspects of terminal operations. Container vessel calls increase, as shipping lines deploy 'extra loaders' to complement their regular services to deal with the added cargo volumes. Vessel exchange times lengthen to reflect the increase in containers exchanged. Reefer capacity utilisation rises well above the average, though reefer dwell times decrease to reflect the pressure exporters work under during the season that almost reduces them to packing reefers just-in-time for vessels. The number of rehandles rises to mimic the added container volumes as the terminal employs strategies to cope with the scarcity of reefer space.

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Chapter 1: Introduction

1.1 Introduction

The aim of this research is to gain a better understanding of the pipfruit export season at the Port of Napier container terminal. This chapter presents the background to the study, and states the research objectives and the research questions formulated to help achieve the objectives.

1.2 Background to the Study

Shipping containers have been in existence for about five decades and are widely regarded as the foundation of the unit-load concept (Steenken, Voß, & Stahlbock, 2005). Up until then labour intensive break bulk operations were the norm in ports, where armies of harbour workers loaded and unloaded vessels in an inefficient process that could last up to several weeks, and at considerable expense (Levinson, 2006; Martin & Thomas, 2001). Operations were vulnerable to weather disruptions as hatch lids were shut to protect the cargo from physical deterioration. Cargo was also vulnerable to pilferage during port operations, as well as in transit, and mechanisation was limited to cranes and nets that were used to lift cargo on and off vessels (Martin & Thomas, 2001; Rosenstein, 2000). The lack of unitisation meant that each consignment had to be physically handled at each point of transfer until it got to its final destination.

Containerisation improved packing and handling efficiencies as contents were only handled during packing at their point of origin, and once again during unpacking at their destination. Containers offer improved security to cargo and protect it from the elements, so loading and unloading operations are not as prone to weather induced delays as break bulk operations are (Steenken et al., 2005). The unitised loads vastly improved vessel exchange rates and enabled smooth intermodal transfers. The gains in productivity and efficiency translated into lower handling costs, opportunities to gain economies of scale in operations, and ultimately lowered the cost of shipping.

The first regular container service began around 1961, and ran between ports on the Eastern Coast of the US, the Caribbean, and Central and South America. Prosperity soon followed significant investments that were made in specially designed vessels, container handling equipment in ports, and the purchase and/or leasing of containers

(Steenken et al., 2005). This transformation gave rise to container terminals where the large volumes of transshipments of containers made it economical for vessels to call in, as well as road and rail carriers. Container terminals provide temporary storage that enable vessel loads to be consolidated in anticipation of vessel arrivals, and enable containers discharged to be stored prior to departure by road or rail. Sea container terminals are essentially the buffer, and add value by being the point of transfer between the land and sea transport modes. Containerisation eliminated many of the inefficiencies inherent in break bulk operations such as the armies of harbour workers that needed extended periods to work vessels. The handling efficiencies brought on by containerisation meant vessels could be turned around in for example, an eight hour shift by eight men operating container handling equipment, where as it would have taken 26 harbour workers over a week to work a vessel in a break bulk operation (Rosenstein, 2000).

There has been a massive growth in containers in circulation in the last 30 years and this has been directly responsible for the dramatic growth in global trade. Container terminals hold a special place in global supply chains as they are the gateways to foreign trade. This growth has been matched by the increase in vessel sizes as the shipping lines seek to gain economies of scale in their operations. Container terminals have had to make significant investments in deepening channels, as well as acquiring container handling equipment capable of handling these larger vessels. This has resulted in increased competition between terminals, particularly those in the same geographic locations. The terminals compete for services of the shipping lines (both short and deep sea), rail and road carriers (Günther & Kim, 2006; Kim, 2005; Steenken et al., 2005). To compete effectively container terminals need to fully utilise their assets whilst focussing on improving productivity to lower costs. Ultimately they are judged on how quickly they can turn around vessels, trains and trucks, and on what handling rates they charge (Kim, 2005; Steenken et al., 2005). These competitive forces faced by the terminals have forced them to eliminate inefficiencies in their operations, and by so doing, have helped global supply chains in their quest for lowest total cost.

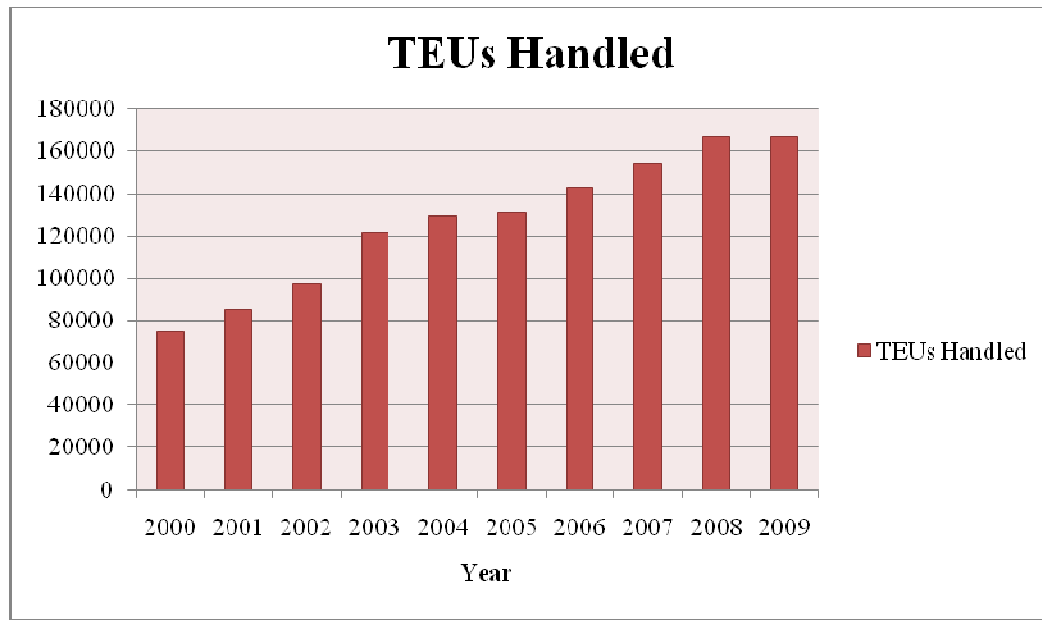


Figure 1.1 The Port of Napier’s Container Volumes 2000-2009

The Port of Napier has experienced its own significant growth in container volumes as seen in figure 1.1 above. This has been largely due to the migration of break bulk cargo to containers. Container volumes have more than doubled in the last 10 years and the terminal has seen increasingly larger vessels calling. The largest vessel to call at Napier has been the 4578 TEUs (Twenty-foot Equivalent Unit) capacity OOCL New Zealand (Anon, 2010d). As a result of the growth of the container business the company has invested in mobile harbour cranes capable of twin lifting. Twin lifting occurs when crane spreaders load and discharge two 20’ containers in one lift. The company has purchased forklifts and reach stackers capable of stacking containers to the fourth tier to increase the yard’s storage capacity. The yard has been developed to accommodate more reefers (refrigerated containers), and land has been reclaimed to extend berth capacity and increase storage space. Earlier on in the decade, the company purchased a terminal operating system (Navis Express and SPARCS) that helps to optimise various operations in the terminal. These investments have all been directly influenced, and financially justified by the growth of the container business, and put the company in a position to increase productivity, and continue to attract the business of the shipping lines.

1.3 Problem Definition

As an employee of the Port of Napier, the researcher has come to associate the pipfruit export season with the significant increase in rehandling work and the scarcity of reefer (refrigerated containers) storage space. This study is motivated mostly by the researcher's long standing desire to gain a better understand of the pipfruit export season. An extensive search of the literature revealed very little about seasonality in container terminals but the individual problems of rehandles and capacity issues have received attention from academics.

Chen (1999) highlighted that the choice between the 'pre-marshalling' and 'sort and store' strategies for export container storage influences the number of rehandles (unproductive moves) performed. The 'pre-marshalling' strategy stacks exports randomly and then sorts mixed stacks closer to the time of vessels arriving, to suit the loading sequence because of the scarcity of storage space. This strategy generates significant rehandles. The 'sort and store' strategy attempts to sort each container as it arrives at the gate, and is only effective in terminals with ample storage space. There are fewer rehandles generated with this strategy.

Kim and Bae (1998), Kang, Oh, Ahn, Ryu and Kim (2006), Lee and Hsu (2007), Lee and Chao (2009), Park, Park and Ryu (2009), Choe, Park, Oh, Kang and Ryu (2009), all address the 're-marshalling' problem which is the sorting of stacks to suit the vessel loading sequence. The problem is addressed in different ways but with the common objectives of minimising the number of moves to complete the process, minimising rehandling during the process, minimising travel distances of the yard cranes and avoiding yard crane clashes. de Castillo (1993), Kim (1997), and Kim and Kim (1999) examine the problem of rehandles when dealing with imports. The number of rehandles to retrieve the target container is estimated so that can be factored in when determining the productivity of container handling equipment, and consequently what level of service to promise customers.

Moving onto capacity issues Broens, van Dyk and Tavasszy (2000), van Dyk and Maspero (2004), Ortmann, Vuuren and van Dyk (2006) address several capacity issues in the South African fruit export logistics channels. Maloni and Jackson (Maloni & Jackson, 2005a; 2005b) examine capacity issues in the US West Coast ports of Long

Beach and Los Angeles in light of increasing container volumes. Le-Griffin and Murphy (2006) compare the productivity of the same ports with those of leading ports in Asia and Europe to highlight issues related to country specific factors in the differences that exist. Murty, Wan, Liu, Tseng, Leung, Lai and Chiu (2005) report on the use of information technology to address capacity problems in Hong Kong. Slack (1999), Kia, Shayan and Ghotb (2002), Jarzemskis & Vasiliauskas (2007), and Roso, Woxenius, & Lumsden (2009) argued for inland/satellite terminals to take the pressure off sea port terminals as only the transfer function needs to be done at sea port terminals.

What is evident is that most of the current research is based on the high throughput terminals of the world that handle mega-vessels (In excess of 10 000 TEUs capacity) and turnover millions of containers a year. These are container terminals that handle volumes large enough to justify investments in deepening channels and implementing strategies such as automated container handlings systems in their terminals.

There is a lack of attention by academics given to small container terminals like the Port of Napier, that handle less than 200 00 TEUs per annum. Most of the available literature addresses problems in terminals utilising yards cranes, or straddle carriers, and gantry cranes for vessel operations. The Port of Napier container terminal uses forklifts and reachstackers and mobile harbour cranes for vessel operations. One paper by Alvarez (2001) was found that involved a terminal similar to the Port of Napier's but one that addressed an unrelated problem of the ship planning process. Very little literature was also found on the New Zealand port industry. Price Waterhouse Coopers (2004) did an infrastructure audit on behalf of the Ministry of Economic Development. They revealed the uniqueness of the port industry, in that the terrain of the country and the high cost of consolidating cargo at hub ports by rail and road favoured international calling at numerous ports. This is unusual for a country so small. The ports themselves have excess capacity and some are highly seasonal like the Port of Napier. The urban waterfront locations of ports like Napier leaves options on expansion limited to increasing productivity with existing infrastructure or expensive land reclaim. As previously mentioned, there is a dearth of information on small container terminals, and ports in the New Zealand context, so this study is an opportunity to help address that.

1.4 Research Objectives and Questions

The aim of this study is to gain a better understanding of the pipfruit export season at the Port of Napier container terminal. The study is guided in part by the following objectives:

- 1.To explore the motives behind the actions of the pipfruit exporters.
- 2.To analyse the impact seasonal reefer cargo has on terminal operations.

The following research questions were formulated to help meet the objectives of the study:

- 1.What strategies do the pipfruit exporters employ to source fruit?
- 2.What is the nature of the logistics network between the growers and the container terminal?
- 3.What does the future hold for the pipfruit exporter?
- 4.What happens in the terminal during the pipfruit export season?

1.5 Outline of the Thesis

A brief outline of the rest of the chapters in this study is given: **Chapter 2** presents a brief history of the New Zealand pipfruit industry from its humble beginnings to the innovative industry it is today. The chapter focuses on the key developments that helped shape the current structure, developments that helped the industry to thrive despite its heavy reliance on exports for income and vast distance from its markets.

Chapter 3 reviews the literature as it applies to seasonality in container terminals. The chapter begins with an examination of the container handling systems used by container terminals to help with revealing the factors behind the adoption of each. A conceptual framework for the research is established by examining how the problem of rehandles and capacity issues are addressed in the literature. The literature review helped shape the research strategy of this study.

Chapter 4 explains the reasons for the interpretive approach adopted for the study. It describes the research strategy adopted, the data collection and analysis methods. It

narrates the procedures used for data collection and examines issues of validity, reliability and ethical considerations.

Based on within case analysis, the results of the case study are presented over two chapters. **Chapter 5** presents the findings of the semi-structured interviews of the exporters supported by qualitative material from the New Zealand Shipping Gazette, the websites of the exporters and the Port of Napier weekly newsletter. **Chapter 6** presents the findings of the analysis of quantitative data from specific aspects of the container terminal operations.

The findings of the research are summarised and conclusions reached based on the objectives of the research in **Chapter 7**. The limitations of the study are explained as well as suggestions for further research.

Chapter 2: Industry Review

2.1 Introduction

The New Zealand pipfruit industry is unique for several reasons. A small domestic market comprising just over 4 million residents deems the local industry heavily reliant on foreign revenue; approximately 65% of the gross crop is exported (Anon, 2009). The local industry, over the years, has had to overcome its high cost structure due to prolonged scientific research dependence and isolation from markets to compete on the global scene. New Zealand pipfruit has the furthest distance to travel of any exporting nation. The industry has positioned itself in the premium segment of the market by differentiating its product and employing creative marketing strategies. This it has accomplished despite being a micro player on the world scene, contributing less than 1% (0.5 million tonnes) to global output and about 4.4% of global export volumes of about 7 million tonnes (Anon, 2009). To appreciate the current structure of the industry, particularly the exporters, it is essential to look back into the history of the industry in order to understand how certain developments led to the current situation.

2.2 History

According to McKenna and Murray, “apples are a truly global fruit having been grown domestically for the past 3000 years in different climatic regions” (2002, p496). New Zealand’s pipfruit industry is relatively young in comparison, with the first seedlings reportedly arriving in the mid-19th century from Europe and the USA. The seedlings arrived to a country (New Zealand) with fewer pests and diseases till woolly aphids came in the 1870s. The local industry was saved by the Northern Spy apple variety’s resistance to the woolly aphid. Breeding was based on the Northern Spy rootstock and production increased culminating in the first export shipments around 1910 (Anon, 2005b; McKenna, Le Heron, & Roche, 2001). “In 1924 the Fruit Export Control Board was established to regulate apple and pear exports” (McKenna et al., 2001, p159).

Exports ceased during World War II and resumed in 1948, the same year Parliament passed the Apple and Pear Marketing Act resulting in the formation of the New Zealand Apple and Pear Marketing Board (NZAPMB) that succeeded the Fruit Control Board. McKenna et al., define it as:

“a cohesive nationally based single desk export oriented cooperative structure that structures key research, production, regulatory and marketing functions so setting parameters of what is produced and to what ends” (2001, p158).

The passing of the Act resulted in the Board setting export standards for fruit, and was obligated to accept and pay for all fruit meeting that standard. The Board was also responsible for the distribution and marketing of that fruit locally and abroad.

The Nelson region was the main growing region in the early years spurred on by a period of speculative planting between 1911 and 1916, and improved tree maintenance. It was almost inevitable that the Hawkes Bay would surpass the Nelson region as the largest growing region given its natural advantages. The highly productive and uniform soils of the Heretaunga plains and the availability of irrigation water provided ideal conditions for fruit growing. Nearby urban areas like Wellington helped sustain growth in the early years, aided by well developed infrastructure, nearby investors and research institutes. The latter being particularly relevant because of the industry’s dependence on scientific research (McKenna et al., 2001). Le Heron and Roche reported that,

“..the concentration of the industry in Hawkes Bay makes it a valuable laboratory for the study of value preserving and enhancing activity in the industry and the local contribution to globalisation and sustainability influences” (1996, pp424-425).

The industry, in the largest of the smaller growing areas, Central Otago, began in the 1860s with the decline of alluvial gold mining. Water races originally reserved for processing gold ore were redeployed to irrigate orchards. Unlike the two dominant regions, orchards in Central Otago were not dedicated to one type of fruit. This, coupled with the region’s isolation limited the expansion of the industry (McKenna et al., 2001).

It was acknowledged as far back as the 1950s that the industry could not compete in the commodity sector because of reasons previously mentioned, a high cost structure, distance from the markets, the small size of the industry and a small domestic market. To focus the industry’s resources on higher earning varieties and to increase the likelihood of competing profitably, the New Zealand Apple and Pear Marketing Board (NZAPMB) deliberately paid the growers more for 15 out of the 139 varieties grown then (Scott, 1994).

The NZAPMB's efforts were complemented by the government through the Department of Scientific and Industrial Research (DSIR, later to become HortResearch) that funded horticultural research (Le Heron & Roche, 1996). The Department of Scientific and Industrial Research (DSIR) launched an apple breeding program in the late 1950s aimed at developing new and unique varieties for export and improving "fruit quality, storage, yield, and pest and disease resistance with desired growing habits" (Le Heron & Roche, 1996, p424). Under the guidance of Dr. Don McKenzie, this program came about after the DSIR examined several varieties from overseas but found very few were suitable for New Zealand growing conditions (Anon, 2005b). These strategic initiatives enabled growers to focus on orchard management issues. The single desk gave the local industry the ability to gain economies of scale in activities such as cool storage and shipping, and more significantly, strength by volume, when negotiating freight rates and supply contracts.

Increased investment in storage and production technology helped the local industry grow steadily up until the 1960s. The 1970s slowed this steady rise, in fact the commercialisation of the Braeburn and Royal Gala varieties was credited with saving the local industry from total collapse (McKenna & Murray, 2002). McKenna and Murray further reported that the challenges in the 1970s emanated from:

" increased production by both Northern and Southern Hemisphere producers, rising freight costs, shifting consumer preferences and the entry of the UK into the European Economic Community that all combined to worsen New Zealand's competitive position" (2002, p502).

The tale of the commercially successful Braeburn and Royal Gala varieties narrates the industry's triumphs despite being a very small player in a very competitive global market. These varieties were developed locally in the 1960s and first sold on global markets in the 1970s (McKenna & Murray, 2002). New Zealand's competitors (particularly Chile and Brazil) imitated these varieties but were unable to replicate the quality of New Zealand fruit. The quality of fruit can be put down to the efforts of the DSIR, and the NZAPMB, who worked closely with the growers to overcome problems of disease, pests and storage life that afflicted the fruit in the early years (Le Heron & Roche, 1996). In the last 20 years competitors have managed to significantly close this

quality gap and at a lower cost (Chile in particular). This development has relegated the varieties to almost commodity status today, and eroded the margins previously enjoyed by the local industry.

On November the 8th, 1981, New Zealand signed up to the International Union for the Protection of New Plant Varieties (UPOV). UPOV's main objective is the protection of newly developed plant varieties by way of intellectual property rights (UPOV, 2009). More importantly for the local industry is that all of its main competitors (Chile, Argentina, South Africa, and Brazil) are signatories strategically positioning it to legally control new varieties it developed. In 1999, 65000 Sciros and Sciglo trees bearing the locally developed Pacific Rose™ variety were discovered in Chile. Chile is New Zealand's main southern hemisphere competitor and traditionally competes on the opposite end of the value scale in the industry because of its cheaper labour cost and size. Through UPOV, the NZAPMB had the illegal plantations destroyed (Anon, 1999).

Two other significant events that had a bearing on the future structure of the local industry occurred in the 1980s. Firstly the government embarked on implementing free market reforms so starting a process that would eventually lead to the industry's deregulation (McKenna, 2000). The second was in 1985, whereby the:

“NZAPMB, the Department of Scientific and Industrial Research and some private breeders agreed that in exchange for funding, the Board would have sole marketing rights for new cultivars” (Le Heron & Roche, 1996, p424).

Lessons of the past hadn't been forgotten, after assuming the risk and cost of developing new varieties, the local industry was powerless to stop competitors imitating the Braeburn and Royal Gala varieties. Each new variety had Plant Variety Rights protection so imitation by competitors would only be under licensed agreements. This event laid the platform for the later development of promising varieties such as Jazz™ and Envy™.

The NZAPMB as in the 1950s, encouraged growers to focus on potentially higher earning varieties such as the Braeburn, Royal Gala and Fuji. In response:

“orchardists continued to replant at least 10% of their stock each year into the 1990s in anticipation of the development of new varieties – a trend that buoyed production and income into the mid 1990s” (McKenna & Murray, 2002, p502).

Export revenue steadily rose in the early 1990s peaking at \$482 million in 1995 (Dobbs & Rowling, 2006). During this period growers gradually replaced the older commodity varieties such as Granny Smith, Red and Golden Delicious, and Cox Orange with newer and higher earning ones with Braeburn, Royal Gala and Fuji as the core varieties. Others included Pink Lady TM and Southern Rose (McKenna, 1998).

In 1991 NZAPMB rebranded, renaming its marketing arm ENZA and marketed pipfruit under the ‘ENZA’ brand name. Prior to this, all export fruit was marketed under the brand name ‘New Zealand’, the NZAPMB argued that any exporter could use ‘New Zealand’ so rebranding was necessary (ENZA, 2009). In hindsight the NZAPMB probably rebranded in anticipation of deregulation and needed to establish an identifiable brand. During the regulation era the NZAPMB did give out a few export licenses to exporters whose activities were deemed complementary to its own (McKenna & Murray, 2002). In 1993 the industry managed to ward off an attempt by the government to deregulate. As a compromise the local industry was deregulated opening up the domestic market to any supplier (McKenna & Murray, 2002).

The second half of the decade brought mixed fortunes to the local industry mostly resulting from events in its macro environment where it had very little control. In 1994, the Uruguay round of the General Agreements on Trade and Tariffs was signed off; of key significance to the local industry was the adoption of phytosanitary regulations by its key destination markets as non-tariff barriers (Le Heron & Roche, 1996). This resulted in the:

“pests and diseases of pipfruit transforming from an orchard management issue affecting production to an international competitive threat affecting the consumption of fruit” (Le Heron & Roche, 1996, p426).

This event coincided with the growing trend of retail consolidation overseas, particularly in Europe, along with their growing purchasing power. To put this in perspective, McKenna (1998) reported that the United Kingdom (UK) received between

25-30% of all of New Zealand's exports but just 4 large retail groups control approximately 61% of all fresh fruit and vegetable sales in the United Kingdom (UK).

To appeal to their more informed, environmentally and health conscious consumer, the large retail groups expanded their product specifications to include 'safe fruit' grown by sustainable methods, and this they expected at no extra cost. The product specifications created challenging conditions for the local industry but the NZAPMB was equal to the task by repositioning itself as an exporter of safe eating fruit, environmentally friendly and grown by sustainable practices. This development led the NZAPMB to adopt Integrated Fruit Production (IFP) and promote it to protect its market share. It encouraged growers by paying premiums on Integrated Fruit Production (IFP) fruit of \$0, 25 cents per carton (McKenna et al., 2001). The system was rapidly adopted by growers and as of the 2000/1 season, IFP and Organic Production Programmes became the minimum export standard (Anon, 2002).

Global production of apples grew about 50% between 1992 and 2002. The local industry faced increased competition from other fruit and manufactured snacks in its markets. This was worsened by global oversupply of apples, and the increased bargaining power of supermarkets, all which served to drive prices down (Prasad, 2002). The industry was also vulnerable to extreme weather conditions as hail halved the export crop in the 1993/4 season (Le Heron & Roche, 1996) and sunburn affected the crop in 1998 (McKenna & Murray, 2002). Growers endured declining returns beyond 1995, export revenue fell steadily from the 1995 peak of \$482 million to \$404 million in 2000 (Dobbs & Rowling, 2006).

The NZAPMB contributed to the challenging conditions for growers by aggressively employing the clawback system. This was money reclaimed for substandard fruit reaching the market (quality clawback) or for anticipated prices falling shorter than initially estimated (market clawback). The NZAPMB paid the growers 50% of the expected value of their fruit upon delivery, the remaining half was staggered throughout the year. In 1997, poor quality fruit cost the industry \$60 million and Red Delicious growers were paid \$0, 22 per carton after the remainder was clawed back from an upfront payment of \$4, 47 per carton (McKenna, 1998).

Despite all these issues the industry was still managed to be considered as the most competitive exporter in the world from 1996-2000 whilst only producing 1% of global production (0.5 million tonnes) and contributing to 3% of global trade (McKenna, 2000). This ranking by the World Apple Review uses production efficiency, industry infrastructure and inputs and financial and market factors to determine the export competitiveness of producing countries in the long run. The ranking provides an objective way by which a country can measure its standing against other exporting nations (Anon, 2009).

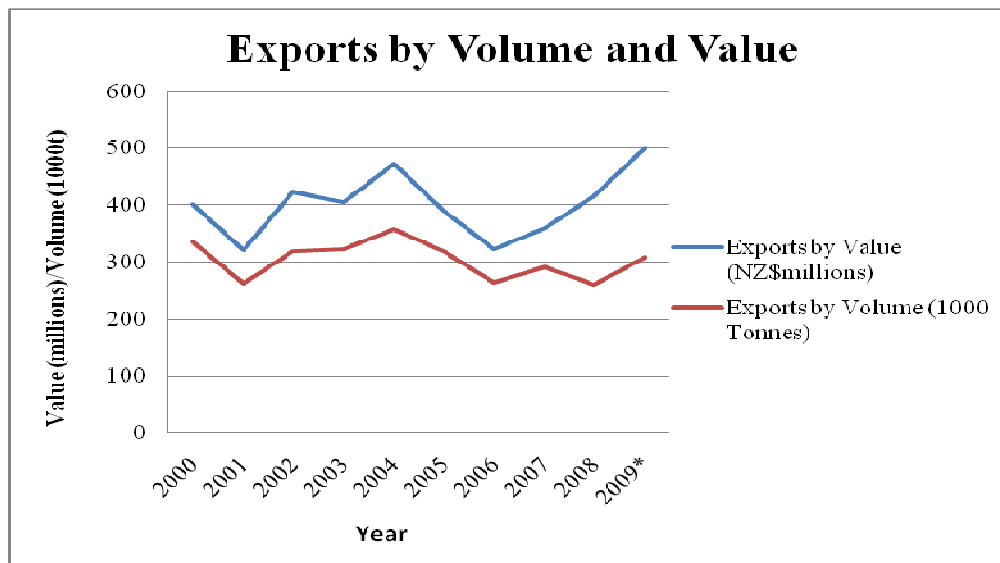
As can be expected, the decline in returns to growers pushed many to the brink of financial ruin. This seemed to give the government ammunition to push forth its deregulation agenda. The decline culminated in the industry's deregulation on the 1st of October 2001 (Ministry of Agriculture and Forestry (MAF), 2001). The industry was opened up to any exporter as of the 2002 season.

Deregulation was pushed forth by the government “to increase the pipfruit industry’s responsiveness to markets, it’s innovative capacity, and its long-term profitability” (Redward, 2003, p71). The government believed that multiple exporters could exploit market opportunities more effectively than the single desk cooperative. As an example, before deregulation, the NZAPMB signed an exclusive supply deal with the Aldi Distribution Group in Germany, restricting it from exploiting other opportunities in that market (Dobbs & Rowling, 2006). The 2002 season saw 97 exporters emerge, most of them small, with only 35 handling over 100 000 cartons (Redward, 2003).

Upon deregulation ENZA shed all the ‘industry good’ initiatives such as market access, crop estimates, price forecasts, research and development and contracted them out to Pipfruit New Zealand Incorporated. Its operations have been funded through a levy charged on every carton as stipulated by the Commodities Levies Act of 1990. The growers in particular were soon to experience new challenges brought on by the new export regime. ENZA no longer guaranteed importing nations that fruit met their phytosanitary and food safety assurance requirements, thus burdening growers, with an added cost and inconvenience. The guaranteed price scheme under the ‘single desk’ also disappeared as well as the advance payment the growers received (Redward, 2003). The advance payment and price guarantee scheme would have provided much needed

financial support because the growers had endured successive seasons of declining returns.

Mercifully for the local industry in 2002, global prices improved and so did returns to growers as shown by the increase in the value of exports in figure 2.1 below. The new export regime explored new and diverse markets essentially restoring confidence in the sector. The new Jazz™ cultivar developed by HortResearch and controlled by ENZA performed well in global markets. Orchards in the Hawkes Bay in particular were expanding with plantings of new premium varieties (Prasad, 2002). 2002 was the first year the Jazz variety was exported having being a product of the development efforts that began in the 1980s (Anon, 2005b).



Source: (Statistics New Zealand, 2009) * - forecast

Figure 2.1 – Exports by Volume and Value

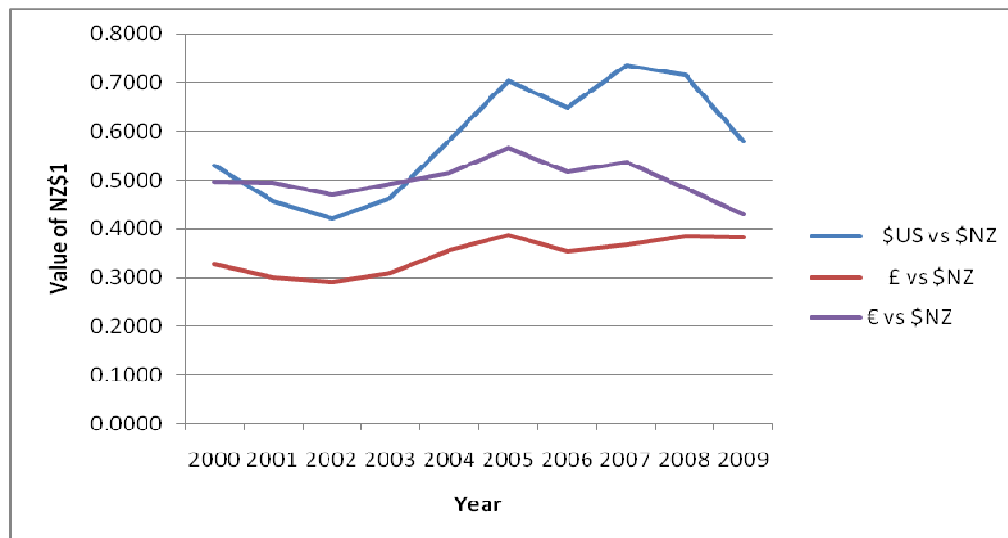
Exports grew, though unusually high; 60% of total production was exported in 2002 rising to 63.9% in the 2003 season (Anon, 2009e). The reason for this unusually high proportion of exports can be traced to the absence of an industry wide export grade standard that disappeared along with the single desk. Each exporter now determined their own. This compromised the local industry’s reputation as substandard fruit reached the market. The exporters also undercut each other in order to get rid of fruit as

they acted as commissioned marketers, a development that favoured overseas retailers. Fruit was shipped at growers risk further compromising their position (Redward, 2003).

Up until 2003, New Zealand had been judged the most competitive apple exporter since the inception of the ranking in 1996. In 2004, for the first time Chile, New Zealand's closest rival, claimed the top spot. This can be attributed to the decline in the market's perception of the quality of New Zealand pipfruit, the fragmented marketing approach of the multiple exporters, and the improvement of Chile's marketing effort and quality systems. It seems evident the reputation built by the 'single desk' cooperative had carried the export crop for the first couple of seasons after deregulation. Despite 2004 being a record crop year, losses were incurred as result of poor quality and marketing indiscipline (Redward, 2004).

The industry's heavy reliance on the Braeburn and Royal Gala varieties was exposed in 2005 with the firming of the New Zealand dollar against most of the major currencies (see figure 2.2 below). Global oversupply saw the price of Braeburn fall by 35% and Royal Gala 12%. This was particularly pronounced in the European market as it was destination to over 70% of exports. Difficulties for the industry arose from the lack of market intelligence filtering back to the growers informing them of what the market wanted. Further difficulties arose from the effects of SmartFresh™, uncoordinated marketing and poor quality reaching the market (MAF, 2006).

SmartFresh™ is an ethylene inhibiting technology that prolongs the storage life of fruit. It enables Northern Hemisphere competitors' fruit to still be present in the market well after their traditional season ends but also enables the local industry to sell fruit outside of the traditional window. Counter seasonality presents Southern Hemisphere producers with a selling window in the north that has been shortened considerably by SmartFresh (Redward, 2003). The industry continued to struggle as 2006 wasn't much better as the New Zealand dollar continued to firm against major currencies (US Dollar, Euro and GB Pound, see figure 2.2 below) making exports less competitive.



Source: (Reserve Bank of New Zealand, 2009) values shown are the average rates over each year.

Figure 2.2 – **The Value of the New Zealand Dollar against Three Major Currencies**

The financial hardships forced many growers to exit the industry. Numbers had declined from about 1500 in 1998 to about 900 in 2005 (Redward, 2003). The exit of growers from the industry allowed others to consolidate orchards and expand their operations. There was some vertical integration as growers formed alliances with downstream businesses like packhouses, coolstores and exporters. Coolstores and packhouses expanded operations to include food safety assurance and phytosanitary requirements demanded by destination markets (Redward, 2003).

Over this decade (2000-present) there have been increased plantings of Jazz™ as well as other recently developed varieties such as Pink Lady™, Tentation™ and the Pacific series varieties, Pacific Rose™, Pacific Queen™ and Pacific Beauty™. HortResearch has continued to lead the industry in the development of new varieties with the Jazz™ variety showing the greatest promise. Marketed by ENZA, the owners of its Plant Variety Rights, 240 000 cartons (4300 tonnes) were exported in 2006 and it had a 65% price premium on its parents, Braeburn and Royal Gala. It is predicted that by 2010, 54 000 tonnes of Jazz™ will be exported from New Zealand (Anon, 2006). “Similar volumes were grown under license in France and the United States (Washington State) enabling the development of year round supplies” (Anon, 2006, p9). Similar trials were

held in South Africa, Chile, UK, Italy, and Switzerland and more significantly for the local industry, Australia (Anon, 2006). New Zealand apples were last allowed into Australia in 1921 because of fireblight, a bacterial disease affecting apple trees. The industry has lobbied the New Zealand government which has eagerly taken on their cause. The local industry argued there's no scientific justification for the ban and the matter is still before the World Trade Organisation as of July 2010. Licensed orchards create a platform to circumvent the ban on New Zealand apples till the matter is resolved.

In an effort to lessen its reliance on government funding alone, HortResearch sold services and licensing rights to the private sector to fund its research projects. Prevar® (deriving its name from 'Premium Varieties') is a joint venture company founded in 2004 to manage the commercialisation of new pipfruit varieties. Its founding members include HortResearch, Pipfruit New Zealand, Apple and Pear Australia Limited (APAL) and the Associated International Group of Nurseries (AIGN) (Anon, 2009). In 2005 Prevar® launched its first cultivars, Sweetie™ a Royal Gala alternative and two pears, Maxie™ and Crispie™ (Anon, 2005a).

Pipfruit New Zealand has taken the lead to present a more united front for the local industry. This was motivated by the need to overcome the challenges presented by global oversupply, a strengthening currency, poor quality exports and the lack of a robust industry-wide marketing strategy. In 2006, Pipfruit New Zealand set up an export market panel that would administer the 'Trustmark' brand. 90% of the export crop is now exported under this brand. 'Trustmark' is a voluntary export program in which members upon signing up to, have access to a range of benefits such as access to newly developed varieties and use of the brand. In return the members agree to adhere to set down operating guidelines. The 'Trustmark' brand assures the market fruit they buy has been grown by IFP and/or Organic Production methods, grown using "Good Agricultural Practice, food safety and quality systems compliant with EurepGAP or equivalent programmes" (Anon, 2009a).

"EurepGAP (now GlobalGAP) is the initiative started in 1997 by retailers belonging to the Euro-Retailer Working Group, that has since evolved into an equal partnership between them and produce suppliers. The objective of this organisation is the

development of widely accepted standards and procedures for the global certification of Good Agricultural Practices (GAP) hence the acronym EurepGAP” (Anon, 2009g).

2.3 Current Situation

The 2009 season promises to be a good year given the favourable growing conditions experienced that have yielded good quality fruit (Anon, 2009b, 2009f). Estimates put the export crop at around 17.2 million cartons/309 000 tonnes, a 16.5% increase on the 2008 export crop. Pears comprise just 2% of the total export volume comprising approximately 73% of total production (Anon, 2009f; MAF, 2009a). The balance of 27% is sold domestically or processed (MAF, 2009a). 17 million export cartons is close to the upper limit of what the growing area in New Zealand is capable of producing, the lower limit being approximately 14 million cartons, with the weather during the growing season determining the final output within this range (Anon, 2009b).

Productivity averages out at 54 tonnes per hectare, the highest of any producing country. Hawkes Bay and the Nelson regions are the main growing areas estimated to contribute approximately 63% and 30% respectively. Approximately 3% will come from the Central Otago region while the balance, 4%, will collectively come from the smaller growing regions of the Waikato, Gisborne and Wairarapa. The export crop is expected to earn in excess of NZ\$500 million in foreign exchange (Anon, 2009f).

The Braeburn and Royal Gala varieties continue to dominate the industry’s exports though there is a significant increase in recently developed varieties. A 20% drop on the 2008 prices of these two varieties is expected in Europe because growers they have had an above average season. Optimism, however stems from the gradual replacement of these varieties by new and higher earning premium varieties as well as the varied targeted marketing strategies employed by New Zealand exporters (Anon, 2009b). In 2006, Braeburn, and Royal Gala comprised 76% of all exports but this year (2009) they are down to 64% with increases in the new varieties, Jazz™ up 71%, Pink Lady™ up 15% and Tentation™ up 52% (Anon, 2009f). Asian demand for the Pacific Queen has been strong as well as other varieties like Kiku, Eny™, PremA193 and PremA17. The comparatively closer Asian markets are very attractive to New Zealand growers and exporters because there is security offered by fixed price sales, lower transport costs and

quicker time to market than the traditional European and North American markets (MAF, 2009b).

The local industry's traditional markets have been the United Kingdom, continental Europe and the United States though fruit is now marketed in over 60 countries (Fitzgerald, 2003). The diverse markets give each exporter regardless of size, the opportunity to formulate strategies to target specific segments of the diverse market. Collectively as an industry, the risk is lowered as it is spread over wider markets.

In order to develop a sustainable robust marketing strategy for the local industry it is essential to have the necessary building blocks such as the EurepGAP certification. Without returning the industry to the regulation era, the set down operating procedures as well as the fact that over 90% of the export crop is now marketed under the Trustmark brand brings consistency of quality to the export crop. It also helps in uniting and restoring trust in the quality of New Zealand pipfruit: and an industry fragmented by the deregulation process. The trend of late has been for retail groups to establish long term mutually beneficial relationships with suppliers. Such developments (EurepGAP certification or equivalent) differentiate and create an opportunity for New Zealand exporters to acquire preferred status with retailers.

Pipfruit New Zealand has taken a lead role in positioning the industry in the premium section of the market. The Apple Futures and Organic Production Programmes that are complementary to the Pipsure Integrated Fruit Production program are two such initiatives. The Apple Futures project aims to grow apples free of residues. This season (2009) marked the beginning of the second year and approximately 50% of all growers in New Zealand have signed up to it. The project shows a lot of promise with half of the fruit tested in the first year free of residues. In the words of Pipfruit New Zealand's CEO Peter Beaven, "the program has made New Zealand's apples the safest on the planet" (Beaven, 2008, para 7).

The organic food sector offers plenty of promise for the local industry as Innomarc Consulting (2006) report that organic food sales in the US and Europe are growing at a rate of 20% per annum. Last season organic exports averaged out to \$36.03 per carton making them the highest earners with IFP fruit averaging out at \$24.62 (Anon, 2008b). A further 12% of the orchards have signed up to the organic or conversion to organic

program (Anon, 2009c). This project has the support of the government that availed \$2 million over the duration of the project through New Zealand Trade and Enterprise. The project is expected to increase the value of exports by \$159 million in 5 years (Goff, 2007).

New Zealand has worked hard to preserve its green reputation. To give credibility to its reputation it has had to ensure it keeps improving its sustainable environmental practices. In 2007 it was criticised in the United Kingdom for the size of the carbon footprint of its horticultural products. The government believed the claims linked to food miles had protectionist motivations. A study carried out by Lincoln University revealed that the industry had a lower carbon footprint than its UK equivalent. Their claims were based on food miles and the false assumption that a significant portion of New Zealand products were airlifted. In truth 99.75% of local products are sea freighted. The apple industry, as part of the horticultural industry, has benefited from this kind of research and from the actions of government has confronted these damaging false claims through public relations firms, the media and Non Governmental Organisations (Goff, 2007).

In the 2008 season, 93 exporters in New Zealand distributed and marketed the export crop on behalf of the growers (Anon, 2008c). In the 2009 season, 46 of these exporters sent their fruit through the Port of Napier Container Terminal.

2.4 Future Developments

The local industry, for the first time, was ranked the third most competitive apple exporter in the 2009 edition of the World Apple Review (Anon, 2009). This is possibly a reflection of the challenging times the industry has faced dealing with global oversupply, the commoditisation of the Braeburn and Royal Gala varieties, and the high New Zealand dollar. The recession is expected to keep prices subdued but the industry is optimistic it can overcome these challenges. This optimism stems from sales growth in the Asian markets, now destination to 22, 7% of total exports, the increase of new varieties in the export mix, the eventual resolution of the ban of New Zealand apples into Australia, and the continued expansion of licensed orchards overseas.

The Asian markets as previously mentioned are comparatively closer than traditional European and North American markets. There is greater security to exporters as there are fixed price sales. The faster transit times and lower transport costs enable exporters to service these markets well, hence the increase in interest by exporters (Anon, 2008a; MAF, 2009b).

Year to 31 December	Actual			Forecast			
	2006	2007	2008	2009	2010	2011	2012
Export volume (mil cartons) ¹	14.7	16.3	14.7	17	16	16	16.5
FOB ² price (\$/carton) ³	22	22.1	28.2	26.9	32.1	33	33.5
Export value (\$ mil) ³	323	360	415	457	514	528	553
1. A carton is equivalent to 18.0 kilograms							
2. Free on board - the value of goods delivered to the port and loaded onto the vessel for transportation out of the country of origin							
3. Official statistics for FOB price and value modified for 2008 and MAF Farm Monitoring data indicate higher prices were achieved							

Source - (Anon, 2009b, p58)

Table 2.1 – Current and Forecasts of Export Volumes and Value

The increase of new premium varieties in the export mix is expected to continue as new plantings reach maturity. This trend is reflected in estimates provided by the Ministry of Agriculture and Forestry (MAF) in table 2.1 above. Looking at forecasts for the next three seasons, the volumes are consistent but the higher expected earnings stem from the gradual replacement of the commodity varieties (Anon, 2009b).

The Australian market remains closed to New Zealand apples but the matter is before the World Trade Organisation disputes tribunal. Biosecurity Australia issued a Final Import Risk Analysis for Apples from New Zealand in 2006 that recommended importing New Zealand apples only after they'd gone through stringent phytosanitary measures to eliminate the risk of fire blight transmission. New Zealand argues these unjustified measures would add significant cost to the industry (Anon, 2009h). The

argument is worth exploring for the local pipfruit industry's benefit because New Zealand is best positioned to exploit the Australian market. The fast transit times across the Tasman Sea and lower distribution costs distinctly advantage the local industry.

The project involving HortResearch, ENZA and licensing overseas orchards further help differentiate New Zealand pipfruit in the market. Exporters are able to source and supply fruit all year round to retailers as opposed to just seasonally given the counter seasonality of the Northern and Southern Hemispheres. It also offers a way of entering closed markets like the Australian one until the current dispute is resolved at the World Trade Organisation. HortResearch earns royalties on fruit sold from overseas orchards thus creating a secondary source to fund the continuing development of new varieties (Anon, 2005b).

2.5 Summary

This chapter chronicled the history of the New Zealand pipfruit industry from its humble beginnings in the 19th century to the technically sound, scientific and innovative industry it is today. The industry's pursuit of quality and ability to continuously develop new varieties has positioned it to compete in the premium sector of global markets. This has been essential in overcoming exhaustive reliance on exports for income considering its small domestic market, the high transport costs stemming from its remote location, and high cost of development.

Several key developments over time put the New Zealand pipfruit on the path it is today. The NZAPMB encouraged growers to focus on higher earning varieties by deliberately paying more for them in the 1950s. The DSIR's apple breeding program was to later produce the commercially successful Braeburn and Royal Gala varieties that have been the backbone of New Zealand exports since. The decision to sign up to UPOV in 1981 was to prevent a repeat and subsequent loss of income of any varieties further developed, as what happened with the Braeburn and Royal Gala varieties. The NZAPMB again encouraged growers to focus on particular varieties in the 1980s, a development that buoyed export revenue to a peak of NZ\$482 million in 1995.

Beyond 1995 export earnings steadily declined due to a combination of factors, the consolidation of retail groups and their growing purchasing power, global oversupply,

and competition from other fruit and manufactured snacks. Retailer demands for safer fruit increased the complexity for the industry but the NZAPMB was equal to the task by acquiring 100% conformance from growers adopting either the Integrated Fruit or Organic Production programs by the 2000/1 season.

The industry was deregulated towards the end of 2001 primarily because the government felt multiple exporters could exploit market opportunities better than the single desk could. As of the 2002 season 93 exporters came into operation. The industry suffered initially because of the fragmented marketing approach of the multiple exporters. The markets' view of quality of New Zealand pipfruit was hurt the most as exporters allowed sub-standard fruit to reach the market. There was price undercutting amongst the exporters and growers were further exposed to risk by exporters acting as commissioned marketers.

Pipfruit New Zealand has increasingly taken on the responsibility of reasserting the industry to its previous status and successfully so. It has managed to get about 90% of all exporters to join its volunteer export panel 'Trustmark'. This is targeted at returning a consistent level of quality to exports as there was prior to deregulation, because each exporter had their own export standard. Pipfruit New Zealand has also introduced the Apple Futures program designed to grow fruit with nil residues. This was intended to create another differentiating point in the industry's marketing endeavours.

The industry now exports to over 60 countries with increasing replacement of the Braeburn and Royal Gala varieties by recently developed and higher earning varieties such as the Jazz™, Pacific series apples, Tentation, Envy™ and Pink Lady™. The Asian markets continue to grow and increasingly attracting increasing interest from New Zealand exporters given the proximity compared to traditional European and North American markets. In the mean time licensed orchards run by the ENZA and HortResearch offer a way around the current ban on New Zealand apples in Australia. These licensed orchards in the Northern Hemisphere not only raise funds for continued research at HortResearch by way of royalties on fruit sold, but they also provide year round supplies to retailers as opposed to just seasonally. This gives New Zealand exporters yet another negotiating lever.

Chapter 3: Literature review

3.1 Introduction

During the pipfruit export season, the Port of Napier Container Terminal experiences a surge in reefer (refrigerated containers) cargo, well above the average, between the months of March and July. As a consequence the terminal endures a shortage of reefer storage space and an increase in rehandling work during the season. A rehandle is defined as a container moved from one yard position to another. In other words it is a 'yard shift'. It becomes necessary to examine the literature as it applies to this situation to help in situating the research to be carried out. Three sections are presented below in this regard. The first section briefly explains the different container handling equipment systems, the second, the literature reviewed on rehandles, and the third, the literature reviewed on capacity issues in terminals.

3.2 Container Handling Equipment Systems

The availability of storage space influences what equipment a terminal uses. These vary from one extreme in which containers are stored on trailers (chassis) on sites where there is ample storage space, to the other extreme where yard cranes are employed to achieve high density ground stacking where storage space is a premium (Taleb-Ibrahimi, de Castilho, & Daganzo, 1993).

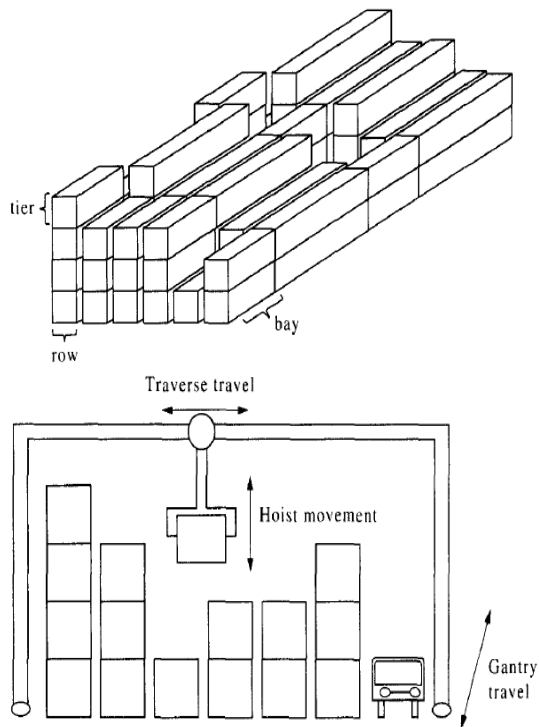


Source: (Kalmar, 2009)

Figure 3.1 – '1 over 2' Straddle Carriers

Terminals not constrained by land use either trailers (chassis) or straddle carriers. In the former, containers are stored on trailers ensuring that every container is accessible so there are no rehandles. In straddle systems, containers are stored in vertical stacks and then laid end to end. These rows are separated by aisles that the straddle carriers travel in as they 'straddle' the containers. In a terminal that stacks to the second tier as shown in figure 3.1 above, '1 over 2' straddles are employed, meaning a straddle can carry a container over two containers. In the worst case scenario rehandles are limited to one container move. Straddles are very flexible as they can be easily manoeuvred to areas of greatest demand (Alvarez, 2001; Taleb-Ibrahimi et al., 1993).

In land constrained terminals, more intensive use of storage space is required. The most common systems employ yard cranes particularly in high throughput terminals. These yard cranes can be either Rubber Tyred Gantry Cranes (RTGs) or Rail Mounted Gantry Cranes (RMGs). The concept is the same for both; the crane straddles the entire yard block, including the truck lane as seen in the figure 3.2 below.



Source: (Kim, 1997, p703)

Figure 3.2 – Three Dimensional and Cross Sectional View of a Yard Crane Block

The difference arises from the ability of the RMGs to stack higher and the greater flexibility of the RTGs. The latter can be easily deployed in different blocks whereas the former are confined to certain blocks given they run over rail tracks. Figure 3.2 also shows a three dimensional view of the yard crane block showing the bay, row and tier layout. As yard cranes can access each row from the top, the likelihood of rehandles is only limited to the number of containers on top of each target container.

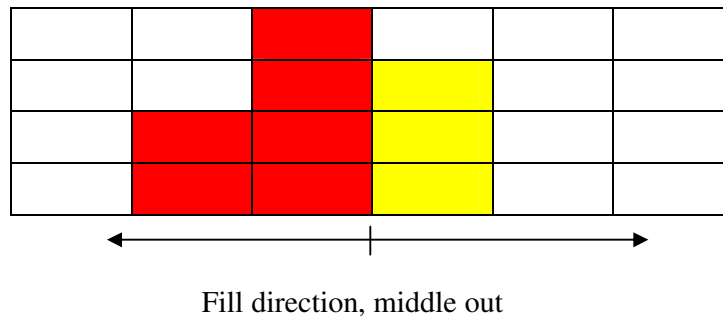


Figure 3.3 – **Cross Section of a Reachstacker/Forklift bay**

The other system making intensive use of scarce land is one that uses reachstacker/forklift equipment. This is the system employed by the Port of Napier container terminal. Containers are stacked to the fourth tier though stacking heights vary by location. The yard blocks are similar to yard crane blocks but differ in the stacking height. At the Port of Napier, to improve access to each target container, yard blocks with two-way access are split in the middle (lengthwise) so a bay for each group of containers is only 3 rows deep as shown in figure 3.3 above (the two colours represent two different container groups). The group of a container contains its routing details, including its outbound vessel, port of discharge, the size (20' or 40', 8'6" or 9'6") and type (reefer or dry) of the container, its weight class (light or heavy) and its International Maritime Organisation status (type of hazardous cargo if it has any). Containers are stored by group in the yard. Access is only from the side of a bay so this system has the greatest likelihood of rehandles.

Reachstackers and forklifts only differ in that reachstackers are able to 'reach' over the first row and pick up a box on the top tier of the second row as shown below in figure 3.4.



Source: (Anon, 2009d)

Figure 3.4 – **Reachstacker Retrieving a Container from the Second Row**

3.3 Rehandles

As discussed in the previous section, all terminals except those storing containers on trailers will encounter rehandles (unproductive moves), the severity of which all depends on the container handling system employed. As terminals handle both exports and imports, it is imperative to examine how rehandles generated handling exports and imports are treated in the literature.

3.3.1 Sources of Rehandles

In a study of container terminal operations, Chen (1999) explains how higher stacking is responsible for unproductive moves (rehandles). The total number of unproductive moves (rehandles) are dependent upon several factors namely, the storage strategy for exports, the quality of information on containers, the storage policy of the terminal and the stacking height of imports.

In the 'pre-marshalling' strategy exports are 'dumped' in temporary stacks using only one group attribute, commonly the outbound vessel. Once loadlists are finalised, storage space closer to the vessel berth is allocated and the temporary stacks are sorted (pre-marshalled) to match the vessel loading sequence. In the 'sort and store' strategy, all the group attributes are used to segregate the container upon receipt ensuring that containers of the same group are stored in the same stacks. Theoretically there is less rehandling in this strategy but it demands ample storage space to function effectively otherwise rehandles arise from the need to sort 'mixed stacks'.

The second factor influencing rehandles is the quality of information. A container can have incorrect details such as its vessel or discharge port, consequently needing rehandles to place it in the right stack. The third factor has to do with the storage policy employed by the terminal i.e. the dwell time allowed for containers in the yard. The longer this is, the greater the likelihood of rehandles as storage space is taken up by boxes that arrive in the terminal well in advance of their vessel working.

In the case of imports, rehandles arise when imports in the yard are moved to make room for imports due to come off vessels (housekeeping moves). Ideally this is done before the vessel starts work to avoid slowing down the vessel exchange. Failure to do so results in new imports stacking over older ones causing more rehandles during delivery to trucks or rail as the older ones normally go out first. Higher stacking of imports is considered the most significant influence on rehandles. There's a greater likelihood of rehandles the higher the stacks are because the departure of imports is a random event.

This study is useful to the research project because it helps in understanding what occurs in the Port of Napier container terminal during the fruit season. The terminal employs a real time terminal operating system (Navis Express and SPARCS) that segregates containers according to the 'sort and store strategy'. Theoretically, a box should be picked off a truck and taken to its assigned position in the yard and only moved again when it's taken under the mobile harbour crane for loading. The large volumes of reefers encountered and limited storage space force the terminal to employ the 'pre-marshalling strategy' that requires the use of overtime labour (drivers and reefer care staff) and resources (forklifts) to sort mixed stacks.

In a study to quantify the unproductive moves (rehandles) in quay transfer operations, Chen, Lin and Juang (2000) examined the operations at the Yang Ming Terminal at Kaohsiung in Taiwan. This terminal uses RTG (Rubber Tyred Gantry) blocks for transship containers as well as its primary import area, and straddle carrier blocks for local exports and as its secondary import storage area. Chen et al., identified 'shift and housekeeping moves' as the unproductive moves occurring during loading and discharge operations respectively. By general and regression analysis of 43 'Summary of Quay Transfer Operations' and 'Daily Yard Inventory Reports' they identified the number of containers loaded and discharged as the most significant cause of shift and housekeeping moves respectively. Shift moves comprised 9% in straddle crane blocks and 17% in RTG of all containers loaded, the difference arising from the higher stacking achieved in RTG blocks and the change of vessel or discharge port that occur with transship containers. Housekeeping moves comprised 21% of the total discharged, a figure influenced by the high stacking achieved in RTG blocks. This supports Chen's (1999) suggestion that higher stacking does indeed cause rehandles as there's a higher percentage of rehandles in RTG blocks than straddle crane blocks given the former have higher stacks.

The literature reviewed in this section reveals the main cause of rehandles to be linked to the shortage of storage space. The increased container volumes terminals deal with force them to stack higher reducing access to each container and increasing the likelihood of rehandles. The lack of space forces terminals to employ the pre-marshalling strategy that generates rehandles to cope with the volumes. The storage policy of a terminal also influences the number of rehandles as it controls container dwell times. The more generous this is the more likely rehandles will be as shippers take advantage of the cheap storage increasing congestion in the yard. Lastly the quality of information also has an influence on the number of rehandles as any change will require rehandles to place containers in the right stack.

3.3.2 Rehandling Export Containers

The arrival of exports in the terminal is a random process and because of storage space constraints, terminals are forced to stack containers of different groups in the same stacks. It follows that the final layout of exports for a vessel will not suit the loading

sequence. It becomes necessary to re-marshall (generating rehandles) the containers to suit the loading sequence and this is done by allocating space close to where the vessel will berth to minimise the travel distance of the container handling equipment. The problem becomes finding the most efficient way of re-marshalling, as it needs to be done without slowing vessel operations.

Upon confirmation of a vessel's load list, Kim and Bae (1998) propose a methodology for re-marshalling export containers in a yard block with two yard cranes. This method focuses on minimising the travel distance of the yard cranes as well as performing the re-marshalling process with the least amount of moves. The re-marshalling problem is addressed in two stages by mathematical programming. In the first stage, the bay matching and move planning problems are addressed by dynamic programming and the transportation problem technique respectively. The current stacking layout of exports is matched to the ideal layout, and then the number of moves required is solved by an iterative process considering the constraint imposed by the minimum distance allowed between yard cranes. The second stage, the task sequencing part, then uses these results to find the sequence that minimises the distance travelled by the yard cranes. The authors draw attention to the long computational times demanded by this method.

Kang, Oh, Ahn, Ryu and Kim (2006) put forward an approach to solve the problem of developing an intra-block re-marshalling plan in the least possible time, using multiple cranes. This approach assumes the vessel loading plan is known prior to sorting, the objective being to create a re-marshalling plan that generates no rehandles during sorting and vessel loading, and minimises crane interference. As expected, there are numerous possible crane schedules so to pick the optimal one the simulated annealing process is employed to search for good partial orders. These good partial orders are then expressed in the form of partial order graphs. An evaluation heuristic is then employed to construct full crane schedules by crane simulation, whose quality is judged by the length of time taken to complete each schedule. Kang et al., point out that in practice rehandles are inevitable given storage space constraints and incorrect container weights given.

Lee and Hsu (2007) propose a integer programming model with constraints reflecting movement rules containers follow in practice, that seeks to optimise the re-marshalling

of exports. The research is based on the sorting of containers in one bay with one yard crane. In practice moving containers between bays in a block is avoided for safety reasons, yard trucks are used to perform the horizontal movements. The model is intended to reposition exports so vessel loading generates no rehandles, and more importantly, the remarkshalling process occurs with the least amount of moves to minimise the time taken. The model's computational time is significant so a heuristic is suggested to simplify the computational process.

In a similar study Lee and Chao (2009) propose a heuristic model to address the remarkshalling problem. The methodology is less computationally demanding than the integer programming model proposed by Lee and Hsu (2007). The model sought to have a final layout that produced little or no rehandles during loading and that required the least amount of moves during the re-marshalling process. The model had two major subroutines, the first a neighbourhood search process that seeks to minimise rehandles in the target bay layout. The second, a binary integer programming formulation, that reduced the length of the movement sequence. Three minor subroutines worked in the background to enhance the work of the major subroutines by ensuring at least one stack was completely emptied, stream lining the movement process and reducing the rehandles in the final bay layout.

Park, Park and Ryu (2009) propose a cooperative co-evolutionary algorithm to develop a remarkshalling plan for an automated container terminal. Their work is based on a yard block employing two automated transfer cranes, one that works on the seaside and the other on the hinterland side. The vessel operations (seaside) and receiving and delivery (hinterland) operations are kept separate so when time permits, exports stacked on the hinterland side of the blocks are moved to the seaside and imports from the seaside to the hinterland side. The problem is subdivided into two parts, the first, target stacks are chosen heuristically and secondly, specific slots are chosen and the movement sequence is determined by the cooperative co-evolutionary algorithm. The ideal candidate is one that eliminates rehandles during the remarkshalling and vessel loading operations, and consumes the least time. Travel distances between yard cranes in different blocks are kept the same to keep the quay cranes even and minimise vessel turnaround time. Simulation results showed the plans generated by this method were more efficient than those generated by algorithms that don't decompose the problem.

Choe, Park, Oh, Kang and Ryu (2009) employ simulated annealing and heuristic algorithms to propose an intra-block re-marshalling plan that generates no rehandles during the sorting and vessel loading, and one that minimises yard crane interference in an automated terminal. The problem is decomposed into two parts, the first identifying the possible target slots. The second part schedules the yard cranes to move the boxes in each possible configuration, the ideal one being the one consuming the least time.

This section dealt with the rehandling of exports. What is evident in the literature is that re-marshalling is standard practice as terminals seek to optimise the use of scarce storage space. The problem is addressed by focusing on generating yard crane schedules that minimise the time spent on moving the containers and on producing final bay layouts that expedite vessel loading. It stands out that the literature reviewed in this section is all based on high throughput terminals that utilise yard cranes (rail mounted or rubber tired gantries). A search of the literature revealed very little work on small terminals, particularly those employing reachstackers/forklifts systems.

It is worth mentioning that re-marshalling is carried out differently in forklift/reachstacker terminals. As access is only from the side of bays, ideally bays have to be homogenous unlike straddle or yard crane operations where only the rows (single stacks) have to be homogenous (as access is from the top). As a result re-marshalling will be inter-bay and inter-block unlike the research covered here that is based on intra-bay and inter-bay moves. Despite the difference, the motivations remain the same.

3.3.3 Rehandling Import Containers

In managing imports there is a trade-off between storage space required and rehandling work. Theoretically, the more ground space used, the lower the stacks are, and the fewer the rehandles will be to retrieve target containers. Dichotomously, the higher the stacks, the less ground space used will be, but the greater the likelihood of rehandles. The departure of imports is a random event so the greater the access to each import is, the fewer the rehandles (de Castillo & Daganzo, 1993).

De Castilho and Daganzo (1993) develop a method by which the number of shuffles (rehandles) can be estimated for one or more target containers. They derive formulas

with which they compare two strategies for managing imports. The first is the non-segregating strategy in which hot imports (older ones) are mixed randomly with cold imports (new ones). The second is the segregating strategy in which hot and cold imports are stacked separately. On average, hot imports (older ones) go out the gate before cold ones (new ones). The adoption of a segregating strategy is a trade off between shifting moves to clear room for new imports and the benefits of less rehandling work after the imports land in the yard. It was shown that for lower stacks (up the third tier) the non-segregating strategy generated less rehandles but for higher ones (greater than 3 tiers) the segregating strategy worked better.

Kim (1997) proposes a methodology for estimating the number of rehandles required to reach an import container (target) in one bay in a container terminal yard utilising yard cranes. Through the use of tables derived from probability calculations, Kim was able to estimate the number of rehandles required to retrieve a target container. Regression equations provide a simpler and faster way to estimate the number of rehandles and provides similar results to those given by the tables. An approximated formula is then developed to estimate the total number of rehandles required to retrieve every single container in that bay. This research is significant because of the need to maintain customer service level as measured by truck turnaround times. Rehandles are a significant factor influencing the throughput rates of container handling equipment because there are almost always rehandles when handling imports as their departure is random. Knowledge of the likely rehandles will help in establishing throughput rates and what to promise customers, rail and trucking companies in this case.

Kim and Kim (1999) propose a methodology for increasing the level of customer service, as measured by truck turnaround time, by minimising the number of rehandles through efficient space allocation. They develop a mathematical programming model that considers import arrivals in a constant, cyclic and dynamic situation, to estimate the stacking height that will minimise rehandles. Rehandles lower the efficiencies of yard cranes and the key to improving customer service levels is minimising them. The methodology prohibits stacking cold (new) imports over hot (older) ones (segregation policy), and assumes rehandles are moved within the same bay and that all imports would have departed before their free storage time expires.

The rehandling of imports as it's addressed in the literature is not directly related to the research project but it is interesting to note the motivation to solve the problem is similar to that of export rehandling. The desire to maintain an acceptable level of customer service to hinterland modes is measured by how quickly trucks and trains can be serviced in terminals. Rehandles influence this process because they tie up the same container handling equipment that service hinterland modes. On the export side, customer service is measured by vessel turnaround times and maintaining them at acceptable levels is the motivation behind solving the problem associated with rehandling exports.

3.4 Capacity Issues

3.4.1 Capacity Constraints in Terminals

A report by Broens, van Dyk and Tavasszy (2000) discussed the work done by the South African Netherlands Transport Forum to optimise the export fruit supply chain between South Africa and The Netherlands. Logistics and senior management representing all levels in the export fruit supply chain were interviewed to identify problems and opportunities to improve the supply chain.

As in New Zealand, the South African fruit industry was regulated, though up until 1997. A similar fragmentation of the fruit industry occurred though in this case, the problems were worsened by the less developed infrastructure. Problems ranged from shortages of cooling facilities and refrigerated trucks that affected the quality of fruit, poor information flows, and the increased complexity of multiple exporters, increased volumes and congestion in terminals at peak season. At the time of this study, only about 5% of all the fruit was exported in reefers, the rest was loaded in conventional reefer vessels. Problems in the terminals arose from the cool stores that were geared for the previous single exporter, the lack of space and appropriate warehouse management systems, long wait times and poor information flows that combined to undermine vessel loading rates. It seems logical the study revealed the need for a supply chain-wide effort to resolving the problems as it was evident the ports bore the brunt of the problems of the entire supply chain. These problems point to the lack of collaboration amongst all stakeholders especially in improving visibility by efficient and effective means of

capturing and transmitting operational data. Visibility gives the supply chain the ability to manage its constrained resources better.

As part of the study reported by Broens et al., (2000), van Dyk and Maspero (2004) reported on the work done to analyse the entire fruit logistic infrastructure in South Africa.

“This was motivated by the rising export and production volumes, development of new markets and the shortage of logistics infrastructure in peak seasons” (van Dyk & Maspero, 2004, p55).

An audit of the entire logistics infrastructure and its capacity was conducted as best as possible, in order to quantify shortfalls and recommend appropriate action. It was concluded that the industry had sufficient capacity to handle the peak periods and what was needed was to synchronise the actions of all stakeholders in the supply chain to overcome the problems faced. This study was significant in that it provided empirical evidence to support the earlier conclusions reached by Broens et al., (2000) that highlighted that the logistics infrastructure was capable of handling the export volumes.

Maloni and Jackson (2005a) reviewed the literature of the North American port capacity. They acknowledge the growing capacity problems faced by North American ports, particularly in the peak season, are not just borne by ports alone but the entire distribution network. Their work classified the existing literature based on all stakeholders involved in the container distribution network. They identify operational stakeholders as landside (shippers, railroads, truck operators and ocean transport intermediaries like freight forwarders), ports (landlords, terminal operators and labour) and waterside (shipping lines). They also identify strategic stakeholders as governments and local communities.

Faced with the ever growing Asian imports, the paper examines how each stakeholder influences the capacity issues faced by the entire network. The authors point to the urgency of a network-wide solution in dealing with the capacity issues as container volumes are projected to keep growing. The ports could help their cause by improving on productivity as they lag behind the Asian ports as discussed in an earlier paper by Chen (1998). The scarcity of coastal land leaves three options, that of reclaim,

productivity improvements and developing inland hubs to ease the pressure on port capacity constraints. Given that reclaim and developing inland hubs fall under middle to long term projects, productivity improvements offer short term improvements.

In a later paper, Maloni and Jackson (2005b) sought to explore the perceptions of port authorities with regard to the capacity issues they faced. It emerged port authorities felt hamstrung by the actions of other stakeholders so they expected the situation to worsen. They cited the lack of collaboration in addressing capacity issues particularly on the West coast where problems range from congestion on roadways, lack of road and rail carrier capacity to dealing with community resistance in seeking resource consent for expansion. Added to this is the unevenness of container flow in peak seasons and unforeseen events like the weather and labour strikes that temporarily reduce capacity.

Productivity is one capacity driver they felt they had the greatest influence over but were constrained by the powerful labour unions in North American ports that fiercely protected the available waterside jobs, working conditions and remuneration. As a coping mechanism, overtime employment of labour and resources was commonly used to deal with the volumes. The problems faced ripple through the supply chain as lines have to re-route containers in transit to avoid the extended delays faced in terminals. Importers are forced to hold more stock to deal with the variability in supply, at a cost and ultimately the consumer is worse off.

In their previous paper, Maloni and Jackson (2005b) mention three options available to ports for addressing some of their issues, reclaim, developing inland hubs and improving productivity. The port authorities are much in favour of improving productivity as it offers almost immediate gains. A comparison of container volume forecasts given by port authorities to forecasts projected from historical volumes revealed that port authorities underestimated their future volumes. This made it even more urgent to find sustainable solutions to the problem.

Capacity problems can be addressed by information technology. Murty, Wan, Liu, Tseng, Leung, Lai and Chiu (2005), report on the work they were involved with in developing a decision support system for Hong Kong International Terminal's operating system, Productivity Plus Program (3P). The Chinese manufacturing boom of the early 1990s saw a significant rise in container volumes that put the terminal under severe

pressure to maintain its position as the region's port of choice. This, coupled with the scarcity of land in Hong Kong motivated the parent company, Hutchison Port Holdings to fund this venture with the objective of improving productivity and increasing capacity.

The authors developed algorithms that enabled the terminal to reduce the number of internal trucks by half, from 8 to 4 per quay crane. This eased congestion on terminal roads and made significant savings in vehicle running costs as well as reducing harm on the environment. They also developed a system for optimal deployment of internal trucks and yard cranes and anticipating future requirements. A truck appointment system was set up to minimise rehandling of import containers and policies to manage demand during the busier daylight hours were adopted when congestion was/is traditionally an issue. The terminal was able to increase capacity which in 1995 stood at 4 million TEU, to 6 million TEU in 2002. Gains were also recorded in the efficiency of yard cranes (15-20% increase) as well as the quay cranes (a 45% increase). The improvements are said to be the same as those the company would have derived from building a two berth terminal that would have cost US\$333 million at a cost of capital of US\$66 million. Some of the changes implemented like pooling of internal trucks as opposed to assigning them to cranes, have been adopted by rival port companies.

Ortmann, van Vuuren and van Dyk (2006) describe the work done to establish the volume of fruit the South African logistics infrastructure can handle in a given time period. Two models were developed, a single commodity graph theoretic model and a multi-commodity mathematical programming model. The work entailed determining the capacities of logistics infrastructure like packhouses, coolstores, roads and terminals. The models were then exposed to two extreme seasonal scenarios assuming there were no strikes, bad weather or any other events that lower capacity and it was concluded that the network had sufficient capacity to handle the volumes at peak times. As suggested by Broens et al., (2000) and van Dyk and Maspero (2004), the authors concluded that it was suboptimal management and use of facilities that lowered capacity and ultimately induced congestion in the terminals. They further suggest that greater collaboration in the supply chain can delay physical expansion in facilities to the long term.

Le-Griffin and Murphy (2006) analyse terminal productivity measures at the ports of Long Beach and Los Angeles, and compare these to other leading ports worldwide. What stands out is that despite having twice the land area of leading Asian ports (Hong Kong and Singapore), the latter handle at least thrice the volume of containers (Chen, 1998). This can be explained by site and country specific factors. The Asian ports have very high land costs so they employ ground stacking in their marshalling yards to make more intensive use of scarce land. Long Beach and Los Angeles (as do all the other US ports) have high labour costs so they mostly employ less labour intensive wheeled operations (trailers). 70% of their volumes are imports making wheeled operations ideal because rehandles are much less likely than if they employed ground stacking. Safety laws in the United States prohibit stacking beyond the fourth tier and environmental regulations and competing urban land uses limit physical expansion. Various measures have been implemented to confront growing container volumes by some terminals in these ports given that physical expansion isn't always possible. Port authorities are aware of the technologies and operational changes to increase capacity but are constrained by the reasons stated above. A reduction in dwell time has been used to increase capacity, the extension of gate operational hours outside of traditional times and the use of inland terminals to provide the sea terminals with a storage buffer.

The papers reviewed in this section reveal that traditional methods to coping with increased volumes like expanding existing facilities or constructing green field sites are no longer sufficient for a number of reasons. The urban waterfront location of most ports limits physical expansion to expensive reclaim. There are competing urban land-uses and environmental legislation to overcome that make this option difficult. There is the realisation that the increased volumes are not just port problems but those of the entire distribution network affecting all stakeholders. It follows that solutions suggested point to the need for greater collaboration and visibility for all stakeholders. The capabilities of all distribution networks need to be known so deficiencies can be addressed in a timely manner. Ports have been forced to employ different ways of coping with the increased volumes such as extending gate opening hours, using information technology to increase operational efficiencies and using inland terminals to take the pressure off main terminals.

3.4.2 Inland/Satellite Terminals

In a preliminary study, Slack (1999) argues for the use of satellite terminals as an option for confronting the capacity problems freight (rail, sea and air) terminals endure. Hub terminals have had to deal with increased freight volumes that have put pressure on them to seek more land for operations. Traditional methods of addressing this problem like constructing new facilities, expanding existing ones and seeking operational efficiency improvements are no longer sufficient. This is all a collective result of tougher environmental legislation that seeks to protect coastal marine habitats, competing land use in urban areas and increased strength of activism. The capacity problems spill over to access routes in the form of congestion and related ills like accidents, noise and air pollution.

Of the four activities that occur in terminals, only the transfer functions need occur in the terminal. Slack further argues that satellite terminals can take some of the load off terminals by taking on part of the other three functions namely the storage, container load consolidation (and the opposite) and the logistics/distribution functions. This would free up scarce space in the main terminals and theoretically save significant capital investment. In practice satellite terminals exist though there are some differences to their benefits. Those created on an ad hoc basis mostly by trucking firms, are not suitably sited hence most have poor access to terminals. The more successful ones are those that involve private and public sector efforts as they are suitably sited and are directly linked to the main terminals by high capacity modes such as rail. Not only do they relieve the main terminals of congestion but they move freight to more environmentally friendly modes and help in alleviating traffic problems as well as noise and air pollution.

Kia, Shayan and Ghotb (2002) employ a statistically based simulation model to compare two different operating systems in a terminal. Using current data from a terminal they compare the results for the proposed system with the current one. The proposed system uses a 'ship to rail' system in which imports are loaded directly from the ship to rail wagons that come alongside, and load exports directly from rail to the ship. Imports are then railed to a distribution centre inland that also acts as a consolidation point for exports to be railed into the terminal. The simulation results

show that by using the proposed method, it is possible to reduce congestion, container dwell time as well as ship turnaround time in the terminal.

As part of the INLOC project (Integrating Logistics Centre Networks in the Baltic Sea Region), Jarzemskis and Vasiliauskas (2007) report on the feasibility study done on the establishment of a dry port in the Baltic Sea Region, in order to gauge acceptance amongst transport operators. They argue for dry ports as a way of confronting growing container volumes and congestion on access routes to terminals. Rail links to the main terminal ease road congestion as well as extending the hinterland of sea ports beyond their traditional boundaries. Locating facilities like warehouses and container repair depots at dry ports allow port companies to offer value adding services to shippers. Given the environmental and land use conflicts at sea ports that limit physical expansion, dry ports offer a solution to not only address the capacity problems of sea ports but can be of strategic importance in widening the hinterland of sea ports beyond their traditional boundaries.

Roso, Woxenius and Lumsden (2009) extend the dry port concept beyond just an inland terminal connected by a high capacity mode like rail to the sea port. They introduce the distant, mid-range and close-range dry ports as options for relieving sea ports of congestion, moving freight to more environmentally friendly modes (rail), and for providing logistics solutions to shippers in the hinterland. Distant dry ports link inland metropolitan areas to sea ports, generating sufficient volumes to justify rail links to sea ports. Road carriers service these areas over short hauls, delivering and picking up containers as if they would at a sea port but without the delays stemming from congestion in sea ports. Shippers are better served and at low cost. Mid and close range ports act as consolidation points for road and rail modes and have the ability to assemble trains dedicated to a single vessel. Close range ports, being on the periphery of cities can assemble trains that are loaded in sequence to vessel loading operations given that train services prove to be reliable. Some of the functions of sea ports like, customs X-ray inspections, stuffing and de-stuffing of containers, container repair facilities and storage of containers can be moved to these dry ports so freeing up scarce space in the sea terminals. Moving freight to rail also relieves road access ways and terminal gates of congestion, and reduces noise and air pollution in urban areas. Reliable rail links enable the sea terminal to use mid and close range ports as extra storage space for

containers therefore providing a lower cost solution to terminal expansion given the difficulty and cost associated with expansion of existing facilities.

The inland port concept offers sea terminals a very novel way of dealing with capacity problems. Not only do they give ports the ability to free up scarce storage space but they also can lower distribution and environmental costs by moving freight from road to rail and by doing so reduce road traffic and any associated problems. Strategically they extend a port's hinterland beyond its traditional boundaries by servicing inland metropolitan areas that would normally have been beyond their sphere of influence. As for the Port of Napier, the establishment of an inland port would be a cheaper alternative to reclaiming land from the sea and could be established much sooner than reclaimed land would.

3.5 Summary

The literature reviewed in this chapter revealed that ports have, and will continue to face increasing container volumes. In an effort to cope ports have adopted certain strategies and chief amongst those is higher stacking to accommodate the growing volumes of containers. Higher stacking however reduces access to each container and increases the likelihood of rehandles. To maintain acceptable customer service levels as measured by vessel, truck and train turnaround time, rehandles are a necessary evil. Exports arrive randomly in terminals so quite likely their final layout is never ideal for vessel loading. To expedite vessel loading, re-marshalling (generating rehandles) is necessary to match the loading sequence to minimise the time the vessels are berthed. Rehandles are also influenced by the quality of information on containers as well the storage policy of each terminal. As regards to imports, there is a trade off between higher stacking and the number of rehandles when considering truck and train turnaround times. The lower the stacks are, the more ground slots used, the lower the likelihood of rehandles but the greater the number of housekeeping moves of older imports to make room for the new ones. The higher the stacks are, the less the ground slots used but the higher the likelihood of rehandles, and the lower the number of housekeeping moves.

The shortage of storage space as well the restrictions on expanding existing sites or developing new sites has seen the adoption of various coping methods. Options in the short term provide gains by stacking higher as just mentioned, extending gate hours

beyond traditional times and limiting container dwell time thereby increasing capacity by 'increasing the velocity' of containers through the terminals. Middle to long term options include the use of inland terminals, the more successful ones being those linked to sea terminals by rail. Information technology provides a way of optimising terminal operations and consequently increasing capacity. Terminals bear the brunt of suboptimal decisions upstream so efforts need to be directed at greater collaborative planning to increase the efficiency of the whole as opposed to localised optimisation.

Chapter 4: Research Methodology

4.1 INTRODUCTION

This chapter gives an account of the methodological approach adopted in this study. It begins with a re-statement of the research objectives and a declaration that the interpretive approach informs the research process. The reasons for the choice of the case study as the research strategy are given along with a description of the data collection and analysis methods employed. Issues of validity and reliability are then discussed in relation to the adoption of the case study method along with the ethical issues that arose.

4.2 Research Objectives

- Objective 1

To explore the motives behind the actions of the pipfruit exporters.

- Objective 2

To analyse the impact seasonal reefer cargo has on terminal operations.

4.3 Research Paradigms

Kuhn defines a paradigm as “universally recognised scientific achievements that for a time provide model problems and solutions to a community of practitioners” (Kuhn, 1996, p.x). Collis and Hussey (2003) elaborated on this by suggesting that paradigms reflect the beliefs and assumptions of a community, so it follows that the conduct of research, namely it’s design, how the data is collected and analysed, and the reporting style reflects those beliefs and assumptions.

The conduct of research has two main competing approaches or paradigms, each with their own distinct view of reality and methods of studying it. There is the older more established positivist approach that has its roots in the methods of the natural sciences, and the relatively recent interpretive approach that emerged from the social sciences (Cohen, Manion, & Morrison, 2000). These approaches in their pure forms sit at the extreme ends of a continuum where a mix of the two exists in the middle. In reality,

research is rarely practiced in such pure forms but as hybrids of these two forms (Collis & Hussey, 2003).

It would be worth noting at this stage that the positivist and interpretive paradigms are more commonly known as the quantitative and qualitative paradigms respectively (Collis & Hussey, 2003). Table 4.1 below shows the various terms used almost interchangeably in the literature for the two paradigms.

Interpretivist paradigm	Qualitative, Subjectivist, Humanistic, Phenomenological Reflective, Hermeneutic, Ethnographic, Action Research, Inductive, Critical, Constructivist.
Positivist paradigm	Quantitative, Objectivist, Scientific, Experimentalist, Traditionalist, Empiricist, Deductive.

Adapted from Collis and Hussey (2003), Creswell (1994) and Veal (2005).

Table 4.1 - Alternative Terms for the Two Main Research Paradigms

Strictly speaking these terms in table 4.1 have slightly different meanings despite being classified as such (Collis & Hussey, 2003; Veal, 2005). In this research project the terms ‘positivist and interpretive’ are used to refer to them. This research project is informed by the interpretive approach. The differences between these two approaches are well highlighted by examining the ontological, epistemological, axiological, rhetorical and methodological assumptions underpinning them (Creswell, 1994).

Wight defines ontology “as the science of being or existence” (2006, p20). Oliver defines it as the “fundamental nature of the world and what it means to exist in that world” (2008, p24). The distinction between the two approaches lies in how they view the possible nature of the phenomena to be measured (Oliver, 2008). The positivists employ a realist ontology that assumes reality is single, hard, tangible and structured, and exists independent of human awareness of it (Cohen et al., 2000; Oliver, 2008). The interpretivists employ a nominalist ontology that assumes the reality that should be studied should be the one consciously created by each individual, a softer one, therefore

implying multiple realities (Cohen et al., 2000; Collis & Hussey, 2003; Creswell, 1994; Oliver, 2008; Veal, 2005).

Epistemology is “the study of the grounds on which we claim to know something about the world” (Oliver, 2008, p24). Epistemological assumptions “concern the very bases of knowledge – its nature and forms, how it can be acquired, and how it can be communicated to other human beings” (Cohen et al., 2000, p6). Collis and Hussey (2003), and Creswell (1994) suggest that in order for knowledge to be accepted as valid, the relationship between the researcher and the phenomena under investigation needs to be defined.

Positivists believe researchers must adopt the observer role to remain objective, and that only those phenomena that can be measured and observed can be validly regarded as knowledge. The researcher achieves this objectivity by distancing themselves from the research process to minimise the possibility of the influence of personal values and bias (Collis & Hussey, 2003). The assumption that reality exists regardless of human awareness of it implies the act of investigation has no effect on that reality (Blaxter, Hughes, & Tight, 2001; Cohen et al., 2000; Collis & Hussey, 2003; Creswell, 1994, 2009; Veal, 2005).

The interpretivists believe that knowledge is personal, subjective and unique and that it demands close interaction between the researcher and the participants for researchers to understand the motives behind the participants’ subjective views. In a sense it is an attempt by the researcher to get inside the mind of subject. The researcher immerses themselves in the participant’s natural setting and actively seeks to get as close as possible to the participant, so the act of investigation has an effect on that reality. This is also known as the anti-positivist view and it entails a rejection of positivist methods (Cohen et al., 2000; Collis & Hussey, 2003; Creswell, 1994; Veal, 2005).

Axiological assumptions have to do with the role of values in the research and are dependent upon the epistemology adopted by the researcher. A positivist epistemology as previously mentioned, stresses objectivity so value statements are excluded from written reports and impersonal language is used. Arguments are focused on the facts with little or no regard to context. On the contrary, interpretivists admit to the value-

laden nature of the study and bring values and biases to the research. They can also report in the first person and use personal language (Creswell, 1994).

A distinction can also be made along rhetorical lines. Positivists use impersonal and formal language that is based on terms that are accepted in the paradigm such as relationship or comparison. Concepts and variables are well defined from accepted definitions. The language used in the interpretivist paradigm was deliberately set to be different from the convention of the positivist tradition. Words such as understanding, discover and meaning form part of the vocabulary that is personal, informal and based on definitions unearthed in each study (Creswell, 1994).

The distinctions stemming from the ontological, epistemological, axiological and rhetorical assumptions make up the two ways of conducting the entire research, they are the methodological assumptions (Creswell, 1994).

Positivists use a nomothetic methodology which is “an approach characterised by procedures and methods designed to discover general laws” (Cohen et al., 2000, p7). The approach uses deductive logic to test theories and hypotheses by statistically analysing numerical data in cause and effect order (Veal, 2005). Veal defines deductive logic as “a process based on prior logical reasoning” (2005, p26). A possible explanation (the hypothesis) is given and then data are collected to negate or support it. Sample sizes are large to ensure reliability and the results are generalised to wider populations. The design is static meaning concepts, variables and hypotheses chosen prior to the study commencing don’t change. The data is collected by instruments such as experiments, questionnaire based surveys and archival secondary data (Creswell, 1994, 2009; Veal, 2005).

The interpretivist methodology assumes an inductive logic where categories emerge from the research as opposed to being formed prior to the study. The methodology is termed idiographic as the emphasis would be on the particular and individual to understand behaviour (Cohen et al., 2000; Collis & Hussey, 2003). Data collection is flexible gathered by instruments such as interviews and participant observation unlike the rigidity and precision required in collecting quantitative data. The data is mostly qualitative in nature and sample sizes are small but depth is emphasised as data is collected with the hope of providing rich descriptions of the phenomena under

investigation (Veal, 2005). Creswell (2009) suggests that the more open ended the questioning the better, as it gives the participant the greatest scope to narrate their situation. “The approach is based on the belief in the value of a full and rounded understanding of the experiences and situations of a few individuals” (Veal, 2005, p26). Although it is possible to have representativeness in the samples, there is no claim made in that respect and results are not normally generalised to the wider population (Veal, 2005). The researcher takes certain steps to improve reliability and validity by using multiple sources of information (triangulation) and verifying information with research subjects (Creswell, 1994).

4.4 Methodology

Oliver views methodology as “the theoretical and practical aspects of the conduct of research” (Oliver, 2008, p103). A more descriptive definition is given as “the overall approach to the research process, from the theoretical underpinnings to the collection and analysis of data” (Collis & Hussey, 2003, p55). Cohen et al., (2000) suggest the interpretive approach to research as being most suited to the case study given its subjective and interpretive dimensions. This is because it can investigate issues that numerical analysis cannot adequately uncover. “Contexts are unique and dynamic hence case studies investigate and report the complex dynamic and unfolding interaction of events, human relationships and other factors in a unique instance” (Cohen et al., 2000, p181). Veal (2005) points out that the key feature of the case study is the possibility of a rich description of the phenomena under study, as the method can involve the collection of both quantitative and qualitative data using a variety of analytical methods. It is for these reasons the case study approach is adopted in order to address the objectives of this study.

4.4.1 The Case Study

According to Collis and Hussey a case study is “an extensive examination of a single instance of a phenomenon of interest”. The definitions put forth by Cohen et al., (2000) and Veal (2005) all suggest the pursuit of an in-depth investigation of a phenomenon, or as Collis and Hussey (2003) put it, of the unit of analysis. Collis and Hussey define the unit of analysis as “the kind of case to which the variables or phenomena under study

and the research problem refer, and about which data is collected and analysed” (2003, p68).

Yin put forward a more detailed definition for the case study:

“an empirical reality that investigates a contemporary event within its real-life context, especially when the boundaries between the phenomenon and the context are not clearly defined” (1994, p13).

The case study is appropriate for this research given seasonality is a contemporary event, and the boundaries between seasonality (the phenomenon), and the container terminal operations and exporters (its context) are blurred. As this is an exploratory study, ‘what’ questions are appropriate (Yin, 1994). All the research questions are ‘what’ questions aimed at providing an understanding of the operations of the exporters, as well as analysing the impact of seasonal reefer cargo in the terminal. Yin (1994) further discusses the ability of case studies to accommodate multiple sources of evidence that help in addressing construct validity.

Case studies can either be single or multiple cases, and can use various data collection methods such as observations, interviews, archival data or questionnaires, in the same study and in a triangulating fashion (Collis & Hussey, 2003; Yin, 1994). A single case study can either be of holistic or embedded design. The former takes a global approach to analysis while the latter has subunits of analysis within the single case study. This research project is a single embedded case study given the exporters and terminal operations are different subunits of analysis within the case study which require the collection and analysis of qualitative and quantitative data respectively (Yin, 1994).

The findings of case studies are generalised to theories, a method known as analytic generalisation. Existing theories are used as a basis to compare empirical findings between cases. Replication is claimed when two or more case studies support the same theory. There is even greater weight placed on the findings of two or more case studies that support one theory over a rival theory. This method of generalisation differs from statistical generalisation employed in positivist methods where inferences are made about populations from samples, and researchers have access to formulas that determine the confidence with which generalisations can be made (Yin, 1994).

The single case study has a potential pitfall in that the case may not turn out to be what it was at the start of the research process. The design has to minimise the chances of misrepresentation and maximise the access needed to gather evidence required. A potential pitfall with embedded designs is that the focus may shift from the original phenomenon of interest to its subunits. The analysis of subunits does, however, provide means for in-depth investigation of the phenomenon of interest (Yin, 1994).

The case study methodology has its weaknesses, Collis and Hussey (2003) point out getting access to a suitable organisation can be difficult and the research process itself can be time consuming. It can also be difficult to decide on setting delimits on the study and it can be problematic to make sense of a contemporary event when one has limited knowledge of the historical background.

Veal (2005) discusses the merits of the approach, the first being the ability to place the unit of analysis within its real-life context and being able to treat the subject of study as a whole rather than isolating variables for investigation. Case studies are able to employ multiple data collection methods (triangulation) and can use both quantitative and qualitative data. The single or limited number of cases offers a manageable data collection task when resources are limited. Case studies permit flexibility in data collection so the researcher can adapt the research strategy as the research proceeds and the findings of case studies don't need to be generalised to wider populations.

As this is an exploratory study of seasonality, it is believed the flexibility of the case study approach and the tools it has to explore contextual influences justifies its choice as the research strategy. The data collected was both qualitative and quantitative and the case study strategy provides the means to analyse both. Another justification is claimed on the grounds of pragmatism (Veal, 2005). Access to information is made possible by the Port Company's close association with exporters in its hinterland and the researcher's position as an employee. Seasonality and its dynamics in the terminal have been of intrinsic interest to the researcher over the last few years particularly in the researcher's previous role of Yard Planner. Having experienced and dealt with its manifestations in the terminal there has always been a long standing curiosity to learn more about external influences.

4.5 Research Methods

Blaikie (2000) refers to research methods as the ways in which data is collected and analysed for the purposes of research. In this research primary data was collected by semi-structured interviews and was complemented by archival secondary data. The latter included quantitative data collected from the container terminal database, qualitative data collected from browsing the websites of the four exporters interviewed, the New Zealand Shipping Gazette and the Port of Napier's weekly newsletter. As suggested by Yin (1994) a case study database was created to store all the data gathered for the research as part of the effort to address reliability concerns of the case study.

4.5.1 Sampling

“A sample is made up of some members of a population. A population may refer to a body of people or to any other collection of items under consideration for research purposes” (Collis & Hussey, 2003, p155). There are two general approaches to sampling, probability and non-probability methods. Probability samples are used when representative samples are sought so each member of the population has a known probability of being included in the sample. Non-probability samples are used when it is almost impossible to determine an entire population or when no claim for representativeness is sought (Collis & Hussey, 2003; Oliver, 2008).

As no claim to representativeness was sought in this research, convenience sampling, a non-probability sampling method was used. Convenience sampling is used when, as the name suggests, it is convenient because the participants are willing to participate in the study (Blaxter et al., 2001; Liamputtong, 2009). It was the most practical method at the time given the time limitations the researcher faced. In terms of generalising, convenience sampling is the least reliable but a sample can be generated quickly and at minimal cost (Cavana, Delahaye, & Sekaran, 2001). Interpretative research is concerned with an in-depth understanding of an issue, so it is reliant on participants to provide rich descriptions of their circumstances, and as a result it works best with small samples that may not be representative of a wider population (Liamputtong, 2009).

46 exporters shipped their pipfruit through the Port of Napier in 2009. The top 10 exporters accounted for 47% of the total volume while the balance, 53% was shipped by

36 exporters, and most of them shipping small volumes of about 1% of the total volume or less. 11 exporters were invited by email to partake in the research, five of those were from the top 10 and the other six were from the bottom 36. Included in the email was a section briefly introducing the researcher and explaining the nature of the research. The letter requested an interview with the person in charge of the logistics functions for each exporter. Please refer to **Appendix A** for a copy of this email. The researcher did not hear back from six of them, five replied with four agreeing to participate and one declining. Incidentally the four exporters who agreed to participate were from the top 10 group of exporters.

4.5.2 Interview

In the case of research, the purposes of the interview are to “obtain information and understanding of issues relevant to the general aims and specific questions of a research project” (Gillham, 2000, p2).

Interviews can be used by both positivist and interpretivist approaches to research. The nature of the questioning and the extent of structure in the questionnaire influence the inclination to either approach. Straight forward questions that are highly structured such as those giving participants multiple choice options tend to be used by positivist methodologies such as surveys. The researcher ‘builds in’ the analysis by giving respondents specific options as responses. The latter are easily quantified and analysed statistically as is the norm in positivist methodologies. Semi structured and unstructured interviews are more likely to be used in the interpretivist approach as their form gives the participant much greater scope in which to express themselves. Semi structured interviews follow a preset schedule but are open ended enough to allow the participant to narrate their story. Unstructured interviews follow no preset schedule and change between participants as and when it suits (Collis & Hussey, 2003).

Interviews can be conducted in person, between the researcher and a participant, or with a group of individuals. They can also be conducted over the phone where time and cost prohibit face to face interviewing (Collis & Hussey, 2003; Gillham, 2000; Liamputtong, 2009). Three ‘one to one’ interviews of the participants were conducted at their places of work in the Hawkes Bay. The fourth, a ‘one to two’ interview, was conducted over the phone because the participants were based in Auckland.

Research questions 1, 2 and 3 guided the formulation of the interview questions that were designed to reveal the nature of the operations of the exporters, with an emphasis on the flow of fruit and information through the supply chain. Please refer to **Appendix B** for a copy of the interview questions. The wording of the questions and the order was varied slightly with each interview but in essence all participants were asked the same questions. All the interviews were recorded on a digital voice recorder and transcribed on the same day the interview was conducted. The interview scripts and the voice files were saved on the researcher's computer in the case study database. The interviews were spread over four weeks as the participants were only available at certain times because the interviews were conducted during the season. The interviews lasted between 34 and 45 minutes.

The semi-structured interview was chosen because it reflects the interpretivist assumptions adopted. Liamputtong suggests that “the essence of this method is the assumption that people have essential and specific knowledge about the social world that can be articulated by verbal passage” (Liamputtong, 2009, p43). Liamputtong (2009) further adds that interviews can be a useful tool with which to gather rich descriptions of the phenomena under study. Blaikie (2000) points out that people love to be heard, to be paid attention to, and to have their opinions valued so it follows that well designed interviews can be an invaluable tool for data collection. Any research seeking to understand humans needs to use interviews.

4.5.3 Archival Searching for Secondary Data

Secondary data are “data that already exist and which are collected for some other (primary) purpose but which can be used a second time in the current project – the researcher is the secondary user.” (Veal, 2005, p99). One of the main reasons for the use of secondary data has to do with time and cost considerations. It is much cheaper to use secondary data and one can save a significant amount of time than trying to collect primary data (Blaxter et al., 2001; Veal, 2005).

There are numerous sources of secondary data and they range from companies, government departments, educational institutions, archival material and the Internet. Of particular interest are companies that generate two types of data, internal and external data. Internal data is generated by company record keeping such as sales data,

absenteeism, staff turnover or revenue. This information is not easy to acquire and is often restricted because it is commercially sensitive. External data is found in the public domain such as the requirement for public companies to publish financial and ownership structures. Private companies are not obligated to do so and do not normally divulge such information. Fees may apply to access such information but some may be available from trade journals, newspapers or databases on the Internet (Veal, 2005).

As an employee of the Port of Napier, the researcher was in the privileged position of having access to the company data base. The Information Officer was contacted by email and kindly asked to furnish records pertaining to vessel calls, vessel exchange lengths, reefer capacity utilisation, reefer dwell times and rehandles for the period between January 2008 and December 2009. These records were used to address Research Question 4 which is to find out what happens in the terminal during the pipfruit export season in the second analysis chapter (Chapter 6). Secondary qualitative data was retrieved from the websites of the four exporters interviewed, the New Zealand Shipping Gazette and the Port of Napier weekly newsletter, and combined with the interviews to present the first analysis chapter (Chapter 5). The data collected was saved in the case study database on the researcher's computer.

4.6 Data Analysis

The analysis of data is presented in two chapters to reflect the nature of the predominantly qualitative data collected from the semi-structured interviews and archival secondary data retrieved from the exporters' websites, the New Zealand Shipping Gazette and the Port of Napier weekly newsletter, and the predominantly quantitative data retrieved from the container terminal database. Analysis of the exporters' data began when the first interview was transcribed. This gave a clearer picture of what was relevant and allowed the interview questions to be altered slightly to reflect that process. The analysis of the quantitative data began after all the relevant data was collected. The data was collected and interpreted subjectively based on the researcher's experiences as a curious employee of the Port of Napier, and based on the influence of the literature review process.

Collis and Hussey (2003) suggest two ways of analysing case study data, the within-case and cross-case methods. As this research project is a single case study the within-

case method was adopted. Analysis of the interview and archival secondary data collected provided the means with which to build up an in-depth description of seasonality and identify emerging patterns within. Huberman and Miles (1994) suggest that description and explanation are the two levels of understanding when analysing data within a case. The first level, description, is relevant in this case because the type of research questions asked, 'what and how' questions suggest an exploratory nature. The second level, explanation, applies to 'why' questions that seek causality therefore are not relevant in this situation.

Huberman and Miles (1994) emphasise the importance of displays in analysis. Displays give the researcher the means to display full data sets in compact form. The data displays can then be analysed in close proximity with the written text, and should give the researcher clearer ideas of further analysis. The process is sequential and interactive and in the words of Huberman and Miles, "displays beget analyses, which then beget more powerful suggestive displays" (1994, p.433). In this spirit, Research Question 4 is addressed in this manner. Microsoft Excel was used to depict the effect of seasonal reefer cargo on specific terminal operations.

4.6.1 Content Analysis

Gillham (2000) considers content analysis as organising the significant parts of interviews. This organisation is a two part process where the first part entails identifying the key and substantive points, and the second part, placing these key points into categories. Categories are simply headings and are the first stage of presenting interview data. The second part, 'meaning' comes from including verbatim from the interview transcripts and other qualitative sources within the analysis.

The interview transcripts and archival qualitative data were analysed and reduction was achieved in the manner suggested by Gillham (2000). Analysis began with the transcription of the first interview, where a copy of the transcript was printed out and every substantive comment highlighted. Each sentence was considered as the unit of analysis. The transcript was reviewed again to make sure that those comments underlined were indeed important, and to include any that may have been missed the first time. The process was repeated continuously for all the transcripts and qualitative material retrieved from the archival search.

The next stage involved assigning a category to each substantive comment consequently building up an initial list of categories. These categories were further examined, combining, splitting and re-wording some to ensure the final list was exhaustive and exclusive, a process that continued as the research proceeded. A table in Excel was drawn up with the category headings on the top, and the 4 participants running down the side. Each of the substantive comments were then labelled with the relevant code for each category, and tallied on the table for a count analysis. The final list of categories was drawn up, and by cutting and pasting, each substantive comment was placed under the assigned category. Under each category all the emerging themes were identified, and for each of those themes, all the exemplar comments were identified to be used in the analysis. The categories were identified as the supply base, logistics network, information systems, selling arrangements, shipping matters and looking ahead. These categories were developed under the guidance of the research objectives and research questions.

4.7 Validity and Reliability

The quality of research is judged most commonly by how reliable and valid it is.

Blaxter et al., (2001) state that for research to be reliable it has to be conducted in a manner that another researcher can follow the same procedures and arrive at the same findings and conclusions. This is known as replication. The rigour and precision required in positivist studies gives them high reliability, whereas the subjective nature of interpretivist approaches means that results are likely to be different each time the research is repeated hence they have lower reliability (Collis & Hussey, 2003).

Veal defines validity as “the extent to which the data collected truly reflects the phenomenon being studied” (2005, p42). The question that needs to be asked is, “are the research’s findings an accurate representation of the phenomenon under study?” The positivist structured approach to research, their objective stance and their non-inclusion of contextual influences means studies have low validity. The interpretivist focus on capturing the context of the phenomenon under study to gain a rich and full rounded understanding makes the studies highly valid (Collis & Hussey, 2003).

Yin (1994) gives an account of the strategies that can be employed to address the issues of validity and reliability in case studies. There is a detailed discussion on the three types of validity namely, construct, internal and external validity as well as reliability. Since this is an exploratory case study internal validity will not be covered below because it only applies to explanatory or causal case studies.

Construct validity is concerned with “establishing the correct operational measures for the concepts being studied” (Yin, 1994, p33). Three tactics can be employed to increase construct validity namely the use of multiple sources of evidence during data collection, the establishment of a chain of evidence during data collection and review of the draft of the case study report. In this case study all three tactics are employed to achieve construct validity. Semi-structured interviews and archival secondary data are used to address the objectives of the study. A chain of evidence is established by retaining all the data collected for the purposes of the case study from interview voice recordings, transcripts, and the secondary data extracted from the container terminal data base, exporters’ websites, the New Zealand Shipping Gazette and the Port of Napier weekly newsletter. Drafts of each chapter were regularly reviewed by the researcher’s supervisor (Yin, 1994).

External validity is concerned with “establishing a domain to which a study’s findings can be generalised” (Yin, 1994, p33). In other words, “can the findings of the case be generalised beyond the immediate case?” Achieving external validity has been difficult in case studies particularly with single case studies as they have been singled out as being inadequate for the purposes of generalising. The findings of case studies as previously mentioned are generalised to theories, analytic generalisation, as opposed to statistical generalisation used in quantitative studies. Yin recommends the use of replication logic to achieve external validity in multiple case studies. Achieving external validity for this case study was difficult given it is a single case study. However the data collected from the semi structured interviews and the archives can be viewed as multiple case studies so that lent the case study some ability to address external validity concerns for that part of the analysis.

Reliability is concerned with “demonstrating that the operations of a study – such as the data collection procedures, can be repeated with the same results” (Yin, 1994, p33).

The emphasis here is on repeating the same study not replicating the results by doing another case study, to minimise errors and biases. It is acknowledged that interpretive studies have low reliability given their subjective nature. To increase the reliability of a case study as many steps as possible are documented and “the research conducted as if someone were always looking over your shoulder” (Yin, 1994, p37). The two tactics employed are the establishment of a case study protocol and a database. In this case study as many procedures as possible, were documented and stored in the case study database along with all the raw data collected.

4.8 Ethical issues

Research ethics bestow an obligation upon the researcher to behave and conduct themselves in an appropriate manner when dealing with research subjects to protect them from any harm. Clear agreements need to be reached with research subjects, and it is the onus of the researcher to honour those agreements. Blaxter et al., recommend contracts in this regard. The researcher has to get informed consent from research subjects and divulge how the analysis of the data gathered will be reported and disseminated (Blaxter et al., 2001).

All prospective participants were sent an interview request email (**Appendix A**). The document briefly introduced the researcher and explained the nature and purpose of the research. The main aim was to solicit participation from the exporters. The document explained that the main purpose of the research was for the undertaking of the researcher’s Masters Degree but some information may be used by the Port of Napier for their future decision making. It was stressed that participation was entirely voluntary and that interviews would be recorded by a digital voice recorder. Prior to each interview each participant was informed they could decline to answer any questions they were not comfortable with. The prospective participants were informed that only the researcher’s supervisor and the researcher would have access to the data collected and that would be securely stored at the university. Complete confidentiality was guaranteed in the final report.

Prior to the data collection phase, permission was also sought from Chief Operating Officer and the Container Terminal Manager to gather the required data from the container terminal database. A copy of the second part of the analysis (Chapter 6) was

forwarded to the Container Terminal Manager upon completion and slight adjustments were made as requested.

Chapter 5: The Pipfruit Exporters

5.1 Introduction

To restate, the purpose of this research project is to gain a better understanding of seasonality at the Port of Napier container terminal. Seasonality is evident in the terminal through its various manifestations but to get an even better understanding of the process would entail widening the research to involve the pipfruit exporters. The findings of the research are thus presented in two chapters. This chapter presents the findings from the analysis of the semi-structured interviews, and the archival search of the websites of the exporters, the New Zealand Shipping Gazette and the Port of Napier weekly newsletter. The next chapter presents the analysis of secondary data of various aspects of the terminal's operations.

The interview questionnaire (**Appendix B**) was designed to achieve Objective 1 and that is to explore the motives behind the exporters' actions. The findings are presented under the following 6 categories, supply base, logistics network, information systems, selling arrangements, shipping matters and looking ahead. Under each category the themes that emerged from the analysis of the interview scripts are presented under each category.

5.2 The Supply Base

Owned and Leased Orchards

An investigation of the strategies employed by the exporters to source fruit revealed a trend towards vertical integration as narrated by the participant, "70 – 80% is our volume, we are quite vertically integrated there, that through our own and leased orchards". Vertical integration is possibly adopted to minimise variability in supply. This would help in making commitments to customers as well as securing shipping space with the lines. The guaranteed volume would allow the exporters to make better forecasts of their outputs and shipping space requirements.

The trend towards vertical integration is further evidenced by exporters investing in new plantings and partaking in joint ventures to widen their supply base. The participant explained:

“...in the last three years we’ve bought orchards and planted new blocks up, something like 60 hectares in Hawkes Bay at the end of last season.....In Nelson we’ve got a joint venture out there, there’s something like 150 acres planted up at the moment. We are just working with other parties as well in joint ventures so there’s a few different ways we are getting that product”.

This suggests that the exporters want to lessen reliance on third party supplies to make up their volumes and have more control over their supplies.

As previously discussed in Chapter 2, ENZA has the exclusive varietal and marketing rights for certain varieties such as Jazz and Envy. The participant mentioned, “...those are controlled solely by ENZA so that’s another way we can make sure we are getting the volume by owning the varietal and marketing rights of varieties”. This reveals the influence of the competitive pressures faced by the exporters in not only obtaining supplies, but also in establishing a competitive advantage in the market by offering a unique product. It follows that growers licensed to grow these exclusive varieties have only one exporter they can forward their fruit to and that’s ENZA, so licensing varieties would be a sound way of guaranteeing supplies.

One exporter’s business model was initially comparatively lower risk, with minimal investment in orchards and fruit handling facilities, and was reliant on third party suppliers. There is evidence today the exporter has become more vertically integrated with time. The participant said, “we have shares in a packhouse in Nelson. We bought in two years ago so we could get guaranteed supplies”. This suggests that packhouses are consolidating points in the supply chain and the exporter chose this as a point of entry, taking advantage of the relationships the packhouse established with the growers. The same exporter explained how they later on invested in orchards:

“...they owed so much money in the end they couldn’t keep going financially so we just stepped in and paid the balance and ended up owning the orchards. So we now own orchards as well which is quite good because we export all our own fruit, most of it is early season for Asia so it works quite well”.

The comment above reveals the participant’s enthusiasm at handling their own fruit particularly for the Asian market. As will be discussed in later sections, the Asian

market returns are highly dependent upon getting the fruit to the market as quickly as possible, so the greater control given by handling their own volumes would help in this regard.

As will be seen in later sections, the exporters have made significant investment in fruit handling facilities such as packhouses and coolstores. The acquisition and leasing of orchards provide the guaranteed volume of fruit handled to justify these investments. A participant revealed, “we have packhouses in the Hawkes Bay and Nelson so we might as well have a lot of fruit going through so that’s another way of making sure your throughput is running at maximum potential”.

Contract Suppliers

The balance of the exporters’ supplies comes from contract suppliers at the grower and packhouse levels. The nature of these associations is fluid-like though as the evidence will show, the exporters look to establishing long term relationships with contract suppliers where possible.

The exporters send out personnel to secure fruit off growers in the growing regions, the process was explained by the participant:

“We’ve got our supply team based in Hawkes Bay, Nelson and Otago. Their main job is to go and contract fruit off growers. I suppose since deregulation it’s been quite hard, there are a lot of different options around for growers so you’ve got to go with a good case you know and some ideas of the returns for the year upfront”.

The competitive nature of acquiring supplies is again highlighted as growers have many options from the numerous exporters out there. These arrangements are fluid-like because the growers will go to the exporter that gives them the best returns for their fruit, as explained by the participant: “I think it is all part of the negotiation that you have with the growers so if they are not happy with your performance they will leave you”.

The opposite applies, when growers are happy with the returns they are getting, they continue their association with the exporter. There is a trend in which exporters have developed long term relationships with contract suppliers:

“A lot of the growers come with us year after year. They supply their whole volume to us and they leave it to us to market their fruit. The same price we pay our own internal growers gets paid to our contract growers. We see it as an advantage for them to be with us not a disadvantage, and particularly in Nelson where we need that extra supply base to fill our contracts with our customers. We need them as much as they need us so we find it works well”.

An interesting point emerged here that those exporters who have operations in Nelson are reliant upon third party suppliers in that region. The Hawkes Bay, being the biggest pipfruit region in the New Zealand appropriately hosts the bulk of the investments of the exporters. The evidence also suggests a period of learning on the part of the exporters as it was reported by Redward (2003) that in the period just after deregulation, many of the exporters’ actions contributed to the financial difficulties experienced by the growers. Treating the growers fairly would appear to encourage loyalty and would be one of the reasons many of them return to each exporter every year.

In one instance one exporter managed to take this a step further by implementing supplier development initiatives. The participant explained: “We have about five growers who supply their fruit to us that are contracted and we work closely with them, they have been with us since day one (since deregulation)”. One can only assume they work closely together on technical matters, as an organisation that intends on retaining its suppliers for the long term would.

Establishing relationships is not limited to growers alone but to packhouses too. This participant said:

“We work with selective packhouses that we have good relationships with and sort of target the variety and size we want....we work out what they’ve got available and we look at our orders and try and match them up like that”.

The exporter in this instance managed to cultivate the relationship to the level of being able to fill their orders in the manner explained, as though the packhouses were their own.

One exporter has a unique way of sourcing fruit in which they manage investments on behalf of overseas investors. The investors see value in investing in orchards in New

Zealand, and the expertise of the exporter's pipfruit growing abilities, so the exporter manages it for them for a fee. The participant explained the arrangement: "We do a couple of projects for overseas companies where they purchase the land and we manage the orchard for them. The fruit comes through us and is packed and shipped and they receive the revenues".

5.3 The Logistics Network

Fruit Handling Facilities

The exporters use a combination of their own, leased and contract fruit handling facilities in the logistics chain. The bulk of the fruit handling is done in their own and leased facilities as described by the participant: "we have three packhouses here which we own, we also contract another packhouse to do a bit of packing for the overflow in the season because there is too much to pack". The exporters attempt to get the most use out of their leased and owned facilities before passing on any extra volume to contract fruit handlers. The contract fruit handlers have to meet the requirements of the same various compliance programs the exporters have to satisfy. The participant had this to say, "...we own and lease facilities and also contract, we have partners we use as well, other packhouses and coolstores and they have to comply with what our requirements are". This participant's website revealed that facilities have to be compliant with programs such as the British Retail Consortium (BRC), the United States Department of Agriculture Pipfruit Pre-clearance Program and BioGro for the organic market.

One reason for exporters using their own facilities to handle most of their fruit would be to retain control over operations. As will be discussed in proceeding sections the sales of the exporters are largely consignment type sales to the traditional markets of the US, UK and continental Europe. A more recent trend has been fixed price trading type sales to Asia, the Middle East and Russia. These sales are highly dependent upon moving the fruit quickly through the logistics network to the customers as a difference of a week could see a drop in sale price. The significance of this becomes apparent when an exporter uses either its own, leased or contract facilities as expressed by the participant:

"We have our coolstores here in Hawkes Bay which is desirable versus using a third party supplier (contract) where basically the system generally is you go onto a list of

priority, especially with the Asia side of things with very tight time frames. Sometimes containers can get missed because you are so far down the priority list because there are 20 containers ahead of yours. The big advantage with having our own coolstore is we can set our own priority and reach our goal there”.

The consignment and fixed price sales place different demands on the logistics system. With consignment sales, knowledge beforehand of what needs to be done gives exporters the visibility and time to manage the work through the system, whereas fixed price sales are very much short notice, they test the agility of the system as shipments are expedited through an already burdened system:

“...particularly with Asia it is kind of a day to day thing, we make a sale today and it gets loaded the next day just about, whereas with consignments we can see what we are supposed to do for the whole season so it’s a real mix of pressure at the peak. Just in the last few weeks all the coolstores have hit peak and they are full and want orders to clear out, packing is at its peak, it’s crucial to get fruit out to everybody”.

In that respect there are definite advantages to using owned or leased facilities over contract facilities. All exporters are relatively young given they have been operating since 2002. It has been a period of learning for most if not all, and it has been about trying to find the right mix of investing in their own, and using contract facilities. This is typified by the participant’s comment below:

“We’ve only had our coolstore for this the third season but it has made such huge changes to our business because we have that instead of knowing that their (third party) coolstore just couldn’t possibly do that in less than 12 hours notice. We know we can push that through at our own coolstore that is part of the culture of having our own coolstore with our own team”.

The exporter has managed to build a competence within the organisation through learning by doing, pushing the envelope so to speak. To be fair the participant did mention that for about 90% of the time the contract fruit handlers managed to ship containers out on time so contractors are important players in the industry.

Whilst still on the subject of organisational learning, there is evidence to suggest that the exporters have tried to match the volume of fruit with facility requirements. The

participant explained: “.....we have sold off a couple of facilities that we didn’t utilise and we’re getting down to a manageable level with the volume we are doing”. It is understandable that the exporter would want to sell off facilities they were not using and look to contract fruit handlers to deal with the overflow. There are other reasons as well for selling off facilities such as financial strife. The industry has had challenges over the years as the participant explained: “we used to own all of them (coolstores) but 2005 was quite a bad season so we had to sell some of our assets.....we sold them with the contract to lease them back”. This would have been a strategy to raise funds in difficult times.

Capacity constraints in facilities are just part of reality for the exporters because of the large volume of fruit that needs to be handled in such a short period. There have been issues when large volumes of fruit come of the trees quickly as narrated by the participant:

“two years ago we had to shut the gatehouse on Good Friday so we said to the orchards no more fruit till after Easter and kept the packhouse packing right through Easter.....we got the packhouse to pack as much fruit as possible to empty the coolstore”.

In such instances the system problems are pushed upstream as some of the growers may not have refrigeration facilities. The shelf life of the fruit is enhanced by cooling it at the first available opportunity so delays in that respect would compromise fruit quality. The participant did explain that this was a rare occurrence and that most of the time their facilities were able to handle the volumes as they came through.

The weather also influences operations in the facilities. Undesirable growing conditions such as frosts during flowering can delay fruit maturity by weeks. The participant explained:

“...this season most varieties were behind by two weeks so straight away you are behind on the game plan on packing and shipping. It takes a while to catch up...it just delays everything. Sometimes it’s the capacity to get the fruit packed....with the pressure on with most coolstores when we order product out 99.9% of the time it’s

able to be done. This season hasn't been too bad as we've got most things done when we wanted them done".

Here the pressure stems from promises made to customers overseas with regards to shipment arrivals as well as booking space with the shipping lines. A delay in maturity and consequently packing and shipping just means more work would need to be done in less time. The system gets stressed on the evidence given above, but the work can be done most of the time. There is not much room for deviations so any disturbance in the system will just further burden it because of the small time frames the exporters work with.

The Nelson Region

3 of the 4 exporters interviewed had operations down in the Nelson region. As previously discussed, compared to the Hawkes Bay region, the exporters have less invested in orchards and facilities than they do in the Hawkes Bay. As a result they are more reliant upon third party suppliers of fruit in that part of the country. Most of these suppliers are vertically integrated albeit on a small scale, they look after all their activities from picking right through to delivering containers to Port Nelson. The participant explained the situation:

"In Nelson we have got seven coolstores, a lot of owner operator types operations down there so they pack fruit, coolstore it and of course do a cheaper FAS (Free-Along-Side) port rate by doing it themselves. The only thing is the container has to get to many sites to fill so that becomes complicated. Nelson is a big place and it's a long way from the port for some of the suppliers so here in supply group we coordinate all the packing based on what our customers want".

The exporters' sites in the Hawkes Bay are all within a 25km radius from the Port of Napier. In Nelson some of these owner operators are in places such as Riwaka which is about 60km away from Port Nelson, Motueka about 50km away and Tasman which is about 76km away from Port Nelson. Coordinating part container loads with sites so far away from each other can clearly be a challenge in itself. It becomes even more of a challenge when trying to expedite shipments through like those of the fixed price sales. There is less of this in the Hawkes Bay as most of the containers are filled at one site.

The facilities in Nelson are smaller in comparison, and that presents some challenges as the participant revealed:

“It’s only now when we hit capacity at all of the coolstores that we try to share the product between coolstores particularly in Nelson where the coolstores are not quite as big, and we obviously want to look after the apples. It’s company policy to minimise handling so we would rather not move fruit between the coolstores because we’ve hit capacity, we want to put the fruit into a container and send it somewhere”.

The exporter has been forced to move product between coolstores in the past to ensure all the fruit is in cool storage. Clearly this is not ideal given there is a cost to rehandling each pallet and the added handling increases the likelihood of physical product damage and deterioration.

There is, however, a bright side to relying on owner operators in Nelson as mentioned by the participant:

“...the third party suppliers particularly in Nelson where they pack their own fruit, they have real ownership because it is their product. They will bend over backwards to get their fruit loaded in time if we give them late notice to get something on a ship”.

The greater sense of ownership appears to give the participant a measure of comfort in knowing that the owner operators will do their best to get the fruit shipped out for late bookings whilst also looking after the fruit itself. As with all things human, mistakes tend to be made when work needs to be done in haste but because the owner operators own the fruit, they will hurry with a much greater measure of care than a contractor who is alienated from the product, but just providing the fruit handling service.

The capacity of facilities in Nelson is, to some extent, influenced by the frequency of vessel calls, compared to Napier the fortnightly calls in Nelson have a marked impact. Given that facilities are smaller in Nelson, they fill up quicker and the situation can be worsened by the lack of weekly calls. The participant had this to say:

“Probably Nelson is the other quirky thing we have to do because we don’t have weekly calls all the time there, where as we do here in Napier which is very useful. So of course when you hit capacity you have to wait 10 days to get the next container

out which doesn't help. It's traditionally always been like that for the time I've been around".

Evidently this is a problem the exporter knows and has had to live with. At the end of the day it comes down to storage costs and how dire the lack of storage space is in coolstores. If it is cheaper to pack the containers and pay the daily storage costs in the container terminal then that option will be taken. The exporter's hand may be forced if they are running out of storage space and have no option but to make room in the coolstores by forwarding containers early to the port.

Road Carriers and the Terminals

As far as the road carriers are concerned the growers arrange their own transport from the orchards to the packhouses and coolstores after receiving instruction from the exporters. The trend is the same among the exporters as far as transporting containers is concerned. The exporters contract one firm to move their containers to the port and the third parties arrange their own transport. This was summed up by this participant:

"As far as Nelson is concerned they look after their own again because they are sort of owner operators, the orchards surround the packhouses and coolstores so they do their own down there. We negotiate with one supplier for the container transport here in Hawkes Bay and they service all our coolstore requirements and that has worked well".

The exporters are all satisfied with the service provided by the road carriers. Generally the exporters give the road carriers a schedule of a week in advance with the cut offs imposed for the different lines they are shipping with. When asked what they thought of the service provided the road carriers the participant said:

"We are very happy, we've never had a shortage of trucks this season so far and they do long haul for us if we need to go to Tauranga or Auckland.....again I can't think of an occasion this season where we've been held up because of a lack of transport".

Like all of the exporters' service providers, the road carriers also have to comply with compliance program requirements. The participant had this to say: ".....they have to comply with our rules, no dirt on trucks etc". As the exporters outsource services it is up to them to enforce compliance to ensure service providers remain compliant.

One of the most frustrating issues for the exporters is the truck turnaround times at the port and at United Containers Limited (UCL, an empty container depot in Napier). UCL is an offsite container depot that looks after containers for the shipping lines that don't use the Port of Napier empty depot. Delays arise because of two things, the first is the non-availability of equipment (empty containers), and the second, delays experienced in dropping off full containers (at the port only) because of the high volume of traffic within the port during the pipfruit season. Turnaround times of between 1 - 1.5 hours are acceptable to the exporters but any longer causes problems for them especially with the cut offs imposed by the shipping lines to have all cargo delivered to the port by.

The frustrations of the lack of equipment (empty containers) were clearly expressed by one participant:

“The one thing that happens every year, it doesn't matter who you deal with, is the shipping lines will always tell you they've released containers when they haven't....It's just part of the issue and that's why when you get down to the wire and time is precious, particularly when the port is at peak times, where they (trucks) are waiting for an hour to get their full container in and to get an empty out we just run out of time before cut offs”.

To clarify this issue, shipping lines reposition empty containers in Napier (and other ports) that then have to be serviced to ensure they are in a suitable state to carry foodstuffs (in the case of pipfruit), and to ensure the refrigeration unit won't fail in service. This process takes the best part of a day assuming the container doesn't need repairs of any kind, electrical or structural. The shipping lines will issue releases to shippers (in this case the exporters), against the stock they have at each site. The problems arise when some containers anticipated to be ready don't become available, particularly overnight, and the trucks arrive hoping to pick up an empty. This is when the delays start and continue until a container becomes available or the truck driver is instructed to seek another container on a different release. Before that happens, a sequence of events is triggered that ends in more lost time and is well explained by this participant:

“He (the truck driver) radios his boss, and the transporter rings the coolstore who then ring us. We then ring the shipping line who then ring the port to find out what

the problem is.....you know it's time consuming. Having a web based system would be useful, it just eliminates some of the down time”.

The participant further revealed that all the telephone calls made could see another hour pass before a decision as to what needs to be done is made. This seemingly simple process appears to be complicated by this 'red tape'. The participant mentioned that a web based system would help the exporter in minimising lost time. The Port of Napier has a web based system in which exporters (and other shippers) can check the status of releases. The participant acknowledged this below:

“As far as the terminal is concerned Napier port has a really good website. You know before anyone wastes their time they can check if releases have been officially released. The likes of UCL don't have that. It is hard work, there's a lot of telephone calling because that is the only way to communicate besides sitting on their doorstep to get containers. Compared to the port that has longer opening hours, UCL doesn't and that can be quite limiting”.

The participant mentioned that if UCL had a web based system then it would simplify their lives because they could anticipate delays caused by the lack of equipment, and make alternative arrangements to keep everything moving until containers became available.

The exporters' frustrations with the port are not just limited to the lack of equipment and truck turnaround times but also the gate hours. The comment made by one participant summed this up, “...we just wish you were like Tauranga and open 24/7”. The port gate operates between the hours of 0700hrs and 1900hrs in the pipfruit season, and has a late gate service that runs from 1901hrs till 2300hrs. Shippers, by prior booking only, are able to bring their containers during this period. The Port of Tauranga doesn't have these restrictions primarily because it is a much larger port and has the volumes to justify operating around the clock.

The exporters appear to be aware of the reasons why the port can't operate around the clock judging from the comment made by this participant, “...I don't think you are ever going to get that though if it was an earlier start or later finish, even two or three hours extra in a day makes a big difference”. The port used to shut the gate even later a few

years ago at 2030hrs but the traffic for the last one and half hour didn't justify the labour cost. The late gate service ties in well with the afternoon Receiving and Delivery (R and D) shift as they have to wait for the late train anyway.

When asked what the port could do better for them the participant replied "...I guess it's just flexibility, we'll always try to be as early as we can but sometimes we just can't because fruit is picked and packed right up to the last minute and bad weather can delay things".

5.4 Information Systems

Towards Virtual Integration

As the exporters have matured, there has been a visible trend towards full virtual integration of processes right from the orchards to the end customer. This has been achieved through the building of customised enterprise-wide information systems, as well as off-the-shelf versions such as SmartFresh and SAP (System Analysis and Program Development Enterprise Resource Planning). The participant explained:

"We started with just developing our packhouse system, then the coolstore system, and then the supply group system like the head office type side which has all the marketing, invoicing, grower payments, and finance etc....the core of it has pretty much been there for two years. It took about four years to get the whole thing down. We also do orchard spray diaries because of withholding periods as we can't pick fruit till it's cleared. There is a huge process from the bin being picked right to the pallet arriving at the customer. So from the orchard to the packhouse all the data is integrated".

There wasn't much mentioned on teething problems from exporters using customised enterprise systems but there was a hint of issues from the exporter that used SAP. The participant said: "when we got it, it was rigid but over the years we pick a different area to fine tune and we've had some pretty good updates on it lately, it is pretty user friendly now".

The virtual links are not just within the exporters' facilities but also with third parties:

“...we use the likes of Prodoc for putting our CEDOs (Customs Electronic Delivery Order) through for export documentation. Our system links to all the different coolstores and packhouses and all the different systems they use. There’s a business connector there that links all that together”.

The virtual links provide a cost effective way of transmitting information both ways along the supply chain. The systems have been developed in such a way as to automate a lot of the previously manual processes of documentation. This has squeezed time out of the system and complimented the marketing efforts of the exporters where they need to get fruit to the market in the shortest possible time.

Bar codes are in widespread use, and assist in transmitting data seamlessly and eliminate duplication of data entry tasks in the supply chain. For example, the participant said “it’s all bar coded, it has all the spray diary information for each block submitted into our computer systems”. This helps the exporters in managing the complexities of government, industry and retailer compliance as well as the required documentation trail. The participant described the process:

“So our software has the ability to go right when we pack this particular customer’s fruit these suppliers (growers) cannot be packed for it so no human being has to remember that....It (the system) does that for you...it traps all the compliance issues throughout the system”.

The exporter went on to explain how the system helps in fulfilling traceability requirements of the retailers. With just a bar code the exporter can look to see who exactly grew the fruit, what sprays were used, what orchard it come out of, how it was treated, as well as who packed it and what pallet the carton of fruit was on. Barcodes minimise errors arising through transmission of data and are complemented by the widespread use of EDI (Electronic Data Interchange) which is appropriate given the supply chains span continents.

“We use the EDI system and (name given) will send the loadout to the packhouses from our SmartFresh system which quite a few exporters use.....I get the EDI file from the packhouses and pull it into our system...we are quite dependant on the EDI”.

The systems developed give the exporters visibility within their own systems, particularly in their facilities where most of the physical handling occurs. The participant had this to say:

“There is good software to find the product within the stores, things don’t get lost in the process, we have got fruit that is literally packed today and is shipped the next day. You know you can prioritise that through our coolstores, it gets into the forced draught cooler, it gets cold quickly, it’s prioritised and the coolstore can easily see their data”.

The participant gave a hint of past issues arising from fruit ‘being lost in the system’, and how their Warehouse Management System (WMS) has managed to minimise that problem. The ability of the system to expedite particular product through complements the nature of the fixed price sales as discussed previously. The short time frames the exporters have to work with when servicing the fixed price trade are highly dependent upon trusting the system to move the right product through the system quickly.

The Internet

As discussed previously, the exporters and other shippers have to work to shipping line imposed cut offs. They have to get all their documentation done and cargo in the terminal by a certain date and time, prior to a vessel arriving and working. The exporters log onto the port’s website to check vessel estimated time of arrivals (ETAs) as they change because of a number of reasons such as industrial action, bad weather or port congestion at upstream ports. The participant explained:

“The port’s website is very good, we can see exactly when a ship is coming in and we can go back to the shipping line and say it looks like this vessel has been delayed, can we have a later cut-off? I’m on that everyday checking it in that way”.

This is again a reflection of the tight time frames the exporters are working under. An awareness of vessel ETAs helps the exporters to manage and adjust their workloads if need be. There also is the issue of CEDOs (Customs Export Delivery Order). All exporters have to lodge CEDOs (Customs Export Delivery Order) for all export shipments with New Zealand Customs. Shipments that don’t have CEDOs cannot be

exported under New Zealand law. The participant further mentioned that they used the port website to check if all CEDOs for their containers were clear.

As previously mentioned, the exporters also check the status of empty releases on the port website prior to sending a truck out to fetch it. The participant reasoned, "...you know that if it has been released on the website your chances of picking up an empty have increased".

The exporters also get vessel schedules by email from the lines and go onto their websites too. The port website does offer them answers to most of their questions without the need to pick up the phone to talk to someone. The need to make phone calls arises when exporters give their road carriers the wrong documentation and need to liaise with the port gate staff to address the problem.

Communication with Stakeholders

The discussion in section 5.3 revealed that the exporters were generally happy with the service given to them by the road carriers. The road carriers have provided adequate vehicles for the work required to be done, and were getting advanced notice of about a week for the work to be done. The participant mentioned that communication with the road carriers has traditionally been via phone and radio transmission (RT). That has evolved as described by the participant: "...with our system we've designed an extract that can be pulled out and emailed to them (road carriers), so they see all the information for deliveries they need to make of a day or a week". The nature of the release numbers makes this clear. They can take such forms as 170002385083, or AKLUPKG01007891 or 587309256. It is easy to understand that trying to pass them on over the phone could possibly result in transposition or missed figures. As these release numbers have to be in the exact order when they are quoted to the gate staff at the port or UCL, transposition or numbers missing can result in delays.

The participant further explained: "...it's all done electronically so it's not re-entered at any point...I think with all the transporters we've used previously there have always been issues with communicating the right information".

Communication with the shipping lines occurs at two levels. Section 5.6 will discuss the first of the two levels and that involves the exporters giving the lines forecasts of their

expected shipments. The second level occurs on a more day to day basis during the season; the participant explained, “I’m on the phone to most of their sales people and managers a couple of times a week to have a chat and make updates. It’s pretty good really”. This involves resolving day to day issues as they arise.

One exporter has taken this a step further by fortunate circumstances, the participant revealed:

“We are in a fortunate position that the company that own us also own a logistics company so we have an in-house agent from our sister company who works in our office and works directly with all the shipping lines we deal with”.

The agent’s experience, knowledge and contacts have helped to create what the participant called seamless communication with the shipping lines so all they do is pass on what needs to be shipped to the agent and the agent finds the shipping space.

Communication with customers is mainly by email/EDI. The exporters keep the customers up to date with the status of shipments, the participant said:

“...from my side we have fortnightly updates going out saying what is happening over the next fortnight. When orders are done they are getting emails stating what the orders are and what needs to be done, all the cut off times...etc”.

Shipping is prone to delays so keeping the customers informed allows them to make adjustments if and when shipments are delayed. The participant further added that consignment customers are also prompted on pending orders, chasing the necessary documentation and making sure everything is running as planned.

5.5 Selling Arrangements

Consignment Sales

Consignment sales constitute the bulk of the exporters’ sales, and these are largely to the traditional markets of the US, UK and continental Europe. The participant described the nature of these sales:

“Our large consignment customers are in the US, Europe and the UK.....the consignment sales are the bulk of our product, probably about three quarters of our

supplies are for consignment sales. We have a pre-program at the beginning of the season and we negotiate the volume they want of certain products and we stick to that”.

Prior to entering negotiations with retailers such as Sainsbury and Tesco in the UK, the exporters get estimates of the volumes they expect from the harvests and promise to deliver a certain amount. They are able to adjust those volumes closer to the time of delivery depending on what their final output is. The participant said: “we don’t know exactly how that looks (output) until we get to packing during the first few weeks of a variety. Once that is underway we can then reforecast our productions and adjust our programs with our customers”.

These arrangements give the exporters a measure of stability because of the visibility afforded by knowing what needs to be done ahead of time. One participant even mentioned that “...they take all our fruit...for a few customers we actually can’t fill their requirements”. This hints to the potential to send more fruit provided the price is right. Prices in consignment markets change a lot because they are quoted in foreign currencies. It is quite possible for currencies to shift during transit, and the exporters can find that fruit is worth less than it did when it left New Zealand’s shores.

One exporter, in an effort to gain some measure of protection against currency movements got some retailers to agree on a minimum price, the participant said: “...this year because last year was so shocking we got them to agree on a minimum price which they don’t normally like doing”. The power does lie with these retailers and the quality of New Zealand fruit is just about the exporters’ only bargaining tool.

Fixed Price Sales

The balance of the exporters’ fruit is sold on fixed price to the relatively newer markets of Asia, the Middle East and Russia. The nature of these sales was summed up by this participant: “...we also have a huge volume of customers in the rest of the world which is mainly Asia and Middle East where they are more trading type sales. We give them a price of a week and send it the next week”.

These markets have several attractions to the exporters aside from the fixed price such as the shorter transit times to the markets and the upfront payments received. The participant explained:

“In recent years it’s become a trend into Asia because the money is a lot better and the transit times are shorter, it’s just of a lot more benefit to go straight into Asia than spending five weeks shipping into Europe to find the exchange rate and price has changed. So Asia has been a big target for us, about 40% of our fruit is exported there. We’d like it to be a bit bigger but there are other challenges there like the Chilean fruit that comes in there as well but it is a big focus for us”.

Operationally these trading type sales present different challenges to the logistics system because of the tight time frames imposed by changing weekly prices in the markets. The participant explained:

“Some of our Asia business we do....you got to get in there first. The early shipments get the best money so it’s just about getting it off the trees and through the packhouses and back down to temperature as quickly as possible. Some weeks we are picking on a Tuesday and Wednesday, packing on Thursday and cooling the fruit on Thursday night and back to the port on Friday before the cut-off”.

Shipments need to be expedited through the system amid other shipments going out to consignment customers. There is less visibility for these types of sales because of the short periods of notice, and success depends on how quickly the system can move the fruit through and get it to the market.

Compliance

The different markets and customers the exporters deal with impose several standards they have to adhere to such as how the fruit is grown, treated and handled. As previously discussed in the logistics network section, some of the requirements are at the facility level. A significant program is run by the New Zealand government through New Zealand Customs, acting as a facilitator for exporter operations. In response to heightened security issues since 9/11, New Zealand Customs established the Secure Exports Scheme (SES) to act as a guarantor that shipments are not likely to be used for terrorist activities. As a result shipments are less prone to delays at ports of entry

minimising any potential associated costs of delays. The participant had this to say when asked about compliance issues:

“Yes we got people here to monitor and help people through like the SES with customs. We are accredited to that so we have to make sure our business partners are up to specification on that also, trucking companies, the whole works, everyone is required to be compliant to our requirements and our offshore customer requirements”.

The other compliance programs are at the orchard level where growers can be accredited to a wide range of programs such as IFP, Tesco’s Nature’s Choice, BioGro and Apple Futures. Programs like Tesco’s Nature’s Choice are retailer minimum requirements in their quest to provide their customers with safe fruit grown from sustainable practices, and those like IFP and Apple Futures are designed to give New Zealand fruit a competitive advantage in the market whilst also addressing food safety and environmental concerns of consumers.

The different retail customers have their own standards that the exporters have to adhere to and the complexities that come with that. The participant explained:

“...when a consignment of fruit from a supplier arrives, a portion goes to the US, a portion to Asia and a portion to Europe....not only do they need to be handled and treated differently but they also have different packaging types and branding so it gets complicated without going into too much detail”.

The participant further added:

“The Europe stuff is all part of GlobalGap now (previously EurepGAP), British Retail Consortium is another whole set of standards, Tesco has ‘Nature’s Choice’...another whole set of standards...it goes on and on....there’s a lot of paperwork but you can’t send your fruit to all those markets and expect not to have all the standards in place. GlobalGap is good because it’s kind of standardised the whole of Europe but you do get customers that require extra things”.

The enterprise systems used by the exporters help to manage the administration side of compliance. The participant did mention that a lot of the programs were similar and that there was a lot of overlap. Clearly compliance is an important aspect of the exporters’

operations: "...compliance is a huge area. We literally have a few dedicated people within the company that look after that".

Licensed Overseas Orchards

As discussed in Chapter 2, ENZA found a novel way of overcoming the ban on New Zealand apples in Australia by establishing licensed orchards in Australia to grow varieties such as Jazz™. The participant enthusiastically exclaimed when asked about Australia as a market: "...we are already in there! We are selling Jazz over there, Pacific Rose as well. We are selling it in the supermarkets over there now". The participant further added that the fruit grown in these licensed orchards is grown to the same specifications as fruit grown here in New Zealand, and they monitor orchards to ensure adherence to prescribed standards.

ENZA has these arrangements in 12 other countries in both hemispheres, the participant elaborated:

"...we grow varieties around the world and one good thing is keeping a 12 month shelf space up. When New Zealand's season ends you come into to other countries' crops when their season comes along. When our Jazz runs out on our shelves here we bring some from the US so it's all fresh products all year round".

There are barriers to entry with this strategy and that is the exclusivity of the varieties and the financial resources required to undertake such ventures. That aside, there should be less reliance on keeping fruit in cool storage for extended periods in order to keep selling out of season.

Exporter Alliances

The exporters appear to exploit the competences ENZA developed from the regulation days as the NZAPMB to establish alliances to market fruit. One participant mentioned:

".....we have a partnership with ENZA ourselves, they have a very good sales team particularly in the US and Europe so we send a lot of our product via them because they have the best customers to sell their fruit to get the best price so we actually work with them a lot".

These good customers come through the distribution channels ENZA has bought into hence guaranteeing channels other New Zealand exporters can use if they enter into marketing agreements with them. According to ENZA's website they have a 50% stake in Worldwide Fruit who are major importers of fruit in the UK. They have a 15% stake in Oppenheimer in the US who has been selling fruit for about 150 years, and their own company Delica operates in Asia on their behalf.

It would appear that these kinds of alliances are commonplace in the industry, granted the greater volumes give exporters more leverage when negotiating for shipping space or with retailers. A participant mentioned "there are a few large grower-packers that we do that with...most of them help each other out, we are quite happy to talk to people (exporters), there's got to be a mutual benefit".

5.6 Shipping Matters

Vessel Schedules and Shipping Space

In an article in the New Zealand Shipping Gazette, the chairman of the New Zealand Shippers Council voiced exporters' concerns over the limited capacity going out of New Zealand. This was because the shipping lines have managed to achieve their goal of getting their vessels to arrive and leave New Zealand full, but much to the detriment of all exporters:

".....but that puts immense pressure on shippers' supply chains.....Shippers are often held to allocation by the carriers as they have no space to carry any extra cargoes. Also, if we miss a sailing due to production, letter of credit issues, etc, we often have to wait two to four weeks to get alternative space as lines are simply full".

The actions of the shipping lines are understandable given the recent global financial crisis but that has made for some challenging conditions for the exporters. The reduction in available slots on routes has come about as the shipping lines have rationalised their operations. Lines in recent times, have been entering lines entering vessel sharing agreements on routes they previously had their own stand alone services, the participant revealed:

"When I first started we used to have so many options it was really good....for example for the European service Hapag Lloyd had their own service that went via

Singapore, it was brilliant, and it worked really well! Of course they pulled out that service, it doesn't really help us, and it just takes away your options".

Another example from 2009 was the termination Hamburg Sud's ANZL service it had with Hapag Lloyd as a slot charterer. They both joined COSCO's (China Ocean Shipping Company) ICS service that already had COSCO, Maersk, MOL (Mitsui O.S.K. Lines) and NYK (Nippon Yusen Kaisha).

Transit times are evidently a cause for concern for the exporters as they have noticed them extending in recent times as expressed by this participant:

"...transit times to the East Coast of the US went from a 3 week to a 4 week service. Europe used to be 36 days but is now 42 days. I suppose a lot of that is in connections too with transshipping at Tanjung Pelepas, Singapore and where ever".

This in recent times can be attributed to slow steaming adopted by most lines as they look to save on fuel costs. Another reason for the extended transit times can be attributed to the shipping lines' switching from direct to relay operations. A direct service is one in which a container stays on the same vessel from port of loading to the port of discharge. A relay service involves transshipping, so a box will be transferred to another vessel before arriving at its final destination. An article from the New Shipping Gazette reported that just one line CMA CGM, has a direct service to Europe from New Zealand, whereas just a few years ago there were six different options for shippers. Even here in New Zealand time is lost with the feeder services. "You could lose 6 days getting your container out of the country via feeder services. It is tough but what can one do?" Judging from that comment made by the participant the exporters are fully aware of the time lost due to transshipping and would have to factor that in when making commitments to customers.

The lack of shipping space was highlighted by one participant:

"We'd probably want bigger vessels north-bound (from New Zealand) but the problem with Nelson is you are always going to have a draft issue and they are not going to dredge the port because it's too expensive. Another thing is these vessels are not full south-bound (to New Zealand)".

It is understandable that Port Nelson would only invest money in dredging their channels if the volume of business was there to justify the cost. It's not just Port Nelson but the Port of Napier as well that has to contend with this issue. The vessels calling to New Zealand ports will get larger going forward, and they will require deeper channels so it is an issue for both ports to consider.

Compared to Nelson, Napier has more weekly services calling primarily because Napier has a bigger port handling more than double the volume of containers. The fortnightly calls in Nelson present some unique challenges to fruit handling as explained by the participant:

“....we are restricted by what we can do physically....we are pretty much stuck with having to work everything to their fortnightly calls instead of being able to work to a nice regular weekly program. We have to do very little in one week and then push 70 to 80 boxes through the next week. It makes it very hard for the packhouses”.

The problem is exacerbated by the comparatively smaller facilities in the Nelson region so capacity shortages arise in facilities with fruit having to be moved between coolstores to get it all into cool storage.

Port Nelson is also vulnerable to being dropped in vessel rotations whenever shipping lines need to get vessels back on schedule. This negates the marketing efforts of the exporters as shipments are delayed. The participant explained: “I think the only issue with COSCO is that on the COSCO-Hamburg Sud Asian service, vessels can run late and if they drop a port it's usually Nelson”. The participant further explained that when faced with this situation they are forced to use other options with transit times that are not ideal for their marketing plans.

The exporters select carriers on the basis of the overseas ports they call at and the transit times to get to those ports. They use a variety of services offered by the different lines as explained by the participant:

“.....there are some pretty fast services, you just got to look at each line, different lines specialise in different markets....MSC (Mediterranean Shipping Company) might get to Taiwan faster so you use that, or OOCL (Orient Overseas Container Line) might get to Hong Kong faster so you use that, you just mix and match”.

One participant expressed some frustrations at having to work around the shipping lines' schedules, "shipping dictates our marketing at the moment which is not ideal".

The participant further added:

".....we sometimes have to use Maersk to get to Indonesia or Thailand.... their transit times are longer than PIL (Pacific International Lines) and MISC (Malaysian International Shipping Corporation). It doesn't always fit in with our marketing plan like to get fruit up there as quickly as possible to get the best price".

The exporters showed an awareness of New Zealand's uniqueness in the shipping world with regards to its highly seasonal demand for reefers. There is an imbalance because a lower number of laden reefers are imported than the much higher number of laden reefers exported. The shipping lines would rather bring in laden reefers to be used by pipfruit exporters than repositioning empty reefers because they don't get paid for moving empty reefers. Unfortunately they don't have the business to bring in an adequate number of laden reefers to fulfil the exporters' requirements so they have to reposition empties to make up for the shortfall. The participant reasoned and explained:

"...they (shipping lines) are in a hard place where New Zealand exports a lot more reefers than we import so they have to bring in reefers but we have started doing programs with the shipping lines. We say we are going to export five reefers a week with you, with the next shipping line eight etc.....so they know what they are going to receive from us and we expect that service back. If we said we are doing to do five per week we expect the equipment and space from them".

The shipping lines appear to get the exporters to submit forecasts of their shipping space requirements to allow them to make better decisions on determining the empties to reposition to New Zealand, and to know what size vessels to deploy. The participant acknowledged this by saying: "Well it benefits us both especially that they know we hit our targets which is usually 99.9% of the time, and we get looked after the other end like if they are running tight on space they'll look after us too".

The same participant does hint at the lines according preferential status to big volume shippers: "Everyone keeps talking about things (shipping space) being tight in New

Zealand, I suppose if you are going to hit your volumes you are going to get looked after (by the lines)”.

It would seem the establishment and maintenance of good relationships with the lines is essential when confronting tight shipping space. The participant stressed, “...we have to be really careful we maintain good relations with everyone (the lines) because we always have to call in favours at the last minute”. It would be fair to assume that this wouldn't be just limited to shipping space and equipment but to cargo cut offs and late bookings as well.

Overall it seems the exporters are happy with the service the lines give them despite the challenges they face. The participant expressed some of these challenges:

“...this year Swires pulled a couple of their Napier calls. We were quite excited by them because they have got some really good transit times to Taiwan so now we have fewer options to try and get the fruit there. Generally most are reliable, HSD have had a bit of trouble this year with their squash and apple vessels, they kept coming in late which means planning gets pushed out and fruit age becomes a problem”.

Despite the challenges, the exporters have shown that they can cope with the services provided by the shipping lines. The relationships between the exporters and the lines appear to have been strengthened by both sides collaborating on issues such as shipping space and making alternate arrangements when vessels omit certain ports like Nelson. The perception that the lines are reliable would have been reinforced by actions like the one Maersk took as narrated by this participant:

“Most are reliable and for example Maersk when something goes wrong they tend to come up with a really good solution. Once their peak season loader had to omit Nelson and they ended up telling all shippers they would send in another vessel to pick up their cargo to meet the peak season loader in Auckland”.

Maersk were recently reported in the New Zealand Shipping Gazette as having launched the 'Priority Product Upgrade' in which shippers, for a fee, can get loading priority at the time of booking. The New Zealand Manager for Maersk said “where demand for space exceeds supply, this service will allow customers for whom time is of essence to

obtain space on a particular vessel”. This has been touted as a way for shippers to gain more control over their supply chain and for Maersk to build relationships with its customers. In a marketing sense Maersk are taking advantage of the high demand to discriminate the market and offer a product to shippers who are unwilling to wait.

Equipment Availability

A source of frustration for the exporters is the non-availability of equipment (empty reefers). The time lost in addressing problems of equipment non-availability quickly mount. It becomes more than just lost time when it affects late bookings for the fixed price trade:

“...there is always something to hold up the process particularly with the hand to mouth trading with Asia. There’s a big difference in the return to the grower if it arrives this week as opposed to next week so if there’s a sale we’ll push to get it on this week’s vessel because a difference of a week can be about US\$2 /3 per carton so it’s worth trying to push”.

So what could be just an hour delay could easily turn into a missed cut off for a late booking and a missed opportunity to retain that US\$2/3 per carton. There is an awareness of the source of this problem with non-availability of boxes. One participant commented on a recent vessel exchange witnessed in Nelson:

“At the beginning of the season I was in Nelson and saw Maersk drop off some ridiculous amount of say about 2500 boxes (empties) so they are never going to run out of stock but Hamburg Sud and Hapag Lloyd are more hand to mouth, where they drop off enough boxes for each week. If we are doing a last minute booking and increase it we find it quite hard to pick up a container”.

This could possibly influence the participant’s carrier selection going forward when considering the issue with late bookings. They would know that they are less likely to face problems trying to put through late bookings with Maersk than any of the other lines. Maersk are the largest shipping line in the world so that explains their larger resources. The country manager for Maersk in New Zealand was quoted in the New Zealand Shipping Gazette discussing the potential shortage of equipment. The manager explained the recent global financial meltdown had slowed the building of new reefers,

and while Maersk themselves are equipped to manage current demand, any substantial changes would compromise their ability to service shippers. If the biggest container line is in such a position then the issue would be more pronounced with the other lines because they are smaller and have fewer resources. The slower steaming strategies adopted by the lines in recent times would slow down the turnaround of reefers so that would contribute to equipment shortages.

Charters

Currently only one exporter is involved in the charters trade. An exporter has to have the volume to make chartering economical. That is currently the case with this exporter, “I would say about 26% of the volume is chartered and the rest is shipped in containers”. The charter vessels used are conventional meaning the fruit is loaded on pallets directly into refrigerated holds in the vessels. The advantage is the direct calling afforded by such methods, the participant commented, “...it leaves Port Nelson then onto Port of Napier and then arrives outside our coolstore in Antwerp”. The participant further added,

“We get products into the market quicker.....it is 28 days to market compared to 42 days so you’ve got 14 days up your sleeve to get some serious sales under your belt before anyone else gets in the market and that’s the key. We have also got the volumes especially to Europe to be able to do that”.

Even though it takes several days to work these conventional ships, chartering gives the exporter a lot more flexibility than that given by the container lines on their normal routes. It’s not only the flexibility to be able to call into any port but also the reduced lead times that allows the exporter to get into markets before other competitors do.

5.7 Looking Ahead

Expansion

The volume exported is set to increase going forward judging from the comments made by the exporters. There are plans to widen the supply base as indicated by this participant:

“We’ve got orchards out there that are currently coming along, it takes about 2 to 3 years for the volumes to increase and come into supply. We’ve got new plantings coming in, orchards we’ve purchased and orchards whose leases we’ve taken over so yes we are expanding”.

Given the nature of consignment sales the exporters are able to advise their customers of their expected increases and make alternative arrangements if need be. It was mentioned earlier by one of the participants that the consignment customers take all their fruit and more, so this puts the exporters in a very good position.

The attractiveness of the fixed price markets appears to be a source of great optimism for the exporters. The potential benefits have seen increased marketing efforts directed to that market as explained by the participant, “I’d probably say yes, we would like to.....thinking of our strategy, like I said we are increasing to Asia at the same time Europe isn’t going to contract”. Judging from the comments of the participant, despite looking to increase the marketing effort to Asia they will look at maintaining and increasing their sales to their traditional markets.

Another source of optimism stems from the performance of exclusive varieties. When asked why they thought their sales would increase the participant said, “the new varieties and also because of the likes of our Asian marketing at the moment, we are getting pretty good returns. We have more growers bringing their volumes back to us”.

Looking back into the historical fortunes of the Braeburn and Royal Gala varieties, the lack of exclusive growing and marketing rights for these varieties saw the rest of the world eagerly adopt and profit off them. Having learnt from this period the protection given to more recently developed varieties such as the Jazz™, Pacific Rose™ and Envy™ prevents a repeat of the imitation. Judging from the comments made by the participant below, the future of these new varieties looks bright:

“Last year we shipped about 1 million cartons (Jazz™), this year it’s going to be about 1.4 million cartons. Next year it should be about 2 million cartons so that’s going to keep growing to around 3 million cartons out of New Zealand. The Envy™ is our other new variety, this year we are going to ship about 15 000 cartons, next year will be around 100 000 cartons so it’s just going to keep growing”.

The exporters are always looking at contracting more suppliers as described by the participant, "...we are always looking at opportunities as we go forward we'll get more growers and more packhouses coming on board with us that want to deal with us. So I'd say yes over the next 5-10 years we will grow".

The projected growth in supplies is also matched by plans to invest in more facilities, the participant revealed that "as we get bigger we are going to have to increase our storage capacity....the owners have those plans on the table at the moment".

Australia

When the exporters were asked about their thoughts on the Australian ban on New Zealand apples, and if they thought the issue would be resolved soon, the responses given demonstrated nothing short of scepticism. One participant said "I think we'll put it in the wait and see bin", another said "we'll sit on the fence and wait". The general consensus was that the motives behind the ban were protectionist, and as previously discussed, there was no justification for the ban today.

In the event that the local industry was given the green light, the exporters still expressed scepticism, and expected the protectionism to persist. One participant said, "Really they are being a bit like Japan because we can actually export apples to Japan but the costs are prohibitive so nobody actually does it". This was in reference to the stringent phytosanitary requirements they expected to be imposed. The same participant further explained, "I think it will be so regulated. There'll be so many things put in place to make it probably not worth it".

The short transit times (about two days) and superior quality puts New Zealand in a prime position to exploit the market in the event that all issues were resolved. One participant expressed concern about sending just about the right amount of fruit over there to get the best price. Aside from that all were confident they would do well in that market.

Chapter 6: The Port of Napier Container Terminal

6.1 Introduction

This chapter presents the second part of the findings of the research project. It is driven by the second research objective, and that is to analyse the impact that seasonal reefer cargo has on terminal operations. The impact of the pipfruit season is described by its influence on specific terminal aspects such as pipfruit volumes, shipside operations, reefer capacity utilisation, container dwell times and rehandles. The selection of these aspects was influenced by the researcher's experiences as a yard planner and by the literature review.

The Port of Napier's roots can be traced back to the 21st of October 1875 with the passing of the Napier Harbour Board Act. The port and waterfront reforms of 1988-89 brought the Port of Napier Limited into existence (Anon, 2010c). The port company is now wholly owned by the Hawkes Bay Regional Council after the latter purchased the 8% minority share holding previously held by the Horizon Regional Council on the 23rd of December, 2009 (Anon, 2010b).

The port has an on-site empty depot and container terminal that share a 10 hectare container pad. The terminal has a reachstacker/forklift operation that handled 167 225 TEUs (Twenty-Foot Equivalent Units) in 2008 and slightly less at 166 934 in 2009. The company grossed just over NZ\$47 million in 2008 and NZ\$45 million in 2009 (Anon, 2010a).

Looking at the actual containers handled in table 6.1 below it is evident the terminal handles just about as many imports as exports.

Year	2008		2009	
Imports	51408	45%	53710	48%
Exports	55578	48%	53511	47%
DLRs	7688	7%	5682	5%
Container Counts	114674	100%	112903	100%

Table 6.1 – Containers Handled in the Terminal in 2008 and 2009

The remaining percentage is made up from DLRs (Discharge Land Restows). These are rehandles generated by the vessel planner to maximise stowage on board and ensure containers are placed in discharge port rotation (last port of discharge on the bottom). They are landed ashore temporarily and then restowed back on the vessel later on in the exchange. Reefers made up 38% of exports in 2008 and 42% in 2009.

6.2 Export Handling

The port uses the complementary package Navis Express and SPARCS (Synchronous Planning and Real Time Control System) as its terminal operating system. This gives the terminal the real-time ability to automate activities from gate reception to vessel loading, and vice versa. The port has a license for the Expert Decking module (the process is depicted in figure 6.1 below) as part of the SPARCS component of the terminal operating system. This manages containers in the yard using the 'sort and store strategy' (Chen, 1999). To recap, in the 'sort and store strategy' containers of the same group (allocation group in SPARCS terminology) are stacked together in the yard. The group of a container contains its routing details, that is its outbound vessel, its port of discharge, its size (20' or 40', 8'6" or 9'6") and type (reefer or dry), its weight class (light or heavy) and its International Maritime Organisation status (type of hazardous cargo if it has any).

When an export container (reefer in this case) arrives at the gate its group details are entered in the data base Navis Express. SPARCS then takes over and looks to match the group of the reefer with any that are in the yard. If it finds a match, it will look to see if there are any empty slots in that row and assigns the next available slot in that row to the new arrival. The task will appear on the job queues of the forklift drivers on their RDTs (Radio Data Terminals). When a driver selects a job it will disappear from the job queues of other drivers so they see only those jobs that need completing. The container is picked up and delivered by the forklift to its assigned position in the yard. Once the container is landed the driver completes the job on his RDT to verify completion of the task to the server. Upon receipt of the confirmation a message is sent from the server to the RDTs (Radio Data Terminals) of the reefer care team instructing them to connect the reefer. Upon physically connecting the reefer to power, the job is completed on the RDT by the reefer care team.

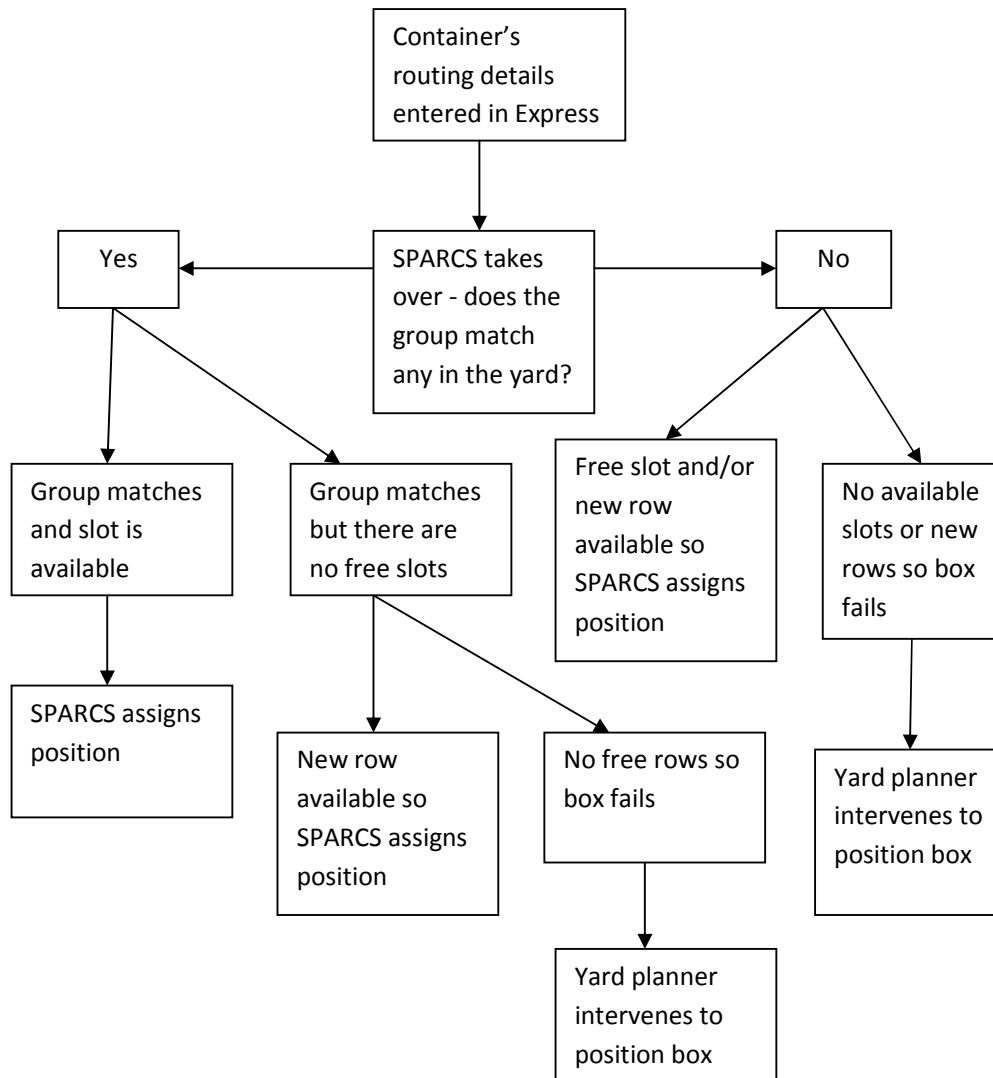


Figure 6.1 – **The Expert Decking Process**

The opposite happens when reefers are sequenced to load onto vessels, depart via truck or rail, or to be moved to another yard position. A message is sent to the reefer care team to disconnect it from power before the forklift driver moves it to the vessel, truck, rail wagon or its new yard position. If SPARCS doesn't find a match it will look to start a new row if there are any free rows available. If the system is unable to match the incoming container to existing ones in the yard or find a new row to start, it will alert the yard planner on duty by 'failing'. This allows the yard planner time to decide a new position that best suits the operation at the time.

Reefers in the terminal are stacked to the second tier as opposed to dry containers that are stacked to the fourth tier. Other than the technical limitation arising from power supply, the second tier is convenient for the reefer care team who have to physically unplug and plug the reefers when they are on the move, and to monitor them during their stay in the yard. They can easily and safely mount ladders to reach the second tier reefers, any higher would make this task unsafe and would need reefer towers to be constructed to enable the reefer care staff to work safely.

6.3 The Pipfruit Export Season

The literature review in Chapter 3 was guided in part by the researcher's experiences as a yard planner at the Port of Napier container terminal. Seasonality as a phenomenon is not tangible but what is visible are its manifestations. The literature review gave confidence to the researcher to give an account of seasonality by analysing its manifestations in the yard. As a result of this process the investigation of the impact of the pipfruit season proceeded under the following categories, pipfruit volumes, shipside operations, reefer capacity utilisation, container dwell times and rehandles.

6.3.1 Pipfruit volumes

The terminal handles about 36 different kinds of reefer commodities. In 2008 the top six contributors by volume accounted for approximately 82% of the total volume of reefer cargo. Pipfruit volumes were the largest, contributing approximately 33% of the total volume of reefer cargo. Frozen lamb was the second highest contributing about 23% of the total volume. The contrast between the flow of these two commodities through the terminal over the year helps in depicting the seasonal nature of pipfruit in figure 6.2 below. Pipfruit volumes were very strong for about five months of the year where as frozen lamb had a relatively even flow spread throughout the year. Only the top six commodities by volume are shown below, the other 30 commodities make up the 18% balance and most of those are less than 1% of the total volume.

The year 2009 depicts the same trend (see figure 6.3 below) only pipfruit gained a larger share of the total volume, improving to 40% of total reefer cargo. This is a reflection of the good harvest enjoyed by the industry for the 2009 season (Anon, 2009f).

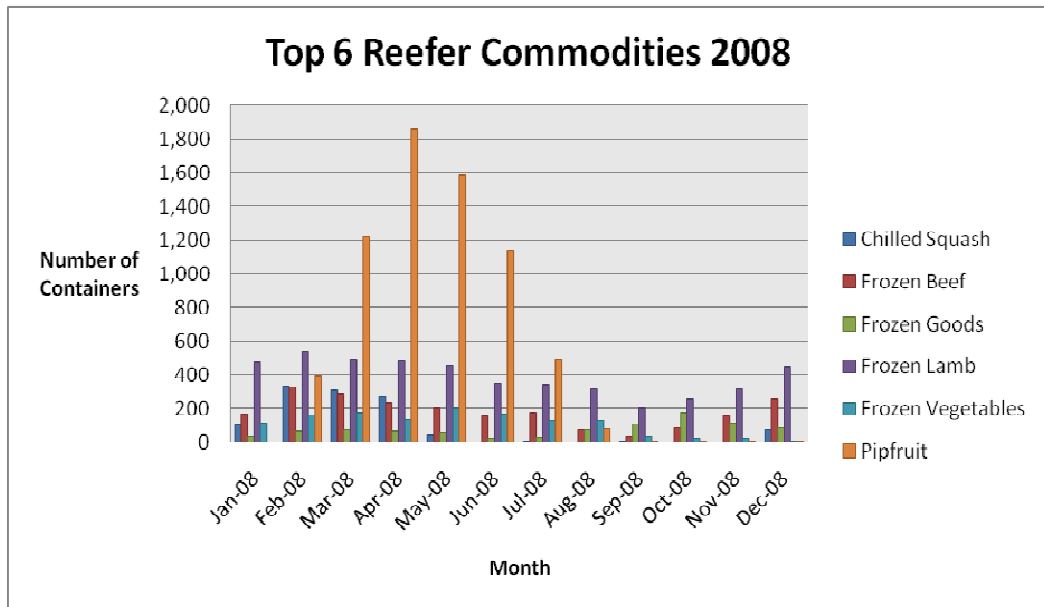


Figure 6.2 – The Top Six Reefer Commodities by Volume for 2008

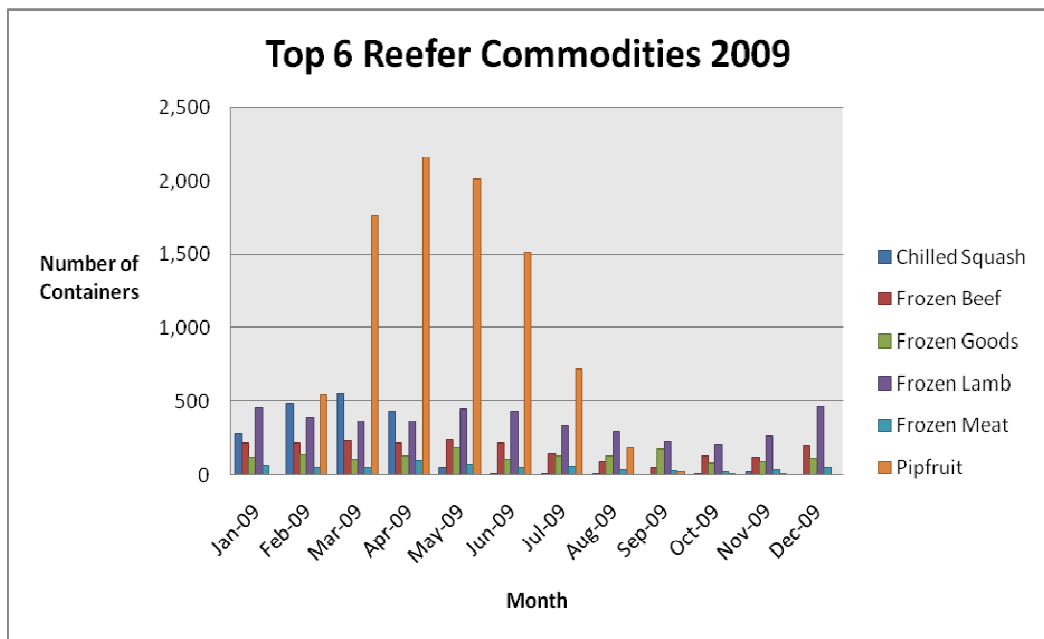


Figure 6.3 - The Top Six Reefer Commodities by Volume for 2009

Consequently, the top six commodities also contributed to a larger share of the total volume of reefer cargo, improving to about 86%. Frozen lamb was once again the second largest contributor weighing in with 19%. The balance, 14% came from the

other 30 commodities, most of them again contributing less than 1% to the total volume.

Regardless of the slight differences in volumes between the two years, what is evident is that pipfruit is the dominant reefer commodity handled at the Port of Napier and is therefore an important contributor to revenues generated from handling reefer cargo. The challenges for the terminal arise because the majority of these reefers pass through the terminal in the five months between March and July where as in comparison the other five significant commodities are more evenly spread throughout the year.

6.3.2 Shiplside Operations

If the number of container vessel calls to the terminal between January 2008 and December 2009 are expressed graphically as in figure 6.4 below, a seasonal trend emerges that almost mimics the seasonal spike in reefer cargo during the pipfruit season. The shipping lines have regular weekly and fortnightly services that call in at the terminal. The rise in container vessel calls during the season is because of ‘extra loaders’ or ‘ring-ins’ that the shipping lines deploy to cope with the increase in cargo.

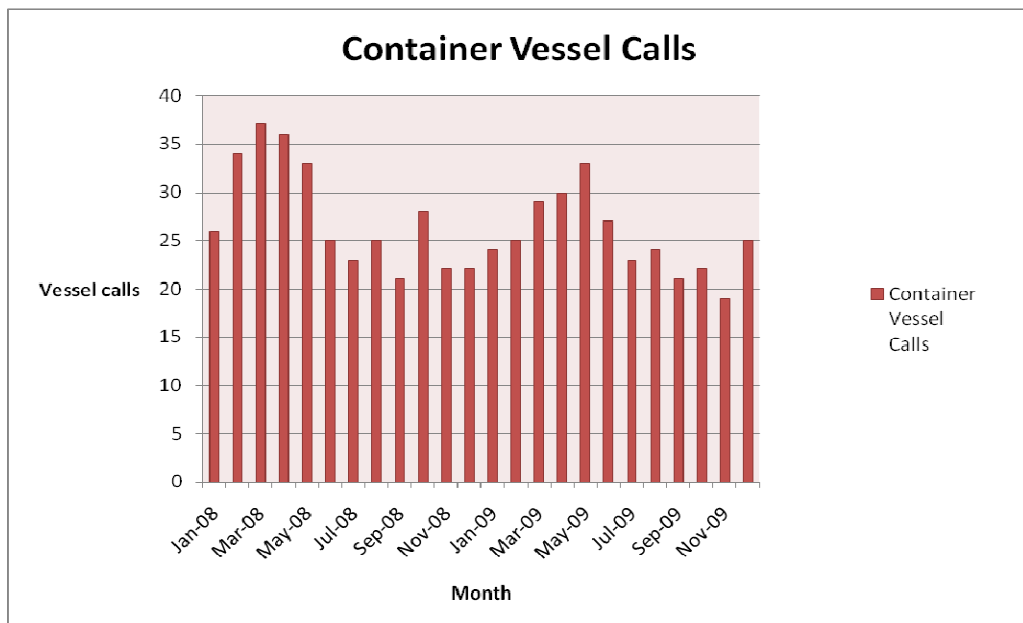


Figure 6.4 – Container Vessel Calls 2008 -2009

The shipping lines also use these ‘extra loaders’ to reposition empty containers in anticipation of the seasonal increase in reefer cargo. This in itself presents operational challenges for the terminal because very large numbers of empties are discharged, frequently in excess of 400 per vessel call. It only takes two or three large ‘empty dumps’ like these to congest the yard. The yard planners have come up with novel ways of dealing with this problem such as using empty stackers on shipside because they can stack up to five or six high, as opposed to full container forklifts that only stack up to four high. Empties are also stored in car parks, in aisles between yard blocks, and other areas not normally designated for containers.

The yard planners have to keep all the empties that are stored at UCL in the terminal because the Port doesn’t have a contract to keep them in the port container depot. These consume storage space normally reserved for dry export cargo on the container pad. The yard planners make special arrangements to work outside of normal gate hours to run the trucks that move the empties to the offsite UCL depot. The trucks are able to move a lot of these empties as there are no delays from other trucks as experienced during normal gate hours. This helps in freeing up scarce storage space in the yard.

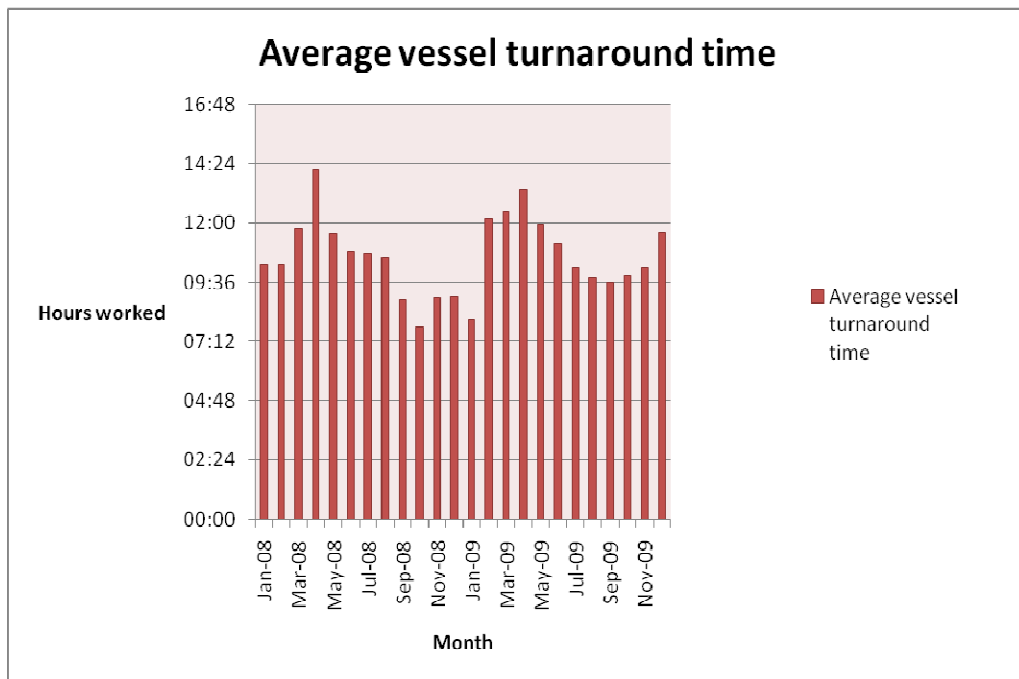


Figure 6.5 – Average Vessel Turnaround Time 2008 -2009

Another significant trend can be seen in the average vessel turnaround time in figure 6.5 above. This is explicitly the time between the first container moved and the last. Looking again at the trend for the period between January 2008 and December 2009 in figure 6.5 above, the average length of each vessel exchange increases during the pipfruit season. This isn't just a result of the increased reefer cargo but also because the shipping lines reposition large volumes of empty containers in anticipation of the increased business. The combined increase in discharge and loading volumes during the season result in the increased vessel exchange times.

Figure 6.5 however does mask the fact that the greater volumes handled allow for the use of three cranes (gangs) on vessels during the season when the norm is two. This has to be balanced out with forklift requirements and driver hours in other areas of the port. Sometimes it isn't possible to work three gangs on vessels while the gate is open because there may not be sufficient forklifts available to efficiently work R and D (Receiving and Delivery) as well as the vessel. It is standard practice to assign two forklifts to a crane and to have at least three forklifts operating on R and D. This is also assuming that there are none in the workshop for maintenance or repair work.

6.3.3 Reefer Capacity Utilisation

Building on from the previous sections, the onset of the pipfruit season sees an increase in reefer capacity utilisation in the terminal. As shown in figure 6.6 below for the months of March, April and May of 2009, the average number of live reefers in the terminal each day exceeds the available reefer power points. If the total number of reefers over the year shown below is averaged out, this turns out to be about 404 live reefers per day in the terminal. Given that the terminal has 824 operational power points, the terminal should be able to comfortably handle 404 reefers per day. However, the pipfruit season brings reefer volume surges well above this average as shown in figure 6.6 below.

The terminal has developed 'coping mechanisms' to address the shortfall of power points. Upon reaching the point where the terminal reefer capacity is exhausted, the yard

planners can turn to an 80 power point generator. The generator is used by the yard planners in two ways:

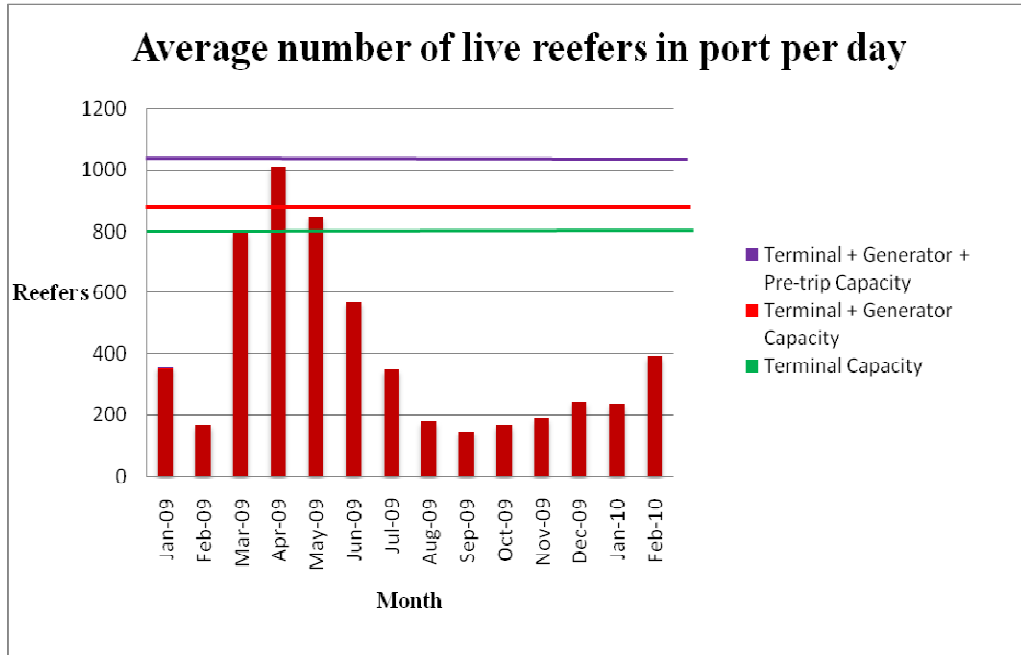


Figure 6.6 – Average Number of Live Reefers in Port per Day

The yard planners can reserve the generator for ‘large port marks’. ‘Large port marks’ are a large number of reefers destined for the same port of discharge on the same vessel. The significance of this can be best explained by figure 6.7 below. Most of the reefer bays in the terminal have two-way access as shown below (figure 6.7) and are 3 rows deep. The different colours above represent two different port marks. There are also bays with one way access as shown in figure 6.8 below, meaning only one port mark can occupy the 12 slots available ideally. Going back to the generator, if large port marks are allowed to occupy these shorter rows in figure 6.7 below, then an undesirable situation arises in which small port marks occupy longer bays and only partially filling them. This inevitably leads to ‘mixing of stacks’ much earlier than necessary. Reserving the generator for large port marks frees up more of these shorter bays for the smaller port marks, and results in more efficient use of the scarce reefer space.

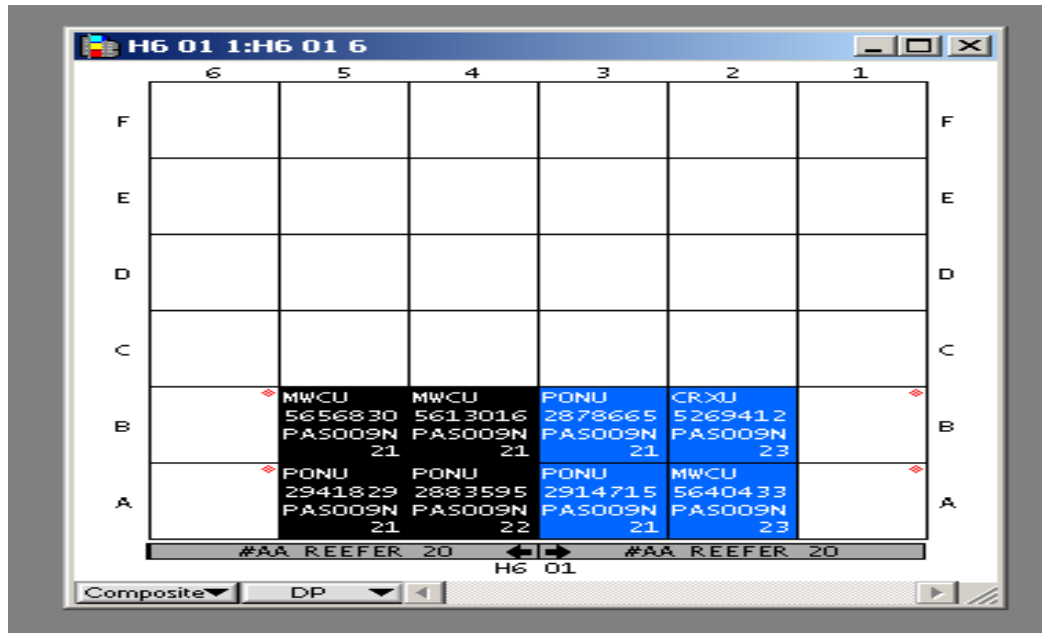


Figure 6.7 – A Two-way Access Bay

The second way the yard planners use the generator is to ‘dump’ reefers arriving a few days in advance of their intended departure on it, and sort those to the yard once working vessels free up reefer space.

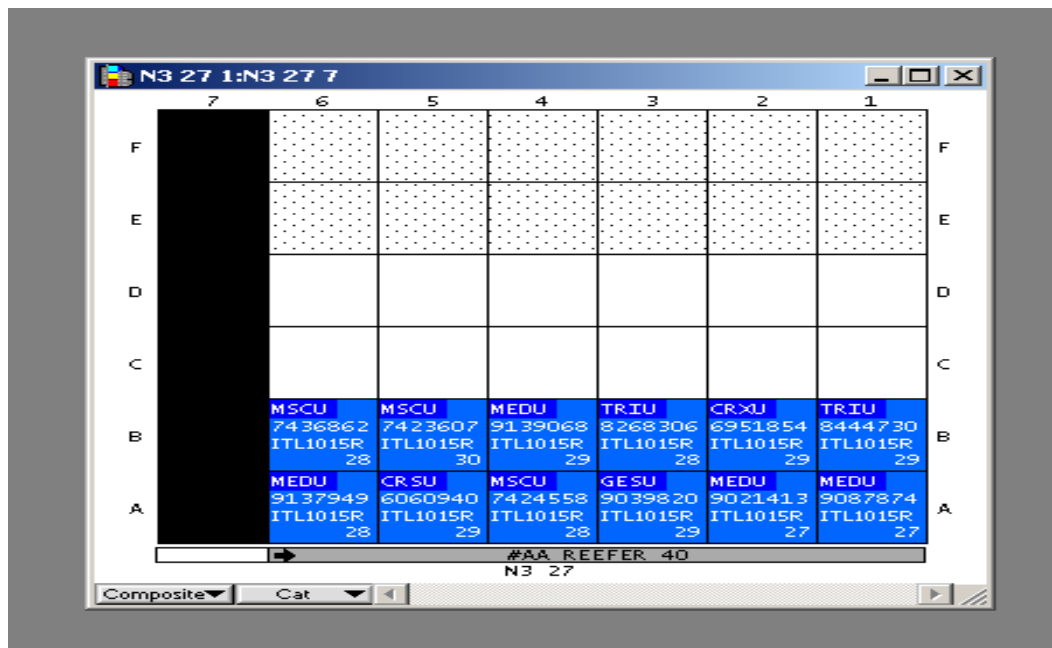


Figure 6.8 – One Way Access Bay

The generator is mostly sufficient to deal with the overflow except in the busiest month of April. Going back to figure 6.6, in April the terminal and the generator reefer capacity are insufficient to meet demand. The empty container depot uses 172 power points to service empty reefers readying them for carriage of temperature sensitive cargo like pipfruit or meat. The empty depot lends some of its power points to the terminal when their service schedules permit, giving the terminal the ability to at least make sure every reefer is powered.

The port runs an extended gate service during the pipfruit season. Management acknowledges that truck turnaround times lengthen during the season because of the higher volume of trucks movements. Normally, the gate operates between the hours of 0700hrs and 1800hrs while also providing a late booking service between 1800hrs and 2300hrs by prior arrangement only. The gate is open between 0700hrs and 1200hrs on Saturdays and shut on Sundays. During the season the gate shuts at 1900hrs during the week and at 1400hrs on Saturday. This compensates shippers for the extended truck turnaround times and allows them to get containers into the terminal in time for vessel calls. All shippers take advantage of the late booking service to bring containers in the terminal that they couldn't during normal gate hours. There is a marked increase in its use during the pipfruit season.

6.3.4 Container Dwell Times

The literature review in Chapter 3 revealed the issue of container dwell time to be closely linked with capacity issues. Terminals have sought to increase capacity by increasing the velocity of containers moving through by limiting their dwell times (Le-Griffin & Murphy, 2006). Analysis of the monthly average reefer dwell time for the last two years revealed an interesting trend as shown in figure 6.9 below. The average reefer dwell times were lower in the pipfruit season months when compared to the rest of the year. The Port of Napier imposes a daily charge for every reefer stored in the terminal, which includes power and reefer monitoring charges, as well as a seasonal surcharge during the pipfruit season. This is not to imply that it causes of the trend seen below.

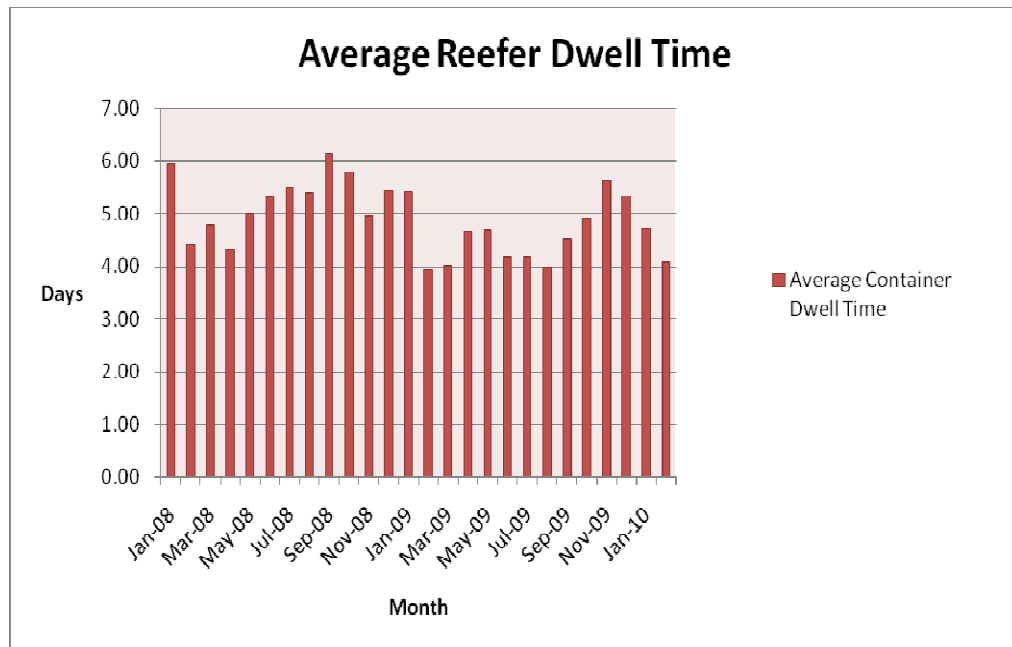


Figure 6.9 – **The Average Reefer Dwell Time**

In the months outside of the pipfruit season when there is no pressure on reefer capacity average dwell times are higher. This could be explained by shippers managing to pack reefers relatively well in advance of vessel calls because there is less pressure on them due to the lower volumes they move. The lower dwell times in the pipfruit season could be indicative of the pressure exporters are under to ship large volumes in a limited time window. This could curtail their ability to stay well ahead of schedule so they are almost packing reefers on a ‘just-in-time’ basis.

6.3.5 Rehandles

Revisiting the definition given in Chapter 3 a rehandle is defined as a container moved from one yard position to another. In other words it is a ‘yard shift’. As identified in the literature review in Chapter 3 there are a number of reasons why rehandles arise, namely when the pre-marshalling strategy is employed, whenever there is a change of destination or vessel on a container, and when a target container is ‘buried’ because a stack is mixed, or because of weight requirements on a vessel (Chen, 1999).

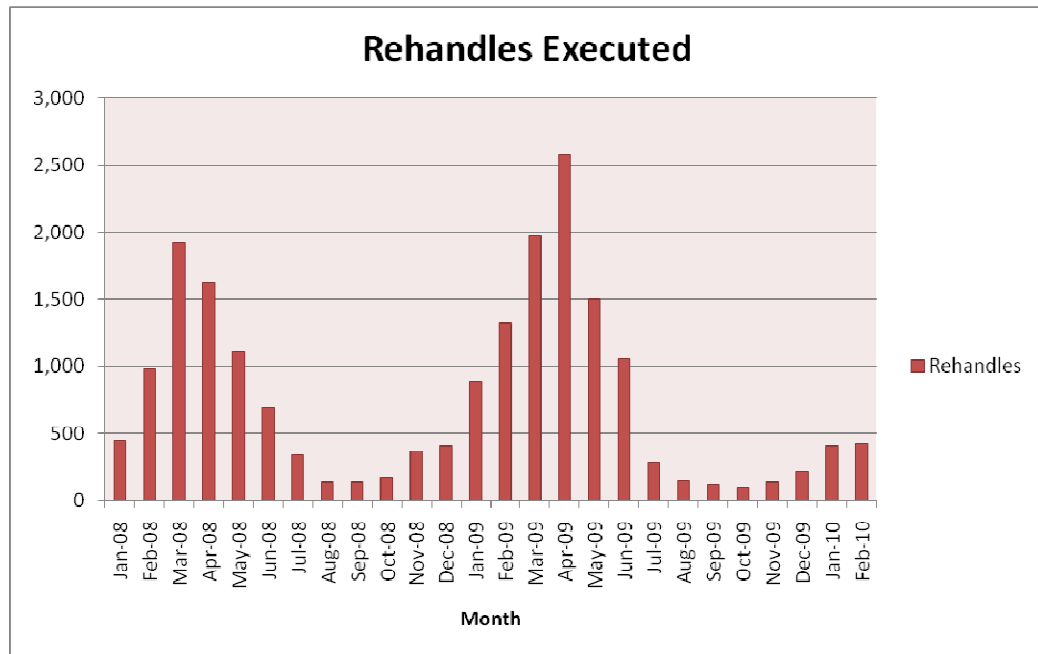


Figure 6.10 – **Rehandles 2008-2009**

The number of rehandles performed in the terminal is presented in figure 6.10 above over a two year period. The number of rehandles is largely influenced by reefer capacity utilisation. The months with the spikes in the number of rehandles correspond to the months when reefer volumes place huge demands on reefer points in the terminal. As explained earlier, the nature of the reefer handling operation during the pipfruit season forces the yard planners to mix stacks in order to accommodate the increased volumes. The yard planners employ the ‘pre-marshalling strategy’ where they block stack reefers for later vessel calls and sort them closer to the time when vessels start work (Chen, 1999). The rehandles arising from this constitute the bulk of the rehandles in the pipfruit season.

Shifting reefers in the yard is a labour and resource (forklifts) intensive activity especially in the pipfruit season when operational demands on both are already high. These rehandles can only be done when and if ‘quiet periods’ can be found. Rehandles occur throughout the year though not at the same level as during the pipfruit season. Despite the yard planners’ efforts at ‘sorting’ mixed stacks they do not always achieve completely homogenous stacks because of the high demand on reefer space during the busy period. Some of the rehandles arise during vessel exchanges where reefers are moved to retrieve target containers. These kinds of rehandles also occur when

containers have their routing details changed as shown below in figure 6.11 below. If the vessel for the purple containers works first then the container in front would need to be moved out of the way. Similarly to retrieve the black one, the two amber containers would need to be moved out of the way. Although the vessel planners can work around these situations when sequencing containers for vessel loading, it is not always possible. Rehandles arise also because of weight requirements of vessels. Lighter boxes can be in front of heavier ones in the stacks when heavier ones would be required first.

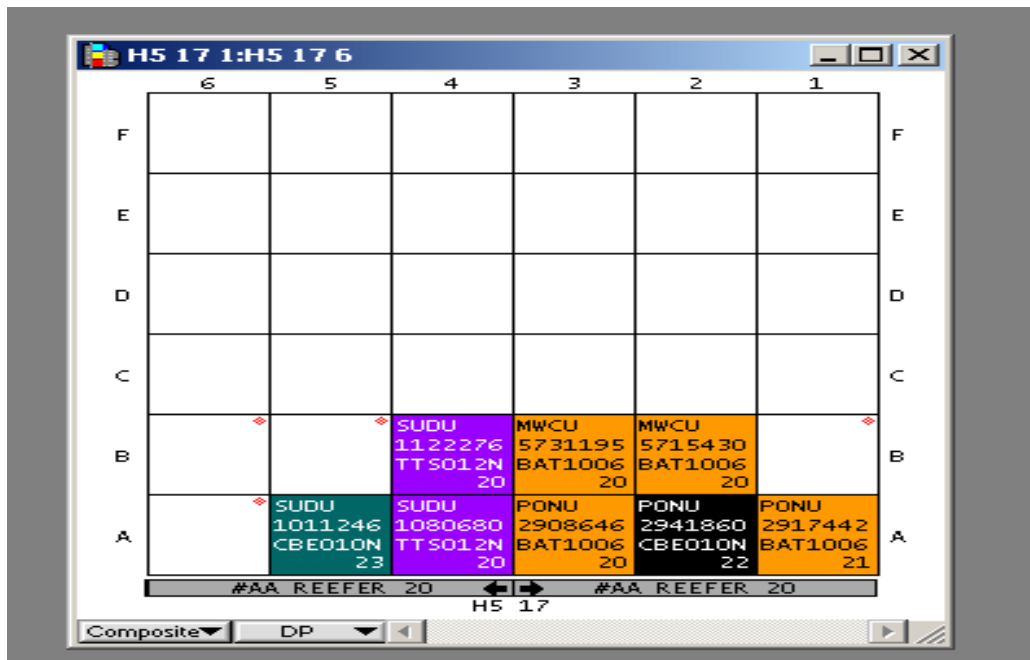


Figure 6.11 – Bays Showing Containers with a Change of Vessel

Outside of the season, there is little need to employ the pre-marshalling strategy because there is much less demand on reefer capacity. It is likely rehandles arise because of a change in reefers' routing details and because of vessel weight requirements. There is ample space in the yard outside of the pipfruit season to effectively employ the 'sort and store strategy' so rehandles decline as shown in figure 6.10 above (Chen, 1999).

Chapter 7: Conclusions

7.1 Introduction

This chapter summarises the findings and draws conclusions based on the research objectives listed below:

- 1.To explore the motives behind the actions of the pipfruit exporters.
- 2.To analyse the impact seasonal reefer cargo has on terminal operations.

The limitations of the research are then explained before concluding with suggestions for further research.

7.2 Conclusions

7.2.1 The Motives Behind the Actions of the Exporters

The exporters showed they are on the path towards full vertical integration as evidenced by their significant investments in orchards and fruit handling facilities. This reveals the exporters' desire to exert control over these critical aspects of their existence. Most of the fruit they handle comes from their own sources, and they have plans in motion to increase output. In situations where third parties supply fruit, the exporters strive to establish long term relationships. This is enabled by their fair payment systems and supplier development initiatives to encourage loyalty. As the exporters have less of a physical presence in the Nelson region, the establishment of long term relationships is particularly important given their greater reliance on third party supplies in that region. The exporters are thus able to secure the majority of their supplies and protect themselves from what can be harmful variable supplies. They are also able gain economies of scale with many of their activities such as packing, cool storage and shipping.

As the exporters have matured they have managed to match the volumes they handle with investments in fruit handling facilities. The guaranteed volumes of fruit justify the investments made in coolstores and packhouses though third party fruit handlers are contracted to handle overflow. There is one distinct advantage to using owned or leased facilities, and that is of control. The exporters have more flexibility in prioritising

shipments in their own or leased facilities than in third party facilities. The exporters take advantage of the expertise of the owner operators in the Nelson region, where the latter oversee their own operations from picking to delivering containers to the port. The exporters play the role of facilitator as they have the global view of the situation, and coordinate the actions of these third parties, particularly as containers can travel to several sites to be filled.

The trend towards vertical integration is complemented by the investment in information systems that have helped forge a virtual network spanning entire supply chains. The flow of fruit in the supply chain is enabled by the flow of information in both directions of the network. All exporters have developed enterprise wide systems that are complemented by the use of bar coding and EDI to transfer information seamlessly and cost effectively along the supply chain. These information systems automate most of the previously manual and time consuming processes by eliminating duplication of data entry tasks, increasing the accuracy of such tasks, increasing visibility in the system and satisfying traceability requirements of their retailer customers. The exporters use the technology available to improve communication with stakeholders such as the road carriers, where they are emailing through releases as opposed to phoning them through. Exporters are also using the Internet to check equipment availability and CEDOs for their containers on the port website to avoid delays where possible. The port website also allows them to check vessel arrival times (ETAs) in real time, which they use to manage their work flows better. The exporters communicate with the shipping lines regularly by phone and email to keep abreast of any developments and solve daily issues as they arise.

The control afforded to the exporters by vertical integration means that most of the compliance programs they are part of are implemented in-house. This gives the exporters far greater flexibility in deciding what fruit they grow for which markets, while considering all the different compliance programs. This flexibility is diminished when taking fruit from third parties because they would be compliant with particular programs that may not be ideal to the exporter. The exporters get around this by establishing long term relationships with third parties, and then operating as though they were part of the enterprise. The overriding objectives would be to meet importing countries' phytosanitary requirements, border security requirements, as well as retailer

minimum requirements. The exporters see value in being part of the SES (Secure Export Scheme) Customs program. This was set up to guarantee importing nations that shipments are unlikely to be used in terrorist activities and hence their containers are less likely to experience costly delays at ports of entry in overseas markets. Industry initiated compliance programs such as IFP (Integrate Fruit Production) and the Apple Futures program enable exporters to meet the food safety and sustainable production requirements of retail customers, as well as providing exporters with a competitive advantage in the markets.

Consignment sales to the traditional markets of the US, the UK and continental Europe give the exporters stability and visibility in their operations as they can see what they have to do most of the selling season. They have cultivated relationships with retailers to be able to negotiate programs for volumes and prices prior to the selling season, and are able to readjust their volumes after harvesting, and consequently work out fruit handling, packaging and shipping space requirements. This would enable them to know how much fruit they would need to get off third party fruit suppliers to fulfil their contracts, and to know what volumes they would need to hand off to third party fruit handlers if need be. One exporter managed to get their retail customers to agree on a minimum price to protect themselves from currency fluctuations.

The rest of the sales are on fixed price to the relatively new markets of mainly Asia, the Middle East and Russia. Although these sales are frequently on short notice, and burden the logistics system as the exporters have to expedite shipments to the market to get the best prices, they do have their attractions to the exporters. Customers usually pay upfront and the transit times are shorter than to the traditional European and American customers. The fixed prices reduce risks to the exporters, compared with consignment sales where prices fluctuate with the exchange rates. The attractions are why the exporters are increasingly focusing their marketing effort to these regions.

The New Zealand pipfruit industry has taken to licensing new varieties developed to prevent a repeat of the imitation of Braeburn and Royal Gala by most of its competitors. This strategy has been further developed by ENZA who have established licensed orchards in 12 other countries in both hemispheres. This has given ENZA a way of circumventing the 1921 ban on New Zealand apples in the Australian market. The

licensed orchards in both hemispheres give ENZA distinct advantages when negotiating with retailers as they are able to supply fresh fruit all year round, and not have to solely depend on stock from coolstores to service markets out of season.

The exporters form mutually beneficial marketing alliances when opportunities present themselves. The competences ENZA has built over time as the NZAPMB are attractive to other exporters because they have bought into distribution channels with good retail customers in the US and the UK. The benefits arise from the economies of scale the exporters derive from their combined volumes that lower costs such as in shipping and marketing. The licensing of newly developed varieties enables the exporters to create niche pockets in the markets.

Recent developments in the shipping industry such as increased vessel sharing agreements, and shipping lines optimising their operations by sailing vessels full in and out of New Zealand, have seen a decrease in shipping space outbound from New Zealand. This has cut down the options of the exporters significantly. Despite the exporters using transit times and port calls as a means for carrier selection, they have to base their marketing plans around the transit times offered by the shipping lines. This is not an ideal situation as the transit times have extended in recent times owing to slow steaming strategies adopted by the lines to reduce fuel costs, and switching from direct to relay operations. The shipping lines have insisted on the exporters giving them forecasts of their shipping space requirements and they are holding them to that. It is in the exporters' interests to forecast their requirements accurately to be guaranteed the shipping space they require. There is evidence to suggest that the larger exporters get special treatment from the lines when shipping space is tight, otherwise the exporters understand the value of establishing and maintaining good relationships with the lines. In giving the shipping lines forecasts the exporters expect the equipment to be there when they need it, as well as the shipping space. Equipment shortages do arise and their impact is felt worse with the fixed price trade as late shipments fetch less money.

One exporter has found a way around the problem of working to the schedules of the shipping lines by chartering vessels, and hence reducing reliance on the powerful shipping lines. Not only are they able to get direct calls and shorter transit times, they are also able to get into the market first before any other exporter does.

The exporters are optimistic about their future given the investments they made in new plantings, plans to purchase and lease more orchards, as well as plans to increase their fruit handling capacity. This optimism stems from the progress they have made in the fixed price trade and the exclusive varieties selling well in markets. The Australian market remains closed to New Zealand exports and even though the government has made progress at the WTO in their dispute against the Australian ban, the exporters are sceptical about the ban being lifted any time soon.

7.2.2 Analysis of the Impact Seasonal Reefer Cargo has on Terminal Operations

The pipfruit export season is best described by its influence on specific aspects of terminal operations. Analysis of the annual flow of reefer commodities at the Port of Napier container terminal revealed the seasonal nature of pipfruit volumes. The latter contribute just over a third of all reefer commodities but most of that passes through the terminal in the five months between March and July. Comparatively the other reefer commodities have a much more even spread throughout the year.

The seasonal spike in reefer volumes is matched by an increase in vessel calls at the terminal. This is the result of the shipping lines deploying extra loaders to cope with the increased volumes. These complement the vessels they have on their normal schedules, and are also used to reposition empty containers in anticipation of the increased business. This sees a sharp rise in containers discharged, most of the times in excess of 400. These present operational challenges to the yard planners who confront the problems faced in a variety of ways. They use empty stackers on shipside operations because they stack higher, they use unconventional areas such as car parks to stack empties and they organise the trucking firm that carts the empties to UCL to work after the gate shuts to get a better turnover of scarce space. The vessel exchange times also lengthen during the pipfruit season reflecting the increased discharge and load volumes. This however does mask the increased use of three crane gangs that is much more common during the pipfruit season as the terminal looks to turnaround vessels faster.

An examination of the reefer capacity utilisation revealed a sharp rise in demand on reefer power points during the pipfruit season, particularly between March and May, when the average number of reefers handled daily exceeds the number of power points in the terminal. The yard planners turn to a generator that provides additional power,

and they can use the empty depot's power points if demand warrants that too. During the season there is a marked increase in the use of the late gate service further reflecting the pressure shippers are working under.

An examination of the reefer dwell times revealed them to be lower in the season than outside of it. This is again, possibly a reflection of the pressure the exporters work under as the sheer volume of fruit handled curtails their ability to pack well ahead of schedule. Outside of the pipfruit season the dwell times extend indicating that non-pipfruit shippers are under much less pressure, and are able to pack ahead of schedule given they send their reefers to the terminal earlier.

The number of rehandles was shown to rise sharply during the pipfruit season though they do occur outside of the season. Despite the ample reefer storage space available outside of the season, rehandles occur because occasionally reefers will have their routing details changed, and reefers might need to be moved to accommodate weight requirements on vessel loading. During the season as previously mentioned, the yard planners employ the pre-marshalling strategy to deal with the huge volumes of reefers that put pressure on the terminal's reefer handling capacity (Chen, 1999). This is responsible for the sharp rise in rehandles during the season.

To conclude this section, the research objectives of this research project have been achieved. The findings of Chapter 5 gave the researcher a much better appreciation of what the exporters face during the pipfruit season, an understanding of how they have matured, and why they conduct their operations the way they do. The literature review and the findings of Chapter 6 gave the researcher a much more balanced appreciation of the workings of container terminals. A more global view and understanding of seasonality at the Port of Napier has thus been gained as a result.

7.3 Limitations

As this was a single case study, the inclusion of Port Nelson to make it a multiple case study would have addressed the external validity problem of single case studies. Port Nelson happens to be in New Zealand's second largest pipfruit growing region. Time limitations prevented the researcher from interviewing more exporters, particularly as those that agreed were all large exporters. A convenience sample was used as a result of

those time constraints. The analysis would have been better had there been input from the smaller exporters, and senior managers could have provided different insights on the issue. This study was exploratory considering time and cost constraints, in an ideal situation the exploratory study could have been used to identify specific areas for further investigation (Collis & Hussey, 2003).

7.4 Future Research

There is a need for future research to focus on the current capacity of New Zealand ports and that of the distribution networks they are a part of considering the contemporary trends of larger vessels calling to New Zealand, and greater liberalisation of global trade. This will enable deficiencies to be identified and solutions formulated to address them in a timely manner. Future research could also focus on investigating the nature of the port and shipper/importer relationship, and to help find ways of improving that interface in the New Zealand context. The solutions to the problems of distribution networks need a global approach, and the research would help increasing the level of collaboration amongst stakeholders.

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Appendices

Appendix A: Interview Request Email

Dear Sir/Madam

By way of introduction I'm an extramural student with Massey University and am employed by the Port of Napier as a Ship Planner. I got your email off Andrew Locke, the Business Development Manager at the port. I'm currently writing my thesis towards a Masters in Logistics and Supply Chain Management. My research is focused on exploring the pipfruit export season and the hope is to gain a better understanding of the industry.

This is an invitation for your firm to become a part of this study. It is entirely voluntary so your consent would be greatly appreciated as it would help me to complete my studies. My motivation for this research project stems from my experiences over the last few years as a Yard Planner in the Port's container terminal. I've only ever witnessed the manifestations of the pipfruit export season from the terminal end, and have always been curious about what happens from the exporters end.

I'd like to interview the person responsible for the logistics functions in your organisation, once, for about an hour. The interview will be recorded with a digital device and transcribed. I'd be more than happy to provide a transcript. I guarantee complete confidentiality in my report and only my Massey supervisor, Dr Norman Marr and I will have access to any data collected. A summary of the findings may be used by the Port of Napier to help in making better informed decisions going forward.

If you have any questions please don't hesitate to contact my supervisor Dr Norman Marr on 06 350 5226 or n.e.marr@massey.ac.nz or myself on 06 835 7923 or karlm@portofnapier.co.nz

Yours sincerely,

Karl Mudzamba

Appendix B: Interview Questionnaire

1.How do you source your fruit?

Do you source fruit from the same growers?

Do you have any issues filling quotas with respect to competition from other exporters?

2.Could you describe the process in which fruit is sourced from the growers and ends up at the container terminal?

3.Do you own or lease the facilities in your distribution chain from the growers to the container terminal?

What are your reasons for your choice?

4.What constraints do you face in the distribution chain from the growers to the port?

Do you face any capacity constraints in coolstores, packhouses and reefers equipment?

Do you have any policy constraints (operational procedures that hinder efficiency)?

How is the service provided by the trucking firms you use?

5.What information and communication technologies do you use in your operation?

To communicate with relevant stakeholders (lines, trucking firms, port, overseas customers...etc)

6.What do you think of the service you are given by the shipping lines?

Transit time to market?

Port calls?

What could they do better for you?

7.What do you think of the service given to you by the Port of Napier?

What could the port do better for you?

8.Looking ahead do you anticipate shipping more or less fruit over the next 5 – 10 years?

What are your reasons for your position?

What are your thoughts on the Australian situation?

9.Is there anything you would like to ask me about related to the service provided by the Port of Napier container terminal?