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LOGISTIC AND DISTRIBUTION STRATEGIES IN THE FRESH FRUIT SUPPLY CHAIN: THE CASE OF KIWIBERRY FROM NEW ZEALAND.


Msc thesis

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*“The Kiwifruit industry has something special,
earned as a result of its collective endeavors and
dedication over many years to what is essentially
a marketing cooperative of scale”*

(Richard Procter, CEO KNZ, 2015)



*“the Hayward cultivar continues to be seen as
adequate but can no longer provide the sort of
excitement that other exotic fruits can generate”*

(World Kiwifruit review, 2006)



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ABSTRACT

The bay of Plenty in New Zealand is well known worldwide for the production and export of Kiwi fruits. Since few years a new potential cultivar from the Actinidia family has been cultivated: *Actinidia arguta*. Despite up to date the trade of kiwi Fruits has only been managed by only one marketing organization, Zespri, the commercialization of kiwi berries has no constraints by law to one unique commercial entity.

The fruit present completely different traits than kiwi fruits - from a productive, storage and eating experience point of view - that hampers the distribution of Kiwi Berries offshore. Because of this, the herein study aims to explore the most efficient configuration of the supply chain for the export market.

Since it is an experimental crop, the study adopted an integrated approach which embraces production design components, logistics management and market's variables. The research's method mainly relies on qualitative results coming from interviews with 18 expert in the field. Additional quantitative data, from Euromonitor reports, has been taken into account while analyzing market characteristics.

The research highlights the main critical points related to the distribution of the fruits. Above all there are: the limited shelf-life, difficulties in guaranteeing uniformity of the crop, high production costs, a lack of integration in the supply chain and low volumes that does not allow for sea freight. Those factors force the supply chain to be shaped as both responsive to the market and efficient.

The study concludes with five possible logistics scenarios evaluated by time, cost, waste and quality.

KEY WORDS: Kiwi berries, Logistics scenario, Supply chain design, Kiwi fruits industry, Bay of Plenty, logistics management, crop management, responsiveness to the market, fresh fruits supply chain, berries market

EXECUTIVE SUMMARY

This report provides an overview and evaluation of the current situation of kiwi berries' production in the Bay of Plenty, New Zealand. The area is well known for the production of kiwi fruits; kiwi berries is a recent experimental crop. The study has the objective of *"To provide recommendations on logistics and distribution options for the New Zealand Kiwiberry supply chain by analyzing existing literature on fresh fruit supply chain design, by assessing the kiwi berry supply chain and by investigating successful and comparable supply chains in the fresh berry business"*. The biggest challenges related to this crop are difficulties in farm management, the short storage life, the complex post-harvest practices and the expensive transportation systems. In constructing the distribution design for agri-fresh produce, the major strain concern incorporating the natural characteristic of the product.

To support the research's structure one main research question has been formulated: "What are options for logistics and distribution structure of Kiwiberry in New Zealand?". This main research question is divided into five smaller questions: (I) *What are potential markets for Zespri's Kiwiberry and what are demand characteristics?*; (II) *What are logistic technical design components of the fresh berry supply chain?*; (III) *What are distribution strategies in the fresh berry supply chain?*; (IV) *How are comparative (kiwi)berry value chains structured (logistic and distribution strategy)?*; (V) *and what are options for improvements for Kiwiberry supply chain in New Zealand?*.

The study uses a theory building approach which adopted a qualitative research method. The research strategy includes a preliminary desk research followed by a qualitative research composed by interviews with expert in the field. Interviews were constructed using open-ended questions either executed vis-à-vis or by phone calls. Two other supply chains has been studied: New Zealand Blueberries supply chain and European kiwi berries supply chain. The empirical research has been further supported by quantitative data, retrieved by Euromonitor reports.

By the literature review three main concepts has been investigated: production design components, market characteristics and logistics management. The study assumed that there is a correlation between production design components and logistics management and between market characteristics and logistics management. The link between those three concepts allows to create some distributive scenarios, evaluated by: time, costs, quality and waste.

The main findings of the research are related to the three concepts described in the literature.

While the kiwi fruits supply chain has years of experience behind - which endorsed for the maximum optimization of the chain - the kiwi berries supply chain still has lots to learn in production, logistics and demand. This learning process creates many inefficiencies in the chain, especially in production.

There is currently a significant ongoing research in the bay of Plenty to find a sub-optimal variety of kiwi berries which represents the best trade-off between waste-time-cost-quality. However, an ideal variety, which embrace a good storage condition, positive eating experience and ease in cultivation technique, has not yet been founded.

In the field, the main strains are related with inconsistent size of cane and bud breaks. Fruits ripe irregularly in the vine which leads to a not precise brix mensuration and not uniform punnets. This represent a high level of risk of obsolescence during distribution.

To improve the competitiveness of NZ kiwi berries abroad it is also necessary to increase efficiency in production and distribution by a better management of the flow of fruits and by introducing mechanization in steps like packing and sorting. For sorting and packing the best process configuration would be half-manual and half mechanical. In fact, while Kiwi fruits are almost a viable business even without technology, kiwi berries to be a viable option require technological support. This concept has been also highlighted by the NZ blueberries supply chain and the EU kiwi berries supply chain.

Another interesting finding of the research concerns harvest modalities since have a central role to ponder for distribution. If, on one hand, multiple harvests facilitates infrastructure and labor capacity, on the other hand it does not allow to gather a sufficient volume of product to justify sea freight. Moreover, multiple harvest are very common in the berry business and facilitates labor continuity but also incentivizes wastes and increases costs.

Costs involved with harvesting and handling such a small fruit are high and, combined with air freight costs, make the price for this fruits extremely expensive for export and therefore not enough competitive in the market. Besides, this high costs put important constraints in investments in new facilities and in machinery.

An increase in production, from a distributive point of view will be beneficial since it would reduce air freight fix costs or, in case of high volumes, it would allow sea freight. However, an increase of production will be positive only if the demand is well managed since it affect the supply/demand balance. Therefore, the stability of the demand is also important in modulating quality and waste. Moreover, an increase in production quantity would require higher capacity to cold down fruits and pack produce in time. An intensification in production would not affect infrastructure capacity neither since kiwi berries occurs in a period of the year where the stock of kiwi fruit is empty. The only difference to be adapted would be the layout of the facility and the type of sorting and packing machinery. In contrast, low volumes of production does not allow to scale up in distribution and to invest in a proactive way in new technologies.

Sea freight would make New Zealand's Kiwi berries more competitive. However, there are some remarkable limits like volume, perishability and responsiveness to the market. Air freight is the best possible scenario for preserving kiwi berries quality. In fact, despite costs are high, if product is well handled in the first part of the chain it consent to avoid expensive repacking costs which will probably be necessary in case of sea freight. Because of this, a mixed transportation system might be the most efficient solution.

Concerning planning activities, since kiwi berries are to some extent unpredictable in production, there is the need for monitoring each step of the chain from field to pack house. Without an accurate flow of information, creating an optimized sales plan is difficult. Furthermore, the most appropriate way to match demand with supply for this niche product is to start slowly to build up a market rather than start from the beginning with high volumes and decisive marketing activities.

From the main outcomes regarding Kiwi Berrie's market, it can be conclude that it also does not facilitate distribution. It is indeed characterized by a high competition in price, high responsiveness and high replenishment cycle. The most important requirements for kiwi berries market are a stable supply of at least 3

to 4 weeks and minimum volumes guaranteed. Since it is a very seasonal product, retailers mainly work on promotions and therefore volumes are already presold before harvest.

For the berry market the main trend is to have a high frequency replenishment model with small and frequent orders which are typical of a very responsive supply chain. Different markets have different order specifications and therefore inventories have to be managed accordingly. The main order specification from the markets, that increases difficulties in managing inventories, concerns traceability.

From these results, it can be concluded that the best distributive model should be as fast as possible but also with strategic quality control points. Direct sales to retailers represent the most efficient and fast distribution configuration. In this way it is possible to have a direct quality control point closer to the final consumer and to reduce intermediaries in the chain. Moreover, few infrastructure at the import market will create a lower bullwhip effect in case of delay or poor quality of the arrival. The best scenario would be to have one retailer which gathers all inventories in one place where quality reports took place and from there the bulk order is divided in smaller quantities.

Because of this, the model in which Zespri operates in a determined market – Direct stock order (DSO) or stock transit order (STO) – results very important in constructing distribution configuration. DSO Markets, like Singapore and Hong Kong, might be more suitable for air freight at present since there is no possibility to have internal quality control points while STO markets like Japan might be ready for sea freight since there is the possibility for an internal quality control. Japan might also be indicated for sea freight since it is a more consolidated market which allows for bigger orders.

The distributive model has to be chosen accurately. Since kiwi berries are extremely delicate, CIF commercial arrangements, where the responsibility of the goods arrived passes to the importer, might be the most viable way at the beginning. Besides, having a STO market would help to reach economies of scale in distributing big shipping volumes later on split to different retailers. Otherwise, having many small orders increases cost inefficiencies in the chain.

The high deterioration rate requires a demand driven model rather than supply driven model. Maintaining the time lines from when the fruits are harvested till the cold chain, and distribution in line with the demand of the target market, is also important. However, the distributive model in which fruits were only picked in case of orders – currently adopted from some growers – is leading to a high level of waste and relationship issues in the supply chain. It can be concluded that a make to stock model gives the better results in terms of efficiency and quality.

The study concludes by providing five possible options for the distribution of New Zealand's Kiwi berries according to the results gathered. These five options can be potted as: Sea freight Japan (I), air freight Europe (II), 70% sea freight and 30% air freight to Asia (III), Air freight Asia (IV) and Air freight Australia (V). Those five conceivable scenarios have been evaluated on the basis of time, cost, waste and quality.

It is important to note that, despite the above suggestions helping to manage the distribution, also relationships in the chain are really important to succeed. As also shown by the blueberries industry, long-term commercial relations founded upon trust permit to exchange a better, in-time, information about quality and production.

TABLE OF CONTENT

Abstract	3
Executive summary.....	4
List of abbreviations	10
1. Introduction	11
1.1. Introduction to Zespri	11
1.2. Kiwifruit industry.....	11
1.3. A new potential variety: <i>A. arguta</i>	12
1.4. New cultivars of Kiwiberry from New Zealand.....	13
1.5. Fresh supply chain management (FSCM)	13
1.6. Problem statement	14
2. Research orientation	16
2.1. Research objective	16
2.2. Research framework	17
2.3. Research questions	18
2.4. Definitions of concepts.....	18
3. Literature study	20
3.1. Delivery demand's characteristics for Berries.....	23
3.1.1. Responsiveness versus efficiency	23
3.1.2. Market push or market pull?	23
3.1.3. Order specifications.....	23
3.1.4. Berry Substitution Effects.....	24
3.1.5. Price.....	24
3.1.6. Importance of seed varieties.....	25
3.1.7. Retail concentration	25
3.2. production process design components fresh fruit supply chain	26
3.2.1. Challenges in logistic design of the fresh supply chain.....	26
3.2.2. The cold chain for fresh fruit	31
3.3. Logistic management Fresh supply chains	33
3.3.1. Introduction.....	33
3.3.2. Infrastructure design	33
3.3.3. OVERSEAS transportation for high quality fresh produce	35
3.3.4. Third party logistics (TPL)	38
3.3.5. Supply chain integration.....	39

3.3.6.	Quality controlled logistic.....	41
3.3.7.	Demand management fresh products.....	42
3.4.	Conceptual framework.....	45
4.	Materials and methods.....	46
4.1.	Methodology adopted	46
4.2.	Concepts classification	46
4.3.	Relationships between factors.....	48
4.4.	Data collection	49
4.5.	Interviews design	50
4.6.	Respondent of interviews	50
4.7.	Validity and reliability.....	51
5.	Empirical research results.....	53
5.1.	Kiwi berries technical production aspects.....	53
5.1.1.	Varieties developments	54
5.1.2.	Choice of variety by growers	55
5.1.3.	Cultivation practices	56
5.1.4.	Uncertainties in the field for planning activities	57
5.1.5.	Harvest	58
5.1.6.	Domestic transportation	59
5.1.7.	Sorting	59
5.1.8.	Packing.....	60
5.1.9.	Cold chain	61
5.1.10.	post-harvest waste	62
5.1.11.	Costs of production	63
5.1.12.	Relation volumes / quality.....	64
5.1.13.	Price and OGR (orchard gate return	64
5.2.	Off-shore Market characteristics	66
5.2.1.	Export challenges	66
5.2.2.	Delivery demand	66
5.2.3.	Price.....	70
5.2.4.	Responsiveness versus efficiency	71
5.2.5.	ORder specification	72
5.2.6.	Retail concentration	73
5.3.	Logistics management.....	74

5.3.1.	Infrastructure design	74
5.3.2.	Third party logistics	75
5.3.3.	OVERSEAS TRANSPORTATION	76
5.3.4.	Quality controlled logistics	80
5.3.5.	Supply chain integration.....	81
5.3.6.	Demand management.....	83
5.4.	Comparative supply chains	89
5.4.1.	NZ blueberry supply chain.....	89
5.4.2.	European Kiwiberries	91
5.4.3.	lesson learned from Nergi and NZ blueberries.....	93
6.	Discussion and analysis.....	94
6.1.	Impact of product technical design components on logistics management	94
6.2.	Impact of market characteristics on logistics management	97
6.3.	Possible distributive scenarios	98
7.	Conclusion.....	100
	Recommendation to the industry	101
	Study limitations and recommendation for further research.....	102
8.	Theoretical reflections	103
9.	ANNEX I	105
9.1.	REspondents of the interviews	105
9.2.	Technical aspects cold chain	107
9.3.	Outsourcing of logistics services decision making	108
9.4.	Inventory management.....	110
9.5.	Managing warehouses	114
9.6.	Concepts from the literature	114
9.7.	Berries market.....	118
9.8.	interviews transcripts.....	120
10.	References	205

LIST OF ABBREVIATIONS

<i>Abbreviation</i>	<i>Meaning</i>
AFSCNs	Agri-food supply chain network
CA	Controlled atmosphere
CIF	cost insurance freight
CPG	Consumer packaged goods
DC	Distribution center
DSO	Direct stock order
FOT	free on truck
FOB	Free on board
FSCM	Fresh supply chain management
PVR	Private registered varieties
MA	Modified atmosphere
MTO	Make to order
MTS	Make to stock
OGR	Orchard gate return
SCM	Supply chain management
STO	Stock transfer order

1. INTRODUCTION

In this section a brief overview about Zespri, the kiwifruit industry, the particular varieties of KiwiBerry and the fresh supply chain management is given. This chapter aims to provide a general ground knowledge to understand the research proposition.

1.1. INTRODUCTION TO ZESPRI

Zespri International Limited is the leader marketing organization in the commercialization of kiwifruit. The company was born in 1997 as a result of the cohesion of New Zealand's kiwifruit growers to promote their production for the international market. Nowadays Zespri is responsible of 30% of the total world volume, selling to more than 53 countries (Zespri website, 2015).

The company acts in the supply chain as an intermediate, it works with growers and post-harvest operators to source top-quality kiwifruit and supply this kiwifruit under Zespri brand through distribution partners to wholesale markets and retail customers (Zespri website, 2015).



In New Zealand, Zespri operates with a single point of entry model, by having scheduled contracts with 13 suppliers (post-harvest entities), which dictates all the terms around sourcing and supply of kiwi fruits and incorporates the commercial framework around what is supplied and ordered. By this set up, Zespri is the only marketing organization allowed to export NZ kiwi fruits.

Since the beginning, Zespri adopted a differentiation strategy, seeking to maximize customers' needs by new appealing varieties, top-quality products, promotions and 12-month product availability. To do so the company has developed a very complex supply chain which is constantly monitored and improved. In fact, thanks to the capital and information flow and to the solid construction of relationships with all the actors in the chain, Zespri was able to develop a strong distribution network.

The way decisions are made among the chain is fully co-coordinated by a centralized decision system. By the adoption of this structure, the flow of information, cash and goods is synchronized by the head office.

1.2. KIWIFRUIT INDUSTRY

The Kiwifruit have originally been born in China (Schroeder and, 1967). It is also known as Chinese gooseberry and Yang Tao but the official botanic name is Actinidia. In the occident world the fruit has become available relatively in recent time. Yet, the path of its spread is not well-known, but it has demonstrated great adaptability to many other areas around the world such as US, New Zealand, many European countries, India and Russia. Throughout the years the kiwi industry has shown a fascinating evolution.

New Zealand is the land where *Actinidia* firstly demonstrated to be well accepted and commercialized. Mr. Allison Wanganui was the first person that brought the seeds in the country in 1906 (Schroeder and, 1967). Already in 1964, there were about 210 acres of the fruit giving a production of about 840 tons/year (Schroeder and, 1967). Till that time the main commercial planting area has been the eastern coast of the northern island, which initially was formed by small plantings of an average 1 to 10 acres. The first attempt to export the product was in 1952, when the first shipment was sent to the United Kingdom (Kilgour, 2007). As the volume of export from New Zealand rose to other destinations there was the necessity to find another commercial name, shorter and quickly connectable to New Zealand. At the end of the 50's, Jack Turner suggested a short Maori name: Kiwifruit (Zespri website, 2015).

There are around 60 edible varieties of *Actinidia* (Ferguson, 1999). Nowadays, the most commercialized ones are the fuzzy kiwifruit/Hayward (*A. deliciosa*) and most recently the gold kiwifruit (*A. chinensis*), characterized by a hard hairy skin, egg-like size and a long storage life 12 month). The selection of those two commercial varieties was mainly driven by the high preference by overseas consumers and by the facility to manage for the export market. Most likely the remarkably long storage life of "Hayward" fruit was the factor that permitted the NZ growers to develop a kiwifruit based industry based on export by ship. The high demand of the fruit around the world has encouraged the industry to combine the production in both hemispheres, north and south, to provide a year round supply. As a matter of fact, the industry nowadays mostly relies on few cultivars (Ferguson, 1999).

The production of kiwifruit has been severely suffered all over the world by the PSA disease starting from the spring of 2011, but the New Zealand production is showing a recovery curve. The level of production in 2011 (prior to the vine disease epidemic) was 425,000 per metric tons (MT), in 2014 the production accounted about 365,000 MT which is 14% less than the optimal production but it shows 7.5% of improvement in comparison to the year 2013 (USDA, 2014). It is estimated that in the year 2018 the production will reach from 414,000 to 475,000 thanks to the new gold variety which accounts to approximately 35% of the total orchard area (USDA, 2014).

	Jan 2012	Jan 2013	Jan 2014
Total production	385,194	340,000	365,000
Export	364,790	318,651	345,000

Figure 2 NZ production per metric tons (USDA foreign agricultural services, 2014)

1.3. A NEW POTENTIAL VARIETY: *A. ARGUTA*

In the recent years another cultivar, the *Actinidia arguta*, has shown an increased market potential. *A. arguta* is also known as Kiwiberry/hardly kiwi/baby kiwi and is closely related to *A. deliciosa* (Byers, 2008). This variety is smaller in size (2-25 gram range), is in fact about the size of the European grape. It presents an edible hairless smooth skin, is rich in nutrients and very palatable (nzkiwiberry, 2015).

The success of this new variety is mainly due to its convenience to eat and ease to handle. While the common kiwifruit requires a knife or a spoon for the consumption, this variety is ready to eat as it is. The fruit has shown a good reception in US, in the western coast especially, where it is sold under remarkably high prices (Ferguson, 1999). Commercial production is now underway on a small scale in Oregon, USA, in Europe, New Zealand and South America. (Williams et al, 2003). Despite

a first general acceptance, the fruit is still viewed as a niche consumption and the spread on a large scale requires heavy promotional activities and improvements/re-designing in the supply chain.

1.4. NEW CULTIVARS OF KIWIBERRY FROM NEW ZEALAND

In the 80's a new breeding program has been started from the Department of scientific and Industrial research - and afterwards carried on by the New Zealand's Food research institute - with the final aim of improving intrinsic characteristics of Kiwiberry such as harvest time, size, productivity, nutrients, flavor and storage in view of a possible commercialization of the fruit. At the end of the 90's four best selections have been isolated, 3 green-skinned fruit varieties (Hortgem Tahi, Hortgem Toru and Hortgem Wha) and one red-skin variety (Hortgem Rua) (Williams et al., 2003). The red variety has been developed no further because consumers were not ready yet to accept this product on the market. The other three green variety represent a perfect portfolio in terms of maturity time and storage being very similar and interchangeable in the market. In fact they differ just for few weeks in the harvest season which could be an advantage because this can permit to extend the harvesting time and availability in the market. In particular, Hortgem Tahi, is harvested at the end of February and stored till the end of March (Williams et al., 2003). The discovery of those three varieties had allowed producers to have a four months availability of fruit.



Figure 3 Different varieties of kiwi berries (Kiwikorner)

The yield prediction for mature and well-managed Tahi variety's are: average weight per fruit of 10-12 g, average of 5000 fruits per vine (50 kg), planting density twice as Hayward variety (Williams et al., 2013). Despite fruits ripened in the plant have a superior flavor, they are also too delicate to harvest and handle afterwards therefore fruits are better picked when they are not completely ripened. Kiwiberry harvested too late are too soft and vulnerable to damage during handling and distribution (ex. Internal breakdown and pitting) (Williams et al., 2003). The harvest time directly influences the storage, in fact if the fruits are pick at the perfect time they just allow 10-12 weeks at 0°C of storage. Unfortunately fruit picked to early are also less appreciated by consumers therefore growers have to make a trade-off between consumer acceptance and optimization of the logistics of the supply chain. After the harvest all fruits are sorted again in the pack-house in order to remove damaged fruits (Williams et al, 2003).

1.5. FRESH SUPPLY CHAIN MANAGEMENT (FSCM)

This research will study NZ Kiwi berries from the point of view of Agri-fresh supply chain (FSC). In this chapter, a brief introduction of the topic is given.

The concept of agri-fresh supply chain refers to the procedures from the primary production to the delivery to the end consumer. The final aim of a food supply chain is to *"leave the intrinsic characteristics of the product grown or produced in the countryside untouched"* (Van der Vorst, 2000). In comparison to other supply chains, the management of the chain for fresh agricultural products is very complicated; these products are in fact subject to higher fluctuations of demand and prices, perishable nature that hampers the storage life, higher consumer concerns on food safety and a high reliance on

external factors such as climate circumstances (Shukla and Jharkharia, 2013). Moreover the value chain for agri-fresh product is also affected by other factors such as globalization, technological innovations, trade agreement, consumer's awareness and environmental concern (Shukla and Jharkharia, 2013).

Nowadays, consumers expect a year-around availability of fresh food produce which has encouraged the formation of a global food-market (Yu and Negurney, 2013). It becomes imperative to comprehend the fresh food supply chain within the context of the full complexity of their network's structure (Van der Vorst, 2006).

Distribution management of agri-fresh produce results a challenging area due to the following aspects (Van der Vorst et al., 2011):

1. strict requirements in temperature and humidity,
2. limited shelf life,
3. product interaction effects,
4. short delivery time,
5. fluctuation in demand and supply,
6. small margins
7. high consumer expectations

Supply chain management is about matching demand and supply by procedures such as integrated planning, coordination and control of activities in the FSC in order to accomplish requirements of all the chain stakeholders (Van der Vorst et al., 2011). One of the major concern in the fresh supply chain is the post-harvest waste as result of the high perishability. It is estimated that the amount of that is remarkably high, it can reach from 20 to 60 percent of the overall production across countries (Widodo et al, 2006).

1.6. PROBLEM STATEMENT

Zespri has always dealt with two main commercial varieties of Kiwifruit (Hayward and Gold varieties) which present completely different characteristics from Kiwiberry. The company believes that the production of KiwiBerry in New Zealand will open new frontiers of commercial possibilities.

There are two main challenges in the diffusion of the Kiwiberry on a large scale, the lack of marketing insight on consumers' acceptance and inefficiencies in the supply chain. This research will focus on the second problem.

Over the past years there have been many attempts to grow *A. arguta* commercially but, because of difficulties in the supply chain, many of them were unsuccessful (Williams et al, 2003). Complications in the logistics of the supply chain seem to represent the main obstacle for the commercialization. In fact, the vines of Kiwiberry have the reputation of being challenging to manage; for example the fruits ripen irregularly on the vine, have a short harvest season and in comparison to the other commercial varieties (*A. chinensis* and *A. deliciosa*), the storage life is significantly limited (Williams et al, 2003).

Another aspect that hampers the commercialization of hardly kiwi is associated with the cost of harvesting and handling the fruit which are mainly related to the fragility of the fruit. In order to reduce the labor component necessary, continuous improvement of the post-harvest handling system has been developed by growers(nzkiwiberry, 2015). Currently, *A. arguta* can only be hand-picked into small containers which are grouped in cartons of about 6 kilograms for the transportation to the packing house. Once arrived, the fruits are sorted and divided into small plastic boxes of approximately 125-175 grams for the sales at retail (nzkiwifruit, 2015).

In comparison with the common varieties of kiwifruit the difference from a supply chain perspective is remarkable. Not only the operational phases of picking, and packaging are more expensive but also the mode of transportation for the export market requires more expenses. While the two bigger commercial varieties can be shipped in containers, Kiwiberry can only be air freighted. In fact, from an international supply chain standpoint, NZ KiwiBerry should be treated more like other high value berry fruits (ex. Blueberries and strawberries). Refrigeration in the supply chain is a key aspect, the KiwiBerry storage life is in fact around 3-10 days at room temperature but at 0 degrees can reach up to 2 months, versus 12 months of storage life of the common varieties (nzkiwiberry, 2015).

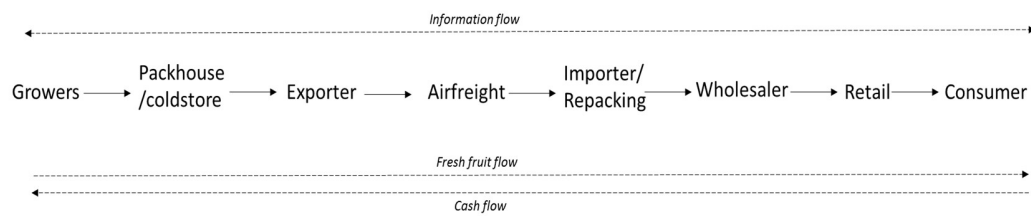


Figure 4. KiwiBerry supply chain

Yet, the production of KiwiBerry has been limited and there is not sufficient knowledge about the logistics of the supply chain (eg. replenishment, fulfillment of orders, transportation and distribution of the product) to create a tailored value chain for KiwiBerry. There is currently a gap of information that needs to be filled.

2. RESEARCH ORIENTATION

This research aims to create a possible configuration of the New Zealand KiwiBerry supply chain. The research is hence design oriented because it aims to systematically analyze the real-life case of NZ kiwi berries by testing the literature on agri-fresh supply chain and by investigating in an empirical way the current KiwiBerry supply chain in New Zealand.



Figure 5 Research orientation

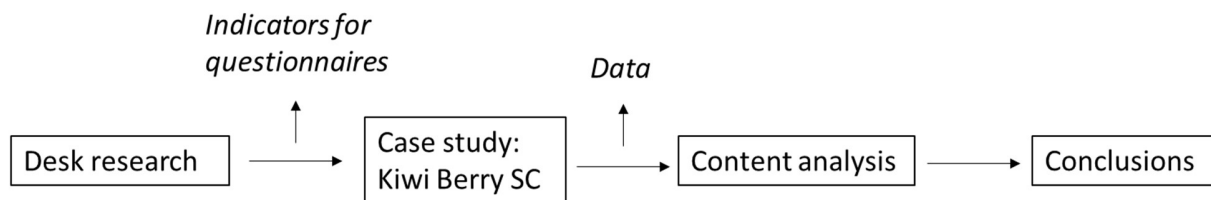


Figure 6 Design concept of the research

2.1. RESEARCH OBJECTIVE

After having analyzed the background and orientation of the research the following research objective can be derived:

“To provide recommendations on logistics and distribution options for the New Zealand Kiwiberry supply chain by analyzing existing literature on fresh fruit supply chain design, by assessing the kiwi berry supply chain and by investigating successful and comparable supply chains in the fresh berry business”

2.2. RESEARCH FRAMEWORK

A research framework is a schematic representation of the research objective and describes the steps that are taken within the research in order to achieve the predetermined research object. The following research framework, as shown in figure 2, presents a schematic overview regarding the research processes. It is composed of four phases which will be described after the diagram.

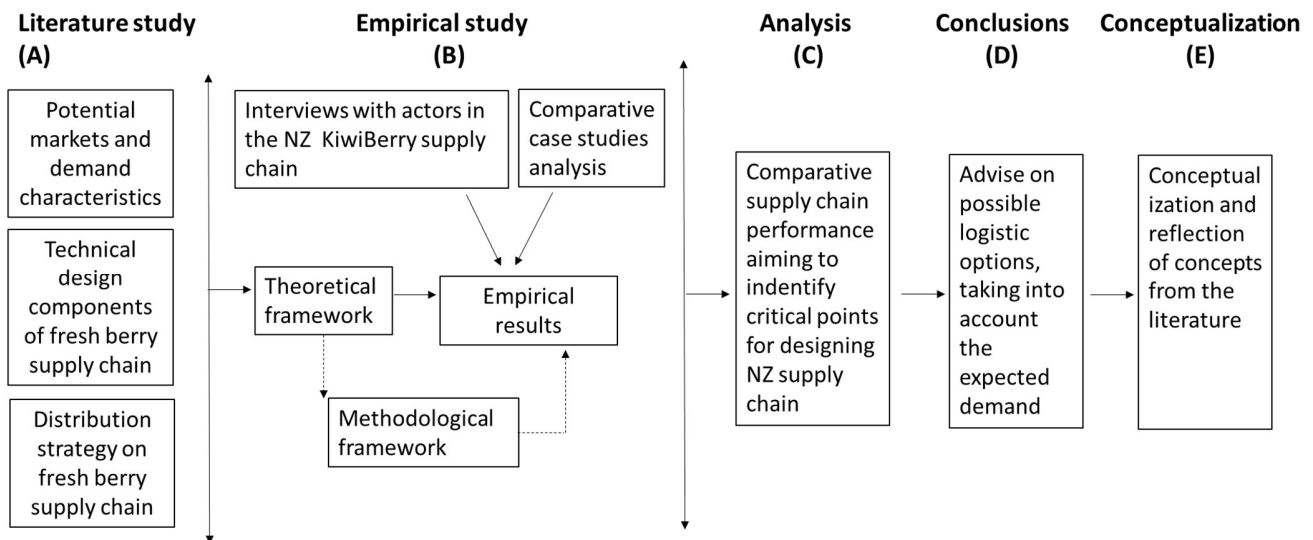


Figure 7 Research framework

- A. The first phase consists of scientific desk research which aims to gather data from scientific articles and reports about different concepts that will form the basis of the empirical study. The first concept to analyse is the global production and market of KiwiBerry since it is a new planting cultivar and there is a lack of literature review. The second concept is about a theoretical model to structure the logistic design options for fresh berry supply chains. The third concept provides insight on the international distribution strategy of fresh berry products.
- B. The empirical study is mainly focused on the practical experience of experts in the Kiwiberry supply chain. The actors in the Kiwiberry chain contacted are from New Zealand. The theoretical framework will serve as a background to structure the interviews. In order to have a meter of comparison with the New Zealand supply chain, comparative case studies are analyzed.
- C. In the analytical phase data from the surveys are analyzed and compared with the case studies in order to identify the critical aspects in the supply chain to optimize.
- D. In the conclusive part of the research, recommendations will be provided to implement the most efficient Kiwiberry SC for Zespri. With this phase the most important elements to optimize in the value chain will be individualized in order to facilitate the decision process about the optimal design of the chain infrastructure in accordance to the demands in the different periods of the year.
- E. In this phase analysis and conclusions are connected by a theoretical reflection section. Here, the existing literature is discussed and the added value of the research is highlighted.

2.3. RESEARCH QUESTIONS

First, the main research question will be given. The main research question is then divided into 5 research questions, one question per research framework phase. At last, the research questions per phase are divided into sub-questions. The five specific research questions reflect the part A, B, C, D of the Research framework

GRQ: **“What are options for logistics and distribution structure of Kiwiberry in New Zealand?”**
(D)

SRQs:

1. What are potential markets for Zespri’s Kiwiberry and what are demand characteristics? (A)
2. What are logistic technical design components of the fresh berry supply chain? (A)
3. What are distribution strategies in the fresh berry supply chain? (A)
4. How are comparative (kiwi)berry value chains structured (logistic and distribution strategy)? (B)
5. What are options for improvements for Kiwiberry supply chain in New Zealand?(C)

2.4. DEFINITIONS OF CONCEPTS

In order to clarify the main concepts of the research the following descriptive table is given.

Table 1 Main concepts of the research

Key word	Explanation
Fresh supply chain	A fresh supply chain differs from a normal supply chain because of the high perishability of the products supplied, which must remain the same from the grower (production center) to the final customer.
Supply chain management	SCM refers to approaches that ensure the logistical and distributional efficiency of flows of materials along a supply chain (Collins, 2004). A broad definition of SCM can be <i>“an integrated approach that aims to satisfy the expectations of consumers through continual improvement of processes and relationships that support the efficient development and flow of products and services from the producer to the consumer”</i> (Gifford et al., 1997).
Value chain management	Is the extension of the supply chain concept that fully embraces the role of consumers. The value chain can be represented by the term <i>“supply chain network”</i> which implies an orientation towards the demand, consumers and the interactions between the actors of the supply chain (Collins, 2014). <i>“Food value chains are systems driven by the interaction of their technical (production, processing, transport, etc.), economic (profitability), information-related (communication) and governance (human relationships) sub-systems”</i> (Collins, 2014)

Post-harvest waste	The term indicates the physical losses of agricultural products from the moment they are harvested to the household's consumption as a consequence of the biological degradation of the product. Despite the majority of this waste occurs at the retail and consumer stages (Parfitt et al., 2010), which is not the focus of the research, by managing efficiently the first phases of the fresh supply chain product's losses can be intensely reduced.
Storage life	Can be defined as the time laps in which the product can be maintained in storage under specified unique conditions, without failing to encounter its operating or performance specifications. It differs from the concept of shelf life because here is intended the time in which the product remains free from deterioration before the selling.
Logistic design	Is intended as the physical disposition of facilities within the supply chain system. Logistic design in the supply chain is important because it is the basis for the optimization of the supply chain, being a primary origin of everyday disruptions and short-term challenges.
Distribution strategy	Distribution strategies refers to all the actors in the supply and distribution of food products. This aspect of the food supply chain basically consist of strategical and tactical planning of the physical logistics of moving inventory along the distribution chain (transportation) and the management of inventory, and in understanding the demand by making reliable forecasting. (Oxford University press, 2015).
Supply chain performance	According to Collins (2014) the performance of a fresh food supply chain can be explained with the following concepts: the balance between price and value, the information shared, time orientation of players in the chain, business relationships, basis of interaction between chain members, state of dependency in the chain, use of power in the chain, and orientation of the actors towards co-operation (Collins, 2014).

3. LITERATURE STUDY

In this section, the existing literature on agri-fresh supply chain is presented. A first introduction to the topic is given, followed by three main chapters; Delivery demand characteristics, product technical design components and logistics management. A more conceptual framework of concepts from the literature is presented at the end of the chapter.

INTRODUCTION: DESIGN OF LOGISTIC SCENARIO

The design of a supply chain is very important in order to satisfy logistics goals, like the delivery service requirement and to guarantee that goods arrive at the final consumer at the right time, with the right quality and at the right price (Van De Vorst, 2011). Post-harvest handling should be placed in a system context where pre-harvest phase and post-sale phase are also taken into account. In this view, three important aspects have to be considered (Shewfelt et al., 2014):

- Consumer's perspective on quality and value
- Understanding pre-harvest factors that influence the shelf life of a product

Managing logistics of the fresh fruit supply chain can be very complicated because many service providers are involved among the chain. Many times the parties involved in the supply chain are not aware of the complexity of the value chain. Indeed, a full understanding of the business process is necessary.

The complexity of the chain increases with the distance between the growing regions to the selling regions. The management of the chain is also challenged by factors like communication and visibility between the service providers at each link (Dodd and Bower, 2014). Lack of communications leads to lost in visibility within the supply chain which hampers marketing plans by compromising production and purchasing schedule (Dodd and Bower, 2014). Making strategic decisions in a distribution network for perishable products imply the consideration of tactical and operational consequences (Keizer et al., 2015).

According to Chen (2012) the features that determine the logistic structure adopted for the distribution are:

- **Shelf value:** The service level required by customers for expensive fruits is high in terms of packaging and quality control. The higher is the service level requested, the higher is the profit margin.
- **Distribution frequency and shelf life:** Fresh produce with a limited shelf life need more decentralized logistic structures for the distribution in the market and a faster distribution frequency in order to be responsive in the market.
- **Country specific products or packaging requirements:** Customized packaging is necessary to face different national markets.
- **Market responsiveness flexibility:** Centralized distribution structures slow the responsiveness in the market while decentralized distributor centers close to the final customer are able to respond faster to the market.
- **Demand variability:** Demand variability influence the choice of the distributor center location since more volatile demand requires decentralized distribution centers which allow to respond quickly to changes in the market.

A system approach

As shown in the 5 points described above, in managing logistics, it is important to see the fresh supply chain as a system, where pre-harvest context and consumption are part of the same chain. Postharvest handling has become more and more sophisticated because of the growing international fresh produce trade, preference of consumers towards a large variety of fresh produce, rising consciousness of beneficial nutritional characteristics of fruits and vegetables and premium price for selling out-of-season high-quality fresh produce (Florkowsky et al., 2014). Nowadays, consumers are able to find a large range of fruits' variety in the retail market as a result of improvements in marketing and distribution of tropical fruits

Long-term storage and handling long-distance shipments, have become important to balance the consumption of customers in colder climates. New efforts in marketing are focusing on widening the variety of fruits accessible to consumers by the application of modified sets of post-harvest practices given the climatic conditions and infrastructure possibilities. To reach this final objective, the margins between pre-harvest procedures and postharvest handling in the organization are becoming blurred and in some cases it is possible to unify those procedures into a single entity with many parts (Florkowsky et al., 2014).

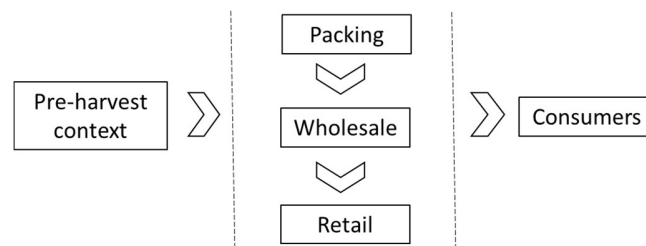


Figure 8 Logistic system context (elaborated from Florkowsky et al., 2014)

Distribution efficiency

Efficiency in the distribution of agri-fresh produces can be seen under four main indicators: time, costs, quality and waste.

The main critical aspect of a perishable supply chain is time, any delivery delay to the customer implicates a loss in the economic value of the fresh produce (Sartika, 2013). Because time directly influences product's quality, technological efforts, especially in storing and transporting, are necessary to control the rate of product deteriorating (Sartika, 2013). An important relationship that must be addressed is between the commercial goals like quality and shelf life and environmental and economic constraints. There must be a strong synergy between "basic" and "applied" research in order to create a virtual cycle (Collins, 2010). As a result the correlation between quality, time and costs is very strong (Sartika, 2013). A trade-off has to be made among those three variables. The quality of a fresh produce strictly depends on the delivery time and transportation conditions, such as maintenance of the cold chain and appropriate choice of packaging which, in turn, involves higher costs (Sartika, 2013). For this reason an optimal fresh supply chain should enlarge decay time of fresh produce and accelerate activity time (Sartika, 2013). Both are influenced by the use of supply chain technologies; decay time is influenced by packaging and storage while activity time is influenced by the mode of transportation and efficiency and efficacy of the supply chain.

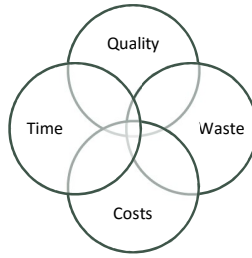


Figure 9 Trade-off in perishable supply chains (elaborated from Shukla and Jharkharia, 2013)

The fourth concept concerns reduction of postharvest waste in the fresh fruit supply chain. The strategies to reduce such losses can be grouped in the following three areas (Shukla and Jharkharia, 2013):

- Application of knowledge to improve handling techniques (like cold chain)
- Overcoming socio-economic constraints like the lack of adequate infrastructure, marketing system and R&D
- Promoting consolidation and vertical integration among actors in the supply chain

3.1. DELIVERY DEMAND'S CHARACTERISTICS FOR BERRIES

The world market for fresh fruits, and in particular for berries, is highly rationalized and professional. It is characterized by a high global competition which is mainly due to optimization and up-scaling. Global retailers are asking for larger varieties, consistent supply, high responsiveness to the market, safer products and good prices. In this chapter, a brief overview of the delivery demand for fresh berries is provided, taking into account the responsiveness requirements, the order necessities and the retail sector.

3.1.1. RESPONSIVENESS VERSUS EFFICIENCY

Fresh fruits market is particularly challenging because consumers not only expect availability of produce but also good quality and safety traits in retail shops. (Van de Vorst et al., 2014) While designing a new supply chain network these demands have to be taken into account. Responsiveness to the market has acquired increasing importance for fresh produce, in particular for berries. In fact, the fresh fruits market requires a great adaptation of the supply to the demand, for example by offering a year-round availability with a stable high quality. On the other hand efficiency is also important. Consumer's price requirements and low margins are pushing operations throughout the chain network to become more and more efficient. For this reason the *"design and management of AgriFood Supply Chain Networks (AFSCNs) is characterized by a focus on product availability and its quality"* (Van de Vorst et al., 2014)

3.1.2. MARKET PUSH OR MARKET PULL?

Many times industries under- and over-produce because of supply restrictions such as the limited storage possibilities which forces growers to supply the demand with the current production (Ahumanda and Villalobos, 2011). The market for perishable product is very unstable. For example, prices are strongly related to the quantity supplied in the market. While designing and managing the production planning and control in relation to the market demand, food companies struggle with the strategic decision of make to stock (MTS) or make to order (MTO) (Soman et al., 2002). In this decision a trade-off between the characteristics of a product and the demand has to be made. Producing only on the base of orders is not feasible due to the high numbers of set-ups necessary, while producing only on a stock basis is risky due to the unpredictability of the demand and the perishability of food products (Soman et al., 2002). Despite the market prefers make to order policy with short response interval, most of the times producers are not able to fully satisfy this demand (Romsdal, 2014). For this reasons, most of the time, companies in the food sector are operating under a hybrid MTS-MTO strategy (Soman et al., 2002). An approach that increases efficiency and responsiveness, especially in the fruit market, where production and packaging process can be decoupled, could be a pack-to-order (PTO) policy (Romsdal, 2014). By a pack-to-order policy only the quantity sold is packed.

3.1.3. ORDER SPECIFICATIONS

Seasonality and insufficient volume are really important aspect while considering order specification since retailers require goods in the store on a consistent basis. In order to start a purchasing plan most of the market asks for a steady and reliable flow of product for as long as possible.

Moreover, due to the perishable nature of berries, buyers prefer a short order cycle with more frequent deliveries. This allows to lower the risk of obsolescence of the stock. The increase in the number of orders from retailer's booster a smaller size of the order. A very important factor to keep in mind - that influence the order size and cycle - is the distance to the market.

Certifications are one of the most important order specification together with safety and residue level. (CBI, 2015). Global Gap (GG) certification is no longer the leading standard but rather an elementary requirement from retailers especially

because GG is no longer a guarantee of food safety (CBI, 2015). Spray protocols have acquired increasing importance since retailers and buyers are now asking for accurate data on spray records putting high pressure on MRL levels (maximum residue limits) (CBI, 2015).

Increasing importance has the CPG model (consumer packaged goods) for berries. This format is only present for fresh cut produce and high value products like berries. This requirement is not observed in commodity produce since the brand recognition there is mainly important for buyers rather than for consumers. (Cook, 2011). Another aspect that makes buyers enthusiastic is new technologies in post-harvest operations and packaging especially if it allows shelf life to increase (CBI, 2015).

3.1.4. BERRY SUBSTITUTION EFFECTS

High promotional activities on positive health aspects of berries, blueberries in particular, has allowed an increase in sales for the category. (Sobekova et al, 2012). In fresh produce business cannibalization effects are quite frequent. Especially if consumers have many purchase options within and across fresh produce categories in the same season. Seasonality influences availability, appearance, flavor and price. The substitution effect has been influenced in the past decades by: the increase of export of specialty produces by different areas of the world, the increase of product differentiation (for example different varieties of products available on the retail shelf), and the increase of import on off-season fruits and vegetables. As a result, despite many consumers have increased in quantity and diversity their fresh fruits purchases, some have just substituted products (Cook, 2011).

The berry category, up to date, has not been involved significantly by this effect since the nature of the category permits consumers to see berries as complements (Cook, 2011). Berries are often preferred in a large variety by consumers which makes more attractive shipper investments (Cook, 2011). However, it is demonstrated that some berries, like blackberries, are more sensitive than others, like strawberries and blueberries, to be substitutes in demand. (Sobekova et al, 2012). A careful analysis of price elasticity is therefore suggested while looking at the berry market. Substitution effects are also related to the spillover effect coming from promotions and marketing tools (Sobekova et al, 2012).

3.1.5. PRICE

A positive aspect for berries, in respect to other traditional fresh crops, is that they are considered high specialty crops giving possibilities to have a better returns per hectare (Sobekova et al, 2012). However, fresh berries are highly seasonal fresh produce so their prices fluctuate depending on the time of the year and season (Sobekova et al, 2012).

Regardless the effort in marketing services of suppliers to gain competitive advantage, from a market point of view, price remains extremely decisive in business relations. Also the berry business, which is more differentiated from the other fruits categories, still mostly works in a commodity business. For this reason the relationship between shippers and growers is mostly based on short term marketing agreement instead of price contract resulting in very tight margins for growers (CBI, 2015). This arrangement push growers to maximize current returns rather than having a long term view and investing in new innovative technologies (Cook, 2011).

Price has a special importance especially in economic recession period. During this economic downturn there has been observed an increasing categories of stores selling fresh fruits leading to the intensification of the “channel blurring” (Cook, 2011). The enlargement of the types of shops put an extra challenge in the price competition since even more hard discount are selling high value fresh fruit (Cook, 2011)

In relation to the demand for berries, a study from Sobekova et al, (2012) suggest that the demand for all types of berries is reasonably responsive to price. It means that the expenditure on berries are likely to increase as the prices drops as a consequence of higher efficiency in logistic and in supply chains operations (Sobekova et al, 2012).

Price is becoming increasingly important also as a consequence of the rise in logistics and freight costs due to the economic downturn which has dropped orders from freight corporations (CBI, 2015). This forces buyers to integrate high logistics prices in their offers and hence look for the cheapest suppliers (CBI, 2015).

Price is also related to the degree of import, it is demonstrated that countries with a year-round availability of fresh fruits are likely to increase consumer demand and in aggregate stabilize price fluctuations (USDA, 2013).

3.1.6. IMPORTANCE OF SEED VARIETIES

The fruit market is paying an increasing attention of good genetics varieties which has been viewed a new battleground to increase competitiveness in negotiation with buyers. The characteristics of new varieties not only gives vantages from a cultivation point of view, in managing disease and in increasing yield for instance, but also from a market point of view. In fact, good varieties help to improve consumer's traits like flavor, texture, visual aspects and culinary characteristics (Cook, 2011). As a consequence, the offer of proprietary varieties to selected customers allows market segmentation at the retail level. Partnership of seed companies and marketing organization are becoming more and more common. These arrangements, dictated from the market, brings benefits to both growers and shippers. The former are able to capture more downstream value while the latter gain more shipper bargaining power with their strategic accounts (Cook, 2011).

3.1.7. RETAIL CONCENTRATION

The percentage of modern retail in the target market is an important aspect for fresh produce, in the special case of berry is even more important. A distribution channel must ensure the continuity of the cold chain in order to guarantee the best preservation of the fresh produce.

Moreover, while looking at the target market an important indicator is the concentration of the retail and food service channel. More consolidated markets contribute to consolidate the supply side. This consolidation is important to achieve larger sales and so to invest more in logistics and marketing tools. In the berry market, where efficiency in logistics and post-harvest operations are the key success factor, having a solid account is important. (Cook, 2011). Having the possibility to invest more is also well valued by fruit buyers and gives the suppliers the possibility to be more competitive (Cook, 2011).

3.2. PRODUCTION PROCESS DESIGN COMPONENTS FRESH FRUIT SUPPLY CHAIN

Before analyzing the logistics and distribution aspects of agri-fresh produce, it is necessary to take into consideration some technical aspects of the chain since they have a direct impact on logistics management choices. In the following chapters the main challenges for agri-fresh supply chains are described for the overall supply chain and in its different operational activities. It follows a section dedicated to the cold supply chain.

3.2.1. CHALLENGES IN LOGISTIC DESIGN OF THE FRESH SUPPLY CHAIN

Produce degradation is the main challenge in designing the fresh supply chain. It is influenced by product intrinsic characteristics (for example initial microbial contamination, cultivar characteristics and respiration rate), environmental circumstances (like relative humidity, temperature and packaging) and the time the fresh produce is exposed to these environments (Luning and Marcelis, 2009).

The growth in production of a crop depends in big part on its flexibility to adapt to diverse land settings, climates and seasons, the distance to target markets, if it is a perennial crop, the laps of time to achieve full productivity, the amount of technological effort needed and the capital outlay per hectares. (Cook, 2011). A key role in the distribution of fresh produce is played by shelf-life, perishability, responsiveness and production of ethylene, and the ability of a product to endure the rigidities of the distribution system and other postharvest. (L. Cook, 2011)

An innovative fresh supply chain, characterized by a short life-cycle, volatile demand and fast “clockspeed” should be designed to be responsive and fast (Blackburn and Scudder, 2009). The value of fresh produce changes considerably over time and many times decision choices in the supply chain are between effectiveness and responsiveness (Blackburn and Scudder, 2009). The rate at which fresh produce loses value over time in the SC is called “*marginal value of time*” and it measures the cost of a unit time delay in the chain (Blackburn and Scudder, 2009). Marginal value of time is dependent on post-harvest technologies. Therefore, investments in chain design does not only improve logistics performance but also the preservation of food quality (Van der Vorst et al, 2011). Fresh supply chain can be separated in two phases; in the initial phase (from harvest to cooling) the deterioration rates are very high and for this reason the supply chain should be more responsive to the market while in the remaining part of the supply chain being efficient is more advantageous since the deterioration rates occurs at a much lower rhythm (Blackburn and Scudder, 2009)

3.2.1.1. TECHNICAL CONCEPTS

Managing the fresh fruit supply chain comport a preliminary understanding of important technical concepts that are summarized in the following table (Kadel, 2013):

Table 2 Technical concepts fresh fruits supply chain

TEMPERATURE	<p>Is the most important external factor that influences the shelf-life. The majority of fruits are better storage at 0°C. For each +10°C of the optimal temperature, fresh produce deteriorates at a rate of 2- to 3- fold. Temperature outside the produce specific range can cause three main problems:</p> <ul style="list-style-type: none">▪ Freezing: derived by the high amount of water present in the cells. The freezing point is between -3°C to -0.5°C. If it happens it creates collapse of the tissue▪ Chilling injury: regards few commodities, especially tropical and sub-tropical fruits, which respond negatively to refrigeration, even below the critical temperature (5-13 °C). Common symptoms are change in surface coloration, difficulty to ripen, change in flavors and susceptibility to pathogens.
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	<ul style="list-style-type: none"> ▪ Heat injury: Fruits removed from the plants cannot longer benefit from the transpiration. For this reason the exposition to high temperature after harvest can cause collapse and localized necrosis.
RELATIVE HUMIDITY	<ul style="list-style-type: none"> ▪ Is the moisture content of the atmosphere at a determined pressure and temperature. In fresh fruits it can influence water loss, decay development, incidence, and physiological disorders. The appropriate range for the storage of fresh fruits is between 85% to 95% RH. It can be controlled by procedures such as humidification of the air, control of air flow, control of temperature, moisture barriers, wetting floors in storage room.
PRODUCT COMPATIBILITY	<ul style="list-style-type: none"> ▪ Compatibility among fruits during transport and storage is determined by several factors: temperature, Ethylene, RH, odor volatiles, sulfur dioxide, 1-methylcyclopropene and organic produce.

The aspects above are valid in general for every fresh fruits supply chain, it is important to take them into account since they significantly influence the logistics and distribution of fresh produces. In the next table some technical indicators are given for storing fruits with similar characteristics to kiwi berry.

Table 3 Long term storage of similar fruits

Common name	Storage temp.		RH	Highest freezing temp		Ethylene prod.	Ethylene sensitivity	Resp. rate	Approx. post-harvest life	Beneficial atm	controlled
	C°	F°		C°	F°						
Kiwifruit	0	32	90-95	-0.9	30.4	Low	High	Low	3-5 months	1-2% O2 + 2-5% CO2	
Blueberry	-0.5 to 0	31-32	90-95	-1.3	29.7	Low	Low	Low	10-18 days	2-5% O2 + 12-20% CO2	
Table grape	-1 to -0.5	30-31	90-95	-2.7	27.1	Very Low	Low	Low	1-6 months	2-5% O2 + 1-3% CO2 To 4 wks	
Apricot	-0.5 to 0	31-32	90-95	-1.1	30.0	Moderate	Moderate	Low	1-3 weeks	2-3% O2 + 2-3% CO2	
Strawberry	0	32	90-95	-0.8	30.5	Low	Low	Low	7-10 days	5-10% O2 + 15-20% CO2	
Gooseberry	-0.5 to 0	31-32	90-95	-1.1	30.0	Low	Low	Low	3-4 weeks	/	
Currants	-0.5	31-32	90-95	-1.0	30.2	Low	Low	/	1-4 weeks	/	

Each fresh produce has then peculiar specific characteristics to look at while managing the supply chain; in the special case of Kiwiberry more precise information can be found in the following points:

Technical considerations of Kiwiberry, relevant for the logistics of the supply chain

- Kiwiberry is harvested when it reach 10 to 14°Brix of sugar otherwise becomes too soft to be handled. (Lim et al., 2015)
- Kiwiberry has a shelf life of 1-2 months at 0°C, then fruit softening, skin wrinkling by water loss and fruit decay.
- It has climacteric-like characteristics (Lim et al., 2015)
- Very sensitive because of the absence of hair and smooth skin (Lim et al., 2015)
- Optimal temperature range $1 \pm 0.5^{\circ}\text{C}$ (Lim et al., 2015)
- 1-MCP extend shelf life to up to 5 weeks (Lim et al., 2015)
- Possibilities to extend the shelf life by edible coat (made by calcium caseinate and chitosan for example) and ethylene biosynthesis inhibitors (like 1-methylcyclopropene) after harvest (Lim et al., 2015)
- Utilization of controlled atmosphere in cold storage help in extending shelf life to 8 weeks (Latocha et al., 2014)
- Cold storage in air should not be extended for more than 4 weeks to avoid bitter taste. Controlled atmosphere more expensive than cold storage in air so utilize it iust in case of a prolonged storage (Latocha et al., 2014).

3.2.1.2. TECHNICAL ASPECTS IN EACH HANDLING PHASE

Efficient handling and distribution system throughout the steps of the chain are the key to guarantee the achievement of logistic goals (Dodd and Bower, 2014). Before taking into consideration the post-harvest handling, a preliminary condition to guarantee post-harvest shelf life and quality of the fresh fruit, is the best handling in the field (Shewfelt et al., 2014). The following handling steps do not have to be seen as independent phases to analyze but rather as a system approach. Integration in the logistics steps is fundamental to guarantee the overall quality of the fruits to the final consumer. In the following paragraphs each major step of the supply chain is be analyzed in order to identify the most important aspects to consider while managing the flow of fresh produce.

In the following scheme the most important steps has been represented. A more exhaustive explanation will follow.

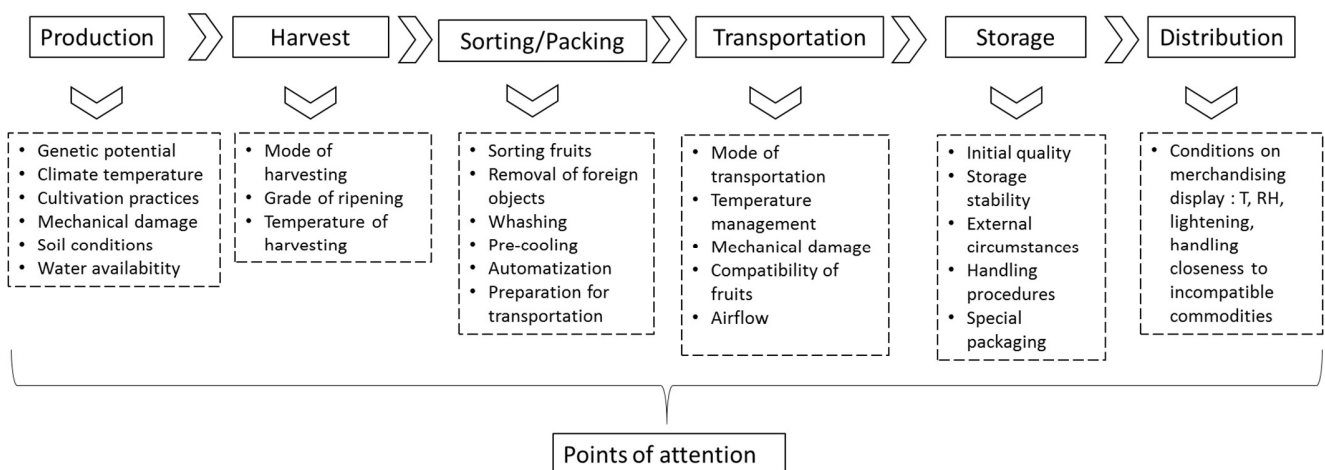


Figure 10 Technical aspects in logistic design fresh fruit supply chain

PRODUCTION AND VARIETIES DEVELOPMENT:

Practices at the production level are a prerequisite; genetic potential, cultural practices and growing conditions directly influence the post-harvest life of a fruit product. In particular, important pre-harvest factors are: climate temperature, cultivation practices (like application of growth regulators and fungicides), mechanical damage, soil condition and water availability (Shewfelt et al., 2014). Plant breeders have a crucial importance in selecting cultivars that produce high yields under a wide range of growing conditions and are more resistant during harvest and subsequent handling operations. The first goal of the production from a distribution point of view is to improve the initial product quality at harvest due to best cultivation practices and breeding programs for example (Van de Vorst et al, 2014).

HARVEST:

The post-harvest handling starts with the harvest. The grade of ripening of the fruit has a significant importance in the logistics and distribution phases. The decision in regards of the maturity of the fruits depends on the tradeoff between ease to manage in the distribution phase (in case of less ripened fruits) and the consumer's acceptance (higher for field ripened fruits). Moreover, the time of the harvest is determined by the yield, visual appearance, anticipated prices, field conditions and estimated culling losses to achieve delivery quality (Shewfelt et al., 2014). The harvest can be achieved by hand-picking, mechanically assisted picking device or mechanical harvesters (Shewfelt et al., 2014). The harvesting time of the day is also important, extended shelf life of the product can be achieved by picking the fruits at cooler times of the day. (More specific information about the respect of temperature throughout this phase can be found in annex 1).

SORTING AND PACKAGING:

This phase may occur as close as possible to the field. Most of the time it is effectuated in apposite facilities called packing house. These facilities are responsible for other important operations that will influence the future storage life; for example sorting fruits to be sure that they meet quality and size standards, removal of foreign objects, removal of deficient or mechanically disrupted items, washing to remove micro-bial load and soil, and preparation in shipping containers (Shewfelt et al., 2014). Sorting is the phase in the supply chain responsible for the isolation of edible or marketable products into separate quality classes; it can happen mechanically or by human means (visual and tactical inspections) (Bollen and Prussia, 2014).

Sorting spoiled or smashed fruit has a vital importance because those fruits are responsible for the release of the hormone Ethylene which triggers the ripening of the other fruits during the distribution (Williams, 2003). Modern value chains have to satisfy a number of specific requirements in order to be competitive. In particular, in case of exporters, many regulations have to be met for diseases and insects. Additionally, a number of criteria such as maturity, firmness and damage have to be applied for products that require to be stored. Quality specifications have acquired an increasing importance to ensure that saleable products arrive at consumers and to protect fruits supply chains (Bollen and Prussia, 2014). Grade standards have become important to satisfy supply chain requirements like storage and transport performance and to meet consumers and buyers expectations.

The packinghouse has the function of transforming highly variable portions of fresh produce into uniform lots of produce ready for shipment. Conform items are sent to the packaging while non-conform items are placed into a discard flow (Bollen and Prussia, 2014). Currently the best performance is achieved by manual sorting but sorters should be first examined in order to determine their visual capacity (Bollen and Prussia, 2014). The range of defect types can be very wide, each process should carefully decide the severity of each. By this decision the potential product throughput is significantly slowed. The throughput rate can vary from 2.0 fruits/s to 1.0 fruit/s (Bollen and Prussia, 2014).

In alternative to manual sorting systems, automated sorting systems are progressively taking place as pre-sorting system to reduce the defects possibilities that human sorters have to detect. The accuracy of automated sorting algorithm is between 60% and 95% (Bollen and Prussia, 2014).

Packing-house are also responsible for a precooling step which helps to remove field heat and slow physiological process (Johnson and Hofman, 2009). In the packinghouse each handling steps could be a source of damage which will hamper the uniformity of quality. A careful selection of automation process is hence necessary.

(More specific information about the respect of temperature throughout this phase can be found in annex 7).

TRANSPORTATION:

Transportation is one of the most important factors that influence the final quality and delivery time to customers. Given a determined market far from the production point, very perishable produce requires fast and efficient transportation modes which involve bigger costs for the company (Sartika, 2013). This phase refers to the delivery of the product from the growing region to the selling region. It can be realized in different ways depending on the distance of the two regions, the overall costs of transportation and the storage life of the particular fruit. During transportation the most important concerns for quality management are the maintenance of the adequate temperature, mechanical damage and compatibility of fruits (Shewfelt et al., 2014). Respect of the cold chain is determined by the initial temperature, refrigeration capacity, refrigeration conditions of equipment and airflow of the product (Shewfelt et al., 2014). The airflow is very important also for the quantity of oxygen (moderate the maturation of the fruit by influencing the respiration) and can be facilitated by the construction of the shipping containers, the position of the vent holes and by the adequate stacking scheme. Attention should be given to the compatibility of fruits, climacteric fruit (generator of Ethylene) such as bananas and apples, should not be shipped together with Ethylene sensitive fruits such as strawberries. Secondary transportation steps, such as from field to packing-house and from wholesaler to retailer, are also important despite the shorter distance. Here important temperature shocks and damage to products can be caused by the time required to load the vehicle, the distance, the speed of the vehicle and the number of vehicles waiting to be unloaded at the packing facilities. Moreover, to minimize vibrations during the transportation further attention can be required such as the use of straw or woven mats on the truck bed (Shewfelt et al., 2014). Despite the adoption of the best practices during transportation, damage can be caused also at the loading docks by worn handling and delay under unrefrigerated conditions (Shewfelt et al., 2014). (More specific information on the respect of temperature throughout the transportation can be found in annex 1).

STORAGE:

The storage time depends on the product's shelf life and on the storage conditions. The final goal of storage is to extend the seasonality of the fruits, delaying selling until prices increase, providing a reserve for constant supply and reducing the frequency of purchase by the customer (Shewfelt et al., 2014). The storage life depends upon initial quality of products, storage stability, external circumstances and handling procedures (Shewfelt et al., 2014). During the storage fruits must be maintained under optimum temperature, relative humidity (RH) and environmental conditions. An effective method for extending the time of storage while maintaining the quality of fruits can be controlled atmosphere. Modified atmosphere, at wholesale and retail packages levels, can be a further addition to the technology (Shewfelt et al., 2014). Another useful approach to extend the shelf life of some fruits is the utilization of gamma irradiation and 1-methylcyclopropene.

DISTRIBUTION:

Frequent product quality damages occur during the merchandising display at the retail level which aims to attract customers rather than prevent product's perishability (Shewfelt et al., 2014). The main concerns at the outlet level are in regards to temperature, relative humidity, lighting, exposition to incompatible commodities and harshness of handling (Shewfelt et al.,

2014). A rapid turnover of product on the shelves could be the most effective way to prevent quality losses. The way products appear on the retail's shelves is very important to fruit producers because is the first opportunity to communicate with customers (Shewfelt et al., 2014).

3.2.2. THE COLD CHAIN FOR FRESH FRUIT

Besides challenges in each step of the agri-fresh supply chain, one of the most important aspect to guarantee throughout the chain, is the respect of the right temperature since fresh produces are alive organisms. Therefore, the cold chain for highly perishable fruits deserves a separate chapter. The cold supply chain can be defined as:

“ A cold chain is the seamless movement of chilled fresh produce from production area to market through various storage and transport mediums without any change in the optimum storage temperature and relative humidity” (Dodd, 2013).

Global cold chain management (CCM) can be defined as *“the process of planning, implementing and controlling efficient, effective flow and storage of perishable goods, related services and information from one or more points of origin to the points of production, distribution and consumption in order to meet customers’ requirements on a worldwide scale” (Bogataj et al., 2005).*

The reason why the cold chain is so important is because it is able to lower the respiration of the fruit. By respiration sugar reserves are drawn upon to create energy for the process. In fact, refrigeration technologies, are the most effective way to maintain the nutritional attributes of the fruit and its quality (Dodd and Bower, 2014). To succeed, a cold supply chain must never interrupt the exposure of the product to the optimal temperature (lowest possible) and RH (highest possible) (Dodd and Bower, 2014). Once a temperature break happens, the air temperature increases with a parallel reduction in relative humidity. As a result there is an increase in respiration and water loss of the fruit which causes an irremediable shock in quality.

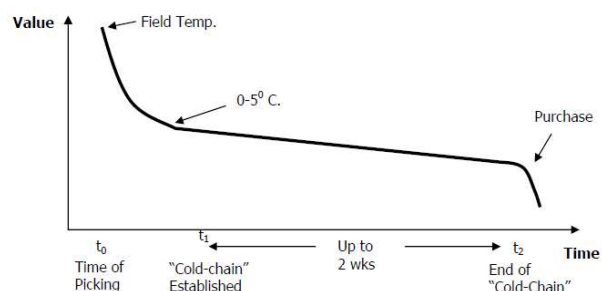
Logistics is a very important discipline to ensure the efficiency of the cold supply chain. It makes sure that the whole process meets customers’ requirements by planning, implementing and controlling the flow of goods (Dodd and Bower, 2014). Maintaining the optimal temperature is not always achievable because modern chains often deals with multiple product categories which need different temperatures regimes being forced to adopt the “best fits all” solution (Van der Vorst et al., 2011)

In order to guarantee a good logistical management two aspects of the cold chain have to be taken into consideration (Bogataj et al., 2005):

- The fresh produce must be cooled straight after the harvest
- Packaging has a vital importance to prevent the quality from mechanical damage and for the exchange of temperature between the produce and the external environment

The highest level of quality is at the moment of harvest while the highest monetary value is at the moment of sale. Product quality is significantly influenced by the cold chain, after cooling down fresh fruits the value loss and deterioration occurs at a much lower rate (Blackburn and Scudder, 2009).

Table 4 Declining value of products over time copied from Blackburn and Scudder, (2009)



The highest value to the customer can only be reached if the product arrive at the best condition by responsible management practices. Refrigeration is the most valid technique to maintain quality as well as nutritive and financial attributes in the value chain (Dodd and Bower, 2014).

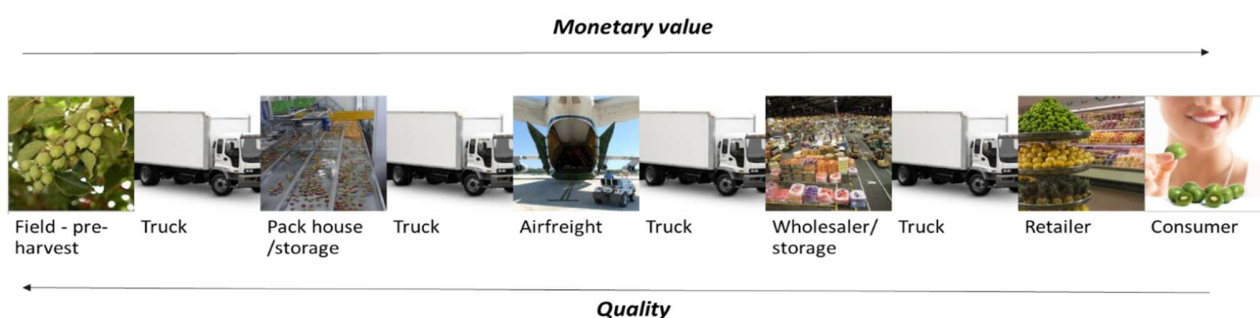


Figure 11 Value chain throughout the cold chain for overseas market

3.2.2.1. RECORDING TEMPERATURE

The management of the cold chain requires very careful temperature control and fast reaction in circumstances of temperature perturbation since this is a very sensitive aspect of the chain. For this reason, visibility and proper control are very important aspects (Bogataj et al., 2005). Temperature control systems put supplementary requirements on rapidity and trustworthiness of logistic systems requiring sophisticated transportation and storage equipment (Van der Vorst, 2011). There are many temperature recording systems. The most advantageous system is Radio-enabled systems which directly send the data by internet without a physical capture of data (Dodd and Bower, 2014). Radio-enabled devices should be positioned at every location where there is a change of transport or storage conditions in order to create a radio network (Dodd and Bower, 2014). Traceability in the cold chain is very important also in regards of quality responsibility and to address poor outcomes (Dodd and Bower, 2014).

3.3. LOGISTIC MANAGEMENT FRESH SUPPLY CHAINS

In this chapter logistics management - the main object of the research - is presented. A first introduction is given where the importance of logistics in the value chain and distribution efficiency are explained. The chapter continues with sections for each main concepts of logistics management for this particular supply chain: infrastructure design, overseas transportation, third party logistics service providers, Supply chain integration, quality control logistics, Demand management and production and distribution planning.

3.3.1. INTRODUCTION

Supply chain management results in the choice of a logistic scenario (Van der Vorst et al., 2011). From a logistic point of view SCM mainly deals with choices on the design of distribution network, transport and production infrastructure, inventory management and management of goods and information flows (Van der Vorst et al., 2011). Logistics can be defined as the procedure of planning, implementing and controlling the efficient, cost-effective flow and storage of raw materials in the phases of in-process inventory, finished goods and information flow from the production till the consumption point (Hsiao, 2010). The final purpose of logistic is the conformity with customer requests. The process of logistics consists of any undertakings that takes one or more inputs, transforms and adds value to them in order to deliver outputs to one or more customers (Hsiao, 2010).

The design of a supply chain should be based on the combination of strategic objectives of the company and the specific characteristics of the supply chain. Characteristics of fresh product supply chains, like perishability and heterogeneous product supply, make the management and the logistic design of these supply chains more complicate (Rijkema, 2014). As the quality of perishable products begins to deteriorate after harvest, the supply chain management problem is to control losses in quality over the continuing phases of the chain, till the final consumers (Blackburn and Scudder, 2009).

3.3.2. INFRASTRUCTURE DESIGN

The physical distribution structure of a network is made by long-term decisions which includes locations, number and size of warehouses and the related transportation link (Akkerman et al., 2010). The design of the distribution network is the most difficult decision for operational management because it affects costs, time and quality of customer service (Akkerman et al., 2010).

3.3.2.1. WAREHOUSING STRATEGY

The proper management of warehouses is the core of the logistic effort. The choice of warehousing strategy must benefit the whole logistics system. Warehousing is in fact directly involved in four different logistic functions: sourcing/inbound logistics, processing manufacturing, outbound distribution and reverse logistics (returns and recycling) (Gourdin, 2001). Decisions on strategic location of warehouses should not only take in consideration costs but also long-term implications on customer service and transportation strategies. The site of warehouses is the first decision to be made, sub sequentially other operational decisions are important to consider such as the choice by management to directly operate the facilities or to rely on a third party (Gourdin, 2001).

The strategic roles of warehouse can be summarized in the following nine points:

1. Provide local inventory for a globally based demand
2. Provide value-added services to the customer
3. Operate near vital suppliers serving as an inbound material-control center
4. Consolidate outbound orders for more economical transportation
5. Protect from production lead-times

6. Handle reverse logistics
7. Perform quality inspections
8. Permit manufacturing economics
9. Permit procurement efficiency

Within the logistic system a warehouse serves three major roles: gathering facility, breakdown facility and the combination of the two (Gourdin, 2001). It can serve as a gathering or consolidation point if small quantities of multiple products are received into less-than-full load quantities in order to reduce the distance that expensive less-than-full-load shipments must be moved (Gourdin, 2001). If, alternatively, it serves as a breakdown function, shipments of goods are broken down into smaller quantity that are delivered to customers in less-than-full-load shipments (Gourdin, 2001). In case of companies serving global markets it is common to find the combination of the two, fresh produce are gathered in a domestic warehouse to arrange full containers loads, multiple containers are shipped in the overseas market to reach the foreign warehouse where lots are broken down into smaller lots for onward movements to customers.

3.3.2.2. STRATEGIC LOCATION OF WAREHOUSE

Normally location-allocation problems are solved by mixed integer linear programming models in which the decision to use or not a distribution Centre is made by a binary decision variable (Akkerman, 2010). The selected location of a warehouse has an influence on the delivery time which is a critical factor for perishable products.t (Keizer et al., 2015). Managers operating in different markets can decide to centralize inventories in one single plant or to place a facility in each market. Centralization of warehouse comport a number of positive and negative aspects which are summarized in the table below (Gourdin, 2001):

Table 5. Advantages and disadvantages of centralized warehousing (derived from Gourdin, 2001)

Positive aspects	Negative aspects
<ul style="list-style-type: none"> • Simplification of ordering process • Elimination of nationally based warehouses • Less need for working capital holding • Less inventory holding costs (reduction in safety stocks due to more accurate single forecasts) • Lower outbound transport costs and eventual better use of intermodal capabilities 	<ul style="list-style-type: none"> • Higher inbound transport costs • Larger facilities requirements • Needs for more sophisticated inventory managements systems • Increase perception by customers and internal marketing managers because fresh produce are transported from abroad.

After having addressed the problem of centralization, the company has to take a decision in regards of the specific location of the warehouse which is influenced by a variety of variables like the number and size of other warehouses, specific demand for each warehouses and location in regards to supplier/vendor. The decision on the specific site have an impact on the entire logistic system. For instance it have a significant impact on inventory management; the level of safety stocks diminish as facilities are more centralized and the replenishment lead time and its variance increase as the distance between the plant of production and warehouse increases. A longer replenishment lead time increases the variability of the demand during replenishment lead time at the warehouse (Gourdin, 2001). Another important effect of warehouse location decisions is on customer service; the distance between warehouses and market affect the order cycle times.

3.3.3. OVERSEAS TRANSPORTATION FOR HIGH QUALITY FRESH PRODUCE

Giving different perishable nature and seasonality among products, it is very important to tailor the transportation strategy on the basis of the specific product characteristics. In deciding the geographical region to transport the goods, consumption habits and climate are very important (Shukla and Jharkharia, 2013). The final goal of the transportation of agri-fresh goods is to find a trade-off between customer satisfaction, delivery time, distance traveled, transportation costs and perishability. Fresh fruits are shipped from the location of production to the market place in a diversity of carriage arrangements. (Rao, 2015) The main aim of a transportation system is to transfer product respecting quality and in a cost-effective way (Rao, 2015). In modern distribution system refrigerated highway trucks always connect the port of departure/destination with exporter/importer, the major decision while transporting perishable products has to be made between air freight and sea freight. In the following chapter those two different systems are presented, stressing more the attention to air freight since it is the focus for kiwi berries.

3.3.3.1. SEA FREIGHT TRANSPORT SYSTEMS

Marine transportation for fruits is a very convenient method for transporting fresh fruits since it allows to significantly reduce costs (Rao, 2015). However, not all fruits permit sea freight transportation because of their perishable nature. Since the distance to navigate is remarkable – it can be from 1 to up to 4 weeks - a distinctive trait of sea freight is the changing environment. In fact, the external temperature may fluctuate from excessive hot to extremely cold temperature, through which the vessel has to travel in the path of its trip (Rao, 2015). For this reason, the insulation and fittings should be suitable both for warm and cold water routes (Rao, 2015).

There are two main modes of transportation commonly adopted: marine container and refrigerated ships (Rao, 2015).

The differences between the two are mainly dictated by volumes (Rao, 2015). The cargo carrying capacity in fact is much higher for refrigerated ship (Rao, 2015). Nevertheless, containers can be conveyed straight to a cooled loading dock at the packing operation, preserving a container cold chain (Rao, 2015).

In both systems refrigeration is determined by electricity. In the holds of vessels and in reefer containers the chilled air is provided from the floor in a vertical path (Dodd et al., 2014). Temperature management in reefer containers is problematic as the airflow at the door end of the container is limited. This aspect can aggravate concerns with shelf life and maturing of delicate fruits like stone fruit (Dodd et al., 2014). There are ways of mitigating the uneven airflow.

Refrigerated ships are loaded ordinarily, the storage does not differ from open warehouses, consenting fruits to be exposed to open-air ambient climate. An example of fruits transported in this method are citrus, apples, bananas, and table grapes (Rao, 2015).

3.3.3.2. AIR FREIGHT TRANSPORT SYSTEMS

In this section air transportation, the most important mode of transportation for highly perishable products, is analyzed. Air transportation is the most complex strategy of shipping for perishable goods which have high value per unit, high value-volume ratio and are very time-sensitive. The main advantage of air transport systems is that allow fast transportation of products over long distance being significantly important for highly perishable fruits that could not be transported to distant market otherwise. Approximately 15% of the world air cargo is made up by perishable and exotic fruits (Vega, 2008). Despite certain types of goods such as electronics, which traditionally have been transported by air, are slowly shifting mode of transportation towards ship, the volume of agri-fresh produce is increasing by 7% per year (Vega, 2008).

AIR FREIGHT AND AIR CARGO

First of all, a distinction has to be made between air freight and air cargo. The term air freight refers to goods imported by a freight forwarding company. These companies act as intermediaries between importers and are involved in the organization of large shipments of goods. In contrast, air cargo is bulk cargo that is added to domestic cargo on airplane. The main difference is that these companies do not have their own planes and they rely on already existing cargo. The main limitation of passenger aircraft is capacity; even though capacity is generated by the flow of tourism, shippers frequently have a fixed shipment schedule established on the minimum available (Worldbank, 2009). Chartered aircraft surely ensure a higher capacity but the freight rates are more expensive (Worldbank, 2009). The cost becomes higher in case of smaller aircraft with a round trip or triangular route. Moreover, capacity may not be guaranteed during peak seasons.

SERVICES IN AIR TRANSPORTATION

Many international air freight services cover airports that have mainly to deal with air cargo rather than passenger traffic. The selection of airports by airlines is mainly based on potential traffic rather than landside facilities and physical characteristics (Worldbank, 2009).

There are three types of hybrid services, born from the exigence to meet demand for small volumes and median value of cargos (Worldbank, 2009):

- Consolidators: combine shipments in order to generate sufficient freight rates
- Freight forwarders: arrange short road transport from cargo origins to nearest airport
- Combination of sea and air freight

In airports the main operations are: receiving and delivering cargo, building cargo pallet, X-ray scanning of outbound cargo, clearing import, and loading and unloading aircraft (Worldbank, 2009). In the past years there has been the attempt to facilitate consolidation through larger cargo terminals with multiple warehouse (Worldbank, 2009). Despite these attempts, improvements of cargo facilities has been limited due to restricted availability of space in the airports.

TIME OPTIMIZATION

The time of cargo operations should be as fast as possible but it is dependent on four factors that should be optimized (Worldbank, 2009):

1. **Customs clearance procedures:** they require the airway master bill and customs declaration after the shipment of the cargo. It can take from a couple of hours to up to a day.
2. **Cargo inspection procedures:** consist in the compilation of documents and utilization of X-ray scanner on cargo before being built into pallets.
3. **Efficiency of cargo handlers:** handling procedures should be efficient and secure. Exclusive contracts are used in case of a small volume of cargo.
4. **Layout of storage facilities:** many old airports have very basic facilities as cargo should not spend too much time in the airport. Modern warehouses have loading dock to speed the process and bonded storage for high-value cargo. For export, facilities have larger spaces to allow scanning, inspection, building pallets and organizing cargo for precise flights

COSTS FOR AIR FREIGHT

Transportation costs deriving from air freight can be very expensive for a company, in terms of both air freight rates and quality losses of the fresh produce (Vega, 2008). Because the cost of air transport is considerably higher than marine transport, only a small proportion of fresh produce can travel by plane (Thompson et al., 2004). In fact, the cost per unit of produce that travel by air can be 4-5 times higher than road transport and 12-16 times that of sea transport (Worldbank,

2009). The unit cost may vary in accordance to destination, the season of the year and the market cycle (Thompson et al., 2004). It has been estimated that the cost of air freight range from \$1.50 to \$4.50 per kilogram of produce while the cost for air cargo can exceed \$4.00 (Worldbank, 2009).

The US bureau of Census defines airfreight costs as “the aggregate costs of all freight, insurance, and other charges, excluding US import duties” (Vega, 2008).

About half of the annual operating costs of aircraft companies is determined by the fuel. Fuel consumption is proportioned to the distance and weight. For passenger aircraft the price depends on the marginal cost and then adjusted for the level of service whereas for charter services rates are higher because it reflect the incremental distance flow and the balance between capacity available and demand (Worldbank, 2009). For short distance travels is always better to use road transport as the air freight rate is higher because of the greater proportion of time spent climbing and descending and then on the ground (Worldbank, 2009).

A study conducted by Vega (2008) on the export of perishable agri-fresh produce to the US and EU, demonstrated how the costs for air freight are not necessarily solely related with the distance; the way the transportation system operate is also influenced by additional factors such as infrastructure and institutional deficiencies. Vega identified institutional deficiencies with: complex governance problems of economic rights in air transportation, high cost of air navigation services, the incidence of unbalanced trade flows and general opposed macroeconomics policies towards the private sectors (Vega, 2008).

What makes the costs for air freight high is also the so called “the peak load problem” deriving from the fact that cargo business is unidirectional in contrast of the passenger business (Vega, 2008). In fact, for air freight the transportation rate must cover also the return trip. As a result, if the international trade unbalance is very positive (more export than import), the cost for export are higher than in a normal circumstance (Vega, 2008). Another important aspect that influences the cost of air freight is that during the industry busy period shipments rates significantly decrease due to scale economies and a more predictable demand (Vega, 2008). The result is a an empty capacity which reduces the outbound costs, an increased competition since chartered aircraft is repositioning during harvesting season and easing of regulatory limitations (Vega, 2008)

Moreover, in some instances due to seasonality and inaccuracy in harvest forecasts, planning air transportation in advance can be very expensive since producers contracting chartered services have to cover both costs of outbound and inbound flights (Vega, 2008).

MARKETING AND SUPPLY CHAIN CONSIDERATIONS FOR AIR FREIGHT

The utilization of air freight should be considerate as part of the general marketing strategy to enhance the overall value, to develop new markets and for product diversification. It can be hence a source of competitive advantage for exporting companies; for instance it allow for agreements between buyers and producers on shorter order times (reduction of the order cycle) and can be a source of flexibility in managing the demand by using sea freight for large initial order and, in case of a greater demand than expected, using air freight to replenish inventories (Worldbank, 2009). By the relative short transit time producers are able to quickly respond to market needs. Transportation by air can also be used to support diversifications’ strategies; it allows to introduce in the supply chain products with shorter shelf-life or to develop new markets by smaller volumes (Worldbank, 2009). Furthermore, air freight permits to serve many distant markets with the same shelf-life. Air freight should increase the value of produce in order to gain competitive advantage.

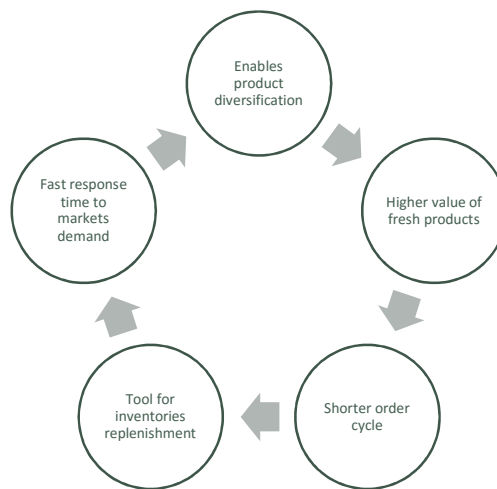


Figure 12 Advantages of air freight
(elaborated from Worldbank, 2009)

3.3.4. THIRD PARTY LOGISTICS (TPL)

Many times logistics activities are carried out by external parties. In this section a brief presentation of this relationship is provided.

3.3.4.1. INTRODUCTION

Third party logistic can be conceived as a dyadic relationship between shippers and provider of the logistic service in the supply chain. 3PLs can be also defined as specialized intermediate markets in the supply chain born from the needs of companies to gain from the trade of specialized production (Anderson et al., 2010). By 3PLs the focus is shifted from the final market of goods to the process in which the value is created (Anderson et al, 2010). Nowadays there is an increased use of outsourcing for organizations that aims to globalize the supply chain – for example export-oriented organizations.

Logistic outsourcing can be defined as: *“Logistics outsourcing is a process that involves the use of external logistics companies to perform activities that have traditionally been performed within an organization, where the shipper and logistics company enter into an agreement for delivering services at specific costs over some identifiable time horizon”* (Hsiao, 2010).

There are two main approaches to define third party logistics providers (3PLs); the traditional one refers to the outsourcing process of a company for warehousing and/or transportation while a more complex approach refers to outsourcing of larger characters that embrace the whole logistic process (Marasco, 2008). Hence 3PLs is a sort of supply of management support that can encompass the entire logistic process or just few selected activities. The choice of the 3PLs depends on how the customer value different services components (Anderson et al., 2010).

In a fresh fruit supply chain that aims to the export market, long distance transportation is inevitable and the transportation should satisfy the requirements of freshness keeping and long-haul delivery. In these conditions transportation logistics is many times outsourced to specialized logistic providers which dispose of the needed capacity and facility. Long distance shipping with the respect of the cold chain permits the 3PL provider to have an advantage over other means of transportation (Cai et al., 2013). However, 3PL still need to consider the reaction of the producer while negotiating rates of transportation and other conditions. For long distance transportation a delay in transport time can be frequent and very

large, as a result significant losses can be caused to producers (Cai et al., 2013). The variability of the transport time has an impact on the way decisions by actors of the supply chain are made.

3.3.4.2. RELATIONSHIP BETWEEN PARTIES

Coordination between the parties involved in the fresh produce supply chain, especially between supplier and distributor, has been object of several studies in the supply chain management. To facilitate coordination many different contracts has been studied with incentives such as price discounts, quantity commitment, quantity flexibility contracts, backup agreements, buy-back or return policies, revenue sharing and sales rebates or markdown allowances (Cai et al., 2013)

The relationship between parties must have a win-win nature and must be arranged by a contract which establish the range of activities and the length of the co-operation. With time TPL become part of the tactical and strategical dimension of the firm, by a broader range of activities, customization of logistic solutions, long term duration of contracts and sharing of benefits and risks (Marasco, 2008). The concept of TPL can be viewed also as a set of three dynamics relationships in the supply chain that link seller, buyer and logistic service provider (Bask, 2001).

While defining relationships, market equilibrium has a central importance. The power structure, as indicated by dissimilarities among equilibrium, is very important in influencing contract designs, decisions at the firm level and channel performance (Wu et al., 2015). The impact of power structure on the decisions of the logistic service level and price and channel performance rises as the performance of logistic service level increase (in terms of product surviving quantity and freshness) (Wu et al., 2015).

3.3.5. SUPPLY CHAIN INTEGRATION

Supply chain integration can be defined as the extent in which separate parties co-operate together to reach a mutually acceptable outcomes (O’Learly-Kelly and Flores, 2002). In a very competitive environment, managing the internal operation is no longer sufficient to be competitive, it is necessary to integrate in the value chain activities of all the parties involved in the business (Prajogo and Olhager, 2012). Particular importance has the contribution of suppliers to deliver value to customers in terms of quality, delivery, flexibility and cost. Collaboration between parties is essential to improve the general efficiency of the supply chain; example of this collaboration can be collaborative planning, forecasting and replenishment (CPFR) (Prajogo and Olhager, 2012).

In the recent past, many different studies have examined supply chain integration with the main goal of individualize how to enhance the final performance. The impact on performance can be derived from internal and external integration. Performance can be analyzed from different point of view - overall performance, plant performance or new product development performance (Jayaram and Tam, 2010). Performance is enabled by factors such as information integration, relationship building and frequency, level and content of communication among parties. Another important aspect is long-term relationship between parties which are considered strategically integrated with firm’s operations. Long term relationship are a pre-requisite to achieve integration of logistics activities and information in the supply chain (Prajogo and Olhager, 2012). Growing importance is given to long-term contracts with suppliers and reduced number of suppliers rather than large base.

In the scheme below the connection between long-term relationships, integration of information and logistic and competitive performance is represented. Better information technologies and information sharing have a direct positive

impact on the integration of logistics systems, and, in turns, indirectly on operational performance (Prajogo and Olhager, 2012).



Figure 13 Effect of integration on performance (elaborated from Prajogo and Olhager, 2012)

INFORMATION INTEGRATION

The term information integration refers to sharing the key information among parties in the supply chain (Prajogo and Olhager, 2012). The flow of information (backward integration) in the supply chain is equally important to the flow of goods (forward integration). Integration in the supply chain comprises both flows and it is characterized by a high level of logistic-related communication and high co-ordination in logistics activities between the company and its suppliers and customers making the distinction of activities more blurred (Prajogo and Olhager, 2012).

The flow of material from upstream to downstream should be supported by the flow of information on the reverse direction. Information technology plays a central role in integrating information. It allows the firm to increase the amount and complexity of information to communicate. Without a well-managed IT system and communication, coordination, participation and problem-solving activities cannot succeed (Prajogo and Olhager, 2012). By real time transmission and processing of information, it is possible to make better decisions which enable the company to lower the costs by the control of logistical activities such as inventory management, delivery status and production planning schedule, and forecasts and align firms in their operations (Prajogo and Olhager, 2012). Information integration must be supported by both IT and willingness to share between parties.

The intensity of communication leads to a higher degree of symmetry of strategic information flows between parties in the supply chain. The benefits of this cooperative behavior affect inventory management, agility and flexibility in the chain and bullwhip effect (Prajogo and Olhager, 2012).

LOGISTIC INTEGRATION

The term logistic integration refers to the integration to the logistic functions of different parties. Integrating the activities of all parties in the value chain contribute to make the production process smooth. Integration of logistic system permit to parties to act as a single entity which improve the efficiency in the supply chain by reducing several problems like the bullwhip effect and unreliable order cycle (Prajogo and Olhager, 2012). In fact by integrating logistic activities firms can benefit from the advantages of vertical integration (like higher control, planning facilitation, low costs, low risks and higher quality) without necessarily having it in the physical sense (Prajogo and Olhager, 2012). Studies demonstrated that firms with a higher degree of integrated logistic activities also shows better performing plants from an operational point of view (Prajogo and Olhager, 2012). Enhancement in performance by integrating process can only be achieved in presence of structural characteristics such as the mutual commitment by SC partners (Jayaram and Tam, 2010). Logistic integration must be supported by preliminary integration of information between partners (Prajogo and Olhager, 2012).

A company that integrates 3PLs, like transportation and warehousing service providers, can be expressed as an entity that includes third party logistics providers in its strategic efforts. For example, this effort can derive from the integration of information between local producers and 3PLs (Jayaram and Tam, 2010)

3.3.6. QUALITY CONTROLLED LOGISTIC

The focus on quality of agri-fresh produce makes the design of agri-food supply chain network complicated. Quality can be perceived in different way, as product appearance, safety and shelf-life and it can only be maintained by an appropriate control of temperature in the supply chain (Smith and Sparks, 2004). Real-time information may be a good pro-active way to improve the design and management of agri-food supply chain network in order to prevent quality (Van der Vorst et al., 2011). By real-time information, the quality of a fresh produce that arrive to a certain phase of the supply chain can be known in advance being able to optimize the process and environmental conditions (Van der Vorst et al., 2011). Despite technological development and quality assurance systems has made important steps ahead towards quality managements, an integrated approach has to be considered (Van der Vorst et al, 2011). The concept of quality control logistic (QCL) is defined by Prof. Van der Vorst as:

“ that part of supply chain management that dynamically plans, implement, and control the efficient, effective flow and storage of food products, services and related information between point of origin and point of consumption in order to meet customers’ requirements with specific attention to the availability of specific product qualities in time by using real time product quality information in the logistic decision process”

(Van der Vorst et al., 2011)

The concepts of QCL involves a pro-active control in all processing stages of the chain. Quality control logistic starts with the customer requirements on the particular market segment so that products with same characteristics are clustered together at the beginning of the chain. In each phase of the supply chain comparable decisions are made by matching demand for a determined product and the price of the product given the available supply with its variation in quality prediction (Van der Vorst et al, 2011). Afterwards, decisions are taken on redirecting the goods to other market or on modify quality by technological equipment (Van der Vorst et al., 2011). The scheme below summarize the quality control process among the chain.

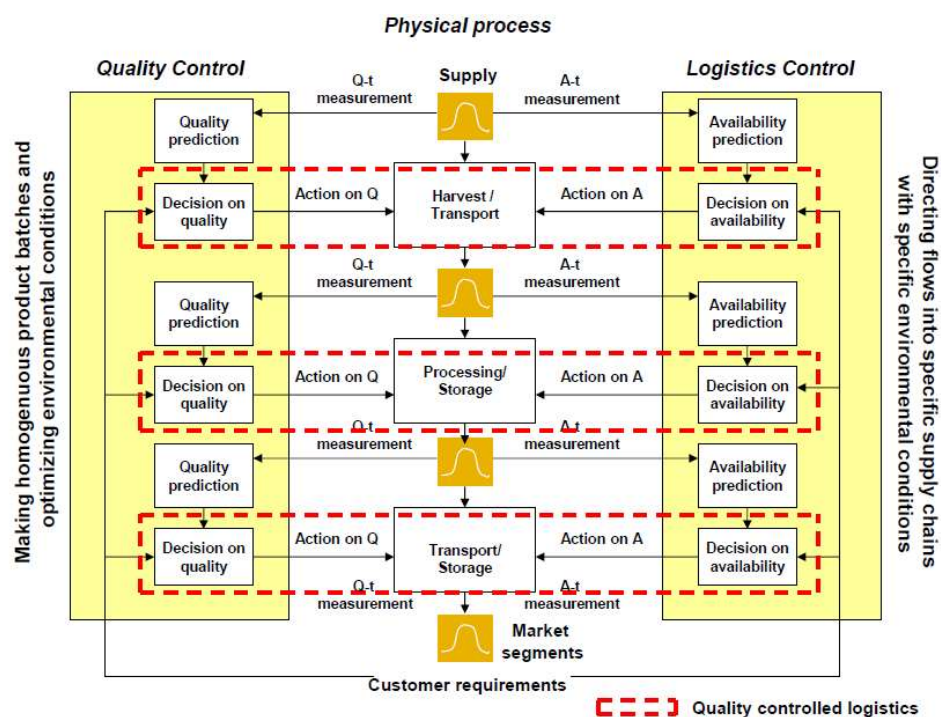


Figure 14 Quality control concept (Screen copied from Van der Vorst et al., 2011)

3.3.7. DEMAND MANAGEMENT FRESH PRODUCTS

In this chapter demand management for fresh produce is presented. It is important to guarantee an effective inbound and outbound flows of fresh produces, and logistics across the supply-demand networks. The chapter is divided in a first part which analyses inventory management for fresh farm produces and a second part which is about the ordering process.

3.3.7.1. INVENTORY MANAGEMENT

The control of inventories constitutes an important logistics operation, especially if products have a limited shelf-life (Cohelo and Laporte, 2014).

The main challenges of perishable product from an inventory point of view are:

- Uncertain demand (Duan and Liao, 2013)
- Limited shelf life (Duan and Liao, 2013)
- High customer service requirements (Duan and Liao, 2013)
- product cannot be stored or produced in advance (Stanger, 2012)
- Pricing has an important role (Stanger, 2012)

Inventory management is related to the customer service. Is about making a trade-off between responsiveness to market needs (let possible to find the desired product available at any time and in any location) and efficiency (Cost reduction). On one hand assortment and shelf availability of fresh produce have a great influence on customer's choice. For example in case the fresh produce is not available on the shelf, losses occurs. On the other hand, wastage of fresh produce, as a result of too high product variety and safety stocks at the retail sector can be as high as 15% which implicate severe loss in profit (Duan and Liao, 2012). A trade-off has to be made between shortages (stock-outs) and product losses deriving from the perishable nature (Stanger, 2012). An efficient management of perishable inventories occurs when wastage deriving from expire time are minimize and the on-shelf availability is satisfied (Stanger, 2012).

INVENTORY POLICIES

Inventories policies decide the management of items of different ages held in inventories. It is about deciding which item to offer to customers and it is strictly associated with revenues (Coelho and Laporte, 2014). The age and value of fresh products held in inventories, most of the cases determine the specific carrying costs because influence the insurance costs which are value related (Coelho and Laporte, 2014). Another important parameter linked with the product age which affect the monetary returns is the value perceived by customers. In fact, the management of perishable inventories may assume a strategic role in maximizing revenue by paying attention to the value expectation of customers. In this context, three different policies can be identified according to different selling priority (Coelho and Laporte, 2014):

1. **Fresh first** (FF): The fresher item is sold first so that customers always have the fresher products but at the same time there is a high rate of spoilage. This policy coincide with the traditional FIFO only if the deliveries from the

suppliers to the retailers are always of the fresh items. This policy is more advantageous if fresh produce deterioration rate significantly affect price. (For example for fresh flowers)

2. **Old first** (OF): The oldest products are sold first. If on one hand surely it generates less wastage, on the other hand revenue are not maximized. This policy is generally more advantageous if the deterioration rate does not affect the price (For example in case of bottle of milk).
3. **Optimized priority** (OP): It embraces the two extremes being more flexible and general. It lets the model to determine which item to sell at any given period in order to increase revenues. Depending hence on the parameter settled in the model, a policy can be preferred over the other. The solution under OP policy may coincide with FF and FO depending on the inventory level and the revenue function of the product under consideration. Op policy have the advantage that it does not impose any constraints about the age of products while coming up with the most profitable solutions.

3.3.7.2. ORDERING POLICY

The order policy balance performance objectives, for example flexibility against cost and availability on the shelf (Rijpmeka et al., 2013). The literature offers a number of policy of order for perishable products. The ordering process in the fruit sector is typically periodic, because the perishability aspect restricts the chance to have buffer inventories (Romsdal, 2014). Having a restriction in the amount of inventories limits the possibilities to exploit economies of scale. Another factor that limits the possibility of keeping high amount of inventories is the product's variety.

Because is hard to have a stock level for each possible age category of inventories, finding an optimal ordering policy for perishable inventories with stochastic demand is complicated (Duan and Liao, 2012). For perishable inventories the three most suitable ordering policies investigated up to now are: **Order-up-to policy**, **EWA policy**, and **Old inventory ratio (OIR) policy** (Duan and Liao, 2013).

3.3.7.3. POST-HARVEST AND DISTRIBUTION PLANNING

As the domestic market opens to global competition there is a shift in focus from a single echelon system to the efficiency of the overall supply chain. To remain competitive in such a market, more sophisticated activities such as SC planning and coordination are required. Planning activities for agri-fresh produce are complex due to the high marketing uncertainties, supply uncertainties, short shelf-life and long lead times (Ahumanda and Villalobos, 2009). A lack of planning activities for fresh products in the past years is due to the fragmented nature of the industry which makes hard the implementation and maintenance of such activities (Ahumanda and Villalobos, 2009). As the industry became more consolidated, more logistical activities are performed, especially those activities directly performed by the producers like packaging, distribution and final delivery (Ahumanda and Villalobos, 2009). Integrated planning models have an increasing importance for medium large companies especially if growers are in charge also on the distribution. As more retailers buy directly from the producers, skipping intermediaries and wholesalers, the importance of planning activities at the production level will increase representing substantial savings and increased efficiencies (Ahumanda and Villalobos, 2009).

HARVEST PLANNING

Farmers of fresh agricultural products very often have to deal with complex planning problems such as technology to use and timing of harvesting (Ahumanda and Villalobos, 2011). Planning activities can occur at different levels; for example decisions on infrastructure can be considered strategic level planning problems while short-term decisions on harvest and distribution can be considered as operational level planning (Ahumanda and Villalobos, 2011). Profit and losses for perishable crops are very dependent on the second type of planning (Ahumanda and Villalobos, 2011). Planning models should take into consideration the tradeoff between loss of value due to the perishable nature of products and costs incurred to prevent that loss (Ahumanda and Villalobos, 2011).

Harvesting planning models should consider the distance of the final market and preferences of final consumers in order to schedule the harvest time at the correct level of fruit ripeness. For this reason farmers have to balance the market demand with their costs and operational limitations (Ahumanda and Villalobos, 2011). The main decisions to take while planning harvest are (Ahumanda and Villalobos, 2009):

- amount of product to harvest per period
- routing of harvesting among plots
- amount of workers to hire or to lay off for each period
- how to transport the harvested product
- how to allocate transportation equipment
- scheduling activities of packing and sorting

POST-HARVEST PLANNING

Production-distribution planning activities for fresh fruits are less implemented in the real life yet. Decisions included in these models are (Ahumanda and Villalobos, 2009):

- Total number of produce to produce and to transport to the cooled warehouses or directly transported to customers
- Capacity-related decisions
- Selection of post-harvest processes

3.4. CONCEPTUAL FRAMEWORK

After having analyzed the literature on agri-fresh supply chain, in this chapter the topics are related to each other and conceptualized. The theoretical framework presented below provides the connection between theories in the value chain for agri-fresh produce. In the outline presented, logistics management - concept C in the scheme below - has a central role. The research provides logistics options for the KiwiBerry supply chain assuming that logistics management is dependent from demand characteristics of the final market and technical aspects of the chain.

The following framework explains how the choice of a logistic scenario is derived. As explained in the literature (Ch. 3), logistics management for agri-fresh produce is composed by 6 main aspects: Infrastructure design, transportation modalities, third party logistics providers, supply chain integration, quality control logistics planning activities, SC integration, and demand management. As displayed in the scheme, those processes are influenced by two independent concepts: demand characteristics and specific technical aspects of the fresh produce. The former consist in the delivery demand while the latter is considered in each of the 6 handling phase from production to transportation and the cold chain

The research also takes into consideration the overall efficiency of the distribution process in terms of quality, time, costs and post-harvest waste. Different logistics scenarios result from logistics management.

Other relationships between these factors exist in the real life; for instance there is a relation between technical aspects and market characteristics. An example could be the rate of ripening of the fruit or the choice of variety which are also determined by the specific final market. However, this study is not exploring these aspects since it is not the prime objective of the research..

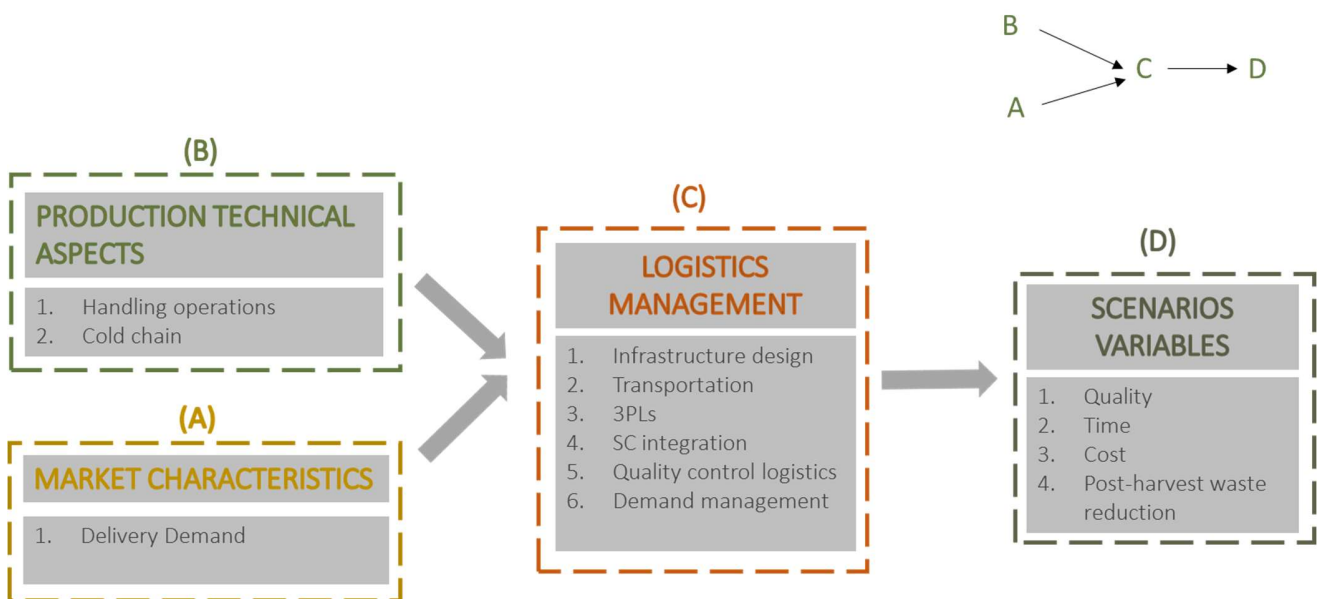


Figure 15. Conceptual framework of the research

4. MATERIALS AND METHODS

In this chapter the methodology of the research, which was already initiated in Ch. 2, is discussed. In order to answer to the research question the most relevant concepts of the literature are isolated and the relationship between the concepts is explained. The chapter continues with the description of the design for the empirical research and the analysis of the sample population.

4.1. METHODOLOGY ADOPTED

The research adopted a theory building approach. The choice of this method is because it allows to build knowledge which is rigorous, practically valuable, and able to stand to mutable settings (Charlile and Christensen, 2004).

The first phase, the research consisted in building a descriptive theory (literature study). In this preliminary stage the basis for the development of the normative theory are formed. The descriptive stage involved three main steps: Observation (description and measurement of the agri-fresh supply chain), classification (division of the phenomena into different categories) and preliminary definition of relationships (association between the category-defining attributes and the outcomes to construct a model) (Charlile and Christensen, 2004). These three main steps were associated by an inductive process.

To the descriptive theory phase follows the normative theory step. In this part of the research, the specific causes of the outcome predicted are defined. This phase was also structured in three main steps: Observation of the phenomena, categorization of concepts and final statement of causality.

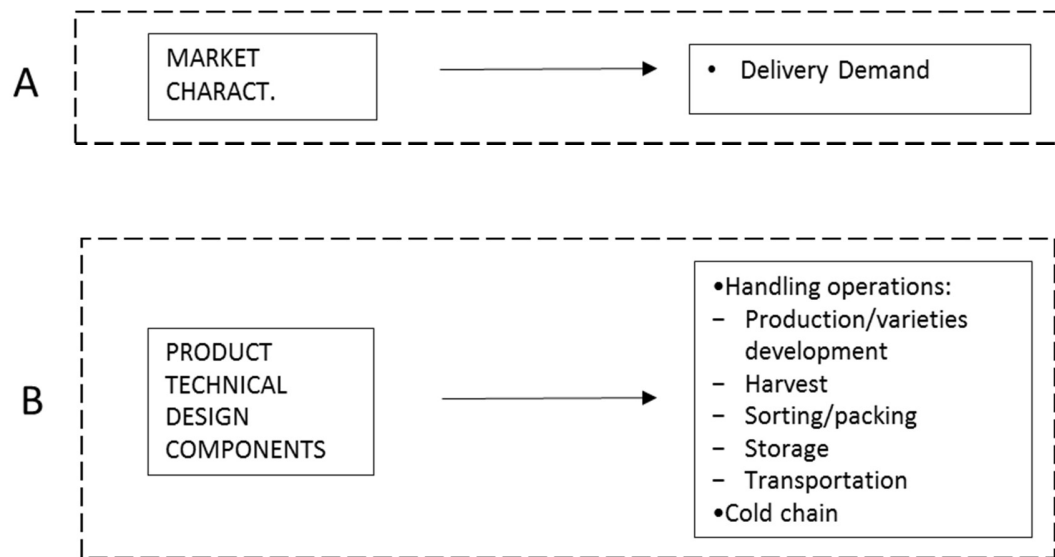
The final moment in which new theory is created is when anomalies – observation which were not expected – are founded. This part is described in the final chapter about conceptualization (phase E of the theoretical framework)

4.2. CONCEPTS CLASSIFICATION

The research aims to investigate possible logistics and distribution options for the Kiwiberry supply chain in New Zealand. As it appeared in the literature there are three main concepts to consider for Kiwiberry supply chain: potential market characteristics, products technical design components and logistics managements. The research is oriented to investigate how product technical design component and the choice of a determined market influence possible logistics and distribution options for kiwi berries. The output of the research are logistics scenarios which will be created by the combination of those three factors. The following concepts A, B, and C, aims to facilitate the formulation of the questionnaire design and to help in creating correlations among variables.

1. A: Market characteristics
2. B: Product technical design components
3. C: Logistics managements

In the schemes below these concepts are better explained. In the left boxes the concepts from the literature are presented while in the right boxes the main areas of investigation according to their concepts is given. The structure of questionnaires will reflect this configuration.



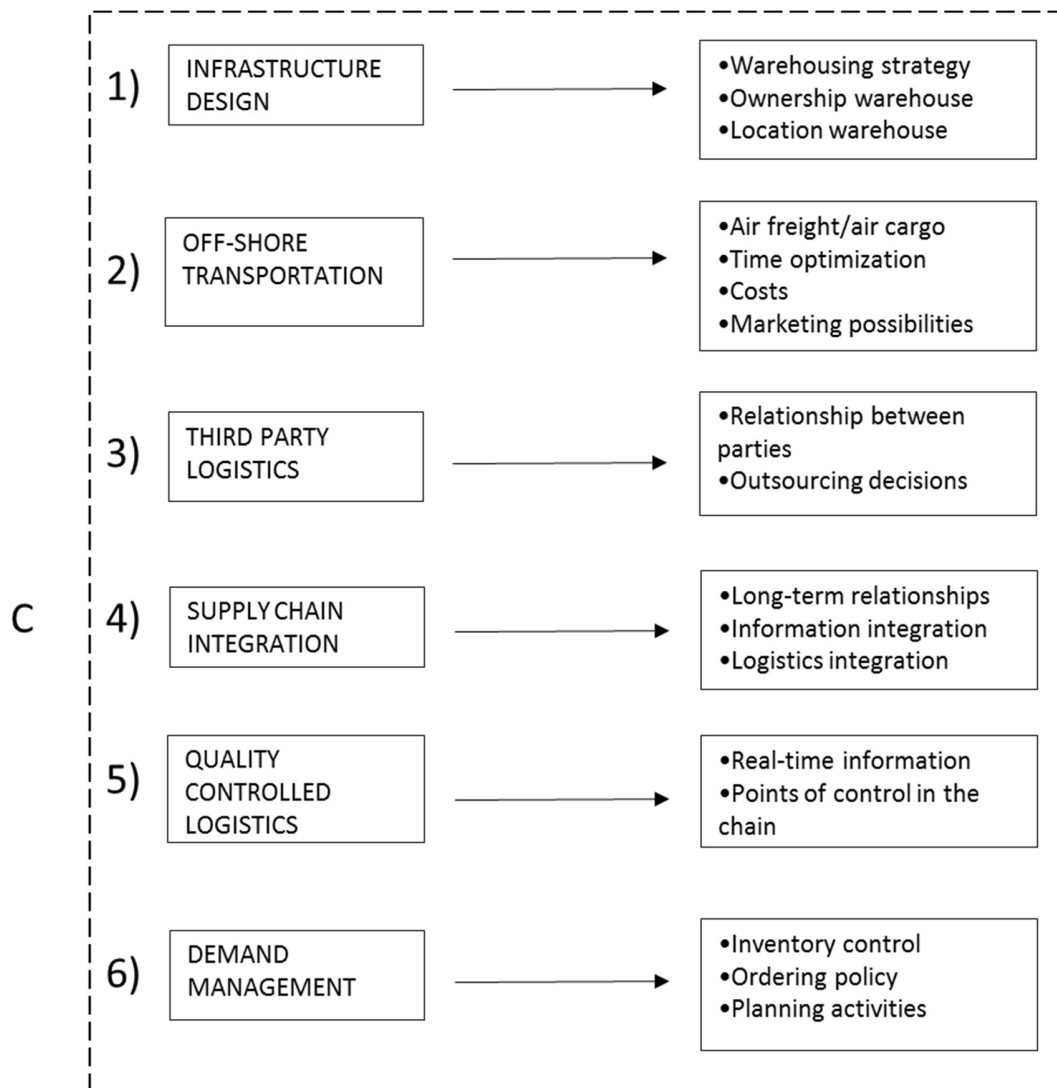


Figure 16 conceptualization of the main concepts from the literature and their field of research

4.3. RELATIONSHIPS BETWEEN FACTORS

The model above is characterized by four important relationships. It is assumed that market characteristics (A) and technical design components (B) are independent.

1. **A → C:** It is assumed that the final market, in terms of delivery demand, has an impact on the distribution choices of a company. In particular, in transportation choices, infrastructure design, distribution planning and demand management.
2. **B → C:** Production process aspects put constraints in handling operations and on the cold chain managements. These constraints have to be considered while managing logistics. In particular in infrastructure design, transportation choices and quality control.
3. **C → D:** Logistics management results in a balanced trade-off between quality, time, costs and post-harvest waste. These scenarios are the results of the link between all the three concepts from the literature.

4.4. DATA COLLECTION

This research make use of documents and people to investigate logistics and distribution options for Kiwiberry chain in New Zealand. Those two sources of information are linked by content analysis which is a suited method for practice oriented studies.

- *Documents*: The literature study is a qualitative form of content analysis. It mainly rely on scientific articles, market reports and books. Articles were selected using key worlds by different search engines, the most used were Science Direct, Scopus, Google Scholar, Global search and Emerald insight. Documents were used to construct the theoretical framework.
- *People*: The purpose of this source is to understand better three main aspects: the current Kiwiberry supply chain in New Zealand, market characteristics and comparative supply chains which are used as case studies.

In the table below, the sources of information are categorized for each research question.

Research questions	Type	Source category	Method	Source
GRQ What are options for logistics and distribution structure of Kiwiberry in New Zealand?	Knowledge	Literature People Documents Media	Search method Content analysis	Combination of academic literature searched on the different topics and case studies
SRQ 1 What are potential markets for Zespri's Kiwiberry and what are demand characteristics?	Knowledge and data	Documents	Search method Content analysis	Academic literature Euromonitor reports provided by Zespri Colloquia with actors in the Zespri supply chain Internal company files on market development
SRQ 2 What are logistic technical design components of the fresh berry supply chain?	Knowledge and data	Documents People	Search method Interviews	Scientific articles colloquia with actors in the NZ KiwiBerry supply chain
SRQ 3 What are distribution strategies in the fresh berry supply chain?;	Data	Literature People	Search method Interviews	Scientific articles colloquia with actors in the NZ KiwiBerry supply chain
SRQ 4 How are comparative (kiwi)berry value chains structured (logistic and distribution strategy)	Knowledge	People Literature Media	Content analysis and Interviews Search method	Skype/phone interviews if possible Case studies analysis and producers websites
SRQ 5 Wwhat are options for improvements for Kiwiberry supply chain in New Zealand	Knowledge And data	People	Interviews	Questionnaires results and literature study

Figure 17 Sources of data collection

4.5. INTERVIEWS DESIGN

Theories and findings from the literature are selected and converted in variables for questionnaires. Semi-structured interviews are used to gather data on three main concepts: Products technical design components, Logistics management and Comparative supply chains.

According to those concepts, different types of interviews are necessary, each of them follows a precise structure given from the literature. This structure will form the interview guide which consist in a clear set of instructions for the interviewer. Having a structure prepared ahead of time during interviews permits to follow a topical trajectory. By these instructions it is possible to provide reliable, comparable qualitative data.

Because the field of the research involves the whole supply chain different set of questions are tailored for each actor of the chain. A first set of questions is specifically designed for the NZ product technical design components, it will provide a clear and complete description of the operative phases which will serve as a basis to create feasible logistics scenarios. The second set of questions will cover logistics management concepts. Since logistics management is the object of the research, this last type of questionnaires will be the same to apply both to New Zealand supply chain and to comparative case studies. This strategy will allow the investigation of other similar supply chains to be based on the same concepts in order to make the information gathered comparable.

The design of the interviews was deliberately chosen open in order to gain more insight about the concepts above. Since the research aims to explore something relatively new (kiwiberry supply chain), semi-structured questions allowed for a certain degree of freedom that permits the people interviewed to feel free to describe each question in their own terms. In particular the choice of open-ended questions provides the occasion for detecting new ways of seeing and understanding the subject. Quantitative questions, in contrast, would have impose too many constriction to the answers.

4.6. RESPONDENT OF INTERVIEWS

Respondents of the study can be classify in different categories since the empirical research involves the whole supply chain. According to the concepts presented in the previous paragraph, different type of expert were selected.

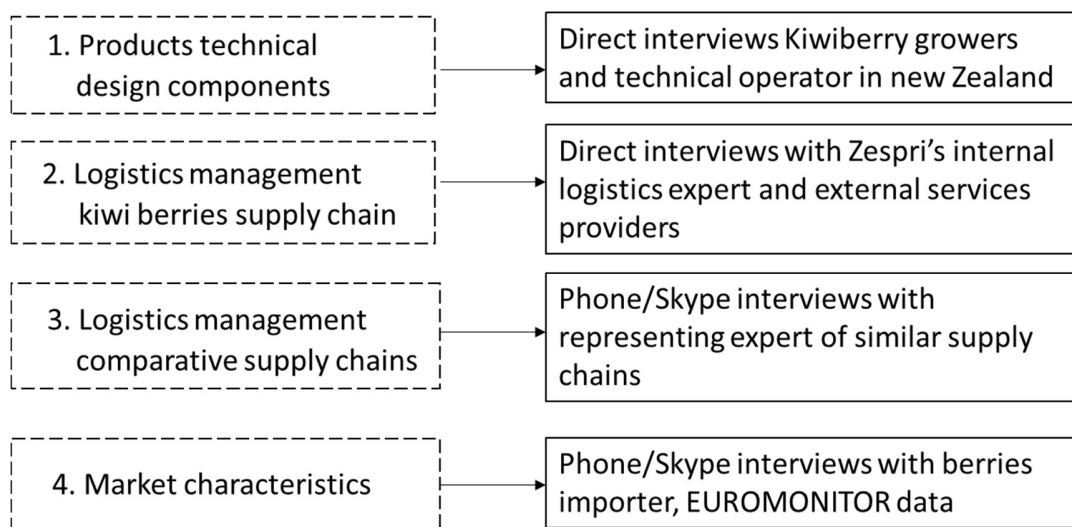


Figure 18 Type of respondent for each concepts

Since the concept of logistic management (2 group) is the most complex one, in the following table, a classification of people to interview for the empirical research in New Zealand is presented.

C- Logistics managements concepts

Concept	Aspects	Name of the expert interviewed
1) Infrastructure design	Warehouse role	Geoff Oliver
	Ownership facilities	Robin Dillmore
	Location facilities	Tony ponder
		Richard Trafford Mike Torr
2) Air transportation	Air freight/cargo	Cameron Hill
	Time optimization	Robin Dillmore
	Costs	Steven Bunyan
	Marketing possibilities	Sasha Patete-Marsh
3) Third party logistics	Relationship	Robin Dillmore
	Outsourcing decision	
4) Supply chain integration	Long-term relationships	Margot cotter
	Information integration	Mike Torr
	Logistic integration	Bryan Parker
		Tracey Burns Tony Ponder Richard Trafford
5) Quality controlled logistics	Real time information	Margot Cotter
	Points of control in the chain	
6) Demand management	Inventory management	Vaughan Judkins
	Ordering policy	Linda Mills
		steven Bunyan
	Planning activities	Sasha Patete-Marsh Geoff oliver Tony ponder Tracey burns

Figure 19 Person to interview for logistics management

4.7. VALIDITY AND RELIABILITY

Validity and reliability are important aspects that determine the quality of a research. The concept of validity indicates how accurately the chosen instrument, which in this case are interviews and market reports, measures the intended object. The concept of reliability refers to the consistency of the measurement in another circumstances.

- **Validity**

Since the herein research is mainly focused on one single case study, the internal validity is very strong while the external validity is weaker. Especially in the fruit business where the production environment

of a crop can change enormously even from a region to another, having an external validity is very hard. Since many different variables may change from different parts of the world it has to be said that the research cannot provide basis for statistically valid generalization. However the herein research can provide general indication on how to arrange a fresh berry supply chain. To make the research more externally valid the comparative supply chains have a relevant impact since the construction of the questionnaires is based on the same variable for the NZ kiwi berries supply chain. Moreover, the people interviewed were selected on the base of their specific background. All of the interviewees were highly targeted because of their key role in their precise supply chain.

In regards to the internal validity, a first complete literature overview has been made about berries market characteristics, technical aspect and management of fresh fruit supply chain. The literature study constitutes a basis to be investigated by the empirical research where the interviews have a central importance.

The validity of the research is guarantee by the formulation of questionnaires that reflect the theoretical framework in its variables. Those variables has been created by the operationalization of the concepts described in the theory.

- **Reliability**

The interview format guarantee reliability of the research. In fact thanks to the pre-defined structure the research gains the same type of knowledge from the same type of actor. By executing the interviews in this format tried is to achieve the same results in every interview.

5. EMPIRICAL RESEARCH RESULTS

5.1. KIWI BERRIES TECHNICAL PRODUCTION ASPECTS

The Kiwi berries industry in New Zealand is still young. It is situated in the same area of kiwi fruit's production. The majority of plantings are in the Bay of Plenty, located on the northern coast of the north island. There are small plantings in Canterbury, Nelson and Auckland. At present, there are approximately 80 hectares in commercial production with a yield of about 459.030kg. The average production per hectare is around 20.865,25 kg but it can differ significantly from different orchard (up to 33.000kg/ha). There are 3 major varieties cultivated: Marge Red, Takama green, K2D4. The last variety is owned by one of the biggest exporter named Freshmax and requires license to be cultivated. The majority of growers are involved also in the kiwifruits production. However all growers believe that the two crops have completely different traits. Historically in the bay of Plenty there has been only two pack-houses dealing with kiwi berries: Southern produce and Kiwi Produce. The situation has recently changed by the privatization of one variety of kiwi berries, the K2D4, which has brought many growers to leave the industry because of the high costs related to the licence. As a result, the industry has got consolidated and Seeka, one of the main kiwifruits pack-house which has direct contract with many growers, has planted a big portion of K2D4. AT present, only 8 exporters are marketing New Zealand Kiwi berries. Fresh max deals with 15 growers (30 or 40 if considered that Seeka is composed by many growers). Delica, Southern produce and Freshmax are the major ones.

In the following section the main results regarding the first part of the supply chain (production and post-harvest operation) are presented.



Figure 20. Kiwi berries Orchards in the Bay of Plenty

5.1.1. VARIETIES DEVELOPMENTS

There is currently a significant ongoing research in the bay of Plenty to find an optimal variety of kiwi berries. The most important factor is understanding consumer response in terms of consistency of both eating experience and flavor experience. For example, a central aspect to consider is the size of the fruits since it impacts the consumers liking, and therefore the willingness to pay a higher price. Fruits size also influence harvest efficiency per kg and therefore yield per hectare.

Storage life is another major concern. There is presently a big effort in researching better storage potentials, by regulating cells structure and response to ethylene - always bearing in mind that, as berries, they have a completely different spectrum than kiwi fruit. Since Kiwi berries are climacteric, the response to ethylene has a significant impact from a distributive point of view. In fact, they cannot be shipped close to any fruits that release the hormone since it will trigger the maturity of fruits. Moreover, everything in the punnet which is overripe will shorten the storage of the entire product and not only of the single fruit. It is the same with kiwi fruits but, there, the shelf life threshold is already almost optimal - meaning that there will still time to sell the product with some profit.

Another aspects that breeders take into consideration regarding distribution is the possibility to increase the resistance of the skin against rubber.

Regarding the size of the cane, Kiwi berries and kiwi fruits are different species and therefore they also have different growth habit. It is about cultivar specific attributes. When it comes to optimizing cultivars, as it happened with kiwifruits, breeders learn what type to keep and what not to keep. Crop traits may be cultivar specific or generic across species; If are specific to the cultivar it is possible to choose a different cultivar that have different specific attributes. On top of that, nowadays breeders are developing low vigor root stock which may change the entire dynamics on how kiwi berries are grown.

One more aspect that breeders are looking at, regarding distribution possibilities, is varieties that consumers perceive as similar but are harvested in different time. At present, this option seems interesting but not yet technically doable to be taken as a model. The breeding project is already too complicated for just one variety. Each variety needs to have good storage, good taste, good yield, good color, and good disease tolerance. Having that in multiple varieties that have different harvesting time from on top of those is too far from the present situation. That is complicated and also unjustifiable given the market sizes approach. An initial outstanding variety has first to be created which will potentially evolve in having an extending variety grown in different locations and which holds in a high value market. The most important thing to develop at the moment is the extension of the shelf life to 16 weeks in order to allow sea freight. At present Plant and Food does not see any variety of Kiwi berries in commerce properly able to fill the gap in the supply chain and suitable for a commercial scale. The impacts that good root stock has on yield and strangeness of a crop is certainly positive but it is not taken into consideration in this first stage of the research.

Comparing kiwi berries to kiwi fruits, which are almost a viable business even without technology, kiwi berries to be a viable option require technological support. An important aspect for logistics and distribution is the interaction between genetics varieties and technology. For example, the technological response of the crop to Smart fresh (control of ethylene), CA, MA edible coats or packaging optimization. However, to study this association, it is necessary to screen down to few varieties since it is too expensive to test it with many different varieties. Most of the screening of varieties is done to make kiwi berries as much resistant as possible to freezing injuries in order to be able to store the fruits at 1 or 2 degrees and increase the storage life. In this way the cold chain of kiwi berries can be aligned to the cold chain of kiwi fruits. Nevertheless, shipping them together is too risky from a climacteric ethylene point of view. An Additional aspects to consider, which has not been touched yet by Plant and Food, is the relation between off-flavors and storage conditions of Kiwi berries,

One of the challenge in developing the optimal varieties, is that Plant & Food has now exclusivity for kiwi fruits breeding with Zespri. However, since Zespri gives plant & food freedom to commercialize these four kiwi berries varieties, it is now making research with other parties and also it is now optimizing the storage and technology. The challenge is coming from

the barrier between part of plant & food doing research work and part of plant & food doing breeding. This circumstance is not optimal since the ideal scenario occurs when technology scientist communicate with breeders. At this stage the main problem appears hence to be first of all political and lately related to science. Nowadays there is a confused co-funding space from Zespri and other parties in New Zealand funding plant and food to do the same research.

Main observations:

- Different varieties perceived as the same are hard to develop
- Consistency of flavor and eating experience
- Extension of storage life to 16 weeks
- Regulation of responsiveness to ethylene and cell structure
- The relationship between varieties and technology is essential
- More uniform size of canes
- Need for an unique source of funding

5.1.2. CHOICE OF VARIETY BY GROWERS

The choice of the variety, in most of the cases, seems not to be dictated by specific criteria but rather by chance. Many of the growers has been influenced reciprocally by exchanging seeds or by utilizing websites to get informed. There is the interest by growers to differentiate cultivars in order to reduce phytosanitary risks, reach different consumers and differentiate harvesting time. Having a longer harvesting time allows to spread the harvest and the volume for the exporters. It is also easier for the pack house because allows a longer packing season.

In the bay of plenty the first variety to be picked is the Takama green, in early January. This variety has a very short shelf life (1 week and a half) so it is only sold in the domestic market. The second variety to be picked is the K2D4, at around the 10 of February. K2D4 is only used in the export market because of its uniform color and good storage. The last variety is the Margi red, harvested around the 20th of February. This variety only turns red at the very end of the season and it is the last one to be picked for the export market (around 20th of February). By the time the red is ready there is one more harvest to go of the green. The Margi red is also the easier variety to grow since is less vigorous during summer and therefore easier to prune. All these varieties has a problem of inconsistent bud break which leads to inconsistent flowers bloom and hence diverse ripening time.

According to the director of Southern Produce, Tony Pounder, the best variety is without any doubts the K2D4 from many aspect. It stores better, it looks better, is more productive and also it taste better than the other two. Always according to him, the red variety is very unpredictable since it has different degrees of blushing from season to season. Also Mike Torr, grower, prefers K2D4 because of the best storage conditions (from 8 to 10 wks) with the hope of starting a see freight program. He avoid Margi red and Takama green because they require a careful handling offshore and a fast supply chain.

K2D4 is therefore becoming the major variety, it has become the focus of marketer and has become a focus of everybody of the industry, it is seen as a sort of a base to start from.



Figure 21. K2D4

(www.guojiguoshu.com 2016)

In contrast, Geoff Oliver, owner of Kiwi Producer and CEO of NZ kiwi berries association, prefers Margi red. He believes that it has the better taste and react better to storage conditions.

All growers agreed on the willingness to have a more uniform maturity in the bunch from the chosen variety, higher consistency in the canopy and longer storage characteristics during the cold chain. Another very important point for growers is also to have a crop that doesn't tangle in the vine. The variety that appears to have the most severe problems of spare buds break and tangles in the vine is the K2D4. However, this variety is also the most productive one.

Main observations:

- Different varieties reduce phytosanitary risk
- Varieties are chosen by: taste, storage, canopy consistency and productivity

5.1.3. CULTIVATION PRACTICES

NZ Kiwi berry is grown on a pergola system with each plant growing in a 5 meter by 3.6 meter canopy area. The plants are dioecious, which means that separate male and female vines are required in the orchard for pollination to occur. KiwiBerry requires well sheltered land that is free draining and frost free in spring.

All growers agreed that the nature of the fruits is more similar to berries than kiwifruits and therefore shouldn't be treated as such. For example, Richard Trafford from Family Trust explained how normal practice for kiwifruits like fertilizing and the use of Hi-cane may ruin the kiwi berries yield. Special attention has to be paid to the use of fertilizers which may stimulate an earlier softening of the fruits which will complicate the distribution and increase field and post-harvest waste. Hi-cane is a chemical which is use on other berries, apples and stone fruits.

The main reason for using hi-cane it is not just increasing the number of flowers but it increases the uniformity of bud break timing, in such a way that, when it comes to picking, it is possible to pick all in once because the maturity and sizes of fruits are even. A uniform maturity will be a lot more cost efficient during harvest. Moreover, hi-cane does clean up wintering tangle problems because is highly acidic and, according to Mike Torr, may help to have earlier fruits to put in the market (5 to 10 days). Unfortunately there is not yet much science behind cultivation practice of kiwi berries as there is nowadays for kiwifruits and the use of hi-cane actually burned the tiny kiwi berries canes. This is mainly due to the high differences in sizes of cane in the kiwi berries vine and the big knowledge gap about methods of application of hi-cane. It will be a long learning process but growers like Mike Torr already started to use 6-8% hi-cane with promising results. According to Brian Parkers, that is related to the growth habit vigor, and Arguta is quite vigorous as a species having lots of small canes everywhere. Consequently, if it is grow it in a completely different way than kiwi fruits, and more like vine on a root stock that slow the vigor down or if a low vigor variety is selected to graft into the roof stock, it might give better results. It is all part of the breeding program and it will change the cost of management. (again an example where the technology might have interaction). Kiwi fruits without hi-cane have the same response in terms of non-uniform bud break.

Moreover, kiwi berries, being more like a berries, are more susceptible to sun burns, wind injuries and get easily smacked which reflects in a higher percentage of class 2 fruits. To reduce this effects a heavy canopy average is necessary but it takes about 5 to 6 year to establish it properly.

One of the most important practice in the field is winter pruning, if executed correctly it makes the difference in terms of productivity per hectare. The main purpose is to untangle the vigorous vines and to create a uniform small size's canes which allows for a higher yield. Summer pruning is barely considered since it is a crop that seems to prefer a higher density of cane to be protected. Moreover, at any time the vine is touched there is the potential risk to create damages and reduce the yield. However, each orchard have different pruning practice depending to the exposition to the sun and wind.

Main observations:

- Inconsistent bud breaks is a key issue to guarantee consistency of yield
- Hi-cane may help in increasing uniformity but the risk of burning the cane is high
- Accurate pruning techniques increase the yield
- Weather is one of the major uncertainties
- The density of the canopy has a key role to productivity

5.1.4. UNCERTAINTIES IN THE FIELD FOR PLANNING ACTIVITIES

The main uncertainties in the field are related to crop damage by insects and harvest window. Missing the optimum harvest period have a high impact on yield. Another important uncertainty is weather, especially in NZ where it can be really unpredictable. A strong wind can create severe skin damages because fruits are a lot more sensitive than kiwi fruits. A strong sun can be even more dangerous. According to Mike Torr, it creates the biggest physical damage for kiwi berries. It not only creates scars in the skin but also create different coloration of fruits in the punnet. Sun problems are more frequent in the first 3-4 years of the orchard when the canopy is still not dense.

These variables are especially important in December, when fruits are still little.

According to Tony Pounder and Mike Torr, the biggest uncertainty for the whole business is predicting the actual quantity of production which is partly explained by the above mentioned variables. All growers agree on the fact that the ease to make planning is proportional to the experience of the grower. For expert growers it is not harder than normal kiwifruits. Mike Torr, for example, has enough canes to produce 15 or 20 thousand trays but since he just started, he just had a yield of 3 thousand trays. Before hi-cane was applied to kiwi fruits there used to be a variability of 50% of supply. Hi-cane has also been a great marketing tool regarding predictability of the yield to farmers. The production, instead of going up and down, have a consistent crop to forecast over time and invest properly to stimulate demand for the following season. Otherwise it result hard to manage demand and invest actively.

Main observations:

- The main uncertainties in the field are related to sun, wind and insects
- Yield predictability is not stable

5.1.5. HARVEST

Harvest is one of the most important activity that impact distribution. Harvesting is a very critical phase since it should make a balance between preserving the pressure and aligning the maturity of the fruits.

Normally kiwi berries take three to four weeks to be picked since the fruits mature in different times on the vines. Harvester have to go through the same vine 3 to 4 times before completing the harvest. The best way to increase storage is to reduce the picking window to two weeks and store it in a cold store. According to Geoff Oliver, the fruits tent to last longer in the vine rather than in the cold store so it is better to leave it there and pick it when needed for sell rather than keep it in stock. The problem- he explained- is that on the vine they get softer and the brix level increases.

The firmness of the fruits at harvest is a very critical factor, the harder fruits are, and the better they can be distributed. On the other hand, the taste and the sugar brix level also has to be guarantee to deliver good quality to consumers. According to Brian Parkers, multiple harvest has positive and negative aspects. On one hand is certainly not the most cost efficient way to pick fruits; but on the other hand he believes that may also be positive – saying - *“when you are trying to supply for four*

months and you have got three weeks of storage and you only have got one site of production, then it is actually useful if you get mix maturity”. Currently, it completely differ from the strip harvest and store model of kiwi fruit.

The grade of ripening at harvest have a minimum brix of 6.5 with 90% black seeds. It used to be more than 7 but then the fruits were too soft and hard to storage. This is the only minimum standard as groups. Less than 6.5 the fruits does not have any taste. If it is 6.4 it cannot be picked. In order to have the clearance to pick from the packhouse, a grower must have a spryer kit by an independent body, a grower must have no residue test in library equal for all growers and the fruit must have gone under a maturity test. Growers prefers to pick the fruits at 6 brix because they would have less uncertainties but on the other hand they understand the quality of the fruits for the export market is important. According to Mike Torr, if fruits are picked at 6.5 brix you may have only 5% reject on soft fruits that early ripened on the vine which is still a reasonable percentage.

According to Richard Trafford, the brix should be even lower to maintain the waste level low. Always according to him, after the first brix measurement at the beginning of the season (around the 10 of February), which determinate the starting of the harvest, fruits are picked by size and normally the biggest fruits are the earlier flowers. By this size criteria the brix level at harvest is not scientifically measured and the more you go ahead with the season the harder is to have consistency in sugar brix. For each harvest, the pack-house takes 20 fruits for each variety and they send it to wellington for analysis on brix and dry matter. The problem with the measurement is that they tent to pick the smaller ones to have a safety margin, and this is not an effective representation of the fruits on the vine. According to Richard Trafford, when it comes to picking, a lot of honesty is going on since it is up to the grower to pick just the very big fruits and not also the small ones.

By the time the bigger fruits are picked the later flowering fruits grow but all in different level which makes it very hard to predict the sugar content and to respect a certain standard maturation. That is the main reason behind multiple harvest. This inefficiencies in the way fruits are picked leads to a high level of waste in the field and during post-harvest operations. By having just 3 harvests per vine, many fruits are lost in the ground because are too mature for the coming harvest and too less for the previous one. During post-harvest operations many fruits are lost because of non-uniformity in the punnet. To avoid this problems, Freshmax is making many maturity test, if the brix is not enough they pack the fruits few days later. Also according to them, brix and size are not correlated having cases of bigger fruits with lower sugar brix. Grower like Richard Trafford have the opposite opinion. A more scientific analysis is therefore necessary to clarify this point since fruits size has such an important role in determining harvesting time.

The harvest procedure is very different for Kiwifruits; they are picked all in once, and only after, they go into grader to be sorted by size criteria. For Kiwi berries, since they are currently manually sorted, it would be too expensive to do and thus multiple harvest also can be seen as a pre-sorting technique.

Regarding dry-matter there is not yet a regulation behind kiwi berries as there is for Kiwi fruits. The reason behind is that, according to Mike Torr, dry matter is always above the brix level and thus growers would never have to wait for the correct dry matter as it is happening for Kiwi fruits. It is rather on the other way around, where the dry matter appears against the brix, thus, growers are waiting for brix only.

Another aspect significantly important for distribution is the way fruits are picked. Since it is a very delicate fruit, the harvest has to be done manually and with particular care. According to Tony Pounder, as there is a lot of variation in maturity on the vine, only a prime person is able to determine the best ripening level. A possible way to operate is by contracts, so paying harvester per volume and not by air. The only danger with that method is that harvester picks everything and the quality drops over.

During harvest fruits are placed in small containers since kiwi berries are more similar to berries in this aspect. Different operators have different methods. Seeka for instance puts them in a 4 kg plastic boxes to avoid any mechanical damage.

After harvest fruits are placed in big box of 70 kg and then into trays of 17 boxes. After having been gathered in the shade during the picking day, berries go into cold store the same night. The morning after fruits are graded and packed.

Main observations:

- Harvest modalities influence consistency in brix measurement
- Dry matter at harvest is always ready before the correct brix level
- Paying fruit pickers per harvest may cause drops in quality
- Multiple harvest increases the level of waste

5.1.6. DOMESTIC TRANSPORTATION

After harvest, fruits are daily transported to the pack house by private truck of growers. The overall transit time can be between 30 min to even 7 hours depending on the distance to the pack-house. Closer growers can also bring the fruits to the pack-house twice per day. The truck from growers does not have any T control system and air flow. From the pack house to the airport of Auckland it takes 4 hours with - in the majority of cases - refrigeration systems. In some instances, like for Southern produce, the truck is contracted by the pack house with specialized transport companies for flowers and fresh produce. Since there is not enough capacity to run on daily basis, southern produce has a third party logistic service providers that does certain stable volumes

5.1.7. SORTING

The first sort occurs in the field. Similarly to asparagus, fruits are picked and sorted together in the field. Later on fruits are manually sorted by eye control. This happens mainly for increasing uniformity of color in the punnet and to detect skin damages. By sorting, fruits are divided between class 1 and class 2. Only class 1 is destined to export. Automatic sorting

methods are not yet adopted especially since it would be hard then to sort by color three different varieties. According to Geoff Oliver, the quality of fruits can only be guaranteed by manual sorting procedure. The procedure in the pack houses seems not be yet particularly sophisticated regarding preservation technologies, like washing, controlled/modified atm or pre-cooling, that, eventually, would help to increase storage. Fresh max, however, is making a lot of research in new technologies like smart fresh treatment and CI treatment which are not yet completely adopted especially since some of them are hard to get on a commercial scale. Sorting is one of the most important procedure to contain costs. In fact, if the sorting is not well executed it will lead to considerably high repacking costs that would take all the margin.

Fruits that arrives from the field has all different sizes, for this reason, in the early stage of the industry, there used to be 3 different sizes: small, medium and large/jumbo. They then turned to only one size to simplify the process and be more conform to the whole industry which does mainly one or max 2 sizes.

According to Fresh max, the process of sorting is evolving continuously. As volumes will increase as it is predicted it will go more towards automated procedures, for example grader cluster based on what is already happening in the cherry tomatoes supply chan. Another innovation that Fresh max will introduce in 2016 harvest is automated fruit sizer for a higher uniformity of sizes in the punnet. Despite having more sizes is important to increase punnet's uniformity, it also add more complications for inventories and more work in logistics which are risks for a new product like kiwi berries.

Main observations:

- The first sort occurs in the field
- One of the main aim of sorting is color uniformity and skin damages
- Automatization increases fruits uniformity
- The market will require different sizes of kiwi berries

5.1.8. PACKING

When the packing method has been decided, it has been based on traditional berries packing system. Fruits are packed into 125g plastic punnets which goes into trays of 12 punnets each for a total of 1,5 kg plus a bit of extra fruits. The choice of this packaging, according to Geoff Oliver, is because it makes people associate kiwi berries to the other berries in the supermarket's shelves. The fruits are packed already in the market format before going to the cold storage. Trays are then collected into BLOK pallets of 120 trays each. In the choice of the packaging, distribution plays an important role; for example, factors like cooling capability and strength of the borders, to avoid collapse in transportation, are considered. There is an interest in introducing bigger punnets, like Chile does (165g for example), but 125g is the best tradeoff that retailers pointed in value. Moreover, as Brian Parkers underlined, if punnets are independent, in bigger punnets the probability to get spoiled fruits is much higher since just one overripe fruit is sufficient to set the rest off. Conversely, if there is gas permeability between all of the punnets, it is better to look at the gas atm around to determine probability and risk of spoilage.

The best packaging is firstly what appeals more to consumers and then packaging ultimately may be reasonably smart with modified atmosphere, cell claim shelf and different storage optimization packaging possible. The challenge of many of those,

is that it depends on the harvest and the packing system - most of the berry system, pack into clamshell so it is just one touch pack. But the sealed packaging, that modified the atmosphere, presents a multi touch systems that has to run over a grader. Many experimental trials has to be done to understand if touching twice is worst or better. On one hand it is more expensive but on the other hand it may pay for itself by improving quality control and fruit's maturity.

According to Freshmax, the timing of packing also depends on weather. In case of rains, for instance, it is always better to pack the fruits within 24hrs from harvest. In case of dry weather and sunny days it is better to wait for the proper sizes before packing and thus fruits can sit in the cold store for even 2 3 days. This also helps to maintain the cold chain.

For kiwiberries the best supply chain configuration appears to be half automated and half manual. There is the need for new preservation technologies, like modified and CA atmosphere, that will extend the storage window. Nothing has been yet put in practice but there are continuous investments in this field. Fresh max already adopted automatic punnets fallers. Despite this way of packing is reasonably working for the current volumes, in a future vision, according to Freshmax, some innovative technologies that will allow for more cost effective packing in a short time frame, are required. This is especially valid considering the high responsiveness required to the supply chain.

Main observations:

- The most cost effective packaging is the 125g punnets
- A block pallet contains 125 trays of 12 punnets each
- Fruits should be packed within 24 hours from harvest
- The best configuration of packing activities would be half manual and half automated
- Preservation technologies like CA and smart packaging extend the storage window

5.1.9. COLD CHAIN

Cold chain is the key aspect for a successful distribution of kiwi berries. In the cold room the temperature is monitored at 0-4 degrees. According to Geoff Oliver, the main condition necessary is the low temperature (4 degrees in his infrastructure) and hence it does not really differs from kiwifruits storage conditions. The Temperature is continuously recorded and visible throughout the chain. The time fruits spend outside the cold store for picking and packing is very relative since the supply chain is pretty fast. Pack-house like, Southern produce, also have the possibility to moderate temperature if needed and keep records of all the information. However, there are points where the cold chain breaks up a bit, for example when fruits are going after cold storage to the truck. It can hence be observe that the best scenario is not completely respected.

An important aspect to consider, regarding temperature break-downs is the external temperature when kiwi berries are picked which is very different from Kiwifruits. Green and gold are picked in April may when the T is only 12 13 degrees but in February March external temperature is about 17 to 25 degrees, accordingly, the fruits are significantly getting warm back up again after cold storage. To avoid thermic shock fruits are firstly cooled down to 12 degrees within 20 hours in the pack house and then down to 4 degrees before it is put on the plane.

According to Tony Ponder from Southern produce, a critical point is also the airfreighting if the wrap up of the pallet is not correctly implemented. Regarding cold chain, Fresh max underlined that there is the need to understand better the effect that the cold chain have on the product. For example the relation between one hour of cold chain lost and the overall shelf life. This knowledge gap makes the handling even more challenging.

Main observations:

- T in the pack-house should also be monitored around 0 and 4 °C
- The external T in February can reach 25° C
- Road transportation is a point where T is likely to be broken
- The effect that the cold chain has on kiwi berries is not yet understood
- T shock may happen from the pack house to the Air freight forwarders

5.1.10. POST-HARVEST WASTE

The rate of obsolescence for kiwi berries is extraordinarily high, for this reason they have to be packed within one day from harvest and send it to Auckland right away. There is a big difference in fruit's softening between fruits that are packed after two days from harvest and fruits packed within one day. In this regard, the dissimilarity with kiwifruits is remarkable.

Tony Pounder affirmed that, in order to optimize the shelf life, they adopted a demand driven model instead of a supply push model. It is about maintaining the time lines from when the fruits are harvested till the cold chain and distribution in line with the demand of the target market. This is also a reason why growers cannot pick when they want but they rather have to wait for the market order. Harvest is therefore an important factor in modulating deterioration rate and fruits losses.

The waste in the first part of the supply chain for kiwi berries is remarkably high – about 20 to 30% while for kiwi fruits is less, about 5-10% for gold and 10-15% for green. For this reason, it is important to create an alternative utilization in the processing industry. In the field, waste is higher in the first years of the crop because the not-compact canopy cannot protect sufficiently fruits. In fact, during the first two productive years almost 40 to 50 % of the yield is lost. To limit waste in the field, winter pruning has a key role. The amount of waste during post-harvest operations comes from the higher level of defects that kiwi berries have in comparison to kiwifruits. Moreover also the unpredictable maturity on the vine leads to post-harvest waste. However, despite the high level of waste, the business is justified by the high productivity gate return.

Main observations:

- Timing of packing is critical to reduce deterioration rate
- Harvest timing modulates fruits losses
- 20 to 30% of waste is estimated in the field versus 5-10% for gold and 10-15% for green
- Wastes are higher in the first year because of a not compact canopy (about 40-50% of the yield)
- A correct winter pruning can limit the level of waste in the field

5.1.11. COSTS OF PRODUCTION

Cost of production for kiwi berries are high, especially in comparison with green and gold kiwi fruits. These costs are mainly associated with winter pruning and picking. The winter pruning may cost from 15 000 to up to 25 000 dollars per hectares while for Hayward is just \$4500/ha and \$5500/ha for Sun gold. For kiwi berries, one person is able to do 3 bases a day while for kiwifruits it is possible to reach up to 25-30 bases per day. This higher costs are related to the fact the plants are tight in very small canes which has to be untangle more. In pruning, you also have to be very selective because the little canes are preferred. Workers have hence to be more specialized and they also have to be paid right otherwise they would go too fast with the result of don't get any fruits. Having a specialized worker for pruning, according to Richard, worth the high cost. It in fact pays off in terms of crop yield at the end of the season. Having an efficacies winter pruning can double the yield.

Moreover according to Richard Trafford, also the cost for pesticide is a bit higher because they are more susceptible to diseases than kiwifruits. For example to little bit spots. Nonetheless, they are more resistant to PSA.

The costs of harvest are high, it range from one to three dollars per kg. The first pick costs about \$1.20 kg to start and the last pick will be \$3 because is harder to see the remaining fruits. In the first harvest one person can gather 5 boxes in one hour while at the 3rd harvest only 2 boxes are gathered. Moreover what is rising the labor costs for picking is the fact that skilled workers are required. These costs may differ from orchard to orchard. Mike Torr, for example, in the past years spent nearly 19000 NZD for 3000 trays (4200 kg) which are on average \$4,5 per tray.

However, the productivity of those varieties is pretty good. Richard Trafford proudly affirm to have one of the most productive orchard with about 4000 trays per hectare.

The net return to growers can be defined between the Hayward and the Sun gold variety. These costs are not related to economies of scale. The only possibilities to reduce these costs is by investing in better varieties and fill the knowledge gap about agronomic techniques. Richard Trafford specify that before to get to know the cultivar it cost a lot of money to run.

These costs might be relative, Tony Pounder, in fact, affirm that "it depends on how you amortize your capital costs and the value, do not forget that this industry has been very small for a lot of time". According to him, by automating for sizing and packing it is possible to reduce the fix costs, especially with technologies that help to differentiate the maturity of the fruits. At present, picking and packaging cost amount to \$ 9/12 dollars per tray. According to Mike Torr, an increase on production will allow to lower these costs to at least \$7 per tray.

Air freight is most likely the biggest post-harvest cost. It accounts about \$2 per kg on average. This depends also on the final destination.

Since post-harvest costs are the biggest expense, reducing these costs will be very important to increase capital availability for investments in new technology. Technology, will also help to lower labor costs which are really high in New Zealand.

In the following table the main data to take into consideration are represented:

DATA	ARGUTA	GREEN	SUN GOLD
Cost pruning	\$15 000/20 000ha	\$4500/ha	\$5500/ha
Cost harvest	\$ 4.5 per tray	/	/
Cost packaging	About \$ 6/7 per tray	/	/
OGR	\$15.60 per tray \$120 00 per he	\$50 000 per ha	\$90 000 per ha

Figure 22 Financial data of production (derived from interviews)

Main observations:

- The main costs in the field are from winter pruning, pesticides and harvest
- The main costs after harvests are for packing

5.1.12. RELATION VOLUMES / QUALITY

The increase in quantity will not affect the quality of fruits as long as growers know how to grow the crop. In the last years, for example, many people initiated to grow Arguta because it was resistant to PSA. However, the results were not as expected because it has been treated like a kiwifruit. According to growers, an increase in quantity produced will only affect the supply/demand balance. In case of over supply, the price would decrease and the quality requirements will increase. If there would be more market's demand, growers would buy more land and not cannibalize the area dedicated to kiwifruit's orchards. Especially because it will be a waste of money.

According to Richard Trafford, if the quantity would increase and the demand remains the same it would be hard to harvest all the fruits in time and the result will be a lost in quality (softer fruits) and increase in waste. It becomes then frustrating for growers that wants to pick and they cannot because there is not enough demand. On the other hand when there is too much demand growers are in a rush to pick as much as possible which is also not good for quality. The stability of the demand has therefore an important role in modulating quantity and especially quality of fruits. According to Mike Torr, an aspects that bigger volumes may influence regarding quality, is the temperature of packing. Because the supply chain is really fast, there might not be enough time to slow down the internal temperature of fruits before loading to the plane. Besides, as quantity will increase to allow to book a full container, trials to asses' cold chain and product shelf-lives will be very expensive.

Main observations:

- Increasing Quantity may affect the Supply/Demand balance
- An increase in quantity may create harvest constraints
- High volumes may affect the Temperature of packing
- An increase of volumes will get the access to full containers

5.1.13. PRICE AND OGR (ORCHARD GATE RETURN

The price free on truck per tray is \$28 for the export market versus \$ 19/21 of the domestic market. This is the net return back to pack so the packing costs are not included. Overall, the OGR is increasing of about 0.50 cent and it is about \$15.60 per tray. This can vary between an established grower and a new grower or according to different utilization of roof-stock. The net return to growers also depend on the choice of the pack-house and to the efficiency in handling operations. There are no differences in prices and no second graded market according to quality in order to protect the export market.

According to Richard Trafford, Kiwi produce is the post-harvest operator that gives a better return to growers. The general model for kiwi berries is to pool returns from each market into one consolidated pool. Southern Produce, generally consolidate people who are in the pool into different markets in order to make an average afterwards. This happens because they work with programs for retailers groups and not directly with the seller. Another explanation is that some markets for many reasons - like exchange rate - may return better.

Also Seeka pool the production of different growers. Services offered by Seeka costs about \$2 per tray. For this reason growers like Mike Torr are not happy to work with them. Mike Torr also stated that Kiwi produce costs \$2 more per tray than Seeka. According to him, the main reasons for this high costs are coming from the initial investments on machinery for the developments of the industry. It is consequently an extra charge for the cost occurred for R&D. According to Mike Torr, a packing machine for kiwi berries cost around 100000 NZD and this is one of the main cost for a post-harvest operator since kiwi berries will not need long storage in the cold room. Freshmax is the marketer viewed as the one that provide the higher returns to grower since they have a strong presence in the Asian market, especially into China.

If the demand of kiwi berries from NZ would increase, some growers like Mike Torr and Geoff Oliver would be willing to invest more capital in Kiwi berries despite it is described like “a capital game”. According to Mike Torr there is potential to reach an OGR of \$120 000 per hectare while the best you can get out of gold is \$90 000 per hectare and \$50 000 for green. What it makes it a capital game, is the perishable nature which leads to many waste and uncertainties.

Main observations:

- Price FOT is around 29\$ per tray
- OGR of 15.60 \$ per tray – 120 000\$ per hectare
- OGR is increasing of 0.5\$
- The choice of post-harvest operators have a remarkable impact on OGR
- Initial investments of Post harvest operators make the service more expensive in the short period

5.2. OFF-SHORE MARKET CHARACTERISTICS

In this section a brief overview of the results from interviews and reports regarding market characteristics is provided.

5.2.1. EXPORT CHALLENGES

As exporter, the biggest challenge is the availability of supply. Besides, the lack of scale makes it harder to establish programs that allows to broadening the appeal of product to consumers. The harder is to get commitment from the main stream retailers, and the harder is to get investments for R&D promotions. According to Tony Pounder, the supply side should be unified to make a bigger commitment to actually get more volume and allow more things to evolve from a cottage industry into main stream capability. New Zealand adopted a completely different commercial model – performance is measured by the FOB value. In this way the environment has become very competitive and doesn't stimulate investment in technology and offshore since it will take away some of the availability to return FOB value. Another big challenge for export is the exchange rate for NZ dollar since currently it is like a tax on final return This leads to higher price that makes NZ less competitive worldwide.

5.2.2. DELIVERY DEMAND

Tracey burns, defines the berry market as a category with huge potential that make retailers really excited about. According to her, Kiwi berries are fully part of the berries market and this is indicated also by the rise of sales from 70 to 100 thousand trays sold by in the last years to 120 in 2015. However, the market for kiwi berries is still very young and not yet mature for an exhaustive analysis. Final consumers are curious about the new product and inexperienced at the same time. Since it is a new product, relationships and trust, once again result important for retailers. Consumers still doesn't know if it should be associated to a berry or to a kiwi fruits. An aspect that increase confusion, is having different varieties in the shelves. For this reason a great effort, by newspaper announcement and stands in shops, have been made to educate consumers and to give them ideas about possible utilization. Tashiro Yasuhi, from Dole Japan, for example specified in the label that the red blush in some fruits does not indicate quality issue but it is natural.

A correct analysis of the demand is necessary. According to Linda Mills, for an expensive product like kiwi berries, GDP is one of the most important aspect to consider. In fact, it should not be positioned as an every day item like Kiwi fruits. In order to positioning kiwi berries in the market, a minimum volume would be necessary. According to Linda Mills the minimum volume necessary to achieve a good positioning in a new market is from 5 to 10 million trays. The speed to wrap it up in the final volume, totally depends on perform trough the supply chain and on the consumers experience.

An aspect of the demand that makes the distribution of kiwi berries very difficult is the fact that the demand is very unstable and therefore it is hard to predict. It also depends on the availability of other cheaper products in the market coming from different geographical areas. According to Steven Buyan, March-April is actually a good period since there is not much fruit's variety in the market.

In all markets, kiwi berries were associated to berries and positioned in the chilled space apposite for berries like strawberries and blueberries. At present there are no data in regards to percentages of sell of different berries.

According to Fresh max, consumers still do not fully associate kiwi berries to other common berries. The demand for kiwi berries is still not as strong to be able to cannibalize big products like blueberries and raspberries. If kiwi berries are sold in the same shelf space than the other berries the association might be stronger. This is more likely to happen in big retail chain rather than small traditional Asian retail shop.

If on one hand, the hope is to do not have any association with kiwi fruits in order to avoid cannibalization, as Linda Mills specified, on the other hand also the association with berries might be dangerous. Berry substitution effect might be a threat for kiwi berries if they are not in a specific niche window that adds value to the market because it is distinctively separated from other produces sold in the same time and space. According to Linda Mills, the final price have an important function in modulating the level of substitution.

POTENTIAL DESTINATIONS

The main market for NZ kiwi berries appears to be Asia and Australia.

The leading destination place in Asia seems to be Japan, Singapore, Taipei, Hong Kong, Kuala Lumpur, Taiwan and Shanghai. According to Mike Torr, China is the market that is paying the most and willing to have also bigger sizes of punnets. However, together with Singapore it is a very demanding country in terms of product compliance.

According to Tracey Burns and Tony Pounder, Australia is one of the strongest market for kiwi berries. However, Sven Bunyan, believes it is more challenging in terms of doing significant volumes. Additionally, Australia generally don't have high quality fruits in the stores being more similar to NZ. Always according to Steven Buyan, the market in Australia might be weak since almost 98% of the fruit sold in Australia is also produced in Australia. However, to get there, airfreight cost almost the same as sea freight so it is more convenient to go by airfreight. In Australia, Perth is the most common destination.

US is not the best market since it is mainly supplied by Chile in the same period of the year which is much cheaper. Moreover, there, the general association that people have with kiwi fruits is worse because of the lower quality standards of Chilean kiwi fruits.

Also Europe is hard to get because of the significant air freight costs. However, because NZ kiwi fruit quality is known as superior (thanks to the good reputation of Zespri in the world), US and Europe can still be a good market if entered in the right niche. For instance, some high end retailers can pay up to \$28-32 per tray CIF. In Europe, for instance, the main destinations, where Southern produce has been able to find a stable market willing to pay enough, are United Kingdom and France. Nonetheless, because of the unfavorable exchange rate, European results might not be as strong as expected.

According to Linda Mills, the best market to look at is Asia rather than Europe since fruits are much more valued there. Steven Buyan confirmed that Asia is probably the most comfortable market in paying relatively high prices for high quality produce, in particularly Taiwan and Japan. In Asia, thanks of the reduction of trade barriers, there is a lot of cherries flowing out of the states, so generally, fruits with high visual impact are a growing category in the stores. The major categories of fruits are getting squeezed down a little bit and the berries type products are moving from being good volumes like 5% up to the group to 8%.

In the following graphs an overview of the main potential market for kiwi berries is provided. Data are retrieved from Euromonitor reports.

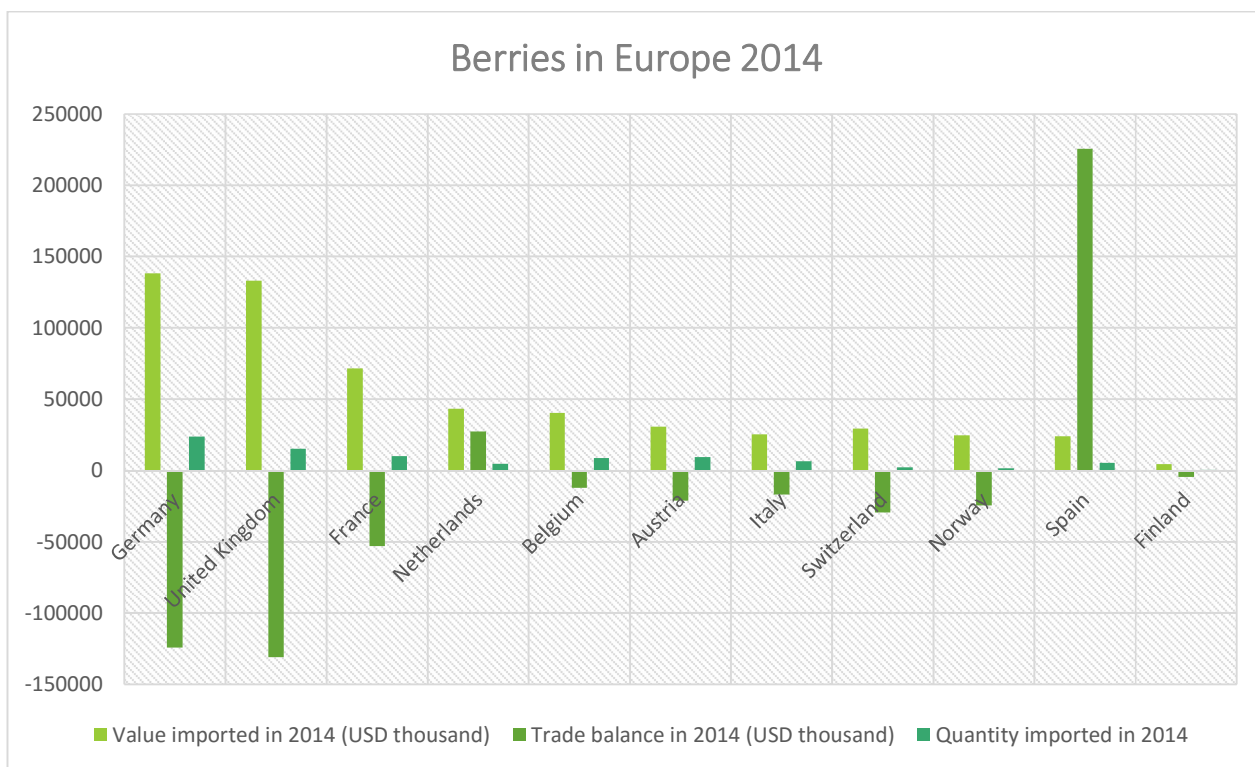
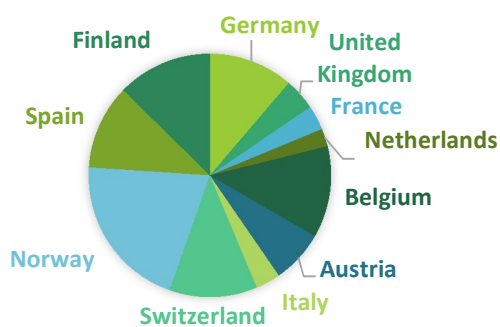


Figure 23. Import berries Europe (Euromonitor, 2014)

In the graph above, the European market for berries is illustrated. As it can be seen, countries like Germany, United Kingdom and France had the biggest import of berries. This is partly explained by the negative trade balance (proportion of import over export) which leads countries to value more imported berries and to increase the quantity imported. In contrast big berries producer like Spain have a very low level of import.

**ANNUAL GROWTH IN VALUE
BETWEEN 2010-2014 (%)**



**ANNUAL GROWTH IN QUANTITY
BETWEEN 2010-2014 (%)**

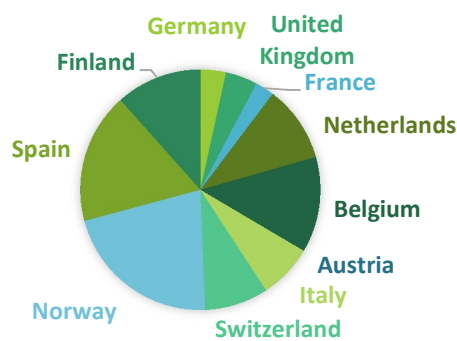


Figure 24 Annual growth in value and quantity consumed for berries in Europe (Euromonitor, 2014)

Europe, being a very distant market has to be analyzed also from a growth point of view - in both value and volumes consumed. As it can be seen in the above figures, Norway might be an interesting market for kiwi berries since both quantity and value are increasing. In countries like Germany and Austria the value of berries is increasing more than the volume

consumed which may indicate a higher willingness to pay by consumers. Other countries, like the Netherlands and Italy, present the opposite trend.

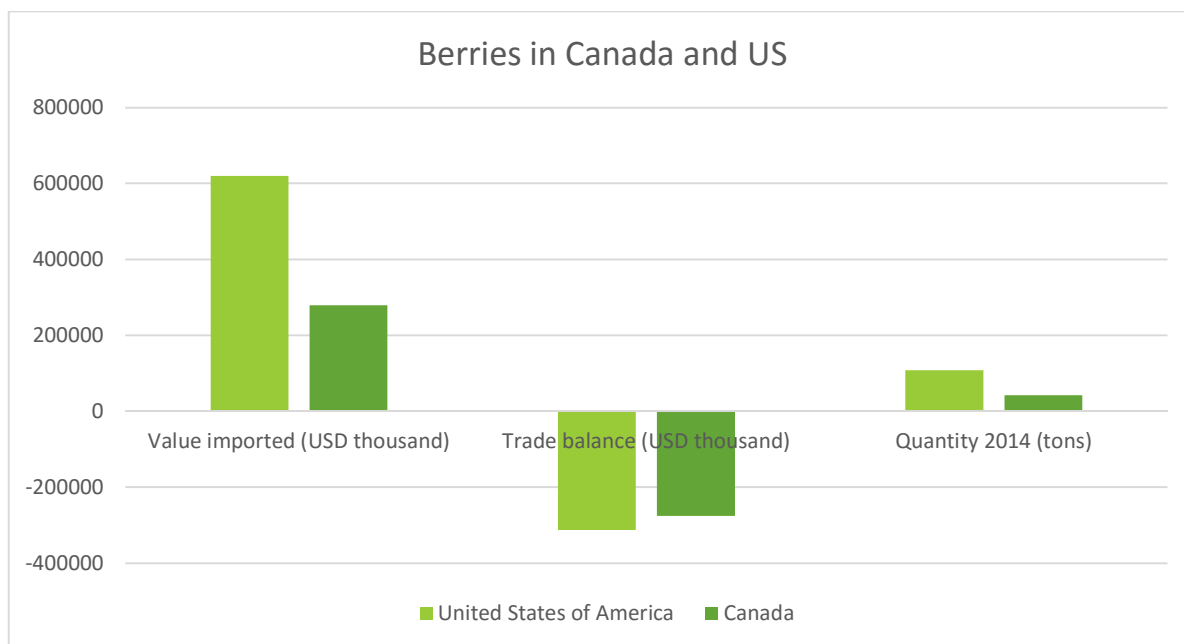


Figure 25. Import berries US and Canada (EUromonitor, 2014)

In the above figure the market for berries in US and Canada is presented. Both may present good opportunities for kiwi berries because of the negative trade balance. US shows a bigger volume of import than Canada which is mainly dictated by different market sizes.

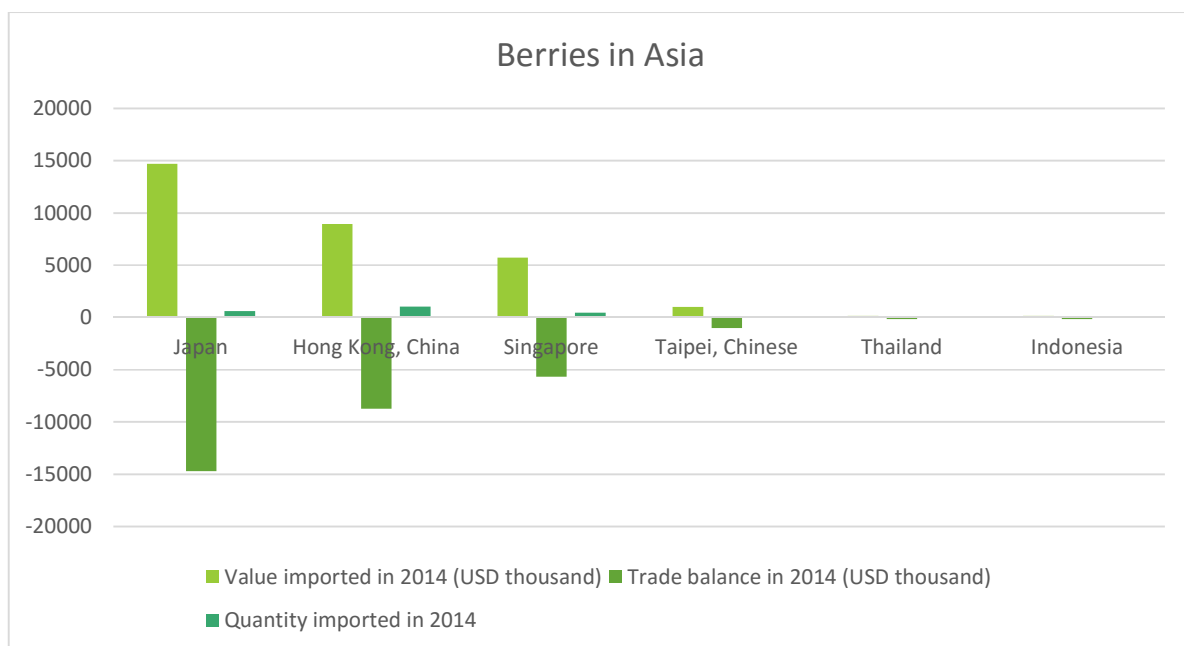


Figure 26. Import berries Asia (Euromonitor, 2014)

In the graph above the main markets for berries in Asia are presented. Also for Asia, the high value of import is explained by the international trade balance. As it can be seen Japan is the main market, followed by Hong Kong, Singapore and Taipei. There is a big difference with market like Thailand and Indonesia since the volumes of import is significantly lower. It is interesting to see that Japan, despite imported a quantity similar to the other five countries, have a much higher value imported – meaning that the willingness to pay for high end produce is higher.

Main observations:

- Main markets for NZ Kiwi berries are Australia and Asia
- Asia has most of the values for NZ kiwi berries
- China is the market that is paying the most and willing to have also bigger sizes of punnets
- Berries are slowing taking some volumes out from the major fruit's categories
- US market is mainly dominated by Chilean production
- In Europe it will be a niche market – UK, France and Germany have more opportunities

5.2.3. PRICE

The price CIF from New Zealand to the main market is about \$30 per tray but it can be higher. The price to the final consumer is influenced by the purchasing price of buyers but also on how the last part of the supply chain is structured. If, for example, additional repacking are necessary or if there is a high number of intermediaries from the first buyer to the final retailer the price rise significantly. According to Tashiro, Kiwi berries in Japan were sold in 125g punnet at the final price of 4 USD to consumers which made them one of the most expensive fruits in ordinary retailers. Since the volume available were small, this was achieved by focusing only on High-end consumers. However, the differences in price on supermarkets shelves it is mainly related to the origin of the product to the respect of the selling hemisphere. There are no differences in price between the two varieties exported since the Margi red goes red nearly at the end of the season and at the start of the season is always green.

Price relativity of kiwi berries towards similar berries is also an aspect to keep in mind, for example, according to Linda mills, the gold kiwi fruits have a price relativity towards the green kiwi fruits of 20-39%. Beyond this point the demand for gold starts to be less rigid.

Main observations:

- Average price CIF is 30\$
- The complexity of the last part of the Supply chain increases the price to the final consumer
- Price relativity of Kiwi berries towards other berries is an aspect to consider

5.2.4. RESPONSIVENESS VERSUS EFFICIENCY

The best configuration for kiwi berries supply chain should be as responsive as possible in order to guarantee the quality of the product. For this reason small and frequent orders to a destination as close as possible to the final consumer are the best scenario to adopt. Likely, air freight allows for a reactive response to the market. According to Linda Mills, in the berry business being responsive is very important to continuously stock product in order to achieve enough volumes of fresh produce on the shelves. Having a guaranteed fix volume is the priority for buyers and retailers and since it is a very risky product to stock, a high frequency replenishment model is preferred. It is also important to have a product already ready to sell to avoid additional repacking in the market.

On the other hand the importer purchasing price and the low margin sometimes doesn't allow to make the chain as much responsive. Tashiro for example, used a centralized warehouse in Tokyo from where the different distributors all around Japan shipped the fruits by truck. This assets was very time consuming (from 1 to 2 days) and very risky for the integrity of the cold chain. Moreover, the main distributive problem raised from the initial quality of the fruit. Port warehouses were used to check the quality at arrival before deliver it to customers. This is the same structure for Kiwi fruits. For this reason he is planning in the next season, to do not use a centralize port warehouse but truck fruits directly to customers where quality is checked together.

Since the demand is very unpredictable having a responsive supply chain might be helpful to reduce wastes in the import country. For each stock that remains too long at the port, the repacking costs are really high and distributors would be forced to make a discount based on quality. Repack is necessary for each fruit not conformed in the punnet, especially since it is a new product in the shelves. For this reason in the case of Japan, it was better to sell for few weeks without any discounts. The main problem, according to Tashiro, in matching demand and supply, this gets harder if there are many people in different stages of the supply chain. In fact, in case of poor quality at arrival or delays, it is not possible to fix the problem in time. Fortunately, retailers are pretty flexible for kiwi berries since it is a marginal product that does not interfere with the company turnover.

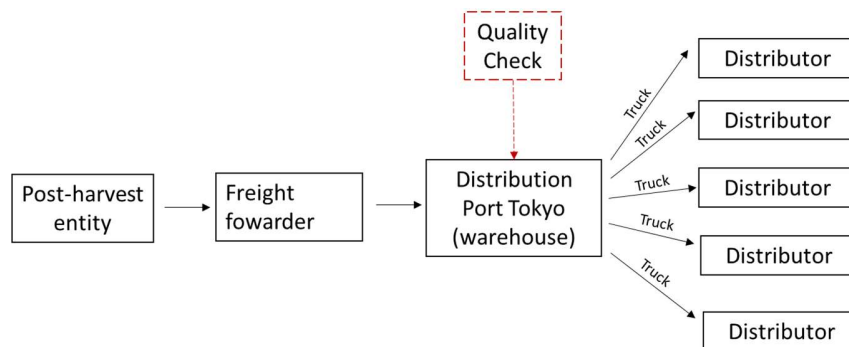


Figure 27. Distribution model for NZ Kiwi berries in Japan (Tashiro, Dole Japan)

Main observations:

- Small and frequent order to retailers
- A fast supply chain is required to deal with the unpredictability of the demand
- Stable flow of orders is important for retailers
- Repacking costs are extremely high but necessary in case of not uniform punnets

5.2.5. ORDER SPECIFICATION

According to Tashiro, the market is asking for more supply coming from New Zealand and it is afraid that there will not be enough production. This version is confirmed by exporter like Fresh Max and Southern produce. According to them, is the production that push and stimulate the market and therefore production is not waiting for demand to occur. In contrast, kiwi Produce believes it is on the other way round, the production is stimulated by the market demand which seems to be too low for their production possibilities.

According to Fresh max, the marketing plan is a mix of retail and sales programs which are fix because are promotion based. Some markets are more flexible than others in adjusting orders, for example some of the Asian market distribution channels allows to adjust the volumes easily while with big retailers is not possible. This is important to consider since it can happen to have short supply, especially with kiwi berries. Always according to fresh max the production therefore is made to stock (market push) since growers - in order to guarantee the best quality - doesn't need to accomplish the market in harvesting but the rather pick when the fruits are ready with the perfect maturity grade. (growers limitation are only dictated by pack house capacity). This seems to be the model occurring when the marketing organization is very strong in the market and therefore the quantity produced is already been sold, the only mismatch between supply and demand that can happen is because the supply is too little due to uncertainties in the field.

The order size for export may vary according to the exporter. In general, exporter requires a minimum 2 to 3 pallets (each Blok pallets contain 120 trays) in order to reduce the fix costs coming from air freight. The most important thing is to manage well harvest volumes. On the other hand, having bulk orders can also be risky From two main reasons. Firstly, it may be not the best option in case of any delay in freight which may lead to missing program opportunity. Secondly, bulk orders are risky considering the high perishability of the product.

Order specifications differs a lot according to the distribution channel. Fresh max, for example, reports that for the online market, like China, the order lead time is normally bigger than traditional channel since they have to let it arrive first to the distribution center and since they do not rely on online orders, they have to re-check the quality and re-pack the product. This is different in markets like Australia where fruits are directly sold to the DC. It all comes down to the marketing mix according to Tracey Burns.

Traceability aspects and residues analysis should also be taken into account. Retailer are really concerned on having fruits going to their store and, because of that, they places additional requirements. It might mean that they would need every single pack to be able to be placed back to a particular orchard to make sure that the chemicals that has been apply are all known and recorded. Those standards are becoming more and more higher, having in each retail packs a very high amount of information and traceability. Air freight might be very easy to record that exactly. Retailers in countries like China have higher standards in this regards.

Tashiro from Dole Japan bought kiwiberries from Kiwi Produce in three main big order each of them of 1000 trays. The average order cycle was of 2 weeks, but according to Tashiro it would be better to have one shipment per week, each monday. The most important point for distributors is the punctuality of shipments which make a stable and reliable supply. The specifications in this order were very vague since it was the first experience. For example he didn't know which varieties he was about to receive and the sugar brix. Regarding size of packaging, the majority of the kiwiberries sold were in 125g punnets with the only exception of some Chilean Kiwi berries sold to Tesco in bigger punnets. Always according to Tashiro, the best scenario is to have both size of punnets according to different consumer's profile. However, from a distributive point of view, bigger punnets are more risky since fruits are more likely to get smashed. In Chile they can do it because fruits are less mature at the arrival to market.

The first shipment arrived around the 20 of February and it was, on his opinion, not completely mature. It needed around 3-7 days in the cold store before being actually ready for consumption. In contrast the third shipment (around middle of

March) arrived with a very high sugar brix and therefore it had a short shelf-life. With this three arrivals he was able to deliver kiwi berries to retailers for about 3 weeks since all orders were sold out after few days.

The market is getting more aware about the benefits that good genetic varieties can bring in terms of better storage and eating experience. According to Tashiro, the preferred variety is the K2D4 since it has a uniform coloration, good storage and deterioration rate and good tasting experience. Despite there is not a real indication of the variety in the label, different varieties are never mixed in the same punnet. For importers, was hard to educate consumers to the red blush of Margi red (it was perceived as rotten) and also to the different smell but at the end they appreciated the strong and stable sweetness, while - according to Geoff Oliver- K2D4 has some grassy smell and some has sticky pallets feelings. Regarding different varieties of kiwi berries, from a market point of view it comes down to efficiency of branding. According to Linda Mills, there is a transition in between the switch of varieties where they seems different but not sufficiently different and they overlap, and therefore one of them has to be taken out of the market according to consumers preference, quality and ease in distribution. During this transition, the flax of sales create a loss in revenue. If they are marketed as one single variety, this issue is less likely to occur. To do so the different varieties has to look the same

Main observations:

- Undersupply created a supply driven model
- Different markets have different orders flexibility and lead time
- Minimum order size by air is 2-3 pallets
- Traceability requirements are getting more important
- If different varieties are marketed as one the risk of flax in sales is lower

5.2.6. RETAIL CONCENTRATION

According to Tashiro, the more a distribution system, from buyer to retailer, is small and fragmented, as it is in Japan, the more there are risks of quality degradation during distribution despite all the effort in handling correctly the product. For markets, like Japan, where the retail sector is not concentrated, a higher number of quality control points is required. Another important aspect to consider is that with a price of 4 dollars per punnet the best target are not ordinary supermarket chain but high end fruit shops. Tashiro, for example, sold just 20% to normal retail chains. Fresh max only works with importer that have proper cold stores, especially since lots of markets - a part from China - had an inefficient distribution system and there has been lots of Temperature issues and delays. According to Linda Mills, the best market to target is where they are starting to developing direct strong retailers' relationships and high level of sophistications. They would be a good initial target. By leveraging a strong brand it is possible to establish a relationship with modern retailers. Having a direct model in this, would help. Markets like Taiwan, Japan and China, which have importers records, would enable to sell to a wider group of people whereas direct retails, which have to be the importer and also the distributor, might be more complicate. Additionally, one indicator for the choice of distributors is their sales interface. A strong reputation and trust with customers is the very important for a new product with a short shelf life like kiwi berries.

Main observations:

- Market with direct retailers relationships and sophistications should be preferred
- Fragmented market with a not concentrated retail systems have a higher quality risk

5.3. LOGISTICS MANAGEMENT

In this section the main results concerning the six main topics of logistics managements are reported.

5.3.1. INFRASTRUCTURE DESIGN

At present, there are only three infrastructures dealing with kiwi berries in the Bay of Plenty: Kiwi produce, Seeka and Southern produce. Each of them operates in completely different ways from another.

According to Richard Trafford, Kiwi produce does 80% of the overall production and therefore there is not the same competition as there is for kiwi fruits. There are no new pack-houses because it is a risky investment without having to deal with certain minimum volumes.

The handling operations, like packing, sorting and storing, occurs in the same facility where also kiwi fruits will be handled few days later. Since the two productions comes at complementary time of the year, technology and people can be easily adapted. However, kiwi berries requires a special internal layout and special machinery to facilitate the handling in a special order. Tony Pounder, for example, adopted Special machine like BBC to sort better the fruits.

Having private ownership of the facility it is an incentive for owners to invest more in new machinery and new techniques to keep the packing costs down. There is a big difference in corporate model pack-houses like Seeka and single growers. Moreover in managing infrastructure there is the need to integrate different actors in the chain to make a complete understanding of it.

The location of the pack-house appears to be dependent on the area of production. Moreover, private warehouses have the need for accountability, which returns more value to growers and growth in brand because of a consistent quality.

The current infrastructures has sufficient space for storage and sorting/packing, especially after the arrival of Seeka in the industry. However, in case of an increase in production more machines would be needed.

Kiwi produce only is packing 80 000 trays just for kiwi berries with the potential capacity to pack 160 thousand trays. Southern produce has a lower volume with 30 to 10 thousand trays (going down because of the poor supply). The multiple harvest system allows for higher capacity in proportion to single harvest system. According to Geoff Oliver, capacity does not impact distribution capabilities since they have to be careful to what they pack because if some obsolesces happens into the punnet the cost of repacking are really high. For this reason, the perfect scenario of picking all the fruits in the right window and store all of them it is not the best option at the moment. If this would be possible in practice, it would imply better yield for the orchard and a wider selling window for the exporter. At present, it can be hence concluded that the poor storage is not deriving from a capacity constraint. Fresh max has a different point of view from the rest of the industry, according to them since the supply chain is very different from kiwi fruits, there is a huge amount of fruits in the pack house to be move as soon as possible. In the past seasons they were not able to pack all in once - this is also one of the reason why they had to make the harvest separately. For this reasons pack houses like Seeka, are making significant investments over the next two years to cope with the increased production to 6 hundred thousand trays. All the actors in the industry believes 5 millions trays will be an utopia.

Main observations:

- Few pack houses present because of low volumes and high fix costs
- Current infrastructures have plenty of capacity
- Packing, sorting and storing, occurs in the same facility of Kiwi fruits
- Special internal layout of facilities is required
- Pack-houses located close to the production
- Multiple harvest allow for a higher capacity

5.3.2. THIRD PARTY LOGISTICS

At present, in the kiwi fruits industry all logistic related activities are carried by third parties since Zespri is a marketing organization.

The option of insource logistics from New Zealand to the main destinations would have be too expensive and therefore the main question while approaching third party logistics aspects mainly concern the type of third party.

The current mode of transportation for Zespri Kiwi fruits offshore is by boat. This assets seems to be the most cost-effective one for kiwi fruits and at the same time reliable. It is made possible by the suboptimal storage conditions of Kiwi fuits and by the high volumes necessary to justify containers. If Zespri would be able to deal with 5 milion trays of kiwi berries, as suggested by Linda Mills, and the shelf life would allow it would be possible.

In few occasions, Zespri also operated with air freight forwarder like Kuhene Nagel. This was the case of special circumstances, like specific promotions of events. In other situations air freight has been used because of the low cost for a specific period of time. This type of logistic providers offer maximum flexibility. Air freight transportation is only necessary if the product shelf life is very short as it happened for instance for ready to eat kiwi fruits, but if the shelf life is up to two months and volumes are sufficient then it is definitely better to consider utilizing the transportation network of ocean freight transport.

An important aspect while approaching a third party air freight forwarder is their globally presence since they need to offer support in terms of facilities at the final destination as well.

Air freight are only used in case of small volumes while air cargo has only been used in case of at least 10 pallets but it can load up to 80/90 pallets.

Robin Dillmore, provides me an overview of the current arrangement for Kiwi fruits. There are two modes of transport Liners containers and conventional reefer ships. Liners containers are adopted in case of 44 or 24 equivalent boxes loaded onto ships which are owned by shipping companies. It is a service similar to a bus services. It is going to multiple destinations before they arrives to the requested destinations. Charter vessel (conventional reefer ships) are fully controlled by Zespri and does not any stopover to other destinations. The latter is more suitable for delicate products since it is direct and allows for refrigeration because fruits are directly loaded into the hall of the ship. However, this asset requires big volumes – for example: 3 500 pallets to Asia and 5500 pallets averaging for vessels going to Europe. In the chartered vessel there is also the option of temperature differentiation since there are 16 compartments with 8 different temperatures. Each compartment have a capacity of about 600 pallets but it comes down to units of conversion (an Euro pallet is 1.2 m by 1 m and 2.5 high with 249 single layer trays of kiwi fruits is the pallet factor). The main advantage of this third party logistic

provider is that they are reserved on Zespri request at the beginning of the season. However, the vessel need to be full to leave the port meaning that it would be an option only is the volumes will be high enough.

Charter Bookings Require a lead-time of 15 days prior to the ETA date of a charter vessel. This means the order has to be available to the supplier 15 days prior to ETA. Fortunately for the STO markets (markets where Zespri sells to itself i.e. Europe, Japan, Korea) estimating volumes it is easier since there is more visibility in the chain. Liner Container Bookings require a lead-time of 12 days prior to the load end date. This means the order has to be available to the supplier 12 days prior to when the Container has to be delivered onto the port. Shipping companies (both Charter and Liner Containers) are provided with forecast information of capacity requirements. For Charter markets (or Direct Sale orders) a full season forecast of the market requirements is provided. This is updated frequently as information comes to hand. For the Charter Container markets the visibility of future orders is limited to approximately 6 weeks in advance. The costs for liners containers are fix for a season, the only variable is the fuel price. In contrast, for Chartered vessel there is a big variability on price depending on the period of the year. In general, the period of March/April is the most expensive one.

The choice of the TPL also depends on the distribution model. Zespri can work either by STO stock transfer order as it does for Europe, Oz and Japan or DSO direct sells order like it does for Singapore, Taiwan, North America. STO is easier for Logistics because it has a view of the whole season and there the visibility in the chain is much higher. DSO use forecasting of 6 weeks in advance and after there is the visibility it make ocean booking.

To Singapore or Hong Kong, only Liner Containers are used while conventional reefer are used to Japan.

Main observations:

- Shelf life and volumes are the main constraints to see freight
- Air freight forwarders offer the maximum flexibility
- The global presence of a logistic provider is an essential aspect
- Chartered vessel are more appropriate for preserving quality but volumes does not allow
- Liners containers are more flexible requires lower volumes
- The choice of the TPL should be based according to the distribution model

5.3.3. OVERSEAS TRANSPORTATION

In case of air freight, the overseas transportation is mainly managed in collaboration with Air freight forwarder. Kuehne Nagel is the most popular consolidated air freight service provider in New Zealand. The main difference between air freight and air cargo is dictated by volumes. Both ways provides the same responsiveness to client's requirements. Freight forwarder do not have the responsibility for the transport from the pack-house to their facilities but they are in daily contact with the 3rd party logistic provider to arrange timing of pick-ups. Despite this part of the supply chain is slightly fragmented, those different parties collaborate well together.

Goods arrives directly to their facilities in Auckland where the checking off cargo for waiting counts occurs and pallets are wrapped into dry ice to get the right temperature. The role of freight forwarder is just limited to transit the fruits from a country to another on the behalf of the exporter, they do not have any contact with overseas customers. Once fruits arrive

to the terminal, the responsibility is not longer of the exporter (is CIF) and importer have to take the ownership of the cargo by arranging another clearance agent.

According to Tony Pounder see freight has often been considered but the declining volume and the inconsistent maturity made it unrealistic to get enough fruits to be able to put it on a container. In addition, as Fresh max pointed out, there is not yet science and technology to assess that containers will arrive successfully and at this stage of the industry trials are really expensive.

At present the boat transit time from NZ to the main destinations, excluding one day for loading, is:

- EUROPE, Spain, average transit time of 27 days + 2 to reach Italy
- USA West Coast - average transit time of 21 days
- USA East Coast - Philadelphia, average transit time of 26 days
- SINGAPORE Singapore, average transit time of 14 days
- TAIWAN Keelung, average transit time of 15 days
- JAPAN, Tokyo, average transit time of 12 days

The closest market is therefore Asia and in particular case japan. Moreover, there are many lines cargo services going to Asia every week.

In the figure below an average of the see freight per kg is presented. As it can be seen the cost per kg is really contained. In case of chartered vessel the cost is higher but still limited. Data has been given by Robin Dillmore.

Country	Mode	Total T/E shipped	Est. Qty of Pallets	Total Frt Costs (USD)	Total Est. Kg's	Avg USD	Cost P/kg
Japan	Conventional Charter	18.406.000	66.209	\$ 17.384.676	64.752.043	\$	0,27
	Liner Container	2.959.963	11960	\$ 1.879.589	11.696.880	\$	0,16
Singapore	Liner Container	1.084.318	3620	\$ 446.412	3.540.360	\$	0,13
Hongkong	Liner Container	2.005.772	6770	\$ 708.932	6.621.060	\$	0,11
Taiwan	Liner Container	8.816.238	31870	\$ 4.909.824	31.168.860	\$	0,16

Assumptions:

- For the purpose of this summary all Trays has been converted to a STD pallet type (ENIT).
- ENIT = Euro Normal pallet base International Tray
- Euro pallet base (1.206m x1.006m)
- Pack Type - International Tray
- Qty of Packs Per Pallet = 232 trays per pallet
- Avg Weight of an ENIT pallet = 978 kgs (inclusive of pallet base and packaging weight) as per Zespri's 2015 Pack Conversion Guide

Figure 28. Average see freight cost per kg from New Zealand (Estimation from E3 hardcore forecasts)

AIRFREIGHT TRANSPORTATION

TIME

The supply chain, at both departure port and arrival port, has been set up so that fresh produces move very quickly and efficiently. For example, to Singapore it is just 8 hours and it is very rare that there are stopover in some of the international airlines. The priority is to put fruits in the quickest flight available to reduce waiting time at forwarder's facilities. For this

reason, If volumes allows, passengers plane are preferred. This set up seems equal to all the main destinations for kiwi berries from NZ.

When goods arrives to Auckland, generally there are freights coming in in the night and in the morning in order to have a day or two maximum for transit up. It depends on when fruits are available from the pack houses to be send - the ideal scenario is that fruits are packed during the day, put in a truck in the night or early morning the day after and after few hours in Auckland loaded into planes. Freight forwarder facilities are open 24 hours on 24 a day to receive cargo at any time and check peace count, check that there is no damage, that the pack is intact, and load it into mini containers for plane. Moreover, perishable products always take priority over other cargo units. The management of time in this part of the chain seems pretty efficient. According to Cameron Hill, the majority of delays are coming from the relation between pack-house and growers and how fast fruits goes from orchard to being packed.

In terms of order time, freight forwarders are pretty flexible. They allows in fact to receive the order the same day or the day before. The operation of booking the airplane space just takes 30-60 minutes.

According to Cameron Hill, China is the most difficult market to have a fast flow of goods since it has different requirements according to regions, which makes clearance and documentation a bit longer. With China it is all about knowing the exact shipping requirements.

CAPACITY

According to Cameron Hill, from Kuehne Nagel, there are never problems with plane capacity from NZ to Asia and Australia. Moreover their facilities in Auckland, could easily operate with 5 million trays divided into 6 weeks if the volumes in trays are well presented and correctly graded. The main point to facilitate this process is forecasting the demand in order to facilitate planning operations.

The minimum volume required comes down to the unit type to load the vessel. Some ship have for example a max weight and height constraints. There are three main loading devices: AKL/LD3, ALF/LD6 and PMC.

- AKL/LD3: max weight of 1437 KG and pallet height of 163cm.
- ALF/LD6: max weight of 3000 kg and height of 162 with 317.5 cm of diameter
- PMC: It is only a flat little pallet base only used for illustrative purpose.

In case of a very large order size, the airplane can split the volume into different flights but this barely happens with kiwi berries since they are highly perishable. Kiwi berries are transported more frequently and in lower quantities Kuehen Nagel do not have a minimum volume but just a minimum charge for 45 kg. For kiwi berries it is a bit hard because the volumes are small and the supply chain has narrow window from picking to the pack-house.

In addition, since fresh produce takes priority over other cargo the plane space availability is further increased.

TEMPERATURE MANAGEMENT

Temperature is mainly controlled by foil and dry ice as there are no cooling device in the plane. In any case the temperature on the plane is always very low. However, since air freight is quick, fruits doesn't have to sit around high temperature fluctuation. Dry ice is the only way to keep the temperature controlled. In Auckland fruits are store in 6 different chillier according to the temperature required and to the type of fruits stored.

COSTS

There are different types of costs related to the overseas transportation by air.

Air freight costs is calculated per kg (min shipment of 45g). These costs differ from market to market.

There is also an handling fee and a documentation fee. The documentation fee is fix for the season and it is a fix cost per air consign. Some Air lines like Singapore airlines, puts more constraints than other around this cost. The costs per air consign depends on the destination port and on the airline; this information are known at the start of the season. Overall, fix costs are around NZD150 for export custom clearance and NZD80.00 for Phytosanitary Certification per shipment at which is to added the variable cost per kg. Generally the variable costs from new Zealand to the main markets can go from 1,90 to 2,40 dollars per kg.

The price does not change during one season but only from season to season. This fluctuation depends on commodity rights based on the time of the season at which the product is produced and on freight availability. Each different fresh produce has his own right. This is the main way to moderate prices according to the time of the year. In November-December there are a lot of fresh produce and therefore the price goes up while in February-March the rate decrease again. The price difference compensate the less amount of volume in the airfreight to match the volume of products to go. This difference in price is very important for NZ since his wealth is predominantly generated by export and thus has an uneven international trade balance. If NZ will start to import more stuff by air, the situation would eventually change. However, this aspect is more important for see freight rather than air freight. According to Robin Dillmore if volumes reach 6.500kg costs drops significantly, while for less than 45 Kg it can get extremely expensive.

Main observations:

- Low volumes and the inconsistent maturity made it unrealistic see freight
- The minimum transit time by boat is 12 days with a cost of 0,16\$/kg (liners containers)
- There is not yet science and technology to assess the feasibility of see freight
- There is no lead time for air freight
- The minimum Q for air freight depends on unit type of vessel
- The minimum charge for air freight is\$
- Average cost per Kg for air freight are between 1,90 to 2.4 \$/kg
- Overall fix costs per air shipments are around NZD 150 plus NZD 80 for phytosanitary control
- In case of a volume >6 500kg costs of air freight drops significantly

5.3.4. QUALITY CONTROLLED LOGISTICS

The first quality control point in the Kiwi fruits supply chain occurs after packing, to ensure that fruits meets grade standards when goes into the box. In the cold store fruits are checked by both Zespri quality control team and pack-house internal quality control team. Once fruits are in the containers are randomly checked to see the overall quality. At the waterfront there is a check of 70%of pallets to make sure goods are within grade standards. If produces are not conform, are sent back to the facility to be reworked.

Once all the defects are taken out and the product is within the standards goes into the ship. This, according to Margot Cotter, is the most critical control point of the supply chain. After loading into the ship, there are different procedures of control according to the market and transit time. There are also inter checks into the market if Zespri operates as with a STO model, for example in Belgium, Japan and China, by random selections of pallets. In case Zespri operates by a DSO model it is up to the client to check the quality of the arrival by an independent auditors. Clients will inform Zespri about the percentage not conformed. If the percentage is over 50% there is the “major fruits quality pen” where all the costs are directed to the suppliers.

In the STO model, clients gets a reports each week about the quality of the fruits arriving included with a risk score which will inform them about which fruit has to be prioritized for more important customers and better direct the flow of produce. The risk score is created with both quality information from the docks and from the market in the past 5 weeks, and it can be a value from 1 to 100. If the score is below 20, is safe. The risk score is mainly used for the STO model since giving the report directly to clients may incentivize unnecessary claims. It only happen with few distributors which have a long term relationship with Zespri based on trust.

The quality control management have a daily communication with the supplier entity to have more accurate information about defects for example. The most important point is to have ad hoc information. Consequently, there are two main differences in quality control logistics according to the commercial model. As a result, in the STO model there is more control and visibility in the chain. With the DSO model, part of the information are lost and there is a break-down of control. However, there is a constant flow of information about the quality for both model. For example, in the DSO every two weeks there are conference calls in which markets gives feedbacks on quality.

There are markets - like the Middle East - where quality control logistics is more difficult to apply since the transit time by boat is very long and there are lots of new clients which tent to claim more. Moreover there is a problem of different quality standards around the world. For example different perception of fruit’s firmness.

In the scheme below a representation of the quality control logistics of Zespri is represented.

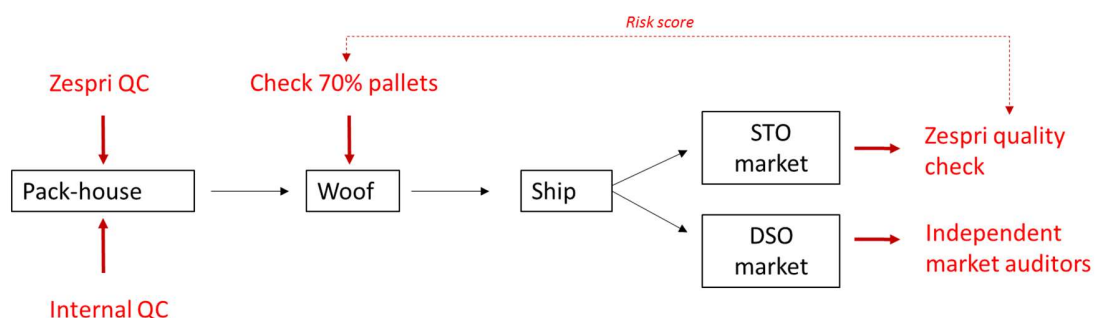


Figure 29. main quality control points in Zespri's system

Despite the kiwi berries business is still young in NZ, and therefore the quality control logistics is less sophisticated than it happen for kiwi fruits, traceability is taken very seriously. For each punnet sold, the specific orchard lot of production is known. A strict traceability system was necessary to maintain the market strong. Southern Produce make an assessment at the arrival in the pack house in order to trace the lines of fruits. It is also possible to trace back all the analysis at the pack house in order to provide transparency in each stage of the supply chain.

Main observations:

- The most critical control point is between sorting and loading into containers
- Market like Middle east requires a more intense quality control
- For STO market the quality control is more reliable and the flow of information more accurate

5.3.5. SUPPLY CHAIN INTEGRATION

TECHNICAL INFORMATION SHARING

The pack house and NZ growers association gives insight to growers on best cultivation practices. There has been organized pruning field days with discussion groups. However this just a marginal support to growers in comparison to what would be necessary to improve the cultivation Practices. In these occasion growers shares their ideas and receive feedbacks. According to Richard Trafford, this is partly useful since every orchard is different and requires different cultivation practices. Mike Torr, recognizes the benefits of NZ grower association but on the other hand he explained that it requires some levy and it is an additional costs to production.

Growers and pack-house also have commercial contacts for the reconciliation of financial program by weekly market updates and inter seasonal reports. Also traders like Fresh max offers technical support from expert in the field like Roger Baily, who has a very good reputation in the industry. They also try to target information according to the specific orchard.

The main problem of having technical data and support is that there is not enough trials to make a statistically valid generalization. The only possible thing is listening to as much people as possible and align different experiences. In general the exchange of information can be defined a bit shallow since there are lots of political issues and commercial stakes. Moreover the CEO of NZ grower association, Geoff, also have commercial stake since he is a grower and post-harvest operator himself. Because of this he has been described as reluctant to share his experience with the rest of the industry. According to Mike Tore, information sharing is the key for a better crop management. Fresh max has - as part of PVR deal - the communication of technical aspects with the variety breeder with a sort of annual catch up in order to take into consideration weakness and constraints in new varieties developments.

RELATIONSHIPS IN THE CHAIN

In planning the choice of the post-harvest entity, most growers are influenced by the net return per tray. However another important factors are trust and long-term relationships building. In fact, growers seem to trust more pack-houses like Kiwi Produce which are also direct producers of kiwi berries.

Cultivators feel quite a high pressure from the pack-house regarding harvest time. The fact that is the pack-house to give the green light to growers to pick the fruits creates some argues between parties. The sooner grower can pick fruits, the better it is for them. The reason why pack-houses put constraints in harvest time is coming from demand and pack-house space availability. The pack house have to treat all growers at the same time respecting equal size of orders. In spite of this, growers which are closer to the pack-house, many times are facilitated in case of improvise demand.

The relationship of the different actors differs according to the exporter, varieties available in line with the demand and type of pack house. If the demand is not well managed and the pack-house cannot receive the fruits, there is the risk that fruits sits too long on the vine. Regarding varieties, for instance, exporter like Fresh max only accept K2D4 while for the public varieties growers do not have any protection. At present, according to growers, supply seems to exceed the demand and thus everyone is waiting to get their brix level up to get it off to pack and enter to cold store and then offshore as quickly as possible.

Other growers that operated with Seeka and Fresh max, like Mike Torr, report a different scenario. Growers do not wait for an order from the post-harvest entity but it is up to them to inform when the fruit is ready for harvest and deliver it to the post-harvest entity. This seems to be the case when the exporter have a strong position in the market, like Fresh max, where is the market that wait the fruits to be ready rather than on the other way around.

For this reasons, many growers are feeling frustrated and are considering to invest in pack-houses themselves.

At present, the SC is structured in a way that the biggest risks are for growers. The best scenario will be to have an integrated supply chain from field to export. In this way it will be possible to integrate crop and demand information in real time. This is one of the main reason of the former success of kiwi fruits, where thanks to Zespri that had market figures and packing license, the industry was well controlled without profiteering.

Tony pounder insist with the collaboration between growers/pack-house/exporter. In his facility, growers have to directly deliver to the pack-house because, according to him, *“the grower has to be accountable for the pack house and the pack house has to be accountable for the grower for the delivery of best practice”*. He believes that the best model for kiwi berries supply chain is where exporter and growers are in direct contact. This model is different from the one adopted from Kiwi Produce.

In general, whereas for kiwi berries relationships are very young and not well defined, in the kiwi fruit industry is the opposite case. Zespri tend to have a very stable structure, by long term relationships with supply entities, 3PL and distributors. To achieve a reciprocal trust and to work in the best condition in terms of facilities and cold storage. In fact, it is in Zespri interest that all actors in the chain have enough profit. One of the key success factor of Zespri is the management of relationships. For instance, relationships on sales based with retailers. For a high value product like kiwi berries, it would be extremely important that the person who receive or store fruits has to be able to assist the quality and it will have to be able to make regular deliveries.

One of the most important aspect to gain competitive advantages against other fruits companies is having good reputation and being trusted in the market. Tashiro, for example, was able to introduce kiwi berries thanks from his long collaboration with Zespri and therefore he was known in the sector for delivering high quality kiwi fruits. Tony pounder, focus on post-harvest to gain good reputation abroad.

Main observations:

- Technical information sharing between growers and exporters are more valuable if targeted on the specific orchard
- There is not enough trials to make a statistically valid generalization of technical knowledge
- The net return per tray mainly determine relationships between growers and pack-house
- Harvesting time is a object of tension between pack-house and growers
- The SC is structured in a way that the biggest risks are for growers
- Mutual accountability between growers and post harvest operators is required
- Kiwi berries industry is characterized by very different relationships model than the kiwi fruit industry
- Reputation and trust of exporters in the market is a key aspect

5.3.6. DEMAND MANAGEMENT

INVENTORIES MANAGEMENT

Inventories are managed according to the demand. In order to avoid deterioration of packed fruits in stock, the harvest volumes is restricted in order to harvest only the fruits which has already been sold. If the Demand is not there it is more risky to harvest and pack the fruits rather than leave it on the vine.

In this way the time window between harvesting and getting fruits on the shelves is shortened up. Generally, the main stock practice is FIFO but this approach can be moderated according on the presence of priority requirements. For example, Fresh max use to manage inventories also according to grower history. For instance, if one particular grower have very good canopy cover, this fruits will probably be stronger while if it is from a very young canopy with a very light cover it would probably need that the fruits move more quickly.

Inventory management for kiwi berries changes also according to the marketing channel. In case of e-commerce for example, it is more complicate since a non-uniform maturity in the punnets has higher risk of complaints. For this channel only the most firm fruits are sent, which increase the complexity in inventories management.

The way Zespri is currently managing the supply for kiwi fruits is far more elaborated and it is based on a very unique mechanism of contracts rather than a simple FIFO. Each supplier have a certain volumes in terms of millions of trays and each supplier get payed by taste and size. Because of this, Zespri has nothing whatsoever to do with inventory management of kiwi fruits. Suppliers entities (packhouses + growers) decides by their own what kiwi fruits to supply to through Zespri based on the price they want to get.

However, suppliers have a commercial arrangements with Zespri around when the season first start and when the season finish - this will be the kiwi start scenarios. When the season start getting into market for the first time, Zespri wants to get the fruits as early as possible to be earlier in the market. Therefore, fruits are shipped at modified maturity in order to get the fruits earlier from the vine (lower brix) and get it to the market already ripened. To stimulate suppliers to harvest earlier,

and therefore get a lower price, Zespri put some incentives, like a Kiwi start payment at the beginning of the season, to compensate for the taste and size forgone. This is called “kiwi start policy”.

Another variable for inventory management is the time rate - the more fruits are kept in the cold store, the more suppliers get payed to compensate the higher inventory costs and fruit wastes since the quality deterioration rate over time has incurred more cost to the supplier entity. In general, fruits are harvested all in once and after that moment are kept in the cold room, Zespri is only taking care of moving inventories by its ordering policy.

For kiwi fruits inventory control, on the top of all variables there is taste. Taste is the main driver for differentiation of inventory. For example, knowing that some markets like Japan are more sensible to good taste, only high taste fruits are sent there. This differentiation is made by maturity test in the Orchard and classified into taste banding. It can be either high or low.

Besides, on the top of that there is the market excess variable which is complicating inventory control since it is hard to always control what the fruit is going to be and is suitable for. Thus, when looking at inventory management, it is not just about quality and deterioration rate but it is also about market excess and around taste characteristics as well.

Once fruits has been packed it may go into a pack type that can only fit to one specific market, this gives more rigidity in managing inventories.

Another constraints in inventory management is phytosanitary requirements of some markets and the conformity of only part of the harvest. Consequently, the way inventories are managed is mainly determined by the type of market.

Since the market have a key role, Zespri actively communicate with pack-houses by an online collaboration network called WAKA in order to check constantly that the right pallet will go on the right place.

For Kiwi berries, at this stage, is much easier. The impact that kiwi berries inventory control will have on Zespri current resources will be limited, especially since they will comes in a period of the year when no kiwi fruits are exported but only planning and negotiations on contracts are going on. A challenge would be managing a big volume like 5 million trays in only 6 weeks' time.

Main observations:

- Harvest volumes are restricted in order to harvest only the fruits which has already been sold
- FIFO model is modulated by priority requirements and different clients specifications
- There are no early start policy agreement for kiwi berries at present
- The time rate of product in stock would not be applicable for Kiwi berries
- Packing fruits before storage add rigidity in inventories management

ORDERING POLICY

In the Zespri policy of ordering, an important aspect is to make sure that orders are assigned in equal percentages for each suppliers according to their volumes. At the beginning of the season each suppliers knows which is their percentage share of kiwi fruits. The bar chart below illustrates an example of the system.

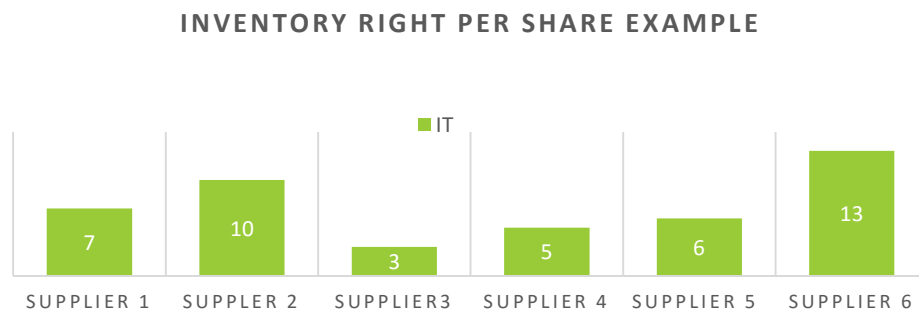


Figure 30. Example of diverse right per share

The management comes harder when the quality variable is taken into account. Even if the quality of a supplier is not good, the share percentage is the same as all the others, however all orders are given earlier otherwise fruits will get spoiled at a later point. So Zespri is constrained to order each supplier by their share and different time buckets. The supplier then has to manage their own inventory.

A very important aspect for this configuration of the supply chain is to guarantee an adequate lead time to suppliers which normally is 2 weeks.

An additional aspect is to take into consideration, is to guarantee no changes in orders, especially since kiwi fruits inventories are divided by sizes. The matter of sizes is very important in inventory management because it may create changes along the way from supplier and from demand; those changes cause a lot of challenges in the supply chain. If there is only one actual product with no differentiation in size or packaging then the demand will not swing as much.

The main challenge regards changes in order size from clients once fruits are already in the boat, it is all about lead time and flexibility to the market. The lead time is agreed with both suppliers and clients. For each change in quantity from the supply side there is a penalty imposed by Zespri and for each change from the market side Zespri gives a premium to compensate the extra work. Within the lead time agreed with customers, the challenge is to limit changes in orders. Once kiwi fruits are into containers or on the ship, the only possible change is to divert the order to a different market. During the time from order to execution of the product arriving in the market all the changes from the marketing should be limited. A single change in market would lead to a big bullwhip effect. Changes in market are a big issue for kiwifruits which have months of storage life, for kiwi berries this aspect would be extremely difficult to handle.

The current model is probably not the best for optimizing quality results but it is fair towards the first part of the SC and is facilitated by the long shelf life of kiwi fruits. In case of kiwi berries the same rule cannot be applied since the supply chain is faster and fruits barely stay in the cold store.

Zespri may transfer kiwifruits orders in two models: Direct stock order (DSO) and Stock Transfer Order (STO). In the case of STO Zespri also operates as importer, as it happens in Europe and Japan. In this model fruits are checked at the arriving point and the supplier gets a premium or penalty depending on the fruit they sent. In case of the DSO market, Taiwan for example, the container is going to turn out and it goes straight to the customer, or straight to the retailer without any previous check from Zespri. The model is getting blurred for some markets like Taiwan, where there is also an operational manager that is

directly checking the fruits through three different retailers. In Australia is also different since there are no operational person there but they are only STO market with a service provider.

The main difference is the understanding of the arrival in the market, in order to direct the stock to preferred customers around what they can receive and the quality pressure they can manage. DSO occurs in markets which are close and there is a long term relationship based on trust. With kiwi berries it will be very different. On the other hand, according to Steven Buyan, DSO is more indicated in case the volumes are small.

In the scheme below the two main commercial models that Zespri operates are represented.

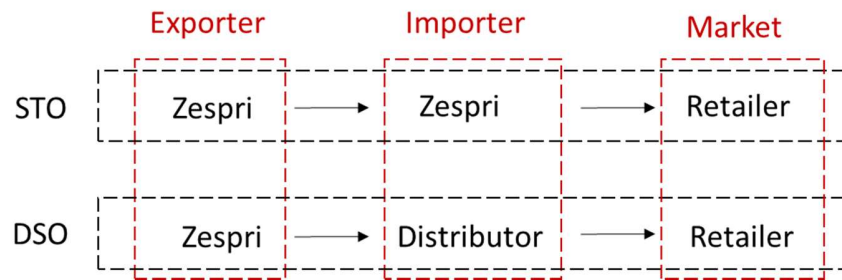


Figure 31. Zespri's commercial models

Main observations:

- Giving the proportional percentage of orders to each suppliers is harder when quality is taken into account
- In case of different sizes and packaging formats the demand is more likely to swing
- Changes in orders may create a big challenge for a highly perishable fruit ad Kiwi berries
- DSO can only work for close and trustable markets
- STO gives more responsiveness in orders quantities

PLANNING ACTIVITIES

The way activities are planned in the field, according to Geoff there are no significantly different from kiwi fruits. However, regarding selling planning activities there is a big difference since the systems of harvest and the shelf life are almost opposite. Tony Pounder believes that the way production and selling activities are planned is completely different from kiwi fruits. Berries, in fact, has to be viewed as *“high value, short shelves lives, and seasonal way of thinkin”*, therefore everything is more in line with the berries business. This is facilitated if the supply chain from grower to exporter is integrated. Pack-houses have to collaborate with exporters to plan export sales in order to always give info about the crop one week ahead of picking and packing activities. In this way demand and supply are matched. During this exchange of information, quality is also highlighted. Fresh max, to avoid surprises, start to monitor the orchard from pollination and then constantly reviewing as the season is getting closer to the harvest. It directly goes into the orchard to monitor the canopy, how is shrinking. In this way they are able to shape the market according to what is coming out of the field.

The biggest challenge for planning the distribution of kiwi berries is in terms of getting enough commitment from the grower and getting enough volume to provide realistic commercial proposition to the retailer. The main reason of this is that retailers around the world only commit for at least 4-6 weeks. According to Tony Pounder, it is always better to do not over commit with clients in volumes and be more conservative on the offer to customers since the whole commercial relation is based on trust and long term relationships. According to fresh max, one of the disadvantage of NZ kiwi berries is that they are cultivated in the Bay of Plenty which is full of Kiwi fruits people who has in their subconscious the long shelf life and the flexibility of kiwi fruits. This is making really hard for them to synchronize planning activities.

The perishable nature of Kiwi berries would introduce a challenge for the system in which Zespri is operating. The main difference will be in time for mistakes correction, all the changes along the way will affect upstream orders. For kiwi berries, harvest constraints will lead to a more careful control that orders are well planned in advance, measured and constant. Communication in planning is essential to avoid surprises. This, is very similar to the beginning of the season for kiwi fruits, when the supply is lower than the demand.

In planning activities Zespri comes up with an optimized sales plan, therefore supply entities knows weeks in advance what the plan is. In total, they know the demand by week, by size to which is the market or is it going to go. Suppliers then, individually receive the pack plan, and thus it is an equal percentages of all the different packs Zespri have for each suppliers. Zespri also have the overall plan but each suppliers is given by an individual one together with a total departure plan or arrival plan. This gives all markets by pack type, by size by volume, and timing for the whole industry. This is done with 13 registered suppliers' entities but within the supply entities they have all different pack houses. An example is Seeka.

During planning activities, market forecasts, which are made by the market team, are matched by crop estimation. The total amount estimated is allocated then into different markets according to the demand specifications. Mismatch between supply and demand are always present since it is an unpredictable business. It is all about coping that in the best way by giving the most up to dated information and communicate it correctly. Every two months, forecasts are updated and consequently order plans are adapted. For a product like kiwi berries, which have a window of 8 weeks maximum, radical forecasts are necessary in order to rapidly adapt to changes. That will be a big difference in a planning cycle.

One of the bigger risk while trying to rapidly grow a new category of product is having mismatch with price and quality which leads to reallocations of fruits between markets. To be able to reallocate fruits it is necessary to have information in advance. By see fright the price responsiveness in this regards is very low. Considering see freight for a product like a kiwi berries, there would be not enough time to make changes. If the fore standing order is 14 days and the freight is 16 days, by the time three weeks of shipping of transit time to Singapore occurs, including one week of loading the vessel, the feedback about sales would be too late. It will remain just two weeks with the fruits to sell and this actually all lined up to the coming

containers to go to the markets. To cope with this situation it would be necessary to make some market contingency plan and to pack the fruits in a flexible way that they can be adapted to many customers.

In matching production with demand there are two main option. According to Steve Buyan, either the product is sold at best in big volumes in order to create the demand for consumers or either sells start very small in order to slowly build the market and get confident with the quantity to put into that. According to Steven Buyan, the second option might be the best scenario for kiwi berries. Also considering what the backups are when export is not working is important, because, according to him , *“if you have to sell 1 m trays of kiwifruits or 5m that have a life cycle of 7 days in NZ you could never get them sold true nz retailers. We faced with our fruit ourselves by not having a strong domestic market.”*

The model Zespri is operating is governed by a market push since it is an SPA and have to take all the fruits produced. Zespri is governed by supply rather than demand - it just comes down on how to optimize that amount of fruits and to what markets fruits have to be sent. It is all produced anyway, and thus it is a make to stock production model. From an optimization point of view, the MTO policy would better minimize waste.

Main observations:

- Planning activities should be completely different from kiwi fruits
- “high value, short shelves lives, and seasonal way of thinking” should be considered in planning activities
- Getting enough commitment from the production is one of the main challenge
- The perishable nature of kiwi berries doesn’t give time for corrections in case of mistakes
- Mismatch between price and quality would lead to market reallocation
- MTS policy would minimize waste

5.4. COMPARATIVE SUPPLY CHAINS

In this chapter, two different supply chains are presented: the New Zealand's blueberries supply chain and the European kiwi berry supply chain. Each of them has completely different traits but results interesting for the sake of this study. The former, since gives an example of a berry business in the same area of production and the latter because present the same cultivar in another context/hemisphere. A first presentation of the main results from the interviews is given, followed by a brief conceptualization paragraph that highlight how NZ kiwi berries can benefit from this observations.

5.4.1. NZ BLUEBERRY SUPPLY CHAIN

The development of the blueberry industry in NZ started around 1970. At present, around 800 hectares are cultivated with an overall production of about 2 500 tones. Over this production, 1 000 tones are exported, about 800 tones goes into the domestic market and the remaining are exported. Overall 70 growers are registered.

The main uncertainties are related with climate conditions like rain and frost. Since blueberries industry in NZ is very small, there is not much agronomic knowledge around. Each orchard requires different agronomic management and experience is the main help for a grower. Most of the growers mainly grows blueberries. For many growers, the business started as a leisure activity and it was not be taken seriously, that is the main reason why many of them went broke. Blueberries, as kiwi berries, is a crop that requires a lot of attention. The main costs of production are related to the labor costs for harvesting, pruning and packing. Harvesting costs are particularly high since they have a multiple harvest model. Each grower would usually grow five to ten varieties and so the harvest can be quite long – there might be many individual harvest for each variety and usually the picking occurs every day. The different varieties are sold as one single one at the eyes of consumers. However buyers does recognize the quality of different varieties. There are no specific criteria behind the choice of a specific variety. In some circumstance the choice of varieties is dictated by specific climate conditions of a geographic area and, despite the quality might not be the best, the correct timing of the year may allow for better money than other varieties.

On one hand, according to Dan Pech, multiple harvest are an advantage for labor continuity and longer harvest window which gives access to different market places. In each different period of the year there are different buyers. The export market is the preferred since is willing to pay more than the domestic market. The market places vary according to the varieties, period of the year and availability of cheaper source of supply. The season last diverse months, from August till May-June of which February and March are export focused.

The only market for export sales is Australia. In the past were also Asia, Japan and USA but not anymore because in the same season there is now too much competition from Argentina and Chile. South America compete better because of the better financial support from USA in genetic varieties which allows them to be more efficient in the distribution.

Having a longer harvesting window does not necessarily imply a positive return since only few months are available for export. There is therefore a significant difference in prices between different times of the year.



Figure 32 Destination of Nergi kiwi berries volumes (interview)

Price is mainly dictated by the balance between Supply and Demand. In August, September and October the price is around \$ 15 per kg because the supply is poor, each grower have different timing when they supply and therefore different average prices. Within that there are some varieties that are oldest selections and the quality would be recognized as not as good in terms of shelves life.

Every grower have his own niche where he found some return. The main impact that multiple harvest have in the pack-house is that it allows for labor continuity. Since harvesting, pruning and packing blueberries requires skilled workers, this will allow to keep the same personnel on a stable basis without changes.

Multiple harvest requires also lots of effort in synchronizing activities between growers, pack-house and marketer.

In the pack-house some automatization is important. For example, they adopted color sorters, defects sorters and weight sizer for punnettization. This allows them to sharply reduce costs and have a standard quality of output. Before these innovations the process was considerably more expensive. However, the level of adoption of new technology is not uniform throughout the industry.

The shelf life for blueberries is about 2 weeks, 3 weeks considering the arrival in the household. Shelf-life may vary significantly among varieties, for instance, some of them may last just for few days. Shelf life is therefore an important determinant of market choice.

A positive aspect of the blueberries SC is the fact that in case of a mismatch between D and S, there are always possibilities in the transformation industry. However, this option does not have big margins. Moreover, the conditions for mismatch between D and S does not occur often since NZ is a very small producer.

Currently, blueberries are exported by air freight. The main obstacle for sea freight transportation is volume. The volumes in fact does not allow for entire containers, to do so they would need the same varieties picked and packed the same day. Air freight has a big impact on the final price but it is not possible to do otherwise. -According to Dan Pach price is very important in consumer's choice and it comes at the first place before healthy attributes and taste.

Regarding supply chain integration and information sharing the industry has more an individualistic approach. There are field days but not a real sharing of ideas. Exporters- importers and suppliers, however, have a solid flow of information. The exporters from Australia visit often plantations in NZ and the relationships are very important. Information are divided by variety and week and are constantly updated.

Inventories are managed by each pack-house, there are no fixed percentage based on volumes but it is up to the pack-house to take care of the sales of each grower. The general inventory model adopted is FIFO. It is not simply a daily activity, but it is organized by a five year projection for each grower. For each varieties and growers, the quantity is known in advance and this allows marketers to find in a proactive way the market. Up to date, the D has been higher than the supply. In case of an incorrect communication about the actual quantity from the supply side, exporters pays less money. The model they operate requires small and frequent orders so that importers does not keep anything in stock in Australia.

CHARACTERISTICS:

- Few knowledge is shared between producers
- Unpredictable yield
- High costs for harvest, pruning and packing
- Type of variety influence market
- Multiple harvest: good for labor continuity and access to a wider market window
- Different period of the year have different markets and prices according to location of production and competition abroad
- Technology important to increase efficiency
- Possibility to access to transformation industry in case of mismatch between demand and supply
- Low volumes for sea freight
- Strong relationships with exporters

5.4.2. EUROPEAN KIWIBERRIES

The production of Kiwiberries under the name of Nergi started in 2011, to start the commercialization in 2013. Nergi is a club which holds three companies: Fruits Word in the Netherlands, Prim'land in France and Ortofrutta Italia in Italy. In 2015 the overall amount produced was 1,2 million punnets but the production it is estimated to increase in 2016 to reach 2 millions trays which is more than 2 million kg of kiwi berries. The area of productions is about 140 hectares divided between Portugal, the Atlantic side of Southern France and the Piemonte region in Italy. Only in Piemonte 70 hectares have been cultivated.

At present the supply chain is developing new know how on cultivation techniques, especially to deal with climates challenges and to adapt New Zealand varieties to European climate conditions. The major costs are associated with pruning and harvest since the labor costs is expensive, especially in France.

Kiwi berries are sold in punnets of 125g, each tray contain 12 punnets and each euro pallet contain 196 trays.

The main varieties are Rua, Tahi and Toru. These varieties are never mixed in the punnets since they look slightly different and there would be a visual difference in the punnet. Rua is marginally longer than the others and weight 14g per piece while the Tahi has a more round shape and weight 10g. The reason behind these different varieties is mainly for experimentations and because it allows to increase the seasonality. In fact, Rua blossom start around one week before Tahi which allows to harvest 6 days earlier. Private varieties like Tahi and Rua have a central role in maintaining quality standards and to make consumers recognize Nergi as a superior brand. For this reason the brand Nergi is the results of many investments.

Harvest start the first 10 days of September and fruits are picked all in once once fruits reach 7 brix and 12 of dry matter. According to Jean-Pierre Carusel, the max distance from the field to the pack house is 30 km. Straight after harvest, fruits are sorted, packed and stored at 2 degrees. According to Romualdo Riva, storage is very important to ripening the fruits. The reason why it is possible to pick all in once is that the bud break is even on the vines. During sorting, fruits are divided according to size and level of defects. There are 3 different sizes sold at the same price. The reason behind this differentiation is that it allows to have more uniform punnets which is very important in the berry business. The quality perceived by consumers acquires a significant importance once fruits are sold under a special brand like Nergi.

The second criteria of selection regards defects. According to the level of defects, fruits can be divided in two quality classes: Premium and medium/standard. Both are sold under the name of Nergi but with different label specifications. The

remaining part of fruits goes into processing industry. To achieve this results both manual and mechanical sorting are effectuated.

Fruits can be either packed directly in the market format after harvest (before storage) or it can happen afterwards according to clients requirements to be more responsive to the market.

Fruits can be store for up to 2 months. According to Roumualdo Riva, the cold storage has the role of fining the product and to transform starch in sugars. This process will allow to reach the perfect firmness to be ready for consumption. Once the product is sold, they can guarantee 10 days of shelf life before consumption. After 10-12 days at 8 degrees or 7-8 at ambient temperature, the product is no longer sold at the retailer since the color gets darker and consumers see in the label the date.

Inventory management is up to a special team which match demand's specifications with lot numbers and consequently adjust sales.

Nergi is mainly sold in Europe and transported by truck. The main markets are Germany, France, Italy, Benelux, UK, and Scandinavia. Each market have specific requirements.

Only European kiwi berries are sold under the name of Nergi. However, during February-March fruits World sells also kiwi berries from Chile which are much cheaper and without Nergi's name. The price range can vary from 1,99-2,19-2,29 per 125g punnet. All fruits are Global Gap certified. With the current production they were able to sell the product for two months. From next year Nergi will start to be promoted also outside Europe

To introduce the new product in the market Nergi invested significantly in promotions and communication to consumers, especially with stands in supermarkets. The most important thing was to make consumers associate it to the berries category.

CHARACTERISTICS:

- Well integrated supply chain
- Possibility to access to transformation industry in case of mismatch between demand and supply
- Uniform bud break → only one harvest
- Storage necessary to ripe fruits
- Shelf life up to 2 months
- Slow increase in production and contemporary investment in demand
- Partnership with berries expert → strong association to the berry category

5.4.3. LESSON LEARNED FROM NERGI AND NZ BLUEBERRIES

Both supply chains have interesting traits to look at as example for New Zealand Kiwi berries. First of all, in both supply chains fruits are associated to the berry category. Particularly, Nergi Kiwi berries made partnerships with expert in handling berries like Fruit World in Breda (NL).

As all berries, mechanization has a central role in packing and sorting since it increases punnet's uniformity. Besides, the tight margins and the high cost of harvest, pruning and packing make this step necessary.

Blueberry supply chain is characterized by multiple harvest, this is seen as positive since it allows for labor continuity and a longer seasonality. On the other hand European Kiwi berries only have one harvest which permits to have a higher level of uniformity, lower picking costs and less risk of obsolescence. Additionally, having only one harvest allows to have a shelf life of at least 2 months.

Both supply chains are export oriented. However, despite Nergi is planning to expand outside Europe and NZ Blueberries used to be sold also in Asia, their export market is closer and much easier to manage.

Interesting is to observe in the blueberry supply chain how different periods of production shape the market according to the competition abroad. Since sea freight from New Zealand is extremely expensive, NZ blueberries can only compete in period of the year when the production from other countries is null. Being able to use sea freight would definitely change its competitiveness. However, small volumes (also due to multiple harvests) does not allow to fill an entire container. Another interesting aspect that influence the market for blueberries is the choice of the variety.

One of the strongest point for blueberries, is the tight relationships between importers and exporter which, once again, underline how important is trust in the fruit business.

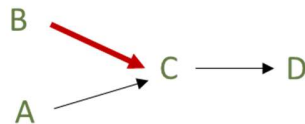
Also remarkable is to see that, as typically happens in the berry business, both supply chains have access to the transformation industry as contingency plan.

Lastly, it is important to observe from Nergi, an innovative unknown fruit, the amount of investments that aim to stimulate the demand contemporary to the slow increase in production.

6. DISCUSSION AND ANALYSIS

In this section the correlation between the factors (A, B, C, D) explained in the methodology (Ch. 4) is enlightened. This discussion is coming from the analysis of the empirical observations (interviews).

6.1. IMPACT OF PRODUCT TECHNICAL DESIGN COMPONENTS ON LOGISTICS MANAGEMENT



Kiwi berries technical design components largely impact the management of the distribution offshore..

In terms of breeding programs the most important goal to achieve from a distributive point of view is to improve responsiveness to ethylene and cell structure in order to allow for a longer storage. The extension of the shelf life to minimum 16 weeks will consent to consider sea freight as an option. Moreover, the synergy between technology and genetics variety will further facilitate distribution.

Another important aspect regarding varieties developments, will be breeding plants with equal sizes of canes and low vigor. It will help to increase efficiency in harvesting and to reduce the overall cost of production. To do so the utilization of Hi-can may help in having a more uniform production (uniform maturity and untangled canes) and to increase efficiency in crop management. One of the biggest uncertainty is predicting the actual volumes since the current varieties behave very unpredictably. Hi cane may reduce variability by 50% giving a more stable yield to forecast and therefore it would facilitate planning activities.

One more aspect, which will take more time to develop, is the creation of varieties with same traits but different harvest time. It will allow to extend the distribution window and to keep a constant flow of stock without having obsolescence's problems. An essential aspect while choosing a variety is its uniformity in the punnets, varieties which have different sizes and different level of red blush should be avoid. Moreover, the choice of a variety directly affect the configuration of the supply chain offshore. For example varieties like margi red or Takama green requires a faster supply chain.

The most important point in production is to consider kiwi berries different from Kiwi fruits. For example, for kiwi berries winter pruning have a vital importance to increase yield and give a better predictability of production. Infrastructure should be allocated as close as possible to the production. Likewise, in planning activities, it would be important to start thinking like a berry in terms of high value, short shelves lives, and limited seasonality.

One significant aspect in production, is to consider that kiwi berries have a very delicate skin which can be easily damaged by sun and wind, a heavy canopy –which can only be achieved after few years from planting - would protect fruits and increase uniformity in the punnets. The main uncertainties in the field that make

planning activities hard are related to the correct harvest window and damages due to insect, wind and sun -especially when fruits are little.

Harvest is one of the most important aspects that affect distribution. It modulates not only quality and fruit losses but also on inventories management and mode of transportation. In the scheme below the most important pro and contra are presented.

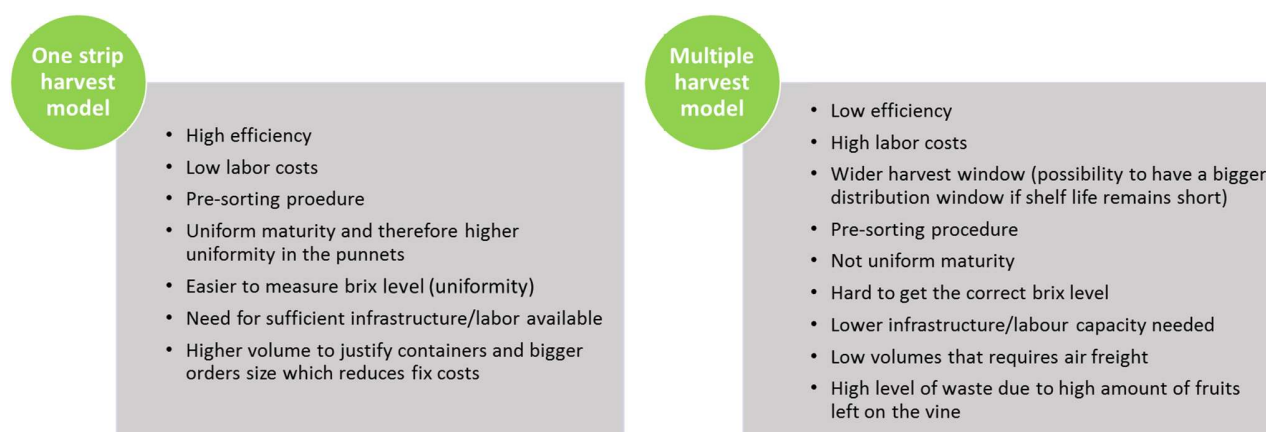


Figure 33 Two different harvesting model (from interviews)

Regardless the two model mentioned above, the best way of harvesting - to limit fruits damage - is manual. Handling in a correct way fruits after harvest is also important. To limit damages fruits should be gather in small containers and be subjected to fast transit time, taking into consideration external temperature.

For the sake of having an efficient distribution, sorting procedures should be as accurate as possible since eventual repacking at the import market would significantly increase costs. If kiwi berries are carefully sorted, it would be possible to store and transport already packed fruits. During sorting, the one touch system will allow to better maintain shelf life. Punnets of 125g appears to be the safer format for distributions since spoilage is minimized. For sorting and packing the best process configuration would be half-manual and half mechanical.

The presence of different classes of fruits will create complications in inventories management and rigidity in distributive options.

Continuity of the cold chain would be significantly important for kiwi berries giving their high perishability and the high external temperature in February-March. Because of the hot weather, to better affect shelf life, the best scenario would be to gradually slow down temperature to avoid thermic shock.

Deterioration rate requires a demand driven model rather than supply driven model. Maintaining the time lines from when the fruits are harvest till the cold chain and distribution in line with the demand of the target market is also important. However, the distributive model in which fruits were only picked in case of orders - adopted from some growers - was leading to a high level of waste and relationship issues in the supply chain. It can be concluded that a make to stock model gives the better results in terms of efficiency and quality. The high costs put important constraints in investments in new facilities and in machinery.

An increase in production, from a distributive point of view will be beneficial since it would reduce air freight costs or, in case of high volumes, it would allow sea freight. However, an increase of production will be positive only if the demand is well managed since it affects the supply/demand balance. Therefore, the stability of the demand is also important in modulating quality and waste. Moreover, an increase in production quantity would require higher capacity to cool down fruits and pack produce in time. An intensification in production would not affect infrastructure capacity since kiwi berries are harvested in a period of the year where the stock of kiwi fruit is completed. The only difference to be adapted would be the layout of the facility and the type of sorting and packing machinery. In contrast, low volumes of production does not allow to scale up in distribution and to invest in a proactive way in new technologies.

The choice of the mode of transportation is influenced by both perishability and volumes. Volumes also influence air freight since it determine the choice between air freight and air cargo. Additionally, orders sizes higher than 6 500kg allow to significantly reduce freight costs.

In case kiwi berries would allow sea freight, conventional reefer ships would be better since the boat is fully controlled (more flexibility), it does not stop in other destinations and has refrigeration systems. However, current volumes do not allow to reach 3500 to 5500 pallets just for one market- especially in case of multiple harvest - since kiwi berries and kiwi fruits have different seasonality and in February there is no export of kiwi fruits.

Sea freight also requires a large lead time for orders which is difficult for product like kiwi berries, especially in case of unpredictable harvest and multiple harvest. In contrast air freight match well with the unpredictable production of kiwi berries since the lead time is just a few hours. Additionally Air freight would also preserve better the quality.

Given the difficult storage life of kiwi berries, quality controlled logistics is very important. STO model might be easier for distribution of kiwi berries because it gives a higher visibility of the chain and season. In contrast DSO models - where relationships are less strong - there might be the possibility of a high level of claims. Trust and long term relationships assume in fact of special importance for a new highly perishable product like kiwi berries. Besides, STO also can benefit from weekly risk scores reports. Regarding this weekly reports, kiwi berries would requires ad hoc information. A higher number of control points will be necessary in comparison with kiwi fruits. In this regard, sea freight might represent a break in quality control.

Air freight is the best possible scenario for preserving kiwi berries. In fact, despite costs are high, if the product is well handled in the first part of the chain it consent to avoid expensive repacking costs which will probably be necessary in case of sea freight.

At present, kiwi berries inventories are manage according to the demand, however, to achieve the best quality results it should be the other way around. For this reason, managing demand throughout the whole chain is really important. To attain this, the best set-up for kiwi berries is having an integrated supply chain where each actor is accounted for the others.

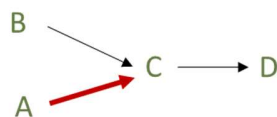
In regards to inventories management, the FIFO model will be predominant. Keeping the stock level at both import and export countries low and continuously refreshed would be the less risky and easiest way. In doing

so multiple harvest facilitate stock management. Additional variables also plays a role. For example, different share of growers (as it happens with kiwi fruits) or grower's history to allocate stronger fruits to more demanding market. Time rate policy would be premature to adopt in the industry at the moment, especially in the berry category since it is very different from kiwi fruits. The management of kiwi berries inventories is compatible to Zespri capacity since it will come just before the kiwi fruits season.

The main difference between kiwi berries and kiwifruits is coming from the different shelf life, this creates a higher rigidity in the ordering system especially if the transport is by boat. Giving the short shelf life, in case of an order modification there will not be enough time for corrections and reallocations of the produce to another market.

Concerning planning activities, since kiwi berries are pretty unpredictable there is the need for monitoring each step in the production from field to pack house. Without an accurate flow of information, creating an optimized sales plan is difficult. Additionally, the most appropriate way to match demand with supply for this niche product is to start slowly to build up a market rather than start from the beginning with high volumes and decisive marketing activities.

6.2. IMPACT OF MARKET CHARACTERISTICS ON LOGISTICS MANAGEMENT



As for all agricultural product, the most important requirements for kiwi berries market are a stable supply and minimum volumes guaranteed. Moreover delays in transportation should be avoided. The majority of retailers needs at least 3 to 4 weeks of supply to commit to a program. On the other hand, a vantage of such a niche product is that retailers are flexible since it does not interfere with company's turnover. Despite supply chain's relationships and trust have a key role in initiating new businesses, demand needs to be supported. However, disaggregated supply and competitive environment make it hard to achieve investment to stimulate demand. The export market from New Zealand has many threats which oblige the supply chain to increase efficiency in distribution to recover costs. One of these threats is the exchange rate. Another example, is the availability in the market of cheaper kiwi berries from Chile. A different factor that contributes to squeeze margins is price relativity towards other product offered in the shelf. Moreover, the more intermediaries in the chain are present and the more price is likely to increase and quality to decrease. Overall, the tight margins does not allow for inefficiencies in logistics.

A positive aspects regarding planning activities is that, since it is a very seasonal product, retailers mainly works on promotions. Therefore volumes are already presold before harvest. For the berry market the main trend is to have a high frequency replenishment model with small and frequent orders which are typical of a very responsive supply chain. In general, the more the demand is unpredictable, the more distribution has

to be responsive. This is only achievable by airfreight. Another option could be using sea freight in the STO markets where Zespri gather the product from containers and later send small and frequent amount to customers. For this reason the most indicate market for sea freight is Japan. However, Charter vessels – despite are the most appropriate sea freight option – does not allows for a matter of volumes.

DSO Markets like Singapore and Hong Kong might be more suitable for air freight at the moment. Taiwan, since it has an Hybrid model, might be a winning market since there is an internal quality support. Japan might also be indicated for sea freight since it is a more consolidated market which allows for bigger orders. It is followed by Hong Kong and Singapore. The order lead time may vary from market to market, for example the online markets requires higher leading time.

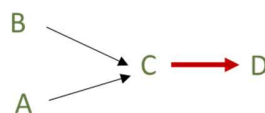
Markets like Europe and Middle East can only be reachable by air freight while market like Asia and Australia might be reachable by boat. For Australia, air freight is more convenient in any case as the rate is very cheap and orders required are small and repeated.

Direct sales to retailers represent the most efficient and fast distribution configuration. In this way it will be possible to have a direct quality control point closer to the final consumer. Moreover few infrastructure at import market will create a lower bullwhip effect in case of delay or poor quality of the arrival. The best scenario would be to have one retailer which gather all inventories in one place where quality report took place and he will split the bulk order in smaller quantities. (Eg Australia).

For kiwi berries production stimulates the market (make to stock). Market push can only occur if the marketing organization is strong in the market.

Different markets have different order specification and therefore inventories have to be managed accordingly. The main order specification from the markets, that increase difficulties in managing inventories, concerns traceability.

6.3. POSSIBLE DISTRIBUTIVE SCENARIOS



The previous analysis is followed by 5 major scenarios:

1. **See freight Japan:** This option is probably the most risky one and it will only be possible in case of improvements in shelf life of at least 8 weeks since only the freight time would be 12 days. Moreover, chartered vessel has to be excluded since the volumes required is almost impossible to reach, however also liners containers requires considerable volumes. For this reason it will be possible only with a single strip harvesting model. The two most negative points concern transport time and waste. Sea freight is in

fact not as fast as air freight and the quality is not best preserved. However, it would allow to significantly reduce transport costs and being more competitive toward Chile. It also has to be consider that the benefit of cost reduction might be null in case of further repacking costs. It might be a strategy to ship the product not in the market format. Another aspect to consider is that by only using see freight, the season in postponed of at least 2 weeks.

2. **Air freight Europe:** This is the less cost effective option. In fact, is the most expensive one and also risky in terms waste and quality. Time is relatively acceptable since it is air freight. I believe, considering the low quantity produced in New Zealand, the best way to supply Europe would be from a production of the northern hemisphere.
3. **70% see freight and 30% air freight to Asia:** this would be the most cost effective scenario since all the four variables are respected. To do so – as for option 1 – shelf life and volumes must allow. Air freight is only used to adjust orders and at the beginning of the season to anticipate sales, while see freight would do the majority of the quantity. As in option 1, only liners containers are considered.
4. **Air freight Asia:** At present, is the most common choice since it has the best trade-off between time, cost, waste and quality.
5. **Air freight Australia:** If market allows, it is probably the best choice. In fact, costs would be really contained and the maximum product freshness would be achieved. Moreover in the Australian market the configuration of distribution is optimal for kiwi berries.

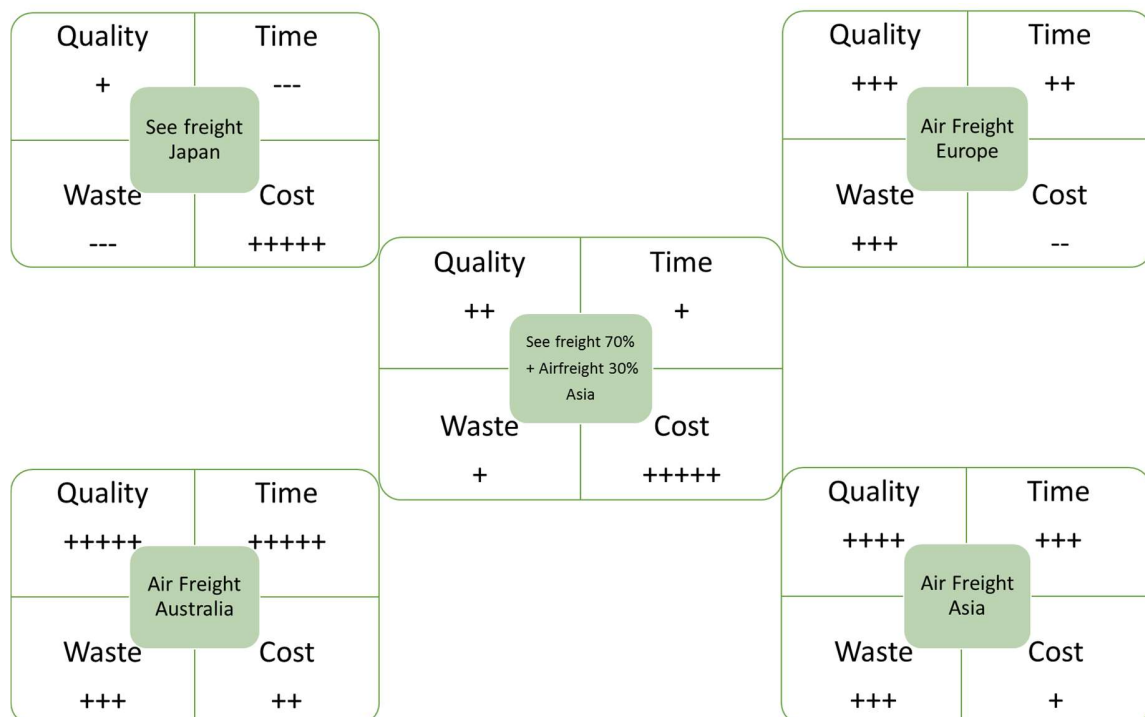


Figure 34 Five distributive scenarios

7. CONCLUSION

The research aims to provide an integrated overview of the current supply chain for Kiwi berries in New Zealand and to possibly highlight critical points that impact the distribution offshore. The study also wishes to individualize the main differences with Kiwi Fruits in order to differentiate the two supply chains. While the kiwi fruits supply chain have years of experience behind, which allowed for the maximum optimization of the chain, the kiwi berries supply chain still have lots to learn.

Grown under optimum conditions, 23 tons of fruit per hectare can be produced. Unfortunately, the costs involved with harvesting and handling such a small fruit are high. The combination with transportation costs make the price for this fruits extremely expensive for export. The main costs are associated to practices in the field -like pruning and harvesting- and transportation by air. To improve the competitiveness of NZ kiwi berries abroad it is necessary to increase efficiency in production and distribution by a better management of the flow of fruits and by introducing mechanization in steps like packing and sorting. Increasing knowledge around cultivation practice would also increase efficiency in production. However, the unpredictability of yield and the high level of waste does not consent a completely effective distribution.

Harvest modalities have a central role to ponder for distribution. If on one hand multiple harvests facilitates infrastructure and labor capacity, on the other hand it does not allow to gather a sufficient volume of product to justify sea freight. Moreover, multiple harvest are very common in the berry business, it facilitates labor continuity but also incentivizes wastes and increases costs.

Having fruits in the market earlier may help to have more cash-flow to survive to the high cost of production. Sea freight would post-pone the arrival in the market of at least 2 weeks. Additionally, having an absolutely outstanding variety to supply as much as possible year round to grow in different climates -assuming that the cultivar grows in different climates- would maximize the year round production and extend the supply window globally. In contrast, having different varieties with similar traits would add more complexity in distribution and breeding programs. The choice of varieties is determinant in governing distribution offshore. As also shown by the blueberries supply chain in New Zealand, seasonality and storage life of a particular variety strongly determine the market niche to supply.

Having a mixture of transportation systems (air and sea freight) might be a good option. Sea freight would give opportunity to lower costs, so that the extra profit can be invested in the difference of costs. Air freight would be mainly used to make the adjustments necessary to deal with uncertainties in the field and market. Besides, air freight would be necessary to enter in the market earlier since the minimum transit time by sea to Asia is 12 days.

Air freight has the major impact on costs and competitiveness since as soon as someone can produce kiwi berries near to the market, air freight will never allow to compete. Shipping by sea transport appears to be a more sustainable competitive platform to build on. The main constraint at present are shelf life and volumes. I believe that, at the end, the main trade-off to ponder will be between costs of freight – cost of repack and orders lead time/responsiveness required. It might be that sea freight would allow to reduce volumes but at the end costs of repacking cannibalize all the margin.

The evolution of thinking should be from New Zealand centric to a global perspective - saying: if kiwi berries are produced near to market there is no need of 16 weeks storage, but if an outstanding cultivars is grown in different varieties it can be in the market for 40 - 20 weeks of the year. That would lead to an efficient supply chain to the consumers.

The distributive model has to be chosen accurately. Since kiwi berries are extremely delicate, CIF commercial arrangements, where the responsibility of the goods arrived pass to the importer, are the most viable way at the beginning. The step after will be to sell to someone CIF but also starting to do a certain amount of marketing to try to get the product moving. The next thing is to put a person into that market and to try to support marketing programs and build the relationships within

customers till when an entity, which own the inventory in the market and sell directly, is settled up. Having a STO market would help to reach economies of scale by distributing big shipping volumes which will be later on spitted to different retailers. Otherwise, having many small orders increase cost inefficiencies in the chain.

There is not an unique distributive model that would work but the most important thing to consider is related to relationship in the chain. As also shown by the blueberries industry, long-term commercial relations funded upon trust permit to exchange a better, in-time information about quality and production.

The current kiwifruits model is a marketing base model that stimulate demand and provide the fruits on an anticipation of demand. In contrast, what is happening is many circumstances for kiwi berries, is a reaction model. This model implies waiting for the demand to occur and harvest/pack fruits only after orders are scattered to growers. In this way the risk of wastes is lower but the possibilities to get a big market are limited since demand is not stimulated in any way. In case of mismatch between supply and demand there should be more opportunities in the processing industry as it happen with Nergi and for blueberries.

Investments in building demand, like fairs and stands in supermarket, are also very important as it was demonstrated by the case of Nergi. However, these investments have to be carried contemporarily to investments in production-supply chain. Kiwi berries are not just like a niche product that comes in and out like strawberries - even though strawberries shows to have a longer sales windows because of its different origins and growing conditions. It is about having a product within a category that has sufficient volume and/or sales window opportunities to make it worth the effort to build up strong programs, strong branding and expensive machines behind.

RECOMMENDATION TO THE INDUSTRY

The first recommendation that I would like to suggest to the whole industry is to increment cooperation to scaling up and in researching as it happened to kiwifruits few decades ago. Building up knowledge together is the best way to grow in the industry since the overall NZ production is very small. Knowledge is not only important in varieties development and in correlating technological aims but also in cultivation practices. There is the need for a financial support to invest in technology and research which can only be gathered conjunctly.

Another point that I feel to highlight, is to get away from the kiwi fruits idea and to start thinking like a berry: high costs, cold chain, perishable nature and seasonality. This, considering the size of the NZ kiwi fruit's industry, is hard to observe.

Regarding see freight, it will be surely a challenge and it will take some time to develop in concrete. Despite small trials will be expensive, positive results can only be achieved by many experiments.

Moreover, the production should be more market oriented in the choice of varieties. I would suggest to research the best commercial opportunities by choosing a variety that allow to be competitive in the market according to timing of the year and intrinsic traits like flavor, storage life and visual aspect. Not only the specific market plays a role but also the related environment around. For example, I would try to find a combination of characteristics that permits to enter in the market in a period of the year where the competition from countries like Chile, which offers cheap produces, is low. Another aspect to consider is the integration of production aspect with demand – I would suggest to localize production and timing of the year according to consumption habit of target market. For example, considering markets like Europe, by shifting the supply from the southern hemisphere onward in the season. It would allow to get closer to Easter's period which have a more excited demand rather than the after Christmas period.

This can only be accomplished if the whole supply chain from supply to the demand is integrated. I believe, that this is one of the main success factor of Nergi, while the desegregation of the industry is a large disadvantage of the blueberries supply chain. In the scheme below the ideal configuration of kiwi berries value chain is represented, where supply and demand are viewed as part of the same system.

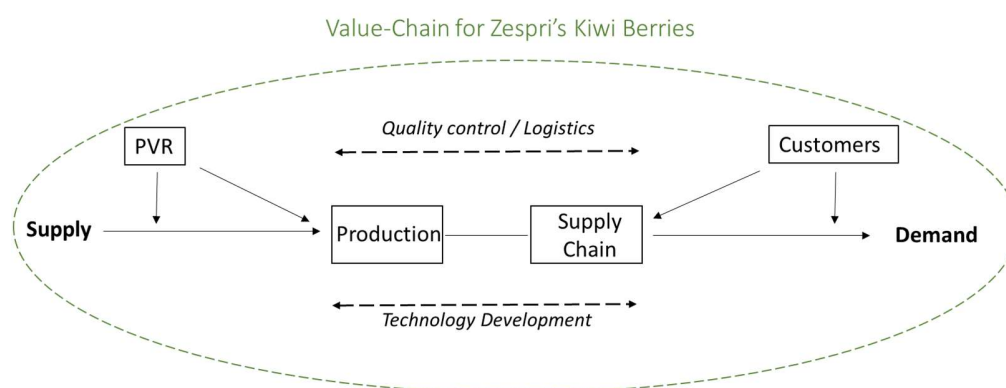


Figure 35 Value Chain for Zespri's kiwi berries

STUDY LIMITATIONS AND RECOMMENDATION FOR FURTHER RESEARCH

The boundaries between the two supply chains – kiwi berries and kiwi fruits- are blurred. The actors of one supply chain are the same of the other. The only different actors are the exporters, Zespri for kiwi fruits and 8 different exporters for kiwi berries. This leads to a state of confusion in clearly defining the content of the empirical research. Moreover, because of the peculiarity of the kiwi berries industry in New Zealand, the research cannot be easily extended to other Kiwi berries industry.

Since it is an explorative research and the market is still in its early stage, it was not possible to further investigate the last part of the supply chain. I would recommend to take better in consideration the importer's structure of the market of interest.

This research is only one little part, I would say just the beginning, of the analysis for kiwi berries business opportunities. It aims to provide an overview of the current situation in New Zealand and what could be the alignment with the current kiwifruits supply chain. Further investigation on consumer acceptance and production areas has to be made.

I believe that a weak part of the research is also the investigation of the comparative supply chain – NZ blueberries and EU kiwi berries. Despite it helps to contextualize and to highlight strong and weak aspects it is hard to measure and compare the three supply chains with the same intensity. It might be interesting for the future to analyze those more in details. In addition, I was not able to get in touch with the Chilean Kiwi berries supply chain which from my perspective is the most interesting one to compare since is operating in the same hemisphere and it also has many logistical difficulties.

An important limitation regards cultivars developments. Since an optimal cultivar has not been yet developed, it is hard to estimate the effect that it will have on the current industry. This new cultivar will have very different traits from the cultivars cultivated up to date. This is the reason why the configuration of the European supply chain for Kiwi berries is completely different. I believe that a more accurate study can be done once this aspect is fixed.

8. THEORETICAL REFLECTIONS

The topic of Agri-fresh supply chain management, has been studied in many different occasions by diverse authors. However, most of the studies offer a very specialized perspective of only one part of the chain - for example inventories management, infrastructure design or third parties logistics providers – which, in my point of view, limits the understanding of the whole system. As it has been shown by the results, each step of the chain is connected to another and it has a significant impact on distribution. For example - as described in section 5.1. - harvest procedures significantly affect the logistics offshore in terms of volumes and punnets uniformity. Without this understanding of the production process, concepts like inventories management and planning activities, lack in accurate information. Many of the studies in fact, gives priority to variables like deterioration rate without understanding the production background.

This study offer a simple outline to apply to any agri-fresh supply chain that is export oriented. I believe this framework is able to embrace the peculiarity that characterize each agri-fresh supply chain and better contextualize it into the market of interest by an ad-hoc distribution. As mentioned above, the major limit to this framework is to do not take into account consumers preferences. However, the focus on distribution of the model did not allowed for a further enlargement of the topic.

To do so, a first in depth analysis of the literature has been done in order to select all categories of aspects regarding the topic. Afterwards, the empirical research allowed to select only the relevant categories that impact logistics. The first added value of this study to the academic world is therefore to having created an innovative path to follow for a complete understanding of distribution of agri-fresh produce.

In addition, the study, in its results, enhanced the knowledge of certain themes by the observation of some anomalies that does not completely follow the literature. In particular the main arguments can be reassumed in the following points:

- There is not a predefined rule for configuration of infrastructures – each fresh produce may require different infrastructure design. For example the function of brake down of foreign warehouses described by Gourdin may not always be the optimal as shown by Dole Japan.
- The location of the post-harvest structure is often dictated by where the first site of production was, rather than by a deliberated and accurate decision.
- The choice of a specific infrastructure by growers is mainly dictated by personal relationships rather than by an accurate analysis.
- The literature does not address the theme of competition in production from different countries within the same hemisphere as key success strategy in distribution.
- More attention should be given, in literature about see freight transportation system, on trade balance of agricultural product in order to study how to combine different product to the same market.
- The model of quality controlled logistics from Van de Vorst does not take into account differences into commercial configuration of the supply chain. For example, as discussed in the results, DSO model does not give the opportunity to share with the same transparency quality information throughout the chain than it happens in STO model.
- In the flexible form of inventory management (optimized priority) described in the literature, optimizing revenue might not only be the only reason but other factors like commitment to certain shares of growers play a role in managing inventories.
- An important variable to introduce while modelling inventories management is the quantity of classes and sizes introduced by a more accurate sorting procedure of fresh produce.
- Ordering policies are no always the result of accurate calculations, especially in the case produce are more perishable and with unpredictable supply.

- Literature presents as main constraints for see freight quality degradation and volumes, however the issue of order lead time and order flexibility is not yet addressed.
- Harvesting planning activities are mainly influenced by short-coming revenues rather than long-term view of the chain, especially if the agri-fresh supply chain is not integrated.
- Seed-varieties are perceived important for the market mainly from the marketing organization and barely from producers.
- Seed varieties are becoming important for a marketer also for the ease in distribution and shelf life.
- The relationship between shipper and grower is not only based on short-term marketing agreement as the literature describe but first of all it is based on trust.

9. ANNEX I

9.1. RESPONDENTS OF THE INTERVIEWS

In the Following table an overview or the respondents is given:

PERSON INTERVIEWED	Role/company	Date	Aspects of the interview
6. Linda Mills	Global optimization manager- Zespri international Limited	29.10.2015	Market development, volumes optimization
7. Robin Dillmore	Shipping Operations Supervisor ZESPRI International Limited	2.10.2015	Logistics and distribution kiwi fruits
8. Geoff Oliver	Grower of kiwi berries and owner of Kiwi Produce LTD	3.10.2015	Kiwi berries technical aspects (production and packing), Export market
9. Keith Batten	Pack-house manager –Kiwi produce LTD	3.10.2015	Domestic and export market
10. Steven Bunyan	Global Manager – Commercial Development Zespri international Limited	5.10.2015	Market development
11. Sasha Patete	Analyst - Commercial Development Bay of Plenty, New Zealand Logistics and Supply Chain	5.10.2015	Market development
12. Margot Cotter	Supply quality planner and technical project leader – Zespri international Limited	6.10.2015	Quality control logistics
13. Richard Trafford	Kiwi berry grower-JR &JK TRAFFORD FAMILY TRUST	7.10.2015	Kiwi berries production
14. Tony Ponder	Director SOUTHERN PRODUCE, PACK HOUSE AND EXPORTER of kiwi berries	7.10.2015	Kiwi berries production, technical aspects post-harvest, export market, blue berries supply chain

15. Bryan Parkers	Operations Manager - New Cultivar Development at Plant and Food Research and Zespri International	8.10.2015	Technical aspects on varieties development and kiwi berries industry
16. Cameron Hill	Tauranga Sales Manager Cooltainer-Kuhen Nagel	9.10.2015	Air freight transportation systems
17. Vaughan Judkins	Market supply manager and global marketing manager at Zespri International	12.10.2015	Demand management (inventory management and ordering process)
18. Mike Torr	kiwi berries grower	13.10.2015	Technical aspects kiwi berries production
19. Tracey Burns	Division Manager – Export-FRESHMAX	14.10.2015	Technical aspects production and post-harvest, overseas market, blueberries supply chain
20. Dan Pach	Blueberry producer-Chairman of NZ Blueberry grower association	15.10.2015	NZ blueberries supply chain
21. Yasushi Tashiro	Head of Department Zespri Product Dept. Dole Japan, Inc.	22.10.2015	Market from importer point of view
22. Romualdo Riva	Sales manager Nergi Kiwi berries- Ortofrutta Italia	27.11.2015	European Kiwi berries supply chain
23. Jean-Pierre Carouel	Marketing and varieties licensing manager	13.02.2016	Nergi supply chain

9.2. TECHNICAL ASPECTS COLD CHAIN

In the following paragraphs the cold chain for highly perishable fruits like KiwiBerry will be described for picking, packing and transportation.

PICKING AND PACKING:

After harvest, a priority is to cooling the fresh produce as soon as possible. A general rule applicable to fresh produce is that or every hour of delay from harvesting to cooling, one day of shelf life is lost (Dodd and Bower, 2014). The procedure is important to:

- Inhibit the activity of enzymes responsible for the respiration
- Limit ethylene production
- Reduce water loss
- Inhibit the growth of decay causing enzymes

After harvesting, fresh produce should not be in direct contact with sun light and they should be possibly covered by wet fabric. Product that has to be handled in water or ice for cooling can be packed with wire-bound or nailed wooden crates or wax impregnated fiberboard cartons (Dodd and Bower, 2014). At the pack house, produce should be cooled in either chilled room (by conductive cooling process) or by hydro-cooling for 10 to 60 minutes depending on the size of the fruit and sensitivity to water. After the pre-cooling the produce should be rapidly sorted and packed. Subsequently, it should be air cooled down to the specific optimal temperature (convective cooling). Other two techniques to cool down the produce are top-icing (ice placed in containers on top of the produce) and vacuum cooling chambers (cooling by the latent heat of evaporation of the water off the surface of the produce) (Dodd and Bower, 2014).

In planning the pre-cooling phase, some aspects has to be considered; namely the density of the produce, the packaging, the volume to surface area of the fruits, the distance that the chilled air has to move and the volume of air necessary (Dodd and Bower, 2014). The physiology of the produce is very important in determining the pre-cooling treatment. Fruits with a high respiration rate such as strawberries, blueberries and sweet cherries should be cooled at least within three hours after harvesting.

The packaging must be designed in such a way that the produces are protected from mechanical damage, to enable the flow of air and to group fruits in discrete units which are easy to handle and to label. The amount of attention to the packaging must be proportional to the length of the supply chain. Packaging acts as a barrier between the chilling air and the vital heat of the plant. The chilling air must be as direct as possible to the fruit to remove the heat of respiration, for this reason the packaging must allow air transfer across the produce by ventilation holes in all six sides of the cartons. There are two methods of cooling which are influenced by the packaging, the conductive and the convective cooling. By conductive cooling the chilling air does not comes into direct contact with the fruit whereas by convective cooling the vital heat is completely removed by the direct contact of the chilling air to the produce (Dodd and Bower, 2014). The heat to remove can either come from inside the fruit or from external heat ingress from the penetration of solar radiation through the insulation. The quality of insulation is hence very important. Moreover, the packaging should be strong enough to protect the fruit from shocks and compressions.

TRANSPORTATION:

ROAD TRUCKS AND TRAILER: In the cold chain all the vehicles are refrigerated in order to maintain the specified temperature range. Insulation and air distribution are important aspects as they influence temperature and RH. Refrigeration can be provided by vehicle engine (for small distance) or by its own diesel engine (for larger trucks).

In some cases the trailer room can be divided in two sections with different temperatures (Dodd and Bower, 2014). The chilled air is coming from the roof in a horizontal way or from the front-mounted refrigeration unit. The refrigeration capacity can only maintain the temperature and not reduce it, for this reason produce should be loaded at the already correct temperature. The capacity to refrigerate depends on the cubic capacity of the storage area (Dodd and Bower, 2014).

AIR FREIGHT: The biggest limitation of air cargo process is the limited control over the cold chain. Airports lack in cold storage, especially for horticultural produce. The cargo may have to wait outdoors for minutes and hours at diverse climate conditions before being loaded into the plane (Thompson et al., 2004). The compartment of cargo are kept at room temperature because of the diversity of animals and goods transported. However, the range of temperature significantly change depending on the plane. Some airplanes keep a temperature range between 7 to 30 °C while others may expose the produce close to the outer wall at temperatures close to 0°C (Thompson et al., 2004). Moreover the total transport time is prolonged by several additional hours that are required to reach the originating and destination airports plus the waiting time. In order to weight and load produce into the plane, produce must be delivered to the airport 6 to 8 hours before the departure time (Thompson et al., 2004). Furthermore, after palletization, produce have to wait in cargo areas at a room temperature. Freight forwarders can add pallets coverings and coolant before produce are loaded into the plane.

Before leaving the packing operation products should be already cooled to the optimal long-term storage temperature (Thompson et al., 2004). To control temperature the most used methods are by dry ice (carbon dioxide) positioned in special department not in contact with the produce or wet ice positioned on the top of the pallets if the plane permits. In the last circumstance the packaging must be water proof and there must be a systems for draining. The prefer methods for most air planes is the utilization of gel refrigeration positioned within the containers (Dodd and Bower, 2014). To reduce heat gain, wet ice and dry ice can work as coolant and can be positioned to boxes or outside of load. Moreover, the amount of dry ice allowed is limited and determined by each airline, for this reason pallets that contain dry ice should be labelled to prevent excessive accumulation of CO₂ (Thompson et al., 2004). The wet ice should be protected to contain the melted water and prevent causing damage to the plane. The extra weight of the coolant may increase the rates per freight.

Temperature must be monitored during transit by temperature recorders installed by shippers. Unloading personnel have to collect records and send them by mail (Thompson et al., 2004).

9.3. OUTSOURCING OF LOGISTICS SERVICES DECISION MAKING

Deciding in-house or outsourcing logistic has a multidisciplinary nature; for this reason it can be interpreted by four major approaches: transaction costs view, resource based view, supply chain management and other approaches.

Transaction cost view (**TCV**) focus its core proposition on the costs of making transaction in one mode rather than in another. The unit of analysis is the transaction of a good or service. Transaction costs theory drives resource allocation decision, a company is able to create efficiencies (especially in terms of cost) if the governance structure and the attributes of the transaction are congruent (Jayaram and Tam, 2010). There are three main factors that increase the difficulties and costs of the transaction: asset specificity, uncertainty and frequency of the transaction (Hsiao et al., 2010). In the choice between different 3PLs, according to TCV, costs and risk prevention competencies among the group of competing 3PL providers are the main determinants (Anderson et al., 2010). Research based view (**RBV**) analyzes companies from their resource perspective rather than from the product side in order to identify the company's strengths and weaknesses. A company should increase efficiency and effectiveness by the control of internal resources while conceiving and implementing strategies. Core competencies and value of human asset for determined activities are determinant factors for outsourcing

(Hsiao et al., 2010). In this optic the choice of a specific 3PLs will be determined by the presentation of unique capabilities and embedded knowledge that competitors does not offer (Anderson et al., 2010). Supply chain management (**SCM**) view suggest that outsourcing should be considered when logistic complexity is high. In this view third party logistic providers should be considered if there is a reduction in costs. The decision might be influenced by the supply chain characteristics and logistic strategy (Hsiao et al., 2010).

According to a study conducted from Hsiao (2010) on three different companies that deal with perishable produce and on literature study the main findings has been found:

- Outsourcing transportation is important if time and quality are critical factors; it ensure speed and on-time delivery. Moreover arrangement with a third party transport service might be strategical if the company lack in own vehicles and skills to operate transport at the beginning of the business.
- In case of highly perishable produce warehousing should be kept in house because produce has to stay for just few days before are delivered and because is a very delicate phase.
- If quality and on-time delivery are critical factors, inventory management should be kept in house as problems here comports huge losses in business.
- For products that can be kept at ambient temperature, in-house logistic does not add much value and therefore if outsourcing can reduce costs is a better strategy.
- In case of demand fluctuation for ambient food, third party logistic providers can operate both tactical and operating planning

Case studies analysis and the literature review made possible to create a construct with the key determinants for logistic outsourcing as described in the following table.

Table 6 Reasons for outsourcing or not (readapted from Hsiao et al., 2010)

	Outsourcing	In-house activities
TCT	Lack of ownership of vehicles Logistic strategy is to lower costs	Having experience in finding cheap carriers The activity can be made by internal logistic department The activity is very dedicated for own products No reduction in time and effort
RBV	The activity is less important for the company Logistic has low value for the firm	Outsourcing damage the core business High assets specificity
SCM	Cost reduction strategy Complex logistic environment	Competitive priorities are quality, flexibility and speed Difficulties in monitoring and control performance
Others	Price war between buyers Lack of professional knowledge	/

As a consequence the main key factors that determine the choice of outsourcing are: assets specificity, measuring uncertainty, core closeness, logistics strategy, and supply chain complexity.

9.4. INVENTORY MANAGEMENT

Mathematical modelling of inventory control starts with the classical concept of Economic Order Quantity (EOQ) (Bakker, 2012), in which the number of units to be ordered is defined in order to minimize the inventory costs (holding and ordering) (Gourdin, 2001):

$$EOQ = \sqrt{\frac{2CD}{IV}}$$

Where C represent the monetary ordering costs for placing the order, D is the estimated annual demand in number of units, I is the annual inventory carrying costs and V is the average monetary value per unit of inventory.

Inventory control models for perishable goods can be categorized depending on the inclusion of determined factors which are summarized in the table below (Bakker et al., 2012):

Table 7 Types of perishable inventory management derived from Bakker et al (2012)

Types of deterioration modelling	Description
Price increase/discount:	Assumes that perishables are price sensitive so the selling price is the decision variable. To this model it can be add the cost of backlogging and cost of losing goodwill. The control of time sensitive products can be facilitated by radio frequency identification (RFID) and policy of dynamic pricing. Having two prices (high price for fresh products and low price for old product) might be dangerous because it can lead to cannibalization effect. Some models use preservation technologies in the SC and storage of agri-fresh products in order to see the deterioration effect as an endogenous variable. Temporary price discount can also be used; it affect the size of the order, the price incentive to the final customer and the quantity to be sold.
Treatment of stock outs	The majority of models allow for shortage. Some models include backlogging (delay time between order and deliver) as well which is a negative part of costing inventories as incurred shortage. Partial backlogging is more applicable in the real life than complete backlogging.
Single or multi item	Multi item inventory models are complex but more realistic since most firms sell more than one item with the simultaneous inventory control. Multi item models may be applied in case of complementary or substitute products like two variety of bananas or apples and bananas together. The concept of substitutability is very important in inventory control since replenishment decisions are dependent on available stock of substitute items. If the number of items is more than three, the model may become too complicate.
Number of warehouses	These models may help in case for instance where there are two warehouses, one owned and one rented. Inventories in the rented warehouse are depleted first since

	frequently it bears higher costs. These models may occur also in case of two shops, one for premium price quality produce and the outlet for older produce which are transferred from the first shop.
Single vs multi-echelon	Most of the models include two echelons like single producer-single distributor, rarely models includes more than three echelons. Multi-echelons models occurs when fresh produce occurs in more than one stage before going in the hand of the final consumer. To limit the complexity of the models demand can be assumed as deterministic, time can be fixed and price discount can be avoid. In today's competitive environment, multi-echelons models are acquiring importance due to the needs of more integration in the supply chain. RFID (radio frequency identification) is a technological support for supply chain integration and inventory control.
Cost accounting aspects	Inflation has been recently included in modelling perishable inventories since it has a significant influence in many real-life situations. Inflation in most of the cases is non-deterministic and variable. Similarly to inflation, time value for money is important, particularly in case of inflation because inventories represent a capital investment. In these models demand should be calculated as a linear function of these rates since in real situation consumption rate is influenced by the variation in price.
Permissible delay in payments	Theoretically, the EOQ model does not included delays in payments for buyers to suppliers but in the real life suppliers allow buyers to pay with delay without charging interests. Particularly in case of perishable products delay in payment may prevent loss of value by enhancing the demand. Generally the time of delay allowed is determined by the purchase quantity.

Many of those models includes deterministic settings which are hardly applicable on the business environment. Stochastic models, in contrast, better represent inventory control in practice, but are more complex (Bakker et al., 2012). Moreover many fresh supply chains are represented by multi-echelons models which have an increased importance in times where supply chains are increasingly integrated.

Managing inventories using an integrated approach strategy helps in lowering the joint total costs as compared with independent decision by the handlers of fresh produce at the different stages (Rau et al., 2003). This happens because collaborative supply chains are looking for the global optimum which is reflected in a determinate number of delivery per order cycle for each actor in the chain (Rau et al., 2003). The result is more cost-effective decisions in the integrated system.

Deterioration rate for perishable inventory control is very important, a sensitivity analysis from Rau et al. (2003), demonstrated that as the deterioration rate increases, also the total costs increase. Another interesting study, that extend the concept of EOQ, on inventory management with deterioration items from Dye and Hsieh (2012) investigates the optimal replenishment and preservation technologies (PT) investment strategies while maximizing the total profit per unit. The study focuses on the tradeoff between the higher investment costs and the higher profit derived from the decreased deterioration rate explaining the importance of investments in preservation technologies (Dye and Hsieh, 2012). The contemplation of PT, like refrigeration equipment, to increase he expiration date, is becoming increasingly important since sales, inventory and order quantity are extremely sensitive to the rate of deterioration of fruits (Hsu et al., 2010). Hsu et al., (2010) gives management insight on the amount of investment on PT necessary given capital constraints and deterioration rate

DRIVERS FOR GOOD INVENTORY PERFORMANCE

A study on blood inventory management from Stanger et al., (2012) states that many inventory models are just too complex to put in practice in the real life and estimates and heuristics, and may be more fruitful way, to achieve a good performance in managing inventories (Stanger et al., 2012). A wider view of the supply chain and simple accessible managerial practices have, in fact, a greater level of adoption and a big impact on the final performance (Stanger et al., 2012). The study conducted an inductive case study based on observations and semi-structured interviews on four macro areas on inventory management: stock level, replenishment orders, inventory management principles and inventory management tools and equipment (Stanger et al., 2012). Researchers came out with six major drivers of performance which are summarized in the table below.

Table 8. Key drivers for perishable inventory management performance, derived from Stanger et al., (2012)

Performance drivers	Description
1. Human resources and trading: experience staff	Education of staff increase the level of awareness about the best practices on inventory control so that they are sensitive about the resources they are handling. Staff should be aware on the impact of their decisions in the supply chain by training on standard operating procedures (SOP). Staff rotation could be a good approach in order to let just experienced staff make the crucial task such as placing orders.
2. Target stock levels and other patterns	In order to maintain an adequate stock level to ensure sufficient supply and minimize waste a possible policy is order-up-to. However, the stock level is not determined by complex regression model but by experience and little adjustments over time with open discussion with quality management department on a regular basis. In order to succeed in guarantee a correct stock level, precise information on the demand are necessary. Despite it seems a very easy procedure it must be based on good decisions which are coming from the access on required information and experience to judge information but also from basic knowledge of other processes in the hospitals.
3. Collaboration across departments	Collaboration between staff, the awareness of the problems with limited shelf-life and critical questioning of internal orders are very important factors. As a consequence there is a reduction in just-in-case requests which increases the flexibility. In retailing fresh produce, “partershiping” with suppliers, by agreements on determined order and lead time, may leads to improve performance. As the system becomes larger and more complex, also collaboration results harder to achieve.
4. Transparency of inventories	Transparency and knowledge of the status of all stock keeping units (SKUs) in all inventory locations is very important for controlling perishable inventories. Inventory level must be checked frequently in order to ensure transparency and visibility. Knowing the inventory level is the key to make good decisions in regards to order quantities. As the warehouses becomes larger, more staff are involved and transparency becomes harder to reach.
5. Simple inventory procedures	In some cases approximations and heuristics may be used to make decisions allowing also not experienced staff to place orders without the risk of making mistakes. An example may be the addition of minimum stock levels and simple pre-defined order quantities. When the inventory levels fall below the minimum levels, the predefined order is placed to restore healthy levels while non urgent demand is restricted when inventories levels cross a switchover level. The predefined order avoid the risk of over-ordering and, in turns, spoilage.

6. Focus on freshness and the monitoring of remaining shelf life

The most useful policy in order to reduce spoilage of products is the traditional FIFO (first in, first out). Using a strictly FIFO policy means that high stock levels indicates that products are getting older, as a consequence, the order pattern must be adjusted dynamically. An example to avoid pressure on the inventories if a large number of units expire on the same time, could be split larger orders into smaller chunks of multiple orders so that units have different shelf-lives. Moreover it also reduces the risk of receiving a big deliveries of units with a small remaining shelf life. A strict focus on the freshness of products is strictly related to the inventory performance and to pricing and re-marketing of products close to expire.

MODELLING PERISHABLE INVENTORY CONTROL

In managing fresh inventories many models has been developed to have a more efficient stock level. The first model for perishable inventories was developed by Ghare and Shrader (1963), introducing the concept that product decrease utility and price by a constant exponential deterioration rate (Hsu et al., 2010). Nowadays, in many studies, perishability is defined as the number of units that becomes unusable or obsolete over time (Blackburn and Stanner, 2009). The concept of perishability as loss of product value has recently entered in inventory models (Blackburn and Stanner, 2009) and is currently the most efficient way to manage perishable inventories (Blackburn, 2009). Throughout the years modelling inventory control has become increasingly complex, different assumptions have been included such as demand characteristics, price discount, shortages and backordering, single or multiple items, number of warehouses, single or multi echelon modeling, average cost or discounted cash flow and possibilities of delay in payments (Bakker et al., 2012).

The better way to match demand and supply for agri-fresh produce SC is the use of real time product quality information (Rijpkema et al, 2013). The use of real time product quality information is also expected to help decision makers to deliver products of the right quality at the right place and time. This final goal is often achieved by re-stocking and lower inventory level (Rijpkema et al, 2013).

9.5. MANAGING WAREHOUSES

There are three main alternatives of warehousing management: Private, contractual and public (Gourdin,2001).

In the following table vantages and disadvantages are presented..

Table 9. Advantages and disadvantages of different ownerships of warehouses (elaborated from Gourdin,2001).

	Description	Advantages	Disadvantages
Private	Owned and managed by the company whose goods are stored. Facilities are designed in order to customize the needs of the organization.	<ul style="list-style-type: none"> • responsive to management requirements. • commitment that is reassuring customers and permits to make joint plans and forecast with shippers. 	<ul style="list-style-type: none"> • high upfront investments • long-term obligations. • Low flexibility towards variation of the demand.
Contract	<p>Operated and owned by a third party that dedicates resources to the company whose goods are stored.</p> <p>Third party can offer to the company specialized services like equipment or perform specialized functions like packaging and labelling.</p>	<ul style="list-style-type: none"> • high degree of flexibility • low costs 	<ul style="list-style-type: none"> • Low operational control • Low confidentiality in sharing information
Public	Warehouse is operated by a third party but it is divided between multiple shippers.	<ul style="list-style-type: none"> • low costs deriving from the payments for only the spaced used. • wide range of logistical capabilities • easiest sell to “upper” management. 	<ul style="list-style-type: none"> • poor sharing of burdens • poor joint planning • forecasting • low responsiveness management requests

8.6. CONCEPTS FROM THE LITERATURE

Table 10 Key concepts of logistic scenario

Aspect of fresh SCM	Key concepts
<i>Production</i>	<ul style="list-style-type: none"> • Genetic potential • Climate temperature • Cultivation practices • Number of producers • Total hectares of prod. • Mechanical damage • Soil conditions • Water availability • Cost of production • Production inputs

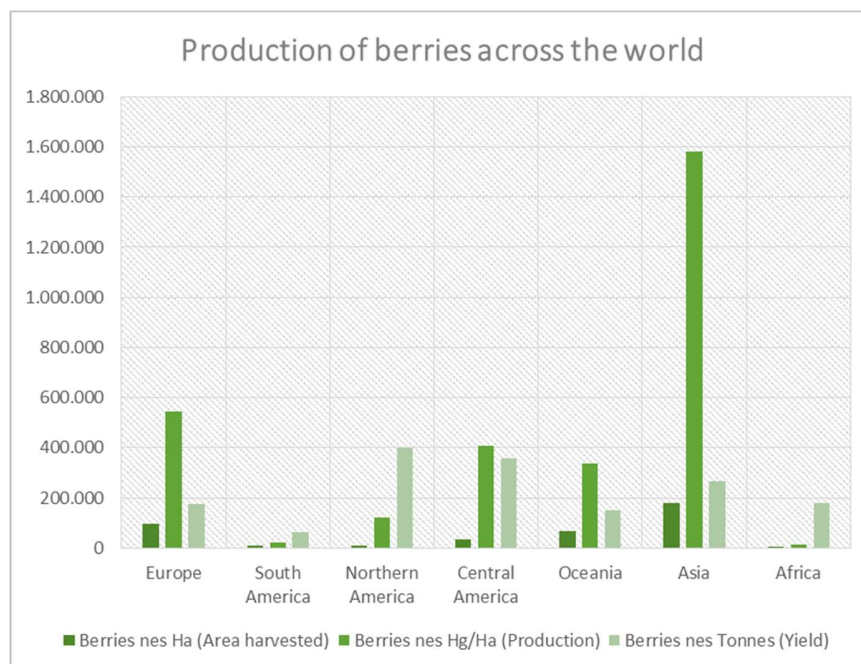
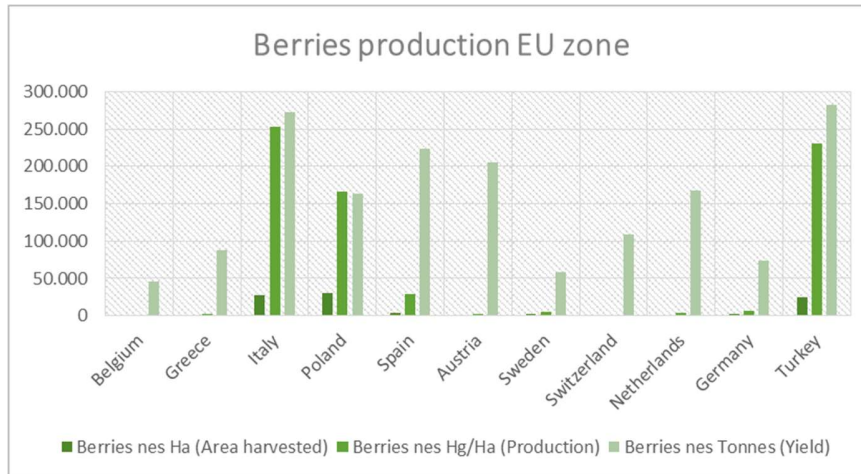
<i>Harvest</i>	<ul style="list-style-type: none"> • Mode of harvesting • Grade of ripening • Time in the year 	<ul style="list-style-type: none"> • Temperature of harvesting • Speed of the process
<i>Sorting</i>	<ul style="list-style-type: none"> • Mechanical/manual • Regulation requirements for export • Criteria of sorting • % of discarded product 	<ul style="list-style-type: none"> • Speed of the process • Cost per kg • Position of sorter • Light
<i>Packing</i>	<ul style="list-style-type: none"> • Washing method • Temperature • RH • Packaging choice • Cost of packaging 	<ul style="list-style-type: none"> • Pre-cooling temperature • Automatization • Infrastructure capacity • Speed of the process
<i>Transportation</i>	<ul style="list-style-type: none"> • Mode of transportation • Type of T control systems • Airflow • RH 	<ul style="list-style-type: none"> • Mechanical damage • Compatibility of fruits • Distance (Km) • Costs
<i>Storage</i>	<ul style="list-style-type: none"> • Initial quality • Storage stability • External circumstances 	<ul style="list-style-type: none"> • Handling procedures • Special packaging
<i>Cold Chain management</i>	<ul style="list-style-type: none"> • T control locations in the chains • Respiration rate • Type of T recording systems • Points of thermic shock • Quantity of product categories • Inventory practices (FIFO/LIFO) • Traceability systems • Communication between service providers 	<ul style="list-style-type: none"> • Visibility of T • Time range between harvest and cooling • Type of packaging • Type of cooling system • Pre-cooling • T range vehicles • T before loading to the vehicles • System of T control in transportation
<i>Infrastructure design</i>	<ul style="list-style-type: none"> • Capacity of warehouses • Product variety • Function of infrastructure (gathering, breakdown, combination) • Delivery time • Product quality decay 	<ul style="list-style-type: none"> • Centralization/decentralization • Number of warehouses • Size and capacity • Distance from vendor/supplier/other warehouse • Type of ownership
<i>Air transportation</i>	<ul style="list-style-type: none"> • Value-volume ratio • Ownership of plane • Shipment schedule • Freight rates • Route of flights • Types of hybrid services • Size Cargo terminals • Speed of cargo inspection and clearance 	<ul style="list-style-type: none"> • % of quality losses • Balance of international trade • Periods of high traffic • Transit time • Presence of cold storage in the airports • Waiting time before loading • T plane compartments

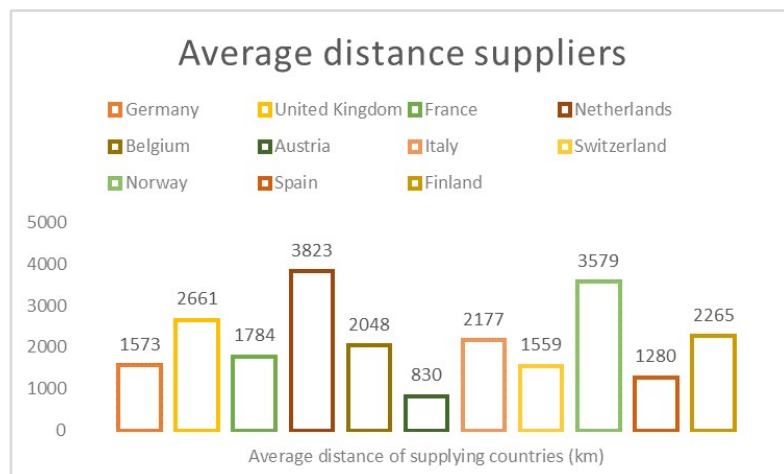
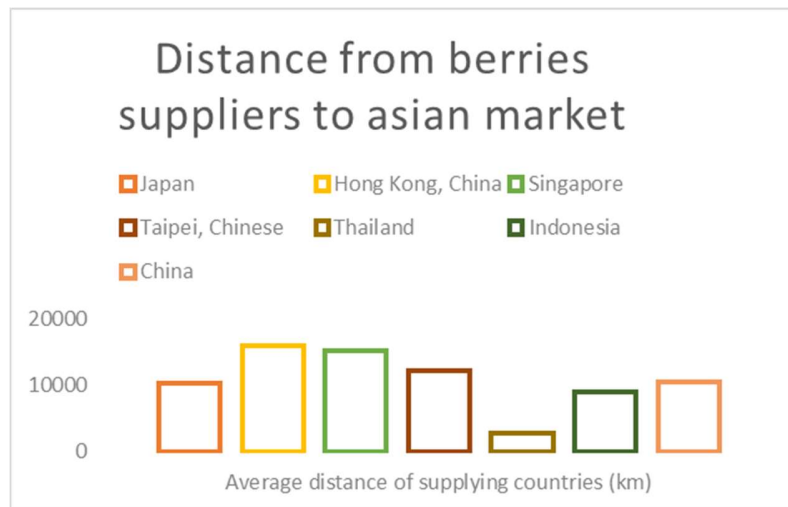
<i>Third party logistic service providers (3PL)</i>	<ul style="list-style-type: none"> • Traffics of goods in the airport • Age of airport facilities • Efficiency of cargo handlers 	<ul style="list-style-type: none"> • Presence of additional coolant/pellets coverings • T before leaving packaging operation • Points of T record
	<ul style="list-style-type: none"> • Use of outsourcing • Level of outsourcing • Transport time variability • Incentives to facilitate coordination • Power structure • Trust • Presence of external factors • Mutual dependence/commitment • Criteria of selection • Time of negotiation • Share of risk • Value perceived • Asset specificity • Uncertainty of transaction • Frequency of transaction • 	<ul style="list-style-type: none"> • Core competences • Value of human assets • Logistic complexity • Reduction in overall costs • Importance of time/quality • Lack of logistic equipment/personnel • Time transit goods in warehouses • Importance of outsourced activity • Price sensitivity of buyers • Level of delicacy of activity • Ease to monitor performance • Distribution channel variety
	<ul style="list-style-type: none"> • Logistic related communication • Frequency of collaborative planning/forecasts • Time of transmission of information • Level of sophistication of IT system • Number of integrated logistic activities 	<ul style="list-style-type: none"> • Frequency of common problem solving • Long-term contracts • Mutual commitment • Performance evaluation criteria • Relationship building • Information integration
<i>Integration SC</i>		
<i>QCL</i>	<ul style="list-style-type: none"> • Quality perception • Real time information • Quality assurance • Knowledge on demand • Decision based on forecast • Knowledge on critical quality points • Presence of automated quality measuring system 	<ul style="list-style-type: none"> • Presence of prediction models • Utilization of data loggers • Quality driven inventory management principles • Sorting efficiency • Level of collaboration • T controlled containers and packaging
<i>Distribution</i>	<ul style="list-style-type: none"> • Shelf value • Distribution frequency • Country specific products/packaging requirements • 	<ul style="list-style-type: none"> • Market responsiveness • Demand variability • Merchandising display conditions
<i>Inventory management</i>	<ul style="list-style-type: none"> • Level of wastage • Level of safety stock • Insurance costs • Value perceived by customers • Carrying costs • Ordering costs • Deterioration rate • Impact of deterioration on price 	<ul style="list-style-type: none"> • Preservation technology availability • Reliability of demand forecast • Capital constrains • Product variety • Staff educations • Standard operations procedures • Targeted stock level

	<ul style="list-style-type: none"> • Stochastic demand • Match between demand and supply • Real time product information • Criteria for inventory modelling • Shelf life • Price sensitivity • Time sensitivity • Size of orders • Quality standards • Backlogging • Substitute/complementary products • Presence of rented warehouses • Number of echelons 	<ul style="list-style-type: none"> • Level of experience • Collaboration with suppliers • Transparency in inventory level • Predefined orders • Focus on freshness
<i>Sourcing</i>	<ul style="list-style-type: none"> • Distance to the production • Number of suppliers • Conditions of contracts • Cost regular/expedited transports 	<ul style="list-style-type: none"> • Distribution inventory costs • Shortage costs for failing to deliver products • Cost of spoilage • Costs of not fulfillment with retailers requirements
<i>Planning production/harvest</i>	<ul style="list-style-type: none"> • Marketing uncertainties • Supply uncertainties • Shelf life • Lead time • Criteria for planning models • Amount of product to harvest per year • Routing of harvesting among plot • Amount of workers • Transport mode • Transport equipment 	<ul style="list-style-type: none"> • Amount of product to transport • Capacity • Reliability of demand forecasts • Post-harvest process • Yield and maturity of the crop • Post-harvest shelf life • Distribution requirements • Distribution agreements • Activities planned at the prod. Level • MTS/MTO • Pack to order • Integrated planning

8.7. BERRIES MARKET

In the following graphs few interesting additional findings about berries market in the world are illustrated.





LINDA MILLS- OPTIMIZATION MANAGER

- ***What do you think about market development of kiwi berries as a new Zespri variety?***

From a kiwi berries point of view I probably don't know a lot more than what Mel has done, but certainly there are market interesting opportunities. And so, we have got the initial positive feedback from the market but, you know, the biggest challenge is to the supply chain. Certainly the initial feeling is that it will add value to the category by having it, it is just constraint by how to get it to the market and how they are going to get a sales window. So is not just that it is a niche product that comes in and out like strawberries that goes in and out, even though strawberries to be fear shows to have a longer sales windows because of its different origins, now they can be grown indoors and in different conditions so you can get them for longer. So it is really about having a product within a category that has got sufficient volume and/or sales window opportunities to make it worth the effort to really build up strong programmers, strong branding and put Zespri's/ machines behind that. To be honest, I am not sure that just mean one variety of kiwi berries or whether where you can have some of these things where you have different varieties that follows on from each other. So you might have one for two weeks and then another one for two weeks and then another one for other two weeks. And again it comes down to an efficiency to branding. Having to stop starting market, is an issues between, what we noticed with gold, it is not even that we have got three different type of gold, you cannot, there is a transition in between where they seems different but not sufficiently different and they overlap etcetera so we had to stop selling one or another. So we do had loss in income, loss in revenue during that time because of the flax in sales because we do had one after the other. And it depends on which one you are going, if is a less preferred variety or more preferred variety etcetera, or storage, quality...that sort of things.

- ***It is interesting because the dress code strategy with berries is just to have different cultivars planted in different places in the world so they can supply the market for as long as they can so that consumers should not notice that it is a different variety, it might be slightly less or more preferred but they do not really are concerned. The challenge is to get it different enough but not noticeable.***

Yes, and part of the issue is branding. If you brand them with different name or if you promote them with different names it might became an issue. This is what we observed with Gold and in the different cultivars flowing in and out, and the same can be for kiwi berries. So if you try to say, hey this is a fantastic kiwi berries and here another fantastic kiwi berries and another one... so if you got orange kiwi berries and red kiwi berries and green kiwi berries you need to think about it. What I noticed is that green kiwi berries might be the favorite one for consumers.

- ***Yes and it is interesting to see what happened with the sweet green, you know all the researches shows that it was not different enough, it was just another variety of green. Breeders thought that because market is pushing very strongly they would have been able to catch this extra value, it has not turn out this way.***

Yes, so if it is significantly different and you want to do something with it then you got to have a very distinct selling and storing window too. So you know some kiwi seems to work quite well, probably because we were really able to differentiate and seems to come to heat the Hayward, especially in the North hemisphere and that's were the sweet green was supposed to come in and heat the Hayward and then because you need something to differentiate on and gives you something like a niche windows, and like strawberries and things like that. You know you can sell that in a

niche windows but it does not come in distinctively separate and you try to sell it at the same time. That's where the complications came in.

- ***Speaking about potential for market development, so potential market characteristics that indicates potential high growth characteristics, can you just indicate what you usually use? We have got a minimum size estimation on what kiwi berries for Zespri should look like. So we need to identify what these markets will look like. So for Kiwi fruit prospective what key indicators are you looking for?***

Because we have a relatively high cost in supply chain production model we look for markets that have got sufficient population and sufficient GDP to essentially purchase and afford kiwi fruit. We try to make them as affordable as we can without putting value off the table but without putting people off the category because they cannot afford it. And we know we are trying to push boundaries for gold because from the last year shortage we started to get pushing from the market that basically met the price with consumers. For the berries categories, when you have this short selling windows and you have 250 g punnets, you know with \$15 per kg, as much as I like them I tend to buy them once and they become a luxury good and not as an everyday item. So again, the position of kiwi fruit is an everyday item and so has got to be affordable to a reasonable number of people to justify adding it to the portfolio. Otherwise we try to push gold and green every day and kiwi berries might just be a treat. People may stop buy the green and gold to buy the kiwi berries and again the question of how big is the category is important for market development.

We also look at fruit consumption, level of market maturity, level of retail development on the market, how easy is to make business, income of the people so we sort of tend to go on the average GDP. We sort of pool those factors together and come up with a volume based on four/five target markets like Taiwan, Japan, Belgium, Hong Kong, Singapore where we have been there for quite an amount of time and which have got a sort of more mature market where our marketing team has been well known for quite a well amount of time. So after a kind of benchmark we work on a proportion. So we have done some work based on Hong Kong where we looked at a reasonable target for this particular market and therefore with time we should be able to develop new products onto the category. We did that successfully with gold so we have good reasons to think that is the good way to launch new products. Because we have got a strong brand before we know that we can launch new products quite successfully especially if the backup is an appropriate quality. So looking at all these different characteristics for kiwi berries we have to think about where we want to position it to the market, portfolio- so whether it is a luxury or normal item and so to make strong the connection with health benefits and therefore it becomes a consumer's preference that they can buy every day but then how much will it cannibalize green and gold, it is a different block in time so that we can ship it from NZ in December and January or does it mean that it is going to overlap with green and gold, it does mean that we can will proportion a different crop or create different window so we can push green and gold later in the season so that we can leave window opportunity for something that may not be something else. So again we have to match time with the market and whether if it is going to be additive or replacing existing products. And, we spent a lot of time in marketing the role of kiwi fruits in people's life's and diets and so we need to be quite clear on what role we want in it to have. For me it will be a very easy product to market itself looking to the volume/revenue equation but is essential to look to the impact on existing products but looking to the future to maintain people in the category as well and certainly to maintain the younger population it may be that kiwi berries is the gun that follows the harrow.

- ***What do you think about the benefits to being able to provide variety within the portfolio?***

Exactly and we know people loves variety, because, you know, everybody just doesn't just buy apples or bananas. In their fruit baskets they are not buying one fruit but a mix of fruits

- ***Don't you think that for this kind of novel product it is very easy to market them at first but after the second season people lose interest?***

Yes, again I think it comes down to the quality of the product and the benefits it has got. Every time strawberries comes around you realize that what counts is the experience that you can have with the product, so if people recognize the quality then you can sell it year after year. Same for the other berries.

- ***How would you deal with the fact that there is a very short selling window which is approx. 2 months, or even less? which might mean that people most likely will purchase kiwi berries twice in a season***

Well again it depends on how you position it, I like the idea that you will get people to buy them at least once per week. In regards to positioning you have to do some volume equations. It depends on what you expect, so for example, you are selling it at the same price as gold, and say something like people normally buy 6 pieces of gold, and the purchase once a week and they buy 500g of kiwi berries, now some of them will replace gold or green and some of them will be extra purchases and next if this is the same price, I would expect that people buy once per week and then it comes down to the size of population and then you get the market and you just multiply that up to get a rough idea of what volume you think you could do. And we can do the equivalent on what, let's say we are shipping at the moment five millions trays a week, or better on average 4 million per week, and you have got 8 weeks is 32 million trays next times 3.5 kg, let's say 112 million kg of products. And then you would have something like what would it takes to produce such quantity of kiwi berries and next there is the case where you fully substituting gold and green for a block of time. So you have to be sure of that. If you wanted to sell 20 million trays, what does it takes to produce that quantity? What's the effort? What's the price is got to be like? Therefore there is the evidence to be a high volume category or it ever going to be a small volume category because you cannot physically produce that much. If you assume the supply chain view, what's the yield? What does it takes to produce that quantity of kiwi berries? And so therefore what is the actual potential.

- ***So with those calculations your starting point is that it could be as big as a gold or a green in terms of volume?***

Yes so if you have the same size in volume of gold and green, you would have the equivalent of gold or green sales per week. So the starting point is that you would be either a 100% substituting or some portion of substitution so you would have the side effect from there and you would have two or three different scenarios. You would have like one if you fully substituting or a completely separate window where green and gold was not and, you know, like I said if it was in February March that you were selling it you may have a completely separate window or you can potentially have the same consumers that you sell your green and gold to and if you are potentially being doing the same volume per week and the same price.

I think it would be earlier but I would be some cress over, and you would hope, you know it is in the berries section of the supermarket so you may attract new consumers as well so we have got to make some estimates.

The best scenario is that people would buy both, so for example gold and kiwi berries.

And that's what you want right, overall the business grow. That is what happened with organic, so you might have some substitution.

Exactly and so depending on how popular it is and the level of substitution, you might wrap up the price towards the end of sales and you bring up something else and you know it depending on different sales models and sales windows.

It has got to have a reasonable costs and then spend the overheads and these kind of stuff as well. I have to think about how you would calculate it. I would have a base volume before you even started. Before you start to break even there would be a base costs in it. So you have a base v that you want to do before starting and looking at some the other categories like sweet green. You need a reasonable volume for a reasonable amount of time to get the shelf space, it would be interesting to understand from a couple of retailers what product attributes they look at for selling at the first

place. So what attributes the blueberries strawberries push, what's the minimum run true the shelf and etcetera. So for instance if retailers want to have it in shelves for at least a month to make it worth the effort, or one week is enough. I don't think we should underestimate the equity we have got and the category development that we have put in place and we can leverage if we do have another variety but again with gold we were feeling a very clear space but when you have more varieties you tend to complicate consumers experience as well. You need so to have enough volume to be distinctively different as well to be able to service fully. There is this example of cherries in Japan, they wanted reliability of services, being able to put volume true.

Going back to the base volume, what is the min base volume to scale up? It might be a different cultivar but probably not...

I guess again it comes down on how you market it but if you would say hey Zespri sells gold and you might have different varieties during the season which meet quality standards and you are going to have a good experience within this. Your volume equation will be different then if you say we are going to market different variety and make a big bang and splash and noise about it and try to position it differently. So, next to the volume it depends on the positioning, because if you not try to position it differently, like to me there is a minimum volume per positioning. If you are trying to positioning kiwi berries with different cultivars flowing true you might get away with each half million of each cultivars, and you have got 10 cultivars and you have got 5 m trays. Or if you were trying to positioning as gold or sungold you kind gonna need five million of each to be able to make enough noise about it and positioning differently. The speed that you wrap it up in the final volume totally depends on how you perform through the supply chain and the consumers experience. If you get that right you can wrap it up very quickly. (Different scenarios).

I would have thought that what if you have 5 to 10 m trays of kiwi berries in 4-6 week windows min volume.

- ***Looking at markets which are now "hot" for berries we also have North Eu...***

Going back to the value of the market I think that instead Europe I would look back to other places in Asia because the value in Asia is so much stronger than the value in Eu.

- ***From a buyer's perspective, what would you think it will be the differences with kiwi fruits in terms of response to the market? For instance in terms on order size, order cycle and lead time?***

I think that both they want to have the volume on the shelf every day, so depends on the storage and etcetera so depends on how they can draw down inventory. So if we are looking on air freight, regular air freight, they continuously stock. Is all about continuously stocking so you can always see berries on the shelf on the super markets. So you would be stocking into supermarket distribution centers or service providers and through distribution network.

- ***So don't you think they would require for example smaller order size and bigger order cycle because of the perishable nature?***

I would have thought so, yes. I think is common sense that because you have got a higher risk on storage you would have, you know day orders. And then it has to be considered whether these order has been serviced by service provider and what you have to do to keep the stock level up there that they can draw and again we did a trial with punnet in nz and sending up to Korea one year. But you know you don't want to do repacking for quality and things like that and so you would prefer to have products ready to sell and so they would be wanting low volume, high frequency replenishment model.

- ***Which percentage of traditional retailers would you expect in the markets we just discussed?***

To me you would be wanting to target market where they are starting to developing direct strong retailers' relationships and high level of sophistications. They would be a good initial target. If we are leveraging our brand and we are building a retailers relationships, for berries and things, you would be willing to establish relationships with modern retailers. So having a direct model would help. Again that's why you may want to target Taiwan and Japan and China with importer records because that's enables us to sell to a wider group of people whereas if you just go to the direct retail everywhere and they have to be the importer and they have to be like our distributor or something like that as well. And again, or we have got to go to a distributor or something similar. But you would have been willing to target retailers I thought so how distributors goes to retailers. We just have to think better about the model and how they should be supported.

1. ROBIN DILLMORE-ZESPRI INTERNAL LOGISTICS

After a preliminary market analysis we were able to distinguish different markets like Japan, Singapore, Taiwan, North Eu, Australia and North America, could you provide me an average shipping time in days?

Okay, so for Europe we allow 28 days, so we allow one day to loading the ship and then we allow 27 days of transit. So overall to eu is 28 days. So that's sort of covers to North eu to Belgium and to the Mediterrean and to Spain and Italy. So for Spain is 28 days to Tarragona and then you add another 2 days to reach the port we use in Italy which is Valdo. For Japan we allow 12 days transit, that's from Tauranga to Tokyo. To Singapore I have to double check because we use liners containers as mode of vessel and most f these services up to Singapore and Taiwan are lines/direct services so at a rough glance they are 12 days to Singapore and to Taiwan maybe 14 but I will come back to you. And seemly for North America I will come back to you because we cover from west cost to east cost so via Los Angeles and Philadelphia so they are quite different in transit time.

Which is, according to your experience, the closest market for shipping?

Well, the closest market is basically Asia. Because what you found is either that there is a lot of export from New Zealand to Asia and so there is a lot of lines cargo services so they are going from point to point whereas for other destinations you may found that some of the transit stop in Singapore and then to other destinations which adds a little bit of extra time. So your most direct approach would be into Asia.

In which occasions did you had to use air freight services?

We use air freight basically sample programs. So when we need to get ready to eat fruit to the market for a specific promotions or events. Or for some testing trials, so just for testing quantities so we do have into south East Asia like Taiwan and Malaysia but the quantity we are talking here are about one to two pallets average. Depending on the pack configuration you can use an average of 270 trays per pallet. So I guess you would be looking forwards for kiwiberries for air freight because they are smaller quantities.

Which companies do you usually use?

All our freight program is true freight forwards and precisely we use Kuehne Nagel and they are globally present company. So they do all of the documentation for us that we require or they can do sort of things where we provide some documentation and they provide some supplementary documentation. So they are quite flexible on the services that they can provide us.

Which advantages do you recognize by using air freight in terms of responsiveness to the market or market penetration...?

I guess I can only come from a transport perspective but given the shelf life of this product, you may consider air freight. But if you say that the shelf life is up to two months then you could definitely consider utilizing the existing transportation network of ocean freight transport that we currently use. But then again comes down to volumes. Do you have an estimates?

The estimates is 5 to 10 m trays per 4-6 weeks.

Okay but it depends on the unit of conversion so how many kg and pallets. But so from a liner containers point of view I don't see a problem with that so you can utilizing our existing coverage, because we could just order up to and add kiwi berries to the existing line. It is not a problem to our requirements.

We have two modes of transport. So we have liners containers where we use 44 or 24 equivalent boxes and we load them onto ships which are owned by shipping companies. We basically going on putting our products on a services which is like a bus services. So they are going to multiple destinations before they arrives at our requested destinations.

So do you think it will not be the best option for kiwiberries?

Well it depends because some of them are direct and another's have a small numbers of stops. The other mode that we use is conventional reefer ships, so these are ships, floating fridges if you like and we load pallets straight into the hold of the ship and is refrigerated and we control the ship because basically we go to the shipping company and we say we want a vessel to go from Tauranga to Japan and we want it on these state and we need a capacity of a certain amount. Normally for our Asian vessels we ship quantities of 3 and a half thousand pallets and for eu vessels we have 5500 pallets averaging. So big quantities but with our Asian program we might fill the vessel up but the vessel would recorn in Tokyo and then would go down the coast of Coby. So if you were looking for kiwi berries on a conventional reefer service, then would depend very much on what you conditioning raging will be because of what is the preferred temperature range.

So there is not option to differentiate temperature?

Yes, in our chartered vessel services there is. we have generally speaking 16 compartment in a vessel and so you have got a possibility of 8 different temperatures. Generally we only separate between gold and green and then at the beginning of the season where we start conditioning we have got further differentiation depending on maturity of the fruit. So I guess if you are talking on larger quantities there could be an opportunity where kiwi berries could be loaded in a single compartment and then you were talking on about maybe 600 pallets to give an indication but then it depends on the unit of conversion, so a normal pallet of food print is a euro pallet of 1.2 m by 1 m and 2.5 high. Going out to Japan we would fit into foot print when we would load 249 single layer trays.

Which is the frequency of conventional reefer?

Because we charter them we can get them when we want, generally because of the demand flow of Japan and Korea, generally at the beginning of the season, so end of March/Early April we probably have a minimum of one vessel a week loading.

So, in order to leave the port the vessel needs to be full right? And if the season for KB is earlier it might be a problem, can you confirm?

The vessel needs to be full to leave the port. So if you are saying the season for kiwi berry would be earlier, that's will be a big problem because we would not ship them early and that would narrow down your options. If is that early you would use a liner service .

Going back to air services, how do you judge the facilities of the companies? In terms of cold storage, transit space and time..

For air freight what we founded is important for us is that we source our services from an international company because then we know they have good support in their destinations they are shipping to. So if there are problems we can have the nz office contact there, local office. And that's really important for air freight because of the sensitivity of it. So you need a global coverage and generally speaking because we are dealing perishable products they would have facilities at the end Certainty for Kuehne Nagel they do. That's definitely a consideration for us. Do you know which is the T range for KB?

Should be around 0 to 4 degrees.

Okay is not too bad. so because our program is so small for us, probably the international coverage is more important than the price. I mean, P is a consideration but you want have this connection.

In terms of transit time, do you have a many clearance procedures and other activities that slow down the process?

Generally speaking no in terms of delays, but you know, I can say that we have difficulties. It is very challenging to air freight into China, that's one of the challenge for us. From a clearance point of view and documentation, is doable but very challenging.

Is it the same for Taiwan and Japan?

No. Generally speaking Taiwan and Japan and those other ones, historically we haven't got significant problems because is quite straight forward.

Do you think that an increase in volume would be a problem for these kind of infrastructures and flow of products?

No because historically in the past we did significantly high volumes. Maybe about 5-6 years ago we had a significant air freight program to Hong Kong and our freight forwarder was Kuehne Nagel and then we were responsible for doing the documentation and obviously the transport arrangement.

Do you normally deal with air freight or air cargo? So with passenger plane or just cargo plane?

That time it was a freighter plane so it doesn't carry passengers. But that was because we had significant volumes and the reason why we had a program like that is that it was very cheap in the past. Things have change now and it has no longer be affordable so we just have small quantities to south and east asia and by passengers plane that fly out of nz. This is not necessarily cheaper but is our only option because we cannot have the volume to hire the whole plane. Unless we have got significant volumes like maybe 6-8-10 pallets then that's sort of service is fine. The sufficient v capacity available for us.

Do you have any t control systems inside the plane?

No. So in the past when we wanted T control systems you can get air line units that have much more T control. Generally speaking when we talk about fruit like kiwi berries they wrap it and it is only out of cold store for a short period of time and when you put them into the plane, the ambient temperature is pretty low anyway.

Do you have the possibility to add some dry ice?

That's right, exactly.

So which would be the minimum amount of product to load the whole plane?

Oh that's a good question. Well, the plane that we used would be about 80 or 90 pallets. So is quite significant.

Do you think that the cost of air freight depends on variables like quantity, period of the year, international trade balance?

Yes definitely, all of that. So we can get freight quotes from the freight forwarder and they come in white brackets so what you generally found is that if you are shipping 6.5 thousand kg than the freight rates drops significantly. If you are shipping less than 45 kg it can get extremely expensive so it is graded. So is not just per kg but it depends on the order quantity.

What about the period of the year and trade balance?

There would be variability depending on the season. But we can say that based on what we have done in the past when we have got to book in advance we asked to have rates for destinations and we had fix them so we had got certainty of price. Is not booking but we had a grade for rates for the season.

What about the impact of order size on shipping?

For shipping, if we use liners containers from a cost perspective it affect costs, we basically contact carrier for a season and the cost is fix for the season. So the only variability is what we call BEF so is the fuel price, so if you are shipping a units, one containers say, a portion of the freight will be fuel and a portion will be the fuel price. The remainder of the price is fix for the year and then also with our conventional reefer program is different again, is determined freight costs is depend on seasonality for a period in the shipping season with the first period being at the end of March/April, that's the most expensive time. And then it gets cheaper with the year.

From a responsiveness point of view which are the differences between AF and SF?

We work backwards for air freight the documentation process takes a little bit of time. I have to check better with the girls about what's the lead time is. I'll check and I will come back to you. Currently in our order systems we receive the order from the market 2 weeks prior for shipping. With market forecast we match ocean booking against forecast by destination port. I guess you also have to take into consideration different models. Zespri can work either by STO stock transfer order as it does for Europe, Oz and Japan or DSO direct sells order like it does for Singapore, Taiwan, North America. STO is easier for Logistics because it has a view of the whole season and there is more visibility in the chain. DSO use forecasting of 6 weeks in advance and after there is the visibility it make ocean booking.

Because our existing air freight program is so small we use contracts with tracking companies to take the products up to Auckland and then we deliver it to Kuehne nagel. When we have significant programs like 6 years ago we use our existing tracking system.

So if the volume is small is better to use a TPLs?

If the volume is small, generally speaking we would organize the trucking for sample size program for air freight and if the volume is significant then the supplier then arrange for the trucking from Tauranga to Auckland.

Do you think that these truck have T control systems?

No. Well, it depends what the nature of the products. For example if the sample is for photo shoot we can just put it in a non refrigerated truck, because the transit time from here to Auckland is just 3 hrs so is not too significant,. But if we need there are refrigerated truck options which again are not in the contract with kuehene nagel but separate. So for the air freight product we have many SC options.

Do you have any special insurance for air freight?

At the moment it is covered under the current Zespri insurance policy so we don't have any special arrangement.

Do you communicate with the freight company about the temperature?

No because generally we don't have any T control device in planes while for our refrigerated containers in our reefer vessels we monitor T all the time. But again it is possible, we have done in the past with T monitor in the plane but I cannot say I have experience making this type of things regarding the quality of fruit.

Followed by e-mail:

TRANSIT TIMES FOR LINER CONTAINER SERVICES:

NZ > USA West Coast - Long Beach weekly service ex Tauranga with average transit time of 21 days

NZ > USA East Coast - Philadelphia, weekly service ex Tauranga with

NZ > average transit time of 26 days

NZ > SINGAPORE Singapore, Weekly service ex Tauranga with average transit time of 14 days

NZ > TAIWAN Keelung, Weekly service ex Tauranga with average transit time of 15 days

AIRFREIGHT LEADTIMES

Approximately 2-3 days lead time required prior to departure date.

LEAD TIME FOR BOOKINGS

Charter Bookings Require a lead-time of 15 days prior to the ETA date of a charter vessel. This means the order has to be available to the supplier 15 days prior to ETA. Fortunately for our STO markets (markets where Zespri sells to itself i.e. Europe, Japan, Korea)

Liner Container Bookings Require a lead-time of 12 days prior to the load end date. This means the order has to be available to the supplier 12 days prior to when the Container has to be delivered onto the port.

We do provide our shipping companies (both Charter and Liner Containers) with forecast information of our capacity requirements. For Charter markets (or Direct Sale orders) we provide a full season forecast of the market requirements. This is updated frequently as information comes to hand.

For our Container markets the visibility of future orders is limited to approx. 6 weeks in advance.

We do not use C/Reefer mode to Singapore or Hong Kong, only Liner Containers. We do use C/Reefer mode to Taiwan, however it is only at the beginning of the season and the cost per Kg would be distorted.

GEOFF OLIVER- GROWER AND POST HARVEST ENTITY, CHAIRMAN OF NZ KIWIBERRY GROWERS

Which are the reasons that made you decide for this particular KiwiBerry variety? Do you think the choice of variety have an impact on distribution?

Here in Nz we have these three varieties: Marge Red, Takama green, K2D4o which is owned by plant foods and we have got his license. In the early day we first started by K2D4o but we also found that takama green and some Margi red plants so we grow both of those. The Takama green is harvested in early January but just last 1 week and a half so is more for the domestic market. The red one has the better storage characteristics and best taste. The red also differ because it has a spike at the end. The red it only goes red at the end of the season. It all store pretty well in the early part of the season but at the end they are all hopeless. The K2D4o is the variety that we use for export. All of them has the problem of inconsistency in the way flowers bloom which leads to an inconsistent maturity. That's the main challenge in the field. They were probably

developed in the early 90' in NZ. And there were in fact, so less risk to have three variety than obviously one. From a PSA point of view they requires less treatment than kiwi fruit.

So do you think that having different varieties is more connected to the need of having diversity in the orchard?

Yeah. And plus the timing. It turned out that the red and Takama green are slightly earlier than the K2D4 so they helps spread the harvest and it helps spread the volume for the exporters. It is also easier for the pack house cause we have got a bit longer packing season.

So do you also export the red variety?

Yes.

Do you think that the choice of the variety is market oriented as well? So you try to select varieties more appreciated by overseas consumers?

Sure. We know that those two taste pretty well and there is always a question marks around the taste.

Going back to cultivation practices, do you have any particular activity in the field that aims to increase the storage life?

No there isn't really so what we try is, you know obviously there is an ideal picking window that is only a couple of weeks. We try to harvest over three or four weeks. And if you could harvest the is in two weeks and store for a while in cold store, then you could have a wider selling window. What we found is that the fruits tend to last longer in the vine than in the cold store so if you pack everything in those two weeks ready for shipping you lose fruits, it just doesn't store that well. Whereas if you leave it on the vine, hanging, you can pick that in week four and you still can sell it. The only trouble is that you start losing fruits, start getting soft on the vine.

Do you adopted any agronomic technique to increase the uniformity of yield? For example in the way you prune the trees?

Not really. It doesn't seems to be any pruning technique that help with harvest window or storage.

From a productivity point of view do you retain satisfy from your cultivars? And which are the best cultivars?

There is now room for improvement in varieties obviously and these improvements would be even more maturity in the bunch, more consistency in the canopy and longer storing fruits in the cold store and longer cold chain. Those are the three main things.

In comparison with kiwi fruits the OGR for kiwi berries is better?

Is probably between green and gold the net return

If the return would increase, would you invest more in kiwi berries?

Yeah

Which is, always in comparison with kiwi fruits, the total cost of production per kg of berries?

The cost structure is higher than both for green and gold because the winter pruning cost is really high. Is between 15 and 20 thousand dollars per hectares. For green is about 4 thousand and 5 hundred and for gold 5 thousand 5 hundred.

Do you think that by increasing the production you would be able to reach some economies of scale that reduce these costs?

No I don't think that there will be. Also because 3.5 hectares are about the size of a green and gold kiwi fruit orchard so there is no really eos for pruning. All we have to do is to improve the techniques.

Do you think that an increase in production will somehow affect the quality of fruits?

No. It is important that the quality standards stays high and an increase in production is not going to have any affect on a change in quality standards but it would affect the market supply/demand balance and therefore the returns. So if Zespri got involved I am sure they will be quite tough on the quality standards so it will not affect quality. What it will affect is supply and demand, so supply from nz and overseas demand. If there is an oversupply the P would decrease.

What are major uncertainties you have to deal with (weather, harvest, quality, uniformity....)? How does it affect distribution? In comparison with kiwifruits?

Ahhh. So there is a high crop damage because of insect, there is some others more on crop whatchouts that we need to keep an eye on but apart from that nothing else changes. The harvest window is pretty critical. If you miss the optimum harvest then it has the major impact on the yield.

Do you think this aspect is due to the thin skin?

No not really. You know anything with tiny skin like citrus and pop fruit will get any damage but kiwi fruits does not because maybe it has a strong skin.

From which organizations do you receive technical support? Do you think this type of information sharing are more important for Kiwiberry than for kiwi fruit in order to increase performance?

We don't receive information. As a pack house we give information to our growers so there is no Zespri involved so there is no technical backup behind perhaps so it is really up to the pack house to help the growers. Or the growers groups to work together. We have pruning field days and we have discussion groups, not a lot but we do have it for our growers

Would you appreciate to have more support?

I think that if Zespri got involved we would have to tight the whole thing together and the whole result is the big better backup and background of some of the key aspects you know

In comparison with kiwi fruits do you have many waste? How do you think it could be avoided?

In our production stream we have about 20-30% of waste for kiwiberries while for kiwi fruits is less, about 5-10% for gold and 10-15% for green. But we are trying to use it processed or get dumped or are freeze for people like you. Ahaha Spry programs may get slightly less of these defects and therefore increase packups. Because kiwi berries have more defects than kiwi fruits.

Would you increase the production of kiwi berries if there will be more market possibilities? Would you change the proportion of kiwiberries over kiwi fruits in your orchard?

Oh yes. But I would not change the proportion but plant more. I think it is good to have both and I would probably buy more land.

At which grade of ripening do you harvest? Which is the effect on the distribution? (ex. Storage possibilities, transportation and acceptance in the market)

The minimum brix is 6.5 with 90% black seeds. It used to be more than 7 but then the fruits were too soft and hard to storage. This is the minimum standard as a groups. Less than 6.5 the fruits does not have any taste. If it is 6.4 it cannot be picked.

What we do to have the clearance to pick a grower must have a spryer kit by an independent person, a grower must a no residue test in library equal for all growers and the fruit must have gone under a maturity test. If no all these things happening we have no clearance to pack to the grower.

Do you harvest manually or mechanically? Why? In the future? (to scale up, quality...)

I harvest manually I can't see many other ways really. The other way you can do it is by contracts so you pay per volume and not by air, the only danger with that is that they pick everything and the quality drops over and you end up with a high rigid rate in the box.

We harvest by size criteria so we are going in the vine three times. We pick one week and then we go away to another orchard and come back next week and we pick again and we go away and we come back a week or two later. The third time is small fruits that gets a little bit bigger. There is no relationship fruit size and sugar content. We thought there was but there isn't.

Where do you place the product after harvest?

We place the products in big bags and then into a box that goes into cold store the same night and then we grae it and pack it.

How much does the cost of harvest impact the overall costs? Do you think that by increasing the production it will be possible to reduce these cost? (differences in varieties...)

Costs of picking range from one to three dollars per kg. Maybe 1.20 to start and the last pick will be 3 because now thare is not much to pack and they have to go looking for the fruits.

Which is the overall transit time from harvest to the post-harvest entities? Do you send kiwi berries straight after harvest to the pack house? (eg problem of deterioration and uniformity of supply)

We try to keep that under three hours but for some people might be 6 to 7 hours but everyday they bring it to our cold store. You know we get some growers which have quite some distance and what they pick today they get to us tomorrow morning so is almost 15 hrs between picking and arrival here but some others bring it here twice a day. The truck does not have T control and air flow. (??????)

Which difficulties did you encounter in planning harvest for kiwi berries? in comparison with kiwifruit?

We just want to make sure that the harvest is in good shape and everything is ready. Yeah. So it is not too hard. We have been doing this for a while. Is the same for kiwi fruits.

Would an increase in production be a problem to the current infrastructure/labor capacity?

No. Is just about how many machine you have got. Yeah. And then the work.

Do you have a stable temperature during the process?

We make a point and make sure that everything goes in the cold store over night after harvest. And then we only bring out to pack when it has to go to the machines. So it does not have to come out of the cold store before it is packed and then when it is packet it goes back to the cold store. We try to keep it as cold as possible.

Did you adopted any special sorting procedures for kiwi berries? To what extent does it help in increasing uniformity in the punnet?

We use eye control, sorting by colors to increase the quality in the punnet. It helps to increase the quality. We then divide in class 1 and class 2 based on the marks on the fruits, only one is for export. But I don't think you can get a color sorter to work across three varieties with different colors. So the girls get to know.

It is the process manual? Did you have adopted any special innovative technology for handling Kiwiberry? Like BBC technologies for sorting and packing?

We have our own sorter mechanism. The quality has nothing to do with the machinery but it has to do with the grading girls looking at the fruits.

Do you have any preservation technologies that helps to increase storage life? (Washing, contr/mod atm, pre-cooling...)

Yeah. There is lots of work to do in that area. We are just trying to be practical and what we are doing seems to work. But I am sure there is lots to do and lots more improvements.

Which are the criteria and reasons for the choice of the packaging? Which costs does it imply? Do you take in consideration distribution? (eg. quality, costs, time of packing, waste)

We pack into a tray that looks like that and then to a punnet that looks like that after sorting. And that's like people that buys blueberries and so if you are sitting in a supermarket, alongside blueberries in the similar part people capt all of that.

So it is simple plastic with sufficient air flow?

Yeah. Look....There is 12 punnets in each trays. One trays has 12 times 125 g which is 1.5 kg and we put a little bit extra so probably a bit more.

Do you pack the product already in the market format before it goes in the cold storage?

Yeah.

Does kiwi berries requires special storage conditions? (RH, T, light...) How often do you control these conditions? Are records visible throughout the chain?

Not really. It is the same.

So it is the same cold storage then for kiwi fruits?

Yeah.

Do you control the temperature?

Mmm. We look at that every day.

Do you thing these records are visible throughout the chain?

Ahhh. The perfect scenario does not often happen. We put it back overnight after packing to get them chill down properly cause then they tents to go on a truck. So the cold chain break down a little bit.

Do you recognize any critical points where thermic shock may occur?

The perfect scenario is when we work on a cold storage at four degrees. Would be.

The same for green and gold?

No. so green and gold are picked in April may when the T is probably only 12 13 degrees but around here, in February March is about 17 to 25 degrees so the fruit is getting warm back up again. So I am saying that you will get all year gear packed and then cold store. At this stage we don't have to and I rathe not. 4 degrees would be the perfect scenario, but is not much fun though.

Which is the overall capacity of the facility? How does capacity impact distribution? (ex inventory control, planning activities, responsiveness to the market, ordering process, quality check points...)?

We pack here 80 thousand trays (80000) just for kiwi berries so we just pack 160 thousand trays easy of kiwi berries.

Do you think that any capacity constraints will have an impact on the distribution?

No because at the moment we do not have to store too much but because it would be good if we can continue harvesting in the right window and store for all over it. That would be the perfect scenario but we have to be so careful because once it goes in the punnet that is it because the costs of repacking the punnet is huge. So that is one of the critical points so if you can harvest the whole crops in three weeks and you can sell it over 12 weeks it would be ideal By the time it goes to Auckland and then to Taiwan then the shelf life is deteriorating a lot. If you could harvest over a short period and keep the fruits quality and store for a while before loading out you would have better yields for the orchards and a wider window for the exporter but in practices is very hard to do it.

Would you be able to increase the amount of kiwi berries to store? (what would be your solution then?)

Yeah I have plenty of capacity.

Which is the initial quality? and the deterioration rate?

Later in the season we need to pack the fruit the next day after harvest if you wait one more day there is quite a lot softening happen. You just see, very simple, rigid softening. If we harvest nearly at the end of the season and we put it in the cold store and we don't pack it the same day but the day after the differences in the fruits from one night to two nights is huge. It deteriorate faster that kiwi fruits.

How do you deal with inventories according to the deterioration rate? If the quantity increases and different variety? (link to the future)

We restrict harvest volumes to load down volumes. If the quantity will increase there will be more problems if the demand is not there. So if the load down time is happening you need to harvest and having a certain cold storage which deteriorate.

Is the way you plan activities different from normal kiwifruit?

Vey similar.

Do you collaborate with the marketing organization for those two activities? If kiwi berries production increases how would it change? (differences w kiwi fruit)

We work with out five exporters and we are always talking a week ahead by the time we plane picking and stuff and harvest, packing and packaging. So we need to know from them about what they are likely to want next week this week. They also ask about the quality and season.

Which is the average transit time (from packing to transportation)?

4 ours. We load out our export trays in a truck every day. A contract truck is coming to pick it up.

Does they control temperature?

Ammm. There is room for improvements in terms of holding lower temps but all comes at a costs. But they are meant to be refrigerated.

Do you have to deal with many uncertainties which leads to high level of waste?

Is the same.

Does operations of packing for kiwi berries occur in the same facility of kiwifruit? Could it be integrate in the same flow?

Does Kiwiberry special handling operations require a particular layout of facility?

We are not doing green and gold at the time but is the same facility. Is also different grading machines all together.

The facility requires a special layout in order to have operations in a special order.

Which vantages do you recognize by having a private ownership of all the facilities? For example more control over activities..

Yeah. We developed over the last 10 15 years new machinery, new technique and everything to try to keep the cost of packing down. Which allows us to be more flexible.

The location of the facility is just because we started here.

Do you have differences in price between red and green kiwi berries?

No. The red it goes red nearly at the end of the season and at the start of the season is always green.

Wow does consumers react to the green variety?

Initially people did not al liked the idea also because it has different smell but it taste the best. It has a strong and stable sweetness. While K2D4 has some grassy smell and it can be sweet some has sticky pallets feelings.

Which is the order size that your exporter is asking?

3-4 pallets. We don't like doing anything then less than a pallets. If you have smaller size there is not economies in air freight.

Do you prefer to sell to the domestic or export market?

The price per trays is \$28 versus \$ 19/21. This is the net return back to pack so you have to take out the packing costs.

The OGR is increasing of about 0.50 cent.

The majority of plantings are in the Bay of Plenty of New Zealand located on the northern facing coast of the north island. There are small plantings in Canterbury, Nelson and Auckland At present approximately 22 hectares is in commercial production.

NZ KiwiBerry is grown on a pergola system with each plant growing in a 5 metre by 3.6 metre canopy area. The plants are dioecious, which means separate male and female vines are required in the orchard for pollination to occur. KiwiBerry requires well sheltered land that is free draining and frost free in spring.

Grown under optimum conditions, 23 tonnes of fruit per hectare can be produced. Unfortunately the costs involved with harvesting and handling such a small fruit are high. NZ KiwiBerry Growers Inc will continue to develop improved postharvest handling systems to reduce the labour component required.

STEVEN BUNYAN AND SASHA PATETE-MARSH -MARKET MANAGER

After a preliminary analysis of markets we individualized as possibilities Australia, Singapore, Taiwan, Japan, North Eu and North America, according to you experience do you also see these market suitable?

Probably the market I know best at the moment would probably be Taiwan. It is a market that have both a strong wet market so then people are selling on the streets plus it also has some quite large and sophisticated retailers and it has a very thin supply chain so there is not much cold storage and a lot of products seems to pass very quickly at low costs.

From our general kiwifruits experience, Japan and Taiwan are both comfortable paying relatively high prices for high quality products so I think that kiwi berries can make money in that situations and potentially can be supplied by sea. I think Australia is more challenging in terms of doing significantly high volumes and almost every market you would find few people who would pay a lot of money for that product but Australia generally don't have high quality fruits in the stores. It is actually quite similar to nz so the have grade 1 and a half fruits not the top fruits and part of that has to do with as nz and a lot of producer countries tent to have a lot of domestic fruits that it is a bit lower grade. So the is a separation with imported fruits with export fruits. In Australia they take around I think 98% of fruits sold in Australia are also produced so they don't have a lot of consumers that top in. Europe I don't as well, but there is a major trend among multiple markets for berries or snack fruits sizes is probably the fastest growing category. So true Asia, you know Driscoll's out of the states they do a lot of strawberries raspberries etcetera and so with a lot of products being punnetized and having a real lot spoilage. And also because the visual appeal of berries in the store are really quite high they have got a strong impact. That's probably one of the growth area around the world. Probably in Asia with the reduction of trade berries there is a lot of cherries flowing out of the states in and around Asia a well so generally, more fruits with high visual impact is a growing category in the stores and probably there are people who are suffering as a result of, you know your citrus your navel orange bit on bananas and bit on apples, the major categories are getting squeezed down a little bit and the berries type products are moving from being good volumes maybe 5% up to the group to 8% so you big groups category might are losing 1% share. So I guess part on what I am saying is that the if Eu is a good berry growth is just because globally there is a berry growth and so when it comes down to what people are willing to pay, depends on where the fruits is produced or if the sc have exits places and it makes to think that Asia is the best place to sell.

Moreover, because of exchange rate the European returns might not be as strong, it is quite hard making quite good money out of Europe because of the foreign exchange.

From a logistics point of view when you look at a potential market, what are you interested about?

We tend to have a very stable structure so it is very unusual to us to enter in a new market so we have got we have distributors who in many cases have been with us for 15-20 years, so we have large volume of customers coming with us

and not a single one of those has been with us for 15 years or longer, uh a part from 2 of them. So what tends to happen is that we chose people for a variety of reasons and we try to make sure there is enough profitability and enough cold store. Facilities are very important. But a lot of it is really about the relationships on sales based with retailers so if you have a high value product like kiwi berries I think is a base level that the person who receive or store it has to be able to assist the quality and it will have to be able to make regular deliveries. But the thing that will make you chose who you really want to stay with is if they are people who pays the bills which is number one requirements and people who have a strong sales interface so people who within the market have the reputation nature to be able to work with retailers to convince them to do something different then you because they have a history behind they performance and so the extra piece with trust and respected has an important value especially with a new product that have a very short shelf life then you really need the people who are the market leader to be considered with reputation.

So do you see uniformity in these type of relationships all around the world?

We have slightly differences but this is our general model that we operate to. We have been around for quite an amount of time as an organization and we constantly look at what our partners are. So we do make some changes but generally know what we want and we also when look in making changes we make some of the work our self, so we might say hey look this is what we might see as the transition used to be and we start a new model to sell to someone CIF and so they take all responsibility to the product and so we tell to an importer CIF and they will manage the products after that so they will take all the responsibility to get the products sold and the next step tend to be that you still sold to someone CIF but you do a certain amount of marketing to try to get the product moving and the next thing is that you probably put a person into that market and you try to support marketing program and build the relationships within customers and then the next step is that you probably try to set up an entity where you will own the inventory in the market and sell more directly yourself and that the sort of way that the model evolve.

Going back to the models; I was talking with Robin about STO and DSO, which differences do you recognize for kiwiberries countries by countries?

I think if Zespri will manage it it will be the same, we are supposed to do it the same. If I would setting up a new business, because the volumes aren't really big, I think that lots of the time I would sell direct DSO. If the volume will be 5 million trays spitted in 4 to 6 weeks, if it goes up to that scale then I think we would replicate what our business model is. It wouldn't make much sense to have it different.

We kind of get a little bit blurred on how we run business so in Taiwan for example we have the DSO model but we also have an operations manager in that market and so Sean, he is a very good guy, he goes through three different retailers we sells directly. So he would go and see the fruit when it turns up and makes sure that it is okay, He is checking the arrival making sure that it is okay and then within a week in case of our regular fruits that is going on the shop shelf and so there is some grey areas in terms of how much infrastructures we have in each place.

The market that you have said and so for Europe, Taiwan, Japan, and Singapore in each of those countries we have people who have operational staff in market and so they can manage the fruits. The only one that is different is Australia because there we do not have an operational person there but they are only STO market and we have a service provider so you may identify quite good markets in terms of reliability to manage the fruits quite closely.

What about North America?

For North America is different because there Zespri only have a tiny presence and the brand is not well known. And plus the general association that people have with kiwi fruits is lower in quality because of other lower quality supplier like Chile which have lower standards.

How do you normally deal with market forecasts?

So we get a picture, we assume that we are going to sell a season with a fruit so we start with a picture of What the supply is because there is no points for us in planning to sell...What was the number again? So and say that crop estimates comes with approximately looks like we need 5 m trays. We also get a picture that says this is when it is going to be ready this is what is likely it taste like and this might be the size and the fact that you may wanted to say is that it is a small bunch of

small fruits you know this year and I am assuming the kiwi berries will have different sizes. So you find out as much as you can on when it will be available, what the size will be and anything else it is interesting to the end customer. And then we split our market up so that each market have different role, so you say that you have 5 m trays so you say okay we are gonna have 1 million and a half to Europe, 1 million to Taiwan and brake it out and then what happen is that those markets at the end are gonna talk to the customers and they establish quite specifics programs about when the fruits is turning up, the d etcetera, they also talks about what is needed to establish a quite well supported product. We don't talk about price because we are selling to the same people for so long so we will tell the price closer to the time but it might be different for the kiwi berries and then we say hey look in terms of market support you know this is a new product so we are going to need this and this and we try to capture retailers interest so that he will be more confident. The feedback from the retailers is used to roll up and create forecast but it is not a contract, they do not commit to that level, so if you have a product that sells quite well you keep going and if you have some that doesn't work the seller will just drop away. we cannot control the retailers we tend to have more influence with the importer so we can say hey this is what you need to do this year and so we put quite a little bit of pressure on them to make it work telling them that they have to commit to make this order, you have 2 importers and you tell them that the market is taking 1 m so 500 each and they have to commit and this is how it is going to work. So we roll forecasts every two months and then we update and change order plans on a more regular bases so for kiwi berries that is going to be 8 week or whatever so you have to be radical on how we are forecasting for that fruit because you have to adapt to chopping change so quickly. So that will be a big difference in a new planning cycle. One of your key risk is that if you try to grow the category really quickly is that because of quality or price point is does not work and then you have got a major problem is how you can re-allocate that fruit so if we have got Taiwan and you have to match but you don't know in advance. so if you go to sell one million trays this year and the next year your volumes is 5 million trays, just to pick numbers, in terms of fruits is not much but asking a store to sell more it means that there is a lot of pressure on the store and if for example you are shipping and the fruits has a life of two weeks after the arrival, but if your sales instead of going from 1 thousand to 5 which is what you want, but if your sales goes from 1 thousand to two thousand units that means your stock levels in the fruit that you have got in the water you are out to have five to ten weeks stock and so with a highly perishable products especially as shipping use is a real challenges to make you sure you manage And that would mean and you price responsiveness is really high so if something goes wrong for example in markets like Singapore where you have 60% of market share you may really get to know from retailers straight away and have a strategy to fix the sales to make sure you keep moving because if you don't fix that flow because the fruits want keep you are in a really bad spot. The key risk is that from a retailers point of view, their job is easy couse they just tells you to go away and they just don't want to take the fruits and so when you think about the economics that goes on, you have to consider the amount of power that they have and also even think about the price and promotions. You have to think about a quite over well min job, so you got a couple of choices, you do such an amazing job on selling that you create the demand for consumers or you have to go small and slow and slowly build the market up and get confident with how much you can put in and that is what probably kiwi berries should do at the moment, because they are so small they would never really put big volumes anyways.

From a responsiveness to the market point of view which would be the differences between kiwiberries and kiwi fruits?

The fore standing order is 14 days, we try to freight in 16 days, I actually I don't know how you would manage it but you probably just have to plan a program and just ship against that program you, because there is such a short time it is just enough to execute it, I think you don't actually have enough time to make changes, and you see it is an interesting one because by the time you will have your, three weeks of shipping of transit time to Singapore including one week of loading the vessel, by the time you get feedbacks if the sales are going well or poorly you will be four weeks into the program and then it remain just two weeks with the fruits to sell and this actually all lined up to the coming containers to go to the markets and so you probably have to produce a schedule of the whole season and you push it true and you basically have to develop two things one is about to develop in market contingency so if the market doesn't work you have got some others ways to sell it and the other one is probably some on water contingency where you pack the fruits in a way that it has got flexibility to go to a multiple market and then if it is going wrong in one you can at least redirect and so you probably would get the other market in time.

So don't you think that an air freight strategy would be the best way to be flexible?

I would probably do both, I would do a mixture because I think that you use effects of some of the sea freight to try to have a reasoning price point and then you invest the difference of the cost of air and sea transportation in the market to try to get the product going but you use the air freight to be able to make the adjustments that you need. So in the perfect world we would do 70 % by sea and 30% by air as the norm and you buy your self just a little bit more of flexibility. And you know that would work okay for Hong Kong, Japan, Singapore all of those are one stop direct flight. And in Eu I am not sure it is possible to do it by sea.

What about the order size, do you think there will be any changes in order size because of the perishable nature?

They will reduce the size, so there is a couple of places where the order has been produced so the order from the retailer to the importer Zespri agent or Zespri store which I think is going to be quite modest, I think I expect is going to be major every single day because they want to keep the stock level down, there will be occasional order when there is promotional activities where you might be able to push more stock into those stores but the challenge around is that they expect you to take the product away if it does not sell so if you take a thousand units in the store make to be displayed and it does not sell there will be on you to create stock away so it is going to be quite a high pressure scenario.

How would to combine transportation with very frequent order cycle?

So for Taiwan or Singapore you take a full container into market, on arrival the fruits will be inspected and graded by where it needed to go, so where needed to be sold first and the distribution center will make daily deliveries to retailer to meet the order and that is not unusual anyway for fruit to be delivered every day to retailers. You just have to, in starting the market I think that the big challenge is becoming important enough that they want to place the order and they think that this is actually really hard. In our industry this is going okay but we still own only a couple of percentage of the fruit basket and so we take one tenth of the percentage of the fruit basket and then expecting that buyers in a not strong market will manage the stock level from a super market that have 60 stores through the market and I have to deliver perishable fruits to them every day and I don't have clear demand if I have to ring each store each day to find out how many punnet they want I am not going to do that. If I receive feedback from my store that they want to step back because sells are not going well....and so the reason berries are so expensive is because they don't last for long, they spoil and every single berry that exist and has been sold has absolutely amazing flavor characteristics because there has to be a reason why people spend their money and so there has to be quite worth, they cannot be bad. Strawberries are the only exception because they have a strong reputation. People think that berries are a very indulgent way to spend their money so they don't mind. Because for kiwi berries they might not knowing them they may have to build up the demand of interest.

Depending on the market but actually we know that February march is not the best selling window, it depends on the market like for example it can be contemporary to the Chinese new year's eve and it can be good for that reason but for a number of market after Christmas is not the best period because consumers already spent a lot of money, it may still fit. But March April may it is actually considered a good selling window because also there is not much fruits variety.

Did you recognized any particular ordering specifications for these markets?

So I think what you need to consider is what the rules are and you need as much flexibility as possible because when you grow a fruit there is not as many pieces of fruits that they can go anywhere. Most find some conditions that they restrict the market that they can go to and kiwi berries could be worst than kiwifruits in that regards but it maybe there is a number of market where it might be really really hard to get the fruit into. The other thing is that you might have to get an approval to get that shipped because it doesn't exist this variety. In the long term I think they can all be sorted up but the biggest challenge is probably around you retailer requirements and so retailers have specifications about traceability which are more stringent than the nz law but retailer are really concerned on even having a fruits going to their store and because of that they place additional requirements and so what it might mean is that they would need to every single pack to be able to be placed back to a particular orchard to make sure that the chemicals that they apply are all known and recorded which is what happens for kiwi fruits now so those standards are becoming more and more higher and so having in retail packs having a very high amount of information and traceability and so in some ways kiwi berries might be lucky if you pack it in nz and then air freighted it might be very easy to record exactly from where they come from but if you put them into market and then rework the product you have to be able to trace how those changes are coming from. But retailers in

countries like China have higher and higher standards. None of them cannot be achieved but they are just a cost burden. I think they would be the same for kiwi berries and kiwi fruits as for other imported fruits in that country.

How do you think consumers would react by the short selling window?

I think you are going to have two different stories you have got to. So in place like Italy where they have got a lot of kiwi berries so they know about it and then if you have got a place where there is not kiwi berries, for that place where you may have some good Zespri kiwi berries which have a nice taste they would buy twice in that window. I think that it would be hard in a market like Taiwan to get people to know the fruit without a quite risky marketing strategy. I think you have to have big store front programs where people could see that there is a lot of stock available, there is the best price you can get, come on try it out! But because of the limited time to get their interest it is pretty expensive. And you know in a lot of stores you can lose stock because they want. Even with things are going well in lots of stores and the product it is great and it has been really appreciated you may have 3 or 4 stores where sales are terrible and you have got to through out fruits so you have got to have a hard game. So I think that the limited window is going to make it very hard to establish in the consumers mind because, you know what is going to happen is that someone goes to the store after four weeks buy the fruits they try it at home and then they say to Kate, hey Kate have you tried this, this is really great! Kate would go to the store one week later and they are gone and so the really short window in the very busy world is a very challenge in building loyalty. Possibly we cannot rely on it, people would buy it because they are interested in but is tricky to consumers to add something to their rituals. I cannot become an habit because it cannot stay there enough. Just to think about the red, it has a very short window but because it is different it has got to differentiate with the zespri brand, people have confidence that they will get a good quality. I wonder if kiwi berries if is a unknown brand I think it will make it even more challenging. I think that with a different red color of flesh I think is quite easy to roll it into the systems. Certainly the Zespri brand will helps.

The Zespri brand will helps but one of the thing it is interesting is that where kiwi berries will be placed in the store because it is not necessarily stay in the open. The gold kiwi fruit has a little bit softer flesh but just to understand how retailers are, so in Thailand so Tesco in Thailand we had to spend two or three years convincing Tesco to put green kiwi fruits not in the chilled but actually in the ambient display for period true something like August they still put it back in in the chilled later on and so the challenge will be that in most market where you have green and gold in the open space and the kiwiberries will be in the chill air and everyone knows that the chill air is expensive.

We will support whatever the customer want, is not our place to make them decide and therefore what is gonna happen is that kiwi berries will end up by increasing the tot amount of fruits sold two time faster because there is more variety because we will support that but the interesting thing is that when consumers make the choice about what they are gonna eat it surrounded, so in the berries shelf you have a very different visual set so you have nice colors and interesting packaging but also have very high price points and our arrival could be quite expensive. Or if you go back to the ambient display and you have the green and gold you see that they are more expensive because you see that they cost two or three times more per kg and so it would be really interesting and I don't know the answer to know how people would respond and how you best positioning it. Are the best positioned beside other kiwi fruit or beside berries?

And what we are already saying about green versus gold is that when the price relativity il 20 to 39% more people aren't too worried but when it start to go beyond that people start to respond. So kiwi berries on a per kg bases you should be 2 3 times more expensive and so people would make decisions around that.

Do you see the benefits of having a larger variety within the portfolio?

I do. But, it comes down to...I think that as an industry it will make ourselves better and our job more responsive, it will make us more better interfaced with retailers. I don't want to be negative but I am not sure I am convinced that it is a particularly large crop. I think that the pathway to making that a larger commercial crop has to be slower, I wouldn't rush, I would never going plant a whole bunch of this and so hey we are going from a million to 5 million trays within a month. I think that because it is soo risky you want to slow down until you grow your demand up and then you have got the right volumes. I think that now there is a model which is low volume high premium and good margins and that is a very different model that have 5 m trays. It is actually quite easy to sell a small amount of anything at a good price but is really hard to sell a lot. If the taste of the product it is not a secret anymore and when a lot of people are making money and a lot of people sell it and can you still make money and I am not entirely convinced that it can.

So people talk about how great the product is but you have to be conscious and I would make some test where I would make people to eat some blueberries, some raspberries some strawberries and some kiwiberries assuming that that they basically all have the same price. And I will get people to give feedbacks and together taste scores. And so if you have a score out of ten, and what you find is that consumers are coming back saying hey we graded 6.5 out of 10 but we graded the other berries as a nine and I think that should really lead what you do. If it goes on the other way and you may found that kiwi berries has a 9 and the other has a 6.5 then I think it is really really exciting because you have got an inbuilt advantage and therefore people really want you over the competition and I think that understanding, because not matter what you market is, at some stage if the product is not better than competition, you are not going to win. I may get people to try things one to make them having an habit you need to have the fundamental quality really good.

Do you think that having many varieties not noticeable by consumers but that allows you to extend the storage window will be a successful strategy?

I think it is a good idea.

The two more critical point are the selling window and the sensory proof that shows that on a p per kg bases they perform better than competition.

Do you think consumers will be ready for a red variety?

I don't think it will be a problem if it is green. And I think you would make a case where people may associate green kiwiberries with ...If you take all the negative aspects of kiwi fruits which are about harder flesh and not being sweet enough, that sort of things and kids are not liking them, you know that sort of things. You might be better with a different color. If you don't have taste you go anywhere. And then you have got convenience and you can't get any negative eating experience. And they quite be really good because they don't leave a store behind so you basically don't have anything left over.

Your problem is that If you have got something that taste good, because of the sc restriction, you have to get enough support behind to let things go because if you need to be on a shelf for a long time to capture market attention. It is expensive to rise the awareness up and if you then have to wait other few months to keep going back. It is so expensive.

I would not buy an orchard.

You need to think about what your backups are when export is not working, because if you have to sell 1 m trays of kiwifruits on 5m that have a life cycle of 7 days in nz you could never get them sold true nz retailers. We faced with our fruit ourselves by not having a strong domestic market. For legal reasons we can sell 0.25% of Zespri crop so almost nothing and that create real challenge for us because it forces us to take more conservative positions on how to sell and how to price because you have to sell everything in the export market. So the eu guys are in a better position because they have a very strong domestic market that is very close by. We only have nz and possibly oz.

MARGOT COTTER- ZESPRI LOGISTICS QUALITY CONTROL

She used to work in planning supply for 5 years, but now she does a lots of quality reporting issues for the technical side and so for example she has to deal with fruits that is not doing so well in the market by identifying the causes.

Which are according to your experience the most critical control points in the chain where you may have a higher necessity to check the quality?

So effectively what we have got onshore is growers, I guess you have got the fruits at the growers and then when the fruits gets packed by the pack-house and go to cold store they goes true quality checks so the have to be sure that it has to meet the grade standards when it gets punned into the box so that is kind on an internal one on how the cold store has made and then it gets checked by our Qs so they are quality assist they goes to each of the cold stores to check all the fruits. so that is an internal sort of process and then they get an order for the fruits and then our suppliers they send it into the woof and they put it into containers. If it is on a containers the Qs can do random check to make sure that they make random specifications and it does not have too many defects so is more like a grade standards that they must make and so we have

checks at the wharf and so when does it arrive at the wharf we have 70% of pallets going true and they go true and they check all of the fruits to make sure is within our grade standards and if it's not we send back to the facility to rework and so they can provide at different products or change, take out the defects and make it within standards so we have that out on the wharf and that is probably before it gets on the ship the most critical parts and then it has got different transit time depending on the market it gets to and you have got different markets that have got different way of checking the fruits. So, Then we also have inter check and checking within the market so for example some of the fruits has owned by Zespri all the way down to the market and so for example we have got a big department for example in Belgium and then China and then Japan. So those are big market so when it arrives in those markets we go through a process to check, I am not too sure what percentage of pallets are but we have a random selection of pallets and we check for those defects as well and so the market make sure and prioritize the fruits for different customers and as well if there is severe defects we can always charge the suppliers back in NZ for providing bad fruits so there is a little bit of accountability for the suppliers so we are sure that they make the right fruits into the ships so they can actually last all the way to the market. So that is what we call inter check. Now there are some for example containers markets that goes directly true customers so there is a difference between STO and DSO model, I am just trying to remember which one is what but the DSO that is to a specific customer so it goes directly to the customer. Or is on the other way around. Any way the one that goes to the customer that for example goes to south east Asia and we have got an order that goes to a customer by containers and we send this directly to the customer so they don't have a specific inter check over there so what happens if they receive the fruits and they check that themselves and they are not happy with that they have to get an independent auditors and get the claim into that to say we are not happy with this fruit, we have got, I think that in the agreement of the contract we have got up to 5% of the fruits defects but if they say we have got 20% of defects and they want to make a claim, then we have to agree and ask to an independent auditor to check their fruit.

What happens if the product is not conformed?

We get an order from them that can say how much is the percentage of product that they can sell and how much is the percentage that they cannot and then there is a negotiation on how much discount they get or we would give them a rebate on the contents. So it all depends on how the outcome of the auditor, so if they says we have got 20% of the fruit that we cannot sell so they we might give them this 20% discount or just a check back on their account so there is different ways around it but those are two differences on how you can manage the quality and then in some instances if it is really really bad of over 50% we can do what is called major fruits quality pen which is what they have to, is up to 50% of defects and then we charge the costs of this directly to the suppliers because if it is really really bad....

So those are the two main quality control points and then there is the market, particularly in Europe and Japan they are constantly checking before it may arrive in the cold store, it might sit there for few weeks and they might check it again before leaves to go to retailers.

So do you think that in the STO model where Zespri is also the importer like it does in Eu there is more visibility of the chain from a quality control point of view?

Yes, that is right and we have got more control as well so control to what goes to different customers rather than at the moment we just give suppliers an order and they can put there whatever they want into containers and then it goes. We lose part of the information so we know what we have to put into it but we don't have the control of that, we can ask to put it firm fruits or... a particular quality but they don't have to so they can put anything, whatever they like in to. And we don't know till after is checked so that is a little bit of break down of control. Because I guess my job, well part of it is about analyzing the quality of the fruits that we have got both on the water and what is about to arrive in market so each week I write reports to all of that markets telling them about the quality of the fruit arriving. So I get them a risk score telling them about what is bad fruits, what good fruits in order to prioritize for more important customers and that sort of things so that is a tool that they use to be able to prioritize their inventories and which one they need to check for quality and stuff like that.

Do you see any differences in quality control between direct refer vessels and containers vessels?

I think I did a little bit of that this year but I am not too sure about the outcome but I guess it all depends on what I am looking on is the fruits that has been putting onto the ships and the quality of each of the grower lines, so that is more what I am focus on so that if you receive the ship and they can say okay hey look at this top 20% or if they have got some containers market saying okay we have got three containers that have bad quality fruit on that I suggest that you look at three of these three before you look at any others so is giving them a stim of what the quality of the fruit is gonna be coming like.

How are you checking this quality attributes? Like do you have any special device?

Oh yes so we have got all these kind of information, so we have got these information on the two parts that I... to quality control, so the fruit that is checked down to ACPI so the woof checks, we have information true ...comes to the datas comes true and we also have the data coming true the inter check so (end to check??) so true the market so this is coming true the computer system and then I have downloads and then is taken into account, so I provide a risk score and rated to a scale from 1 to 100 and so I take into account the ACPI checks that had happened in the past five weeks and the inter checks that the effect in the past five weeks as well. Fruit losses we can see how much has been thrown out to the suppliers of that specific grower lines against to what the expect to get of that. We also look at the fruit age so early earlier fruits tends not to store as well as later fruits and we also look at what is the specific cold store in nz so how have...Because for example because kiwifruits is so sensitive to ethylene, so if there has been an issue of ethylene in the cold store it may reflect on the fruit that is about to came out so it is about to giving an indication on how well they. So I have got multiple facts that is combining all to a risk score between 1 to 100 and so then we can say that anything above 20 is not that good and anything under 20 that is fine you can probably put that away for a couple of weeks.

Do you collaborate with the post harvest entity to get these type of data?

Yeah so that is more...feed that back to the QAs so each of the quality's sss the have each cold storage that they look after and so that would kind of be feed back to them and they would kind of deal with the facilities and how to manage issues and these kind of feed backs loop.

Which is the time laps in which these information occur?

Is not necessarily a real time information, we get an update once a day on that but I only update the risk score one a week so it is just a weekly updated in the way we do. We a trying to get it done in the system more frequently but we still kind of work on that.

I was thinking about kiwiberries, because their selling window is so small as a consequence of their limited storage life, I think that one week of exchange of information might be too late. Do you think this system can be applied in a shorter time window?

Oh definitely you could make it more frequent it just have to be a little bit less complicated or you know we just have to sit down and work out how this gets calculated but everybody has different ideas so we need to find calculations that works for everybody. I guess more than having more people that works on that is more about having ad hoc feedbacks as well because one thing we also does is having every two or three weeks is conference call with the markets all around the world so is just getting feedbacks with them and everybody is communicating and getting feedback with each other as well about how fruit is expiring what is coming out ... for the quality risk score. In an ideal world we are aiming to do that basically overnight and is just that the data flow is trigger us to an update

Do you think that this information flow really helps to increase the performance?

Yes absolutely, I had discussion and workshop with the markets and they use it quite frequently I know particularly China they use it and report it quite a lot and all the information of the match they use it to prioritize their flow and so that really works well. If they have got 20 containers they have to arriving for example and so before they arrive I have seen in the list we have got fruits coming off an then we say okay so anything with the risk score over 60% we want to check that so put that on a side and what have 30% we can put that on the back of the cold store we don't need to look at that before a couple of weeks before you look at that and this is once we need to get to customers very quickly. And so by prioritize the fruit and make sure that they not miss anything because if they just have got everything all right they need to priority some fruits

that do not have that. And if there is no visibility you just have got to check everything and they might not have time to check and they might but some bad fruits back to the cold store and then by the time they could have sold them earlier but they look at it two weeks later and it is not a very good quality so they cannot sell it anymore. So is about prioritize.

This is for the model where Zespri is also the importer..right?

Amm, not necessarily. So yes, this is how it works because we tend not to get the risk scores to the direct customers because sometimes it encourage them to claim when there is no issue so is just a potential hits up that there is an issue but for some of our distributors we have got a good trust and we provide that information to them and there is no problem because is that for their own use, so it all depends on the level of trust there is with our customers.

So do you recognize any particular market where there might be visibility problems?

Yeah so I guess the less visible one are kind of the new market for example the middle east because it takes 5 to 6 weeks for the fruit to arrive there and there are a lot of new customers as well. And we have a lot of claims for that market this year. Like Arabian emirates. So yeah I guess is about trying to understand what the issues are.

Because in some market they may say we have soft fruits but it makes the grade standards so their idea of soft versus our idea of soft are two different things so it is more the education of those and that sort of things.

If you think about Taiwan, Singapore and Hong Kong.....do you think that would be feasible to have real time information on kiwi berries shipped there?

Yes so they are quite short distance markets. Yeah I mean real time in Zespri lags is usually day lags and so things are not really get updated in real time. It would be feasible I guess.

So would you be able to control quality in a sort of pro-active way? To control in advance...

I guess it all depends if we have got information that we have it so providing all the check information from the woof and that sort of things we would be able to provide. At least some information on the quality of the fruit.

Do you have any complaints about the exchange of information among actors?

I guess is one thing that it is also for maybe Zespri because this year we have kind of started to try to set up an email address so that any complaints just can be directed to this email address but some few people say hey we have got this problem but everybody knows about it so we are trying to make sure that they have been captured in a centralized place.

So is more making people to follow a process rather than other. Other the information flow seems to be okay.

Which kind of information do you normally exchange?

Any sort of defects, unaesthetic coming along or any growers that haven't been performing very well. So for example for some green fruits that haven't really performed really well, so for ex the eu operation manager is sending an email every time saying hey this is the level of defects, this is the cold store they are coming from so that sort of info . But that's more ad hoc. And we put the info out of our system but is more a summary that gets to everybody.

What would be the impact of 5 m trays in 6 weeks of kiwiberries on the current QCS?

I am not really dealing with reporting. Is hard for me to imagine but I guess I don't have an answer.

Hallen Shohen is the manager of quality ad she might know more.

Do you also deal with air transportation?

No I am sorry. Also because it is more for small pocket.

I guess that breaks in the cold chain might be the major concern even for a small time.

Which varieties of kiwi berries do you have?

I have got two varieties of kiwiberries: Margi red and Takama green. And the red is a little bit sweeter than the green, I like to place it like if it is a gold taste and the green is the Hayward taste .

Which are the reasons that made you decide for this particular KiwiBerry variety? Do you think the choice of variety have an impact on distribution? (ex. Storage life, market orientation, transportation, less uncertainties, productivity...)

The variety? Ammm...just by chance really I have looked at it 15 16 years ago just on a computers and I thought oh they might be great to grow and I did not really know how to go about so I was talking to Geoff about it and he got interested about it so he sets that all up thinking on the pack house and then we ended up thinking that plants from Christchurch and he knew someone there and he got seedlings to have these two varieties so that how I chose those two varieties and I have the rootstocks so we tried those. So the rootstock comes from Christchurch. Geoff has got different varieties, so so the varieties he has got are from food and plant and but I didn't go that way I got these one true Geoff he got them in Christchurch. It was there it was convenient so it was there, we did not even know if it was going to work.

There is a lot more work in the green the red which is a lot easier to grow especially in summer because they have a little smaller leaves than the green so is easier for summer pruning. The green grows a lot more vigorous than the red. But the red it is a little bit harder to sell, because it goes red and it looks like it is going rotten. It turn red once it goes ripe and it is soft. Consumers have to understand better this that is what happened in the first couple of years especially in the Asian market. They thought was going rotten and they throw it out but the exporters they never told them was was going on they just put that on the market. Once you do better advertising, talk with them and explain what was going on it is fine. Because they better understand the fruit.

Which are the most important cultivation practices that impact the distribution of Kiwiberry? (eg preservation technique like goodling) Which are the differences with kiwi fruits?

Oh yeah we don't do anything with that. I think that because is more like a berry than a kiwi fruit it should be treated like a berry, they are very soft fruits. One one year I have put too much fertilizer on it and the fruit went soft a little bit too early, so you gonna be carefull with that, you know it is a very fragile fruit. We have got to pick them hard but it have got also to have taste and right sugar leve but they are still gonna be hard. So what happen with this type of fruits is that they do goes soft on the vine and because are in bunches the other fruits seems to go soft too so we loose a lot on the ground.

From an agronomic point of view which are the main differences between kiwifruit and kiwi berries?

It is a lot harder and more expensive to run because you tight them in a very small cane so you have got to untangle it more, you cannot just cut it out because you want the little more, thin cane like that. And so it takes such a long time to do anything with that so it is expensive to run but per trays we get more money. You know it is a little bit better than the green and the gold in income. It is still worth the effort but you wouldn't really get much less otherwise because of the cost of running it. Probably a little bit more expensive with pesticide because diseases that they get that normal kiwi fruit don't get, like a little bit spots on that so you gotta put two sprays on so they don't get it and so we actually gotta put a couple spry on for that pesticide and then three or four more so a little bit more of costs but it is not a great deal. They seem to be more resistant to PSA, I have never seen anything in the Arguta. They are pretty hardly.

Are you satisfy from a productivity point of view by the cultivar you selected? (OGR) in comparison with kiwifruits? which is your prod. Trays kg

Yeah, we get a good crop here, some people do not but it is the same old story. You have got to do the job right and you have got to hear, if you are not doing it right you don't get a crop. And that is why it cost you a lot of money to run it because it is so slow to do it and to get it right and cause the workers they have got to make the same for the money as they make other kiwi fruits work that they make along coming do it. so such as winter pruning they need doing about it three base a day for kiwi berries and with kiwi fruits they can do 25- 30 base a day that why it costs a lot of money to do it right and if you don't pay the workers the right money they will go too fast and at the end you want get any fruit.

The OGR is higher for kiwi berries in comparison.

Do you think the production could be further increased by any agronomic techniques? (refer to breeder..)

Yeah a bit more technology. One of the biggest problem is that we don't hi-cane spray which enhances the bad break as we do for kiwi fruits. Bad break it is so far apart that when it comes to flowering it has got early flowers and late flowers so when it comes to fruit picking you really see that some fruits goes soft and drop off before the rest it is ready. So we pick the fruit several time true the vine but we still lose a lots of fruits at the start because we can't even pick, they just fall off. It does not happen with kiwi fruit because one of the main reason is that they have go a longer shelf life but if we could enhance the bad break to be even we wouldn't lose so much fruits but how we do that? I don't know because hi-cane will actually burns the cane because we have very thin cane and it will all die. So in a such big varieties of different size cane we don't know how much hi-cane to put on you know. This is the main problem that we have. And plus we would like to have a longer shelf life but of course if it a berry it a nature of the fruit so you cannot do something that it does not want to do hey! I don't really know to what his is related but I guess size and thin skin.

Which is the total costs of production? Per kg of berries? Do you think that by increasing production you will be able to reduce these costs? (changes in costs by changing variety, proportion of costs according to activities/from where does come from..)

I don't really know... But I think that an increase in volume will not reduce this costs. I think that if Zespri got involved we wouldn't want to many growers because it is a niche market and I think that if we will end up with too many growers the price will goes down and we will not have enough return. Zespri could probably sell us more but the cost I don't know yeah...I don't think they can bring the costs back I think it is hard to know until is done when it is too late. You know I can bring the cost down a little bit but not much the pruning costs as much as I do but where I get the production I don't think so. Couse my contract that does all my work he does another work in another orchard and we used to get, him and I, the best crop around here and they he sold his orchard to another chair. And because he a little bit more expensive than anyone else but he have the best crop, and the next year he stop the contract because he was to expensive and he got someone else for about half the price and he had got about half the crop. He still have the same contract but he does not pay as much so he does not have as much crop as I do. If a breeder can get a crop that does not tangle that much you know you se them growing a day and being thinner just tangle everywhere and because the thin cane is what you want you got to untangle them and cut out the big ones and tight them down which is the opposite that the green which doesn't tangle that much, in some cases does but you know you want the big ones so you just have to cut the thin one. You know I have tried out there putting the bigger canes and you know doing a couple of bases and then takes sort of two hours you know and I think oh that looks really good but you know you cannot come and pick the crop if there is any fruits there. Is quite tricky.

Would an increase of production affect kiwi berries quality? (numerical indications...)

I don't think so as long as people knows how to grow them properly. You see there are a lots of new growers at the moment couse when the gold got PSA some grown Arguta so there is in the last two years an increase in fruits and it will be more if growers will stay with that. I know a couple of growers are not really happy and they chop that out but...

I think it is because they don't really understand the fruit. Because it doesn't have got a (fear???) in that and is more like a grape so it gets sun burn, wind injuries and gets smacked so you have got to keep a heavy canopy average so if the sun comes out it does not get into it couse when we first grewed that it was open and it gets smacked, for the first three years we had problems. It takes years before you learn to grow it properly, 5 6 year to establish it properly. People grow this stuff and think that in 12 months the fruits will be there but it is not it takes two three years so they chop it all up.

I have got half a hectar here which is about 4000 trays, each trays has 12 punnet. It is quite a good production compared to others.

What are major uncertainties you have to deal with (weather, harvest, quality, uniformity....)? How does it affect distribution? In comparison with kiwifruits?

The weather! Yes and bags but we know what to put on now so basically the weather. You if we get the wrong wind at the wrong time it can create a bit of damage, frost and yeah...There is quite a lot of variability between years, it can get not so

bad now that it is really establish but some years you can get many insects and then another year it can be the opposite because of the weather. It is a lot more fragile than kiwi fruits for wind and sun. It is pretty well protected and you just got to keep the canopy thick, dense so the wind and sun doesn't get in. Probably the sun gets more damage. Just before Christmas when you have the little fruits is the most dangerous period. At the end of November it gets pollinated so from then on you can still get the full canopy and the fruit get soft so it can get damaged. Damaged fruits does not affect other fruits around unless you have got bugs. But the wind and sun not. Well the wind might rub against each other and just marks them but the sun not.

From which organizations do you receive technical support? Do you think this type of information sharing are more important for Kiwiberry than for kiwi fruit in order to increase performance?

Yes true our little kiwi berries group, Geoff is the chairman of that and we do little field days. We don't do it so much now but we use to do that back at few years ago when we started first growing that, we shared the best ideas among each other and help on the best ways to grow it. We sort of stick together. While for kiwi fruits we receive support from Zespri. They are two different types of growing methods so it is about the same. It is important for both. I think we have got enough info, I just think that a lots of information that you have got are not related to your orchard, every orchard is different and you have got to learn what it is best for your orchard. What is best for me might not be best for Geoff orchard because we have got different idea and pruning systems and soils.

In comparison with kiwi fruits do you have many waste? How do you think it could be avoided?

We have a lot of fruit losses for kiwi berries. I am not against of that, I mean it is not my main preoccupation. It is the market that we are worried about. If we have more kiwi berries, will be able to sell it? You know at the moment Geoff packs most of the kiwi berries but you know he has troubles in doing that. Sometimes in selling that and sometimes...because it is all ready at the same time ...like if my orchard is ready to pack and other three are ready to pack you know you have got to have the market which has got to be there to be able to sell it. And he has got to be able to pack it in the short space of time, when at the moment he hasn't go the facility, well is too hard for him to pack it all in one and you cannot put it in the cold store and leave it like the green one. Once it is ready to pack it has got to be packed otherwise it gets soft and drops off to the ground and if the market is not quite there you cannot pick it so you lose a lot.

I think that if they want more growers yes, they have to have more facilities. The existing facilities are not really enough. It just needs a little bit more at this stage. Geoff is doing a very good job but we know it is a natural fruit and it gets soft but sometimes it is frustrating when you want to pick and you can't pick because the market want that much fruit for that week. So it goes week by week, sometimes the exporter ring it up and they want so many trays so we are all in a rush to get the fruit and the other one we say oh no we don't want that many trays. If Zespri will get involved it will give the advantage of more stability for the market. I have nothing against that but we just don't want to lose our profit because we cannot sell our fruits. If the P goes down we will get less money. But the further away the market is the harder to sell is because to get the fruits there in good conditions because it goes soft, it doesn't keep and it is going to be flying everywhere and the cost of flying from nz is too expensive. That is one reason we don't sell any to Europe because the cost to go there is just too expensive. We just go to Asia and America.

How would your relationship w pack house change if +production or different variety?

It could well do yeah, you know we always have arguments when it comes to the picking time because if the fruits is dropping on the ground you want your fruits picked and everyone else is in the same situation you know so we always get stressed. Is not just like all the other kiwifruits that you can pick them and leave in a bin for two three days and then pack it, then they just goes in the cold store and stays there for months but for that it just goes off.

How do you think the pack house can improve w the relationship w you?

That is a tough one, ahm I gust wish that we can get the fruits off a little bit earlier but you know you have got to get the market. It takes a month to pick it, what happens is that we goes true one pack out all the big ones and then once it is all down we go true it all again and pick the next big ones, we go true that three of four times. We would like to get there a bit more. Because everyone else pick at the same time and we all want to have return, because if I pick all mine, then other

growers will lose too many fruits on the ground and have a big loss. So we have got to spread the loss and the only way to do it is to take it in terms to picking here. I have got a little bit of advantage here because I am close to the pack house and if they really need fruit they just ring me up and say: could you bring me boxes of fruits? So is fast, I pick they pack and it is gone. I can pick in the morning and by that time the fruit is on a plane from Auckland to the market. Because I am soo close to the pack house.

Are there many pack houses that you can chose?

There are two more. One is Seeka from the last 2 years, which just started up doing Arguta, but they have got totally different ideas from me and Geoff. Geoff in comparison is, we get more money true Geoff than the other pack houses. Geoff does a far better job here and he is very strict with his exporters, they have got to get the money that we think we want you know so they don't goes against each other, they have got a tight line and Geoff does a very good job. And also he have got soo much itself and so he can understand very well. I don't know if we can go true seeka because we are not Seeka growers. And the other one is a little private one and I don't remember the name, but he does not do a lot and he does not, he is a bit shady ahahah I would not trust him. Prindow, Prindow and ammm....people that have packed true there haven't got very good returns properly and not very good prices and they came to Geoff yeah. There are only these three but Geoff does the most, he does 80% or more

Th,. Is hard to get new pack houses because it is too expensive to set it up and they does not get the money back for such small volume in a small window of the year. So if you get the volume you will get more facilities but you won't get the same price then you know.

Would you increase the production of kiwi berries if there will be more market possibilities?

I wouldn't plant any more because half hectar is enough and I prefer to have the green.

In which market do you sell the red one?

Mainly in the Asian countries yeah and a little bit in us but I am not sure.

Is your traceability system as strict as it is for kiwi fruits?

Oh yeah we have got to have numbers and things like that, they always know from which orchard does the fruits comes from. Is the same for kiwi fruits, probably Zespri it is a bit more strict but is pretty much the same. We don't want to put any fruit on the market that is not right otherwise you lose consumers so we have got to be a little bit strict with that.

Which is your level of sugar at harvest?

The minimum is 6.5 brix. Before it was higher, I think 7 something but it was too high, the fruits was going to rotten it was just too soft and falling on the ground but even 6.5 is too high I think. I think that it should be 6 and I keep telling that. It is hard to judge the taste, I mean I pick the fruits out there at 6 brix and I think it taste all right but I don't have proper testing facilities so I might less better. I read somewhere that once the fruit first start to go soft it is ready to pick and because we pick on size and the bigger fruit is normally the early flowering fruit so it is always ready before than the later one so you usually found that is the smaller fruit is the later flowering fruits. So you know if you pick that it would be very nice but if you leave it two weeks it grows and it is ready to pick but if you leave it two weeks it grows more and that's why we go true and we pick all the biggest first and then by the time you finish doing that you go back and you pick the next pick while the smallest one are growing. So when, last year it went a little bit better but when they come here and they pick the fruits off 90 fruits or whatever that is, they come along and they pick them all off and then they test them but you have got some smaller fruits that they never going to be ready you know they are 2 weeks away, so that brings down you average brix level. So if they just go and pick the big ones it could be 7.5 but if they pick the little ones they can get 5.5. Therefore you are going to lose a lot of fruits on a ground because you are going to need the brix. And that when you go back to the whole thing of the bag break it has been so long and the flower has been so long that that fruit there is not ready because it did not get pollinated for three weeks after that the first flower so the first fruit is three weeks earlier than the last fruit. And that is why you get such a big difference in you fruits and they will start dropping off before they are ready. And you don't have

this in kiwi fruits, they all gets pollinated at the same time. For kiwi fruits they pick that all of and then it goes to a grader and they divide them into sizes. But with the kiwi berries it is too expensive to do that at the pack house and that's why we select picking them out there true the sizes and they still have to go true the grader but they just go true the defects. It is a preliminary grading. It is just too expensive to do that. Because it keeps It is just easy to pick the whole lot off and you decide later. If you are happy with that you can keep it and if not you just leave it for another couple of weeks but it does not go anywhere. By having different time of harvest we try to get them all at the same size so you got to pick everything what they got to do at the pack house. So the smaller fruits are not quite ready anyway because they are later fruits so if you leave it a week they just grows a little bit more and they taste better. If you can get it all flowered and pollinated at the same day it would be different but because you cannot it can be three weeks, a month different. Especially the green variety is very spare and you have got to think oh man there is not going to be any fruits there and you see such a big difference with the red.

Don't you think it could be an advantage for the pack house to extend the packing period and to have less volume at the same time?

Yeah it is one of the vantages at the moment. We have just got to get that we can pick the fruits a little bit earlier that the big first big because with the tasting one they test too many little one and the got the brix. It is a bit of an honesty thing too, you have got to pick really the big one and not the little one. So you should take the early fruits.

Who decides which fruits to pick?

Oh once we get the pass from the pack house lets say if you get the 6.5 then you go and pack and then it is up to you to pick the right fruits but if you take too many...So the pack house comes here and they take 20 fruits of each variety and they takes the big ones in Wellington and they test that for your brix and your dry matter. But they tend taking too many little fruits and that is why you have too many waste. We always have argues about that, they do not have to pick too many little ones but just the big ones. But when it comes to picking you have got to make sure you pick those big ones and not the small one. And that's where the honesty comes.

I have about 20 pickers, we give them lessons and we check them all the time making sure that they do not put too much rubbish into the boxes or any small ones. We are pretty strict on that, my contracts are pretty good on that.

Where do you place the product after harvest?

They pick them into a 70KG box and then I put them on a trailer or what they call it a punnet and when they 17 boxes I tight them up and then bring it to the pack house and then they goes into the cold store and usually the next day the goes into the grading and pack and ship them usually the day after hopefully.

Do you think that the cold store is an important process to slow down the internal T of the fruit and hence to be better distributed?

Oh yeah it helps, and an important thing is that because we pick it up in February which is normally very hot and when we are picking them we have got to keep all the boxes in the shade. Because I think that if they get too hot when they are in the field and then they get into the cold store, that is when you get trouble because they go down to quick. We start to pick them the 10 of February, the green one first and then the red at the end and it goes for the whole month. We normally get probably three coolers of the green off before we get the red. The red will keep a bit longer than the green so if there is not a really big market for the green we just leave it a bit later and try to get rid of the green because it does not keep on the vine but because it is generally earlier. So we normally sell first the green and later the red. We start with the red the 20 of February and it might be at the time maybe one small pick to go of the green. It depends on the market as well you know if they want to get the red a bit earlier.

Does the cost of harvest have a big impact on the overall cost?

Yeah it cost is quite high but it is what it is. Much higher than for kiwifruits because it is so slow picking because lot of soft one stays on the vine. The first fruits to pick are quite easy, you can get 5 boxes in one hr but towards the end you get 2

boxes in an hour because it is hard to find and that is where your costs come. So I think that an increase in production will not decrease these costs. It is the same between red and green.

Which is the overall transit time from harvest to pack house?

If the pack house wants the fruits at lunch time I'll take them there at lunch time otherwise I will take them down at 5 o'clock in the night. We usually take down two pallets of 120 boxes at 5 in the night. But it depends, sometimes they ring and ask for fruits at lunch time because they ran out of fruits and I just take them down. It is just 5 m from here.

Which difficulties did you encounter in planning activities?

Is the same

How precisely do you know in advance the size, quality.. of your crop? Is it harder to communicate this for kiwi berries?

Usually before Christmas but depends on the season really the exporter calls. Is about the same as for kiwi fruits. We also share this info between growers.

We all take our own fruits to Geoff with our own vehicle. We don't have control but it is usually in the evening so there is not too much sun and in any case other growers have covers on their truck so they do not take the direct sun.

How does the payments work?

It is all pooled together, I don't get more money than the other growers. In case of defects at the grader it costs more to grade them and you want to get the same money because you want to get the same amount of fruits. Right from the start some growers don't have good fruits and this cost money because our fruits were falling on the ground and that cost more. But this does not happen any more. Most growers now grow good fruits, and if not I have got packed mine first and then theirs otherwise it is not fair on me or to other growers.

Do you have any relationship with the exporter?

No Geoff does all that.

In the field: problem of different canopy size. Green has + production and consistent but harder to grow and + vigorous. Red is more even but biennial. He did not plant gold because it would have meant lose 2 years of yield so no willing to change variety, no market oriented non sperimenta e prende varietà a caso, meccanismo pericoloso.

TONY PONDER – DIRECTOR SOUTHERN PRODUCE, PACK HOUSE AND EXPORTER KIWI BERRY

Is a fresh fruit exporter since 1990. Is involved in the marketing of avocado, blueberries, kiwi fruits and kiwi berries domestically, Australia and Asia. They operate in the domestic market which is best represented by kiwi fruits by a direct sell model so they do not supply whole seller, also in Australia they have the same model. They import kiwi fruits from Italy to Australia. So they have supply relationship. They trade kiwi fruits in Asia as well. They have some intellectual kiwi fruits property as well that they commercializes globally. They deal with 80% of NZ avocados. In the berries category they deal with blueberries predominately and then kiwi berries. One of the subsidiary company which is Holyan

For 15 years they had another logistics company which looks after packing and logistics and distribution for NZ and Oz. Kiwi berries started in this facilities, for both public and PV varieties.

Which varieties are you exporting?

We have been exporting Margi Red and Takama green which are the two public domain varieties and we have been exporting K2D4 which is a Freshmax domain variety. Mainly we export those two varieties.

Which one is the most preferred by consumers?

It is interesting because I guess you have to say that the problem with the K2D4 is the superior berry in terms of productivity at a growers level and taste as well, size and is probably more uniform, it probably is a main season variety and tend to store better, so better shelf life than the takama green which is a bigger berry but not as good production and eating experience as K2D4. The red one is not really red I think is more a misname of... I would say it has a red blush on its skin but inside is the same. So it is the same category as takama green but it does not add anything significant in terms of the shelf space based on its attribute and the level of blush vary significantly from year to year. The problem is the degree of blush which vary from season to season. So it doesn't come out as premium at the market place in my experience.

Do you think that an increase in production will be a problem for the current infrastructure capabilities?

So historically there has been only two pack houses of kiwi berries in nz, our and Kiwi produce, it changed recently because of the whole plant and food varieties which are controlled by int property, a lot of the growers has left the industry and so the industry has got consolidated and seeka has planted a lot of K2D4. So Seeka is now packing kiwi berries in their own facilities, I think that last year was the first year that they have done that, so I don't think there is a problem of capacity to pack kiwiberries but there might be a learning that needs to go on with people that have an handle with people that did not used to do so before.

During sorting and packing process do you have a stable temperature control?

Yes so, we have developed some infrastructure and capabilities around managing fruit quality, and so our packing environment is inside our cold store environment so we have the availability to moderate temperature.

Did you adopted any special technology for handling berries, like BBC technology for example?

Yeah, I think that the first piece of learning is forget kiwi fruits and start thinking in berries. To give you a quick understanding of what guys might sort of thinking have is when I first got involved in the marketing of kiwi berries quite a few years ago they used to be called Arguta or baby fruits and no one actually knew what they was and the people keep thinking about the Hayward, the traditional one, kiwi berries are nothing like that and the whole mind set had to change from kiwi fruits to a berry type category so highly perishable, high cost, cold chain significance....so that is where we create this name kiwi berries, to align it with the berry segment. The whole thinking about how we pack kiwi berries is around high value, short shelf life a lot of kea and certainly not more biotech than mass production, And we haven't invested in automated picking because in our experience is that you tend to have a lot of variation in the maturity of the fruit and you need to be able to grade fruit and we found that prime person are better able to determine the quality ripe.

It is that more expensive?

Well it depends how amortize your capital costs and the value, do not forget that this industry has been very very small for a lot of time.

So eventually if you scale up the production then you might be able to invest in more precise technologies and perhaps reduce those costs?

Yeah potentially, I mean first step you can probably automate for sizing and packing capabilities. But ultimately the quality is more dictated by the maturity ranges in the punnet. So is whether you can use technologies like (nerrewfarred) or (tempeter) technologies that trying to differentiate the maturity of the fruits. But having a manual and auto supply chain could work.

Do you use any preservation techno that helps in increasing the storage life? Ex. Contr. Mod atm, precooling, washing...

Ahhh, for example the balance between getting fruits out of the field early is critical in terms of preserving the pressure and aligning the maturity of the fruits. There is also the managing the geo point from grading to the cold store, so that you can actually see the fruits. We are looking at technologies to extend the window because actually it is a big issue for nz industry so things like modified atmosphere or CA and things like that might be relevant in terms of extending the seasonality. We

are experimenting but there is nothing yet that can be commercialized but certainly there are continuous investments in that part of the business.

Which are the criteria and reasons for the choice of the packaging? Which costs does it imply? Do you take in consideration distribution? (eg. quality, costs, time of packing, waste)

In the standard model we developed early on is a standard singular tray for 12 x 125g punnets. We look at the cooling capability of the tray and also the strength of the boards so that it does its job and doesn't collapse during transit. It seemed to work pretty well, I think our industry has adopted our trays.

Do you pack the product already in the market format before it goes in the cold storage?

Yes. We have used larger format punnet in some markets but generally speaking 125g is the best tradeoff that retailers pointed in value.

This morning I was talking with a grower that explained me the problem of ununiformed of flower pollination, do you think that this aspects create some problems in the distribution?

It is definitely a challenge in terms of packing because you have got to manage a variation of maturity and if you get too much rush in maturity of the punnet you have got problems of uniformity in the punnet once you sale so it does have a lots of costs in terms of sorting and to get it right and from a growers perspective is harvest cost because you have to go true several type.

Do you get the vantage of size uniformity and pre sorting from this different harvesting method?

So the fruits that comes from the growers is a full ranges of sizes so from small to large, in the early stage of the industry we had three sizes so we had small, medium and large, or medium, large, and jumbo. What had evolved over the last few years is that actually is really one size so if you look at a punnet of new Zealand kiwi berries now you see that there is a range of sizes in the punnet but it mix the minimum weight. The difference that we have adopted is that we take out at the top end the very large fruits and we have actually pack the second size with the jumbo fruits in that just because there is too much variation but the industry tend not to do different sizes and tend to do one or two sizes.

What do you do with the fruits that are not conform?

Many times the little fruits doesn't come to the pack house and if it does it just gets wasted but is very uncommon.

Does kiwi berries requires special storage conditions? (RH, T, light...) How often do you control these conditions? Are records visible throughout the chain?

Yeah absolutely. Getting the field out is important and then and then avoiding chilling injuries on the skin, so you got to have a good cooling trough the product, you got to have a early and then you got to manage the cold chain. We always monitor the conditions. We keep records of all the information, when the growers deliver to the pack house we do make an arrival assessment on it, we can track the lines of fruits, we can track the analysis of the pack up and we have transparency around the fruit handling when arrive, so when arrive, when it is pack, which was the store temperature...

So you never mix kiwi fruits with kiwi berries flow?

We don't at all. We never.

Do you recognize any critical points where thermic shock may occur?

Yeah probably you got to be really careful with air freighting, if the do not follow the wrap up, you know you can get chilling damage on the fruit, that whole part of the air freight is quite important in maintaining the integrity of the fruit. We operate by Kuehne nagel.

Which is the capacity of the facility? How does capacity impact distribution? (ex inventory control, planning activities, responsiveness to the market, ordering process, quality check points...)?

Our facility is in Te Puke, at the moment we don't really have any capacity constrain because we are using capacity that is largely developed around kiwi fruits so we have adapted the technology and the system and the people to manage kiwi berries because it is at a complementary timing of the year, for us is when we are handling Italian kiwi fruits but we are not handling nz kiwi fruits so we have got the physical capability and personal and infrastructure. So it is the same facility but different timing.

How it is for blueberries?

No we use separate facilities for blueberries, largely because of the location of the production. Generally speaking the lines supply chain model we have looked at it is the value as close to production as possible (buona raccomandazione!!) so berries, are closer to Northland or Motueka or something so we will pack them in those two regions.

Would you be able to increase the amount of kiwi berries to store? (what would be your solution then?)

Yeah. Fundamentally from our perspective we have the demand driven model and not a supply push model. So we make to order and not to stock (big difference with kiwi fruits). So our whole process is about optimizing shelf life so it is about maintain the time lines from when the fruits are harvest then cold chain and distribution in line with the demand in the market so we are not harvesting because the growers want but harvesting to storing up. And growers struggle with that, they don't get it. They would like to pick them all today and walk away.

Which is the initial quality? and the deterioration rate?

We have done an early evolution of the industry and there was higher deterioration that now because we have understood and we have adapted but if a grower does not manage its harvest correctly and it gets too much mature fruits coming in, he would get higher fruits losses and so he does not manage the harvest correctly. I think tha all years we have been exporting we had never had a quality claim offshore. We have got a very good reputation for our brand internationally and I think that a lot of that has to do with the fact that we have got a lot of focus on our post- harvest.

How do you deal with inventories according to the deterioration rate? If the quantity increases and different variety? (link to the future)

I think it is around understanding that we have a demand drive model in the picking and in the time line based around shortening up the window between harvesting and getting it on the shelf. We generally manage inventories coming in on a first in first out bases but we are always monitoring inventories and we are moderating the approach if there is priority requirement against that but generally speaking we manage it in fruit age.

Is the way you plan activities different from normal kiwifruit?

Yeah definitely, we don't think that kiwi fruits can be compared. We think as berries, high values, short shelf life, we think seasonal, we think everything like you would have around blueberries, raspberries, strawberries...you know that type of mentality. From a marketing perspective.

Do you collaborate with the marketing organization for those two activities? If kiwi berries production increases how would it change? (difference w kiwi fruit)

Yes we are integrated.

Which is the average transit time (from packing to transportation)?

We do it daily, it is probably loaded from our cold chain into the air freight cold store within 2 and a half to three hours

Do you have to deal with many uncertainties which leads to high level of waste?

Once it is packed no, one of the biggest challenges as a marketer is in understanding how much fruit the growers is actually going to deliver. Crop estimation is not good. The fruit should be harvested when it reach the optimal maturity, so if the growers does not know when to harvest it I would be concerned on agronomic capabilities in terms of fruit quality. As in

kiwi fruits there is a general accepted harvesting season of product for new Zealand and there is an indicative traditional start date but that start date has to be moderated every year based on the climatic condition and ultimately what is the cause when we start is that fruit quality not the market.

Do you also pool production according for quality category for kiwi berries as it happens for kiwi fruits?

So our commercial model in terms of how we make returns is that we generally pools returns from each market into one consolidated pool, we generally consolidated people who are in the pool into different markets so then we make an average because we not generally consign to seller and we generally work with retailers groups program we have whole food in the US and programs like that so we have commitments retails programs over number of weeks so we have to have fruits continuously going into that programs, some markets depending on exchange rate and locations may return better than others but everyone needs to contribute to the sustainability of it so we pool it all into one. Growers get a market plan of what we are going to do, who our customers are and basically what volumes and what the flow plan is and then they know that if they harvest that in any week they will be likely to have this fruits in those different markets.

Which is the mode of transportation?

Even though we own a pack house facility we have always insisted that the growers have direct contact with the pack house and we as a marketer we have contract with the grower and the reason we do that is because the grower has to be accountable for the pack house and the pack house has to be accountable for the grower for the delivery of best practice. Some exporters don't have relationship with the growers, they have relationship with only the pack house, we have never believed that that model was the correct one there has to be accountability for the different ones. So in our model we offer suppliers packaging for harvest but generally speaking the growers will deliver their fruits to the pack house one or three times a day. Then to reach Auckland we contracted a truck with cooling, there is not enough volume on a daily bases to make it viable to run a truck back all the way true Auckland so we work with specialist flower carriers who runs a small truck with certain T control department and we commit to a certain amount of volume to that truck on a daily base.

Which is the transit time and distance to reach the destination? (eg. shipping port)

2 and a half hour.

Does operations of sorting, storage and packing for kiwi berries occur in the same facility of kiwifruit? Could it be integrate in the same flow? Does Kiwiberry special handling operations require a particular layout of facility?

Same facility, different time and technology and protocols.

Who is the owner of the facility? Which vantages do you have from this set up? (willing to invest)

Is private, we have the need for accountability so there is a good alignment and at the end we can get more value to growers and to the brand because of a consistent quality. And so we get reliability to retailers. We believe in program commitment rather than spot trade which is what growers prefer this leads to be frustrating from marketing.

How close is the facility to the respect of suppliers and shipping port? (what about competitors? Challenges for future increase in prod)

Not more than 30 km which is 30-40 m. So nothing, but depends on the grower.

Does capacity constraints plays a role in the choice of facility location?

Not really.

Which difficulties did you encounter for kiwi berries from a logistics point of view in comparison with kiwi fruits?

We start the blue berries business later than kiwi berries so the berries market was new. I mean the blue berries has got more scale. The biggest challenge for us in terms of marketing, distributing kiwi berries was in terms of getting enough commitment from the growers and getting enough volume to provide a realistic commercial proposition to retailers. Because retailers doesn't want to set up shelf space for one week and then nothing again or two weeks and nothing again.

They have the expectation that they get the products for minimum 4 or 6 weeks on the shelf. So getting growers to understand that they get to optimize value makes the commitment to the retailer. And getting growers to understand that they have to invest and promoting product in the shelf space.

So the short selling window and storage life was not as much challenging for you?

Is becoming more and more a challenge because nz kiwi berries industry is consolidating, the public domain of varieties are being....those growers are leaving the industry and then the K2D4 is controlled by one exporter that purchase the right which is Freshmax and they have become quite recently involved in the category, they have never being involved before, so as an exporter, going back to the start of the industry the biggest treat is the availability of supply. So that forces us offshore and we are start looking at Chile as an option for example. Because we can't get nz fruits so we got to get fruit from somewhere else. The lack of scale means that is hard to establish programs that allows to broadening the appeal of the product, harder to get commitment from the main stream retailers, harder to get investments to spore R&D promotions. Smartest money would be for growers to make a bigger commitment to actually get more volume and allow more things to evolve from a cottage industry into a main stream capability. The commercial model in Nz is that the growers think performance is measured by the higher FOB return what it does in the competitive environment it constraint the investment they may and actually demonstrating the value proposition and broadening the appeal of the product because exporters becomes constraint and dubious about the investing offshore because the expense takes away some of the availability to return FOB value.

So which is the most demanding market for you?

The US because if you look at the world map of actors Chile tends to dominate the US, NZ dominates Asia and Italy dominate Europe. Also with Kiwi berries Chile tends to come heavy in the US and they come on cheap products. US can be a good market because some of the retailers would pay very good money typically we target 28-32 dollars a tray and there we achieve that. Exchange rate has been one of the main challenges for exporters in recent time because it come tax one of our competitiveness the balance between getting a competitive return...oh sorry....To me the aspiration of the growers FOB (free on board) value with a variable exchange rate it means that push that up price on the shelf of the product which makes less and less competitive nz.

Which is your total volume?

Anyway from 30 thousand trays to 10 thousand trays so is going down because of supply.

Did you never considered the option of sea freight?

We often consider that but the declining volume, the inconsistent maturity made it unrealistic to get enough fruits to be able to put it on a container.

What about blueberries?

I think the problem in nz with blueberries in that genetics is typically old genetics and so the quality and storability of the fruits in business is not just as good as the new mature: I think some of the new genetic blueberries's life of production in nz wouldnot allow to sea freight.

Do you set some standards to them? Do you see uniformity and technological innovations among them?

The kiwi berries grower association has a membership and they trying growers to achieve certain disciplines they may use of the Zespri or kiwi fruits systems generally but the spay diaries are audited we take residue test from our growers our packing specifications are documented our pack houses are accredited, our sc stakeholders are all accredited and we use to show us consistent standard.

Do you think the market ask for higher standards in comparison than for kiwi fruit?

They certainly have and expectation of consistent standards and they generally perceive nz kiwi fruit with a better quality then Chilean for example but is hard to make comparison with kiwi fruits because are very different.

Do you exchange technical information with you growers?

Yes we have commercial contacts with our growers we have obviously full reconciliations of financial program we give weekly market updates to them and we have inter seasonal reports that goes to them so yeah. And we get some of our customers visiting their orchards as well.

How do you deal with inventories control? And forecasts?

How do you deal with mismatch between demand and supply in making orders?

We just don't try to over commit or we tend to be more conservative on what we offer to our customers, we prefer to over achieve than underachieve so we do not over sell the situation. We have been working with this customers for quite a lot of time so it is a relationship based. There is a lot of trust.

Who is your importer?

Do you prefer some particular varieties of kiwi berries? Why? Is the red well accepted?

Which is their responsiveness requirements? (Order size, cycle...)

Depends on the customer but generally they would like to have a minimum shipment rather than a bulk. Probably for us is also less risky, because if you have a lots of fruits on a sea freight for example you know because the risk of get delays you have a risk of having missing program opportunity.

Okay, don't you have difficulties in reach EoS by small orders?

The minimum amount of weight for a kg is normally feasible, so we have a minimum volume . Is not a problem for us. We were exporting to the USA, Australia and France the Uk like that.

How much does the freight cost impact the final price?

Ah significant but probably the larger cost is the post harvest costs. You know the packing and the packaging materials are quite expensive it is about 10 dollars per trays so it is not cheap. While for air freight depends on the market but I think about a 1.80\$ per kg but I have to check better for you.

Who is your freight company? Are you satisfy by the services?

Kuehne nagel does a lots of products for us and we use to have relations with 2 or 3 different air freight forwarders and we work with them because they have the most competitive and best capability and integrity of the product

Do you also operate as importer?

No we do not, we have customers that operate on a SIA bases.

Which major differences do you see with the blue berries supply chain?

I think there is a greater technology demand for blueberries at a consumer level than for kiwi berries. They have done a very good job in building demand and visibility with consumers. The growth of kiwi berries in terms of demand in per capital consumption and the evolution of bluberries cultivars and getting better products into the supply chain are far better job then for kiwi berries. I think that the biggest issue is that I cant see the current model in nz being a sustainable model for kiwiberries in nz I mean you got to have, you really have got no IP coming in in NZ. You have got the right sitting in one company and uncertainty about the politics of the relationship around the industry. You have not got to sit under the Zespri single desk and there is always a cloud out there. So it is nota very enabling situation for commercial pathways so the sustainability is tenues I would say.

An increase in awareness for kiwi berries products and an increase in demand make the opportunity to broad the appeal of the category by bringing superior berries and even different colors into the mix but that cannot happen in nz because A you have got a close importation system of plant material so a lot of that work is going on offshore and is outside nz.

There is need to be a broadening of the harvesting season allows programs to be developed that are longer in terms of the supply window and whether they can be with different cultivars, earlier and later, different colors that broad the appeal of the fruit

What are the traits that the breeders are looking for while choosing a new variety?

For kiwi berries we most important need an outstanding for consumer response. There is not points in having high yield if you cannot having good storage of the fruits at the end of it and the desire by consumers so at the end the variables are the flavor of the fruit and the consumers eating experience and you can't do that on a single piece of fruits is a consistency of experience and the intensity of the experience so that is the first one. We are conscious of fruits size because it impacts consumers liking since they have perfect size but also it impact harvest efficiency per kg, we are interested in yield per hectare so that is the fundamental drive of economic return per he is the yield and of course the price you get driven by consumers desirability. Most of those are generic also for kiwi fruits. From a Kiwi berries perspective, storage we are interested in that as well but it is quite hard since it does not store very well because is a berry. By selecting varieties we can reach quite significances in storage life in the spectrum is totally different from kiwi fruits, so in a range the storage life is similar to raspberry and blueberries. Is all about cell structure, a modified genetic response to cell structure and response to ethylene, there is no single physiological thing that you can point out to say is connected to storage. No one truly unrelieved what storage life means from a physiological perspective.

Sometimes we also look at color although our consumers studies said that green is the preferred one. So generally the work is done on green. There is the shape perspective that normally is not too sensitive because no one have seen the product before but generally... It also has to got disease tolerance which is a fundamental effect to performance.

How many KiwiBerry varieties do you see potentially suitable for commerce? Why?

Currently none. We haven't found the variety that win and commercial viable yet. From our prospective there are varieties that we have from day to day came from the same program that we are working on today so K2D4 came from food research.

Do you think that using a right root stock productivity might be increased?

Yes it is possible but slowly and hard work. so we have a root stock program where we are testing Arguta however it doesn't turn a bad cultivar into a good cultivar generally in terms to good cultivar to a slightly better cultivar. So when we are generally evaluating cultivar we general do it on the seedling initially (upper part) and that is the key to performance. And how the rest of the program works as well. And we are testing on root stock on stage two and three.

In what does K2D4 and Margi Red differ?

I don't know much about the industry response of those two, is that controlled in the program we are bench marking. Plant and food sold at least the right for the cultivar to them so they control that in nz only and don't know for how long. It is interesting to see when the PVR expire, you can look online if you type in the website plant and food nz K2D4 variety.

Do you also make some experimentation on technological response to for example different atmosphere or edible coats?

We are currently initiating that at the moment but is a very expensive way now doing it because you now got thousand of individuals that you need to screen them down to 50 individuals but then if you have to test the technology interacting on the cultivar on every single thing that is fifty times. So normally we assume that, well historically but now we are changing the view, there is no major inconsistent synergy between the technology and the cultivar so what that says is that if you have a good cultivar that becomes better and if you have a bad cultivar that will increase by the same amount whereas the interaction is inconsistent then a bad cultivar may become a great cultivar just because there is a particular synergy between the technology and the storage in the cultivar genetics so that could happen, you know you can imagine that the analogy being you taking a drug and I taking a drug it may work for me but not for you so the technology works in different ways whereas if we take the antibiotics it works for both of us. So it is a technology genetics interaction question.

So where do you normally test this type of interaction?

One of the challenge for plant and food is that plant & food has now exclusivity with kiwi fruits breeding with Zespri however Zespri give plant & food freedom to commercialize these four kiwi berries varieties and it is now making research with other parties and it is now optimizing the storage and technology so that means that now there is a Chinese wall with part of plant & food doing research work and part of plant & food doing reading which is not optimal because you want technology guys talking to the breeders and understanding how they work, but because there are different parties funding these activities that is not happening.

How do you see the future?

We are having conversation at the moment so optimally for me we start developing in the perfect world but I think is politically not viable, Zespri breeding programs with plant & food and start working in partner shipping with the existing kiwi fruit industry and say look if a new cultivar will come along will make what your cultivar is doing redundant we are not here to compete with you but we want to work with you however for these cultivar it is going to make both of us better off to the optimal performance, we should work together on improving the storage. Now politically I don't think it will happen because some of the parties that are working on a kiwi berries today are doing so because they don't want to have Zespri and kiwi berries in an area that they can work on without having to deal with Zespri so there is a lack of motivation to be in that space because they don't want to work with Zespri.

Do you think that the connection with technology is higher for kiwi berries than for kiwi fruits?

I would say that the value of the tray is linear based on the improvements. So we have this kiwi fruits that we can improve storage from 6 weeks more to additional two on it. There is value. But there is a lot more value in taking a variety that last four weeks and making it six weeks long through the technology. So to answer your question I think that kiwi berries will be affected more by technology because the effect in a space that is already sub optimal whereas kiwi fruits spaces almost can be viable without technology whereas I am not to sure kiwi berries can be viable without technology.

Plant&food is now making research for pack houses on the optimal storage temperature.

Which variety is more susceptible to ethylene? Does KiwiBerry produce ethylene itself?

Kiwi berries are climacteric so they respond to ethylene while apple released ethylene but they are not necessarily respond ethylene. So climacterics like bananas where ethylene accelerate the ripening process. So yes kiwi berries are climacteric.

Which is the impact on the distribution?

The response to ethylene means that the presence to anything that release ethylene makes them ripening. From a distribution perspective is that if you have any fruits that have advanced maturity over there close to a container within the distribution space this fruit will trigger the maturity of the fruits around which diminish the sales window. Because the most advanced fruits accelerate the other fruits ripe. It is negative from a distribution perspective because it means that everything it is in there that is over ripped will shorten your storage life of the entire product and not just the individual fruit.

It is different for kiwi fruits?

It is the same but again you are dealing with a threshold that is almost sub optimal. If not commercially viable you have the same problem with kiwi fruits. It is slightly effuse that 16 weeks long and shortening it is supposed to lightening the ripening effuse to which is now two weeks longs and so certainly from a risk perspective you leave...yeah you can imagine strawberries and raspberries in the ultimate there is anything that accelerate ripening of that suddenly you have a product that you cant sell anymore whereas if it naturally store for 3 or4 months and you accelerated ripening you still got the availability to sell it before you end up with zero profit.

In comparison, other climacteric berries?

I cannot think of any other berries but I am not an expert. Being climacteric in any case does not necessarily have to deal with the storage life. It can be, we often think of apple and there is a technology called smart fresh which is able to block ethylene in the pathway and it is used in apples globally because it holds the maturity.

Do you think that packaging will play an important role in increasing the storage life?

Yeah that is what we are looking at now, Jason Johnston, he is on holiday at the moment but there is currently a question with Jason for a few years but Zespri haven't funded him directly so the question is if Zespri should fund him directly for the royalty payments to increase the storage, now there is a confused co-funding space from Zespri and other parties in New Zealand funding plant and food to do the same research. My expectation is that plant and food will work on the area with government and royalty funding and that will flow into the new cultivars program. Now all these third parties that are independently funding their activities are forming a Chinese wall between that activities and Zespri breeding program and government funding then the technology flow won't necessarily happen. So I think that Zespri needs to be funding on a side in order to break down that wall and allow the information flow between the technology and the new cultivar program.

Do you think it will be a necessary step for kiwi berries?

Amm....so there are two answers to extend the storage. One is you get the cultivar that has the better storage the irritability of that trait is very low though so what that means is that per generation you don't get much gain or improvements in the trait so given time the cultivar will be probably fine depending on what the potential is which you don't know but in the short term I would say we don't want to wait a few decades to get the cultivar works and so we have to reframe what is acceptable when apply technology to get that acceptable rather than breeding till getting the effect we want.

Do you think that the quantity in the punnet has an impact on storage life? Any difference between 125g and 250g?

It is just a statistical probability matter because if you only need one individual to set the rest off so the answer is yes and no. If punnets were independent then the bigger punnet has a chance of the ethylene response within the punnet triggering the rest. If there is gas permeability between all of the punnets you have to look at the gas atm around that to determine your probability and risk.

How do you see the best packaging for kiwi berries?

Yes so the best packaging will be what appeals to the consumers number one and then packaging ultimately may be reasonably smart with modified atmosphere and sell claim shelf, different storage optimization packaging possible. The challenge of many of those is that it depends on the harvest and the packing system so most of the berry system pack into clamshell so it is just one touch pack. But if you go down to the sealed packaging that modified the atmosphere in the process you are now dealing with a multi touch systems that has to run over a grader and you need to do an experiment to work out, are you touching twice is worst or better? Because it may be more expensive but it does pay for itself by the quality control and fruits maturity significant variation potentially.

Do you think the industry is ready for this?

Well, the berries guys will treat this as a berry while the kiwi fruit people will treat that as a kiwi fruits. For people that harvest raspberries will say oh this is a very big raspberries to grow and the kiwi fruits guy will say hey this is a crazy Hayward kiwi fruit to grow.

How would you deal with sensitivity to freezing injuries?

Just by getting the right T and just technology. This is part of our screening system for kiwi fruits.

Which variety is more flexible in terms of storage temperature? (Which is the optimal storage temperature? 0 or 4?)

Possibly most of our screening I think is done at 1 or 2 degrees in the breeding program and that is the standard temperature for gold so yes you can find a better range temperature by breeding. The goal is to go down as much as possible without causing fruits damage because the longer you go the longer you storage. So if it will be able to go to 1 degree it can go

with kiwi fruits. From a climacteric ethylene release point of view is a different conversation. Cause if they are both in the same atmosphere space then kiwi berries are higher risk of over ripening because of the release of ethylene gas that will set off for kiwi fruits as well. So can you really put them in the same supply chain? Or in independent gas...

Do you recognize more delicate varieties from a handling point of view? (To pick for example)

The answer is yes because it is part of the testing process. There is different skin types of the different varieties of kiwi berries? Some are particularly easy damaged in the screening system. We have the same problem with kiwi fruits as well, so consistency through the rubber..

From an agronomic point of view? (Canopy problem, blossom problem,)

Kiwi berries and kiwi fruits are totally different species so they just have different growth habit. In regards to the different size of cane, I think is about cultivar specific attributes. So when we are optimizing cultivar we learn what will type to keep and what will not to keep. It is possible that is cultivar specific of generic across species; I don't know...But if it is specific to the cultivar we can chose a different cultivar that have different specific attributes. On top of that we are developing low vigor roof stock which may will change the entire dynamics on how we are growing kiwi fruits.

The vigor in plants is, in fact, another problem for growers, since the K2D4 is more vigorous than Margi red and create more problems in the field...do you think it will be avoided in the future?

Yeah, is different across varieties. The program is large enough that you can find that it is good for all of these traits.

Do you think that it will be possible to solve the problem of the different sizes of canes? It forces growers to have high cost of pruning because of canes are all tangled...

Well that is related to the growth habit vigor, and Arguta is quite vigorous as a species having lots of small canes everywhere. So if you grow it in a completely different way more like if you grow vine on a root stock that slow the vigor down or if you select a low vigor variety to graft into the roof stock is all part of the program and it will change the cost of management. It is a very critical point and we are doing experiment on what is the most efficient way of producing it. And that is again an example where the technology might have interaction.

Another problem is the inconsistency in the blooming, how would you improve it?

Does they use Hi-cane?

No they cannot because when they tried they burned the plant...

Okay. So kiwi fruits without hi-cane have the same response in terms of non-uniform bud break and the main reason for using hi-cane it is not just increasing the number of flowers but it increases the uniformity of bud break timing so again the technology interaction will be, it is possible to use hi-cane on kiwi berries to have uniform bud break and that will help in the time of maturity of all the fruit. Hi-cane is a chemical which is use on other berries and apples and stone fruits. I don't really know the impact that hi-cane has on other berries crops. Many berries crops have a multiple harvest anyway so... the kiwi fruits mind set is a single harvest and the berries mind set is that there is always an ongoing development of berries and you have harvest a sub set when they are ready. The kiwi fruit mind set when you supply kiwi berries is try to get uniform maturity to allow extra powers and biologically that might not be possible, but if it will be possible that will be a lot more cost efficient. Well it might be good when you have got short storage in order to extend the supply window but if you have a good storage then it is negative because you can pick them all and then release them because the strip harvest is far more efficient because you can harvest all and put everything inside so your speed requirements are quite different and that is good if you can strip all and storage in somewhere over six months, it is the most cost efficient way but when you are trying to supply for four months and you have got three weeks of storage and you only have got one site of production then it is actually useful if you get mix maturity but it is not the most cost efficient one. It is the strip harvest and store model for kiwi fruit.

I guess it is all about different models, and it also depends of the market responsiveness and uncertainties of demands...

Well yes that is a low risk supplier only model, whereas the Zespri model is a marketing base model that stimulate demand and provide the fruits on an anticipation of demand. Whereas what you have described is the reaction model what you describe, so you wait for the demand to occur and then you pick the order which is low risk but you never going to get a huge market based on that approach. Because you are not stimulating the market in any way.

Another problem is the inconsistency of the Margi red in yield, growers describe it as a biannual plant...while the K2D\$ shows more consistency throughout the years... Which do you think are the causes of this behavior?

Again it might be a cultivar attributes. Avocados are also well known to be biennial bearing and that is just about environmental interaction. There is a lot of work in trying to overcome that and kiwi fruits used to be the same but the use of hi-cane has changed the response to the climate, so it is depends on the source of if it is environmental for example, then hi-cane can make the supply a lot more uniform because before this technology was applied for kiwi fruits there used to be a huge variability of 50% of supply which made really really hard to market it. Because if one year the demand is not there and you have a massive supply and the next year your demand was there and you cannot supply because of the inconsistency. Hi-cane has been a great marketing tool in sense of the predictability of the yield to farmers instead of going up and down you have a consistent crop that you can forecast over time and invest properly to stimulate demand for the following season whereas if you have no idea of what your supply is going to be the following season you could not invest that actively. so I would say consistency is very desirable and maybe able to overcome Margi Red problems with investments in understanding the source of that.

Another problem with the red variety is related to the inconsistency in the intensity of the blush...

So red expression we see that depends environmentally depending on where you grow it and that manage potentially the intensity of red changes season by season location by location. Anything red appears to be quite environmentally sensitive but we don't know what causes that variability yet. All the obvious things like the sun we have checked. The closest we get in it is that is related to the carbohydrates flaks in a particular time of the development of the fruit. All the easy stuff has been checked We may find the source ultimately, whether is that environmental factor that we can modulate, I don't know.

Which are varieties that consumer perceive similar? Does they have the same harvest season?

Of course it will be possible, and we are looking at this.

Do you think growers will be willing to diversify their crops? Will be hard for them to understand different types of plants?

It depends if you are taking a NZ view or a global view of your production platform. One is that I want supply as long as I can from nz and in order to extend the supply I need different cultivars that supply in different times, and that will it be the maximum supply for nz. The other option is as you say I have an absolutely outstanding variety that I want to supply as much as I can year round therefore I need to go in different climates assuming that the cultivar grows in different climates, that maximize my year round production. So well I might grow some in the north island and some in the south island of the same variety, I will not get maximum spread because is only one single variety, I will get some spread by growing that in different locations but it is easier to take that variety and grow it in Australia and Italy and France to extend the supply window globally that it is to try to produce another cultivar that looks or taste just as good or yield just as good that looks the same but just have a different harvesting time.

Do you think that, just to remain small, it is possible to have different varieties in the bay of plenty?

Yes it is possible, but we are not taking that model now. We are taking the model that says, well that is a very difficult breeding program to deliver because now we are saying I want good storage, good taste, good yield, good color, good disease tolerance and I want to have it in multiple varieties that have different harvesting time from on top of those. That is complicated and also unjustifiable given the market sizes approach, versus saying I want to found an outstanding variety that have good attributes and I am going to grown that in different locations to provide the window. And that is more

technically doable. And that will potentially evolve in having an extending variety that you grow in different locations and it is holds in the market and then say now this is a very high value market, I now need to breed to fill the gaps in my supply chain. But I would not think that we start by breeding multiple varieties that have different harvesting time. First we need to find one variety that absolutely stand out. Then maximize through multiple locations. So Pacific series, have you ever heard of that? An apple series, Pacific Rose, Pacific beauty, Pacific...and different apples, they all look pretty much the same but they have different harvest times and so you can harvest the fruit and that is the Pacific samplings that look like the Pacific red skin apples with similar taste but different harvest timing and so you can have a supply on the shelf of a series of apples over time. Is an interesting case study to see how it is gone because there is a point where if you can store for 4 months and grow it in two locations in the northern and the southern hemisphere and that gives you 12 months so you wouldn't worry about getting multiple cultivars because as soon as you try to get two cultivars that appear the same it is very hard and have different harvest maturity.

How much time do you think it will take to develop a kiwi berries varieties that have this characteristics?

So, that is probably the main thinking that is evolving, we have the perception of what storage is needed to be viable which is about 16 weeks storage, so that was the New Zealand view of the world in order to have a distance supply and allow to ship the products. Air freight from New Zealand is expensive so we did not want to be in the air freight business. Again with the kiwi fruits view of the world which is well... There is a question about air freight and the longevity of this market in New Zealand because as soon as someone can produce it near to market air freight will never compete with them and then you are gone and so shipping is a more sustainable competitive platform to build on but you need 16 weeks to be viable. The evolution of thinking is now from NZ centric to a global perspective saying: if we produce near to market we do not necessarily need 16 weeks storage but if we grow this outstanding cultivars in different varieties we can be in the market for 40 weeks of the year or 20 weeks of the year. That would lead to an okay supply chain to the consumers.

Did you have experienced in some variety any off-flavors due to particular storage condition? (Ex. Bitter taste if prolonged modified atm)

I am not really close to that, is not the other side of the technology barriers that we do not see through.

How do you see a future communication of technical aspect with growers, post-harvest bodies and marketer?

Again, so is a very good question and the reason is because it comes to how Zespri commercialize new cultivar of kiwi berries within the existing kiwi berries varieties in New Zealand and globally. My view, yet to be debated, is that we are developing technology we may develop with the existing kiwi berries industry with the desire to have partnership because when kiwi berries come along where Zespri owns and controls then we want to work with those parties so let's work with them now to develop the technology in partnership that will be applied to the new varieties and then the relationship will be stronger when our variety will come and shouldn't ultimately displace the old technology variety that is here today because it has superior yield, superior taste, better storage etcetera...So that is the model again because a sub set of the industry is getting into kiwi berries because they don't want to work with Zespri it will be quite hard to implement. But if people will be offered complementary free research for their own benefits that will be hard for them to say no I do not want that, I want to fund that entirely by myself, I don't want you to work with me. The fact that Zespri will have a new Kiwi berries cultivar coming through that will make them redundant would be seen by them as a chance to get far better profits by others. And depends on personalities of the groups that you are dealing with. It is interesting to see how the plants planted today on the ground change the power in a few years time. My understanding is that Seeka is putting 20 or 30 hectares so quite a lot relative to Geoff Oliver's current estate. I also understood that Freshmax has the IP rights to it which Geoff Oliver has not in control because he does not own the variety. We did pre-commercial trials larger than the entire kiwi berries industry when we are testing. So from a scale, the kiwi berries program is at a pre-commercial scale.

How do you see the future, with trials financed by Zespri?

Yeah Zespri is already financing that. So the evaluation process has a pre climate trial which is in 7 locations in NZ and then 7 offshore. And we were testing NZ first because it is hard to get the value offshore and then we would test it over 5-6 years

there and then we will contract to growers to test it as a pre commercial test. They generally want to be part of that, so Zespri generally takes and owns the fruits of these pre-commercial trials and pays the grower for those at a grade rate and then takes that fruits and then they use this for research purposes or sell it as a test marketing type model. So if we were in a pre-commercial trials for kiwi berries it would be logical for us to engage with the existing kiwi berries growers to test it and potentially non kiwi berries growers to test that. And someone will see that as a threat because they think it is their territory and some of them would say it is a great opportunity to use a bit of product and now I get to be part of Zespri marketing power. And they will go back to kiwi berries growers that want to make money but not with Zespri because of political reasons and would see as a pattern response I would think.

CAMERON HILL – SALES MANAGER KUEHNE NAGEL, AIR FREIGHT COMPANY

So we are selling kiwi berries at the moment for Seeka who is also an exporter, a post harvest operator, who also run a class 2 kiwi fruit program and avocado program and then they have a little window of kiwi berries that fits into that so.. We do a little bit of work for them and we handle operations in our facilities in Auckland.

Which services are you offering? (Air cargo/air freight) Which is the difference?

So we offer consolidated air freight services depending on customers requirements so in some instances that will be perishable products loaded into passengers air craft and in some others if there is the volume we can put it into freighter services. Singapore airlines offer a freighter but there has to be a reasonable volume. That is the main difference. In terms of responsiveness to the market and order cycle it is the same. The responsiveness is down to the customers requirements so some of the air freight client requires a certain lead time where the products need to be shipped. Because they are perishable the clients comes to ur facilities in Auckland, we consolidate there and that is where we are checking off cargo for waiting count and then wrapping that with foil and dry ice to get to the temperature required.

Which is normally the service you are providing for Seeka?

For Seeka depends where they transit in so our aim is to put is on the quickest flight available so generally is the direct flight leaving that day rather than waiting to consolidate in the weekend. So is more passengers plane but it absolutely can change. There were instances two or three years ago where Zespri was exporting gold fruits directly to market and the volume was such that we chartered the freight collected.

Which is your max capacity? And the minimum amount of goods to be transported?

We do have it, I don't have it now but I can give you. It does come down to the unit type to load the vessel that we are loading cargo. I have a ship which have max weight and height and the meters comparing different sizes planes and cargo constraints. These three are just typical loading devices and they all have different names so this one here is called AKL/LD3 so it have a max weight of 1437 KG and max diameter here. The biggest constraint is the height of the pallet so 163 cm and 162 for ALF/LD6 but this one is a little bit wider with 317.5 cm and max 3000kg so a big bigger capacity and then the third one is called PMC. The PMC is actually flat little pallet base, that is just for some cargo that we have made for illustrate purposes there, but typically it will be loading perishable products on to the sit of the device, and the benefit of that is that we can have different sizes of cabins just to get till that high, we still control constraints by total height which is 163 cm so it is just put into the hall of the air craft. I can send you the sizes now by email. Then you can put as many of those as you inside the plane. It depends just on the capacity of the airline and the plane, I am not sure actually what is the volume that the plane can take, in the case of really large consignments, the airline will split it into different flights but for instances this is 3.4 m long so it is a big load and you can get quite a lot. We do not have a minimum quantity. We have a minimum charge or a minimum cost of 45 kg but in perishable tend to be big volumes of capacity so they are not gonna get to that minimum and that is not an issue. For kiwi berry is a bit hard because the volume is small and the supply chain has a very narrow window from picking to pack house, I thin that the total shelf life is something like 14 days or maybe not but it was such a

short window that requires smaller and more frequent consignments but I do not have any data. I can try to find that and send it to you.

What does this set up imply for you?

Probably the biggest constraint is getting the product loaded in the market as quick as possible. So from a supply chain point of view our part that we touch to handle the goods can be quite small. Consider here if you got orchard pack house freight forwarder airline and customers. We don't have any relationship with customers, our customers for example is Seeka and that is the key relationship. We are quite hands off with the end consumers and when I say hands off is that our function is really between the air line and the facility so from our experience Seeka have been managing the orchard for the grower, the fruit through the pack house and there has a couple of pack houses set up and the pack house take the responsibility to put it on a truck to Auckland, so we are coordinating with the pack house. So if Seeka would say, lets say we have got a booking for one ton of kiwi berries into Oz or Singapore, at that time we book the space in the air line so we have got to confirm booking cargo, this is pretty instantaneous could be 30 m to 1 h, is pretty quick. There is always plane capacity and capacity in our warehouse. So we have got a facility near the airport in Auckland with six dedicated chill room. Cargo goes straight to the chiller before it is ready to be loaded out. The whole booking process is pretty quick because the air freight it moves you know, it can happen in the night of the morning after depending on when it comes from the pack house. But we are not touching the cargo from really the point when the pack house put the fruit on a truck and arrive to our facilities. And that is when coming and getting loaded to one of these format is. We will get the fruits palletized and then is just loaded straight on into here or in some cases the carpet will be strip down to fill into this high. So we kind of touch the cargo from here we get it to the terminal getting onto the lane, all of the documentations has been sent. We do two things, we send the copy back to Seeka and then a copy is sanded to the end customer to whom they has been taking the arrangement, the importer. And seems to be how perishable cargo works in terms of the direct airway bill and the importer then pays their own agency clearance and take the sit of the cargo.

Do you also have chill facilities at the terminals?

At point of the destination that becomes responsibility of the customers so from what we have done so far, they take the ownership of the cargo once is loaded into terminals and because is their responsibility they will get that into their own chill rooms. And often that goes to the distributer of other perishable products. They need to keep the cold chain integrity so the product is taken straight of the plane is landed. It cannot be sited out.

Which is your major market?

Mainly Australia actually, a bit into Singapore. I will get the destinations split out for you if you want.

The estimation of a possible market for Zespri will be 5 m trays to split into 6 weeks, do you think that this volume will be a problem for your capacity?

Not at all. It is just about forecasting demand. With gold it was about 70 tones fruits to Japan. So I wouldn't think that it will be a problem in terms of handling and capacity. This seems to be the model for handling cargo also for the other air freight companies. Very rare that we are asked to deliver that to the importer and that just seems to be the way it is set up. But the exporter will be selling on the CIF terms so cost insurance freight to terminal when their customer will collect from there.

Which do you think will be the competitive advantage for kuehne nagel?

I think for us there are probably 2 or 3 key area. First is having a local or regional representation of the area here where kiwi berries are growing, second would be our cold store facility in Auckland so guaranteeing cold chain integrity so when the product leaves the pack house here in the truck is going straight to our cold store environment. Third from here is our

personnel in Auckland familiar with handling perishable product they then have direct relationship with the air freight so they doesn't have third parties or consolidators. So products constraints with the cold store is checked is loaded and straight down to the air line. And then on the back of that you have got from Kuehne nagel perspective a world wide presence, offices...so if we do need assistances at the local point of destinations giving that the importer of a local point of contact or an agent assistant of clearance and delivery they can use this as well.

There is any T control system inside the plane?

No but you can put some dry ice. Typically the product will be in its original packaging within supporting a cold environment with dry ice and then foil wrapping. So insulated foil wrap goes over the whole consigned. And then, the dry ice it would keep that cold depending on the requirements. So how much dry ice is needed to keep it at a certain T for a period of time. But is one of the challenges with air freight, I mean air freight is quick so the product doesn't sit around big T fluctuation but there is a mechanism to keep at a constant T the refrigerated container. There is no ability to have any other time of refrigerating system other than dry ice which is a standard practice though. Inside the plane is cold in any case.

Are you transporting other types of fresh produces?

Yes along with Kiwi fruits we have avocados. We are not doing any air freight of apples, it does not seems to be doable.

Are all these fruits kept in the same cold storage in Auckland?

Yes they are. We have 6 different chiller in which we can operate different temperatures. We have a special bread product that is frozen, we are doing some passion fruits, avocados, different product at different T so we can split those accordingly. But really air freight is very quick so as soon as they go into the cold room it has got to be loaded out so is pretty quick.

Are there any different Infrastructure in markets eg Taiwan, Singapore, Japan, Europe, China?

I do not have a lot of experience in that. But it does not seems to be a lot of requirements because the supply chain has to set up so that the product moves very quickly and efficiently, you know. For instance is a short and a fast transit time and it need to be in the market straight away so as soon as the plane landed the cargo has picked up and then taken depending on who the importer is back to the facilities or straight into a market.

So, does all the parties communicate between each other to allow a fast transit of goods?

Absolutely yes, so when the cargo has loaded on board the documentation has done straight away and send it to the exporter and the importer simultaneously. They would know when the flight arrive based on when the booking is made in terms of time frames.

Do you have an estimates on the overall transit time from different destinations?

For example is 8 hours to Singapore. It is very rare that you have stop over in some of the international airlines. Generally to the Asian market it takes a day.

Do you have long clearance procedures?

When the goods arrives to Auckland generally you would have freights coming in in the night and in the morning so you have got perhaps a day or two maximum from transit up. I guess it depends on when the fruits is available from the pack houses to be send but the ideal scenario is that fruits are packed today, put in a truck tonight or early morning tomorrow like 3 4 o'clock in the morning...Our facilities is open 24 hours on 24 a day so we can receive cargo at any time so when cargo arrive at early 6 in the morning we would check peace count, check that there is no damage, the pack is intact, we

load it. Because it is our responsibility till when it arrives there so we need to check through that and then if there is an issue we can say how was the pallets when they arrived pretty quickly. So the pallets are loaded and then down lets say this afternoon.

Which are the hardest markets in terms of documentation?

China is tough, I did not experienced air craft to China but I had experienced a workshop with Zespri and one of the main hurdles was the documentation requirements formats. Non tariffs trade barriers the would set up. For instance asking for documentations that they did not really need that any significance to the integrity of the cargos.

Do you think it will be a constant hurdle or once you do it for the first time it will be easier?

No I think it will be constant. But in China different regions has different requirements of what they wanted. I don't really know if it is a government issue between countries or if is between the exporter and the importer. With China is really about making sure that you understand you market and that you are making you research. So you knew exactly which are your shipping requirements.

Are workers aware of the perishable nature of product and how does they deal w this?

Yes absolutely. And perishable products always take priority over the other cargo units so if an air plane has a capacity constraints and has volume of cargo and perishable are behind they go first otherwise we get problems of product damage. That always happen.

How can you improve the timing of operations?

It seems pretty efficient at the moment. The timing of flights is no issues there. Cargo consolidator facilities in Auckland are open 12 hour per day and most of the air freight are, just due to the nature of the perishable product is coming through and is estimated through. The only thing constraints while looking on how efficiently the product is handled is from orchard to pack house or from orchard to the gate of the airline terminal. And maybe that is an area to look at. In terms of transit from pack house to Auckland it is 2 3 hours' drive which is not likely to be an issue. I would suggest to look at how quickly fruits goes from orchards to pack house. This is maybe one of the issue that the industry faces or industry supply chain. When your commodities grows you have got to have capacity or facilities at the pack house otherwise there are products that cannot be packed. There is plenty of pack houses here for kiwi fruits but I don't know the overall capacity for kiwi berries. I just know one pack house, kiwi produces but I don't know other places. And I do not know what is required to set up. I don't know how complex is that.

How does the layout of storage facilities facilitate a fast and effective distribution? How do think it can be improved? (After + production and diff variety)

Yes at the moment absolutely. If there is a viable supply chain or a viable value proposition to have kiwi berries by growers to grow more products and if there is a viable value proposition to sell kiwi berries. There might be pack houses that might just put a line in packing kiwi berries.

So do you think that the facilities in Auckland wouldn't have any problems to handle 5 m trays in 4 to 6 weeks efficiently?

In Auckland there are not problems but it depends on how the volumes in trays are presented into these and how they are grades. It is really just about forecasting the demand. Talking with your customer, you know the exporter, what does these 5 million trays looks like, what it need to be settled up. In terms of facilities that would not be a problem at all. If I was neutral and not working for Kuehne nagel I would say that there are capacity in Auckland of other freight forwarder as well.

Do you arrange any 3PL services for truck transportation?

No. It is up to the pack houses. But we can easily do that with carriers, I think that probably the main reason there is that a lot of carriers operating already have arrangements in place with pack houses because they are dealing with arrangements of other products that we want may or not control so by introducing freight forwarder into that part of the supply chain it may just make it more complex. And as I said we do not arrange it but we work on those carriers to arrange timing pick-ups into the requirements so this supply chain might be a little bit fragmented from pack house to air freight forwarder but all these 3 parties has to talk with each other just to coordinate.

Which other type of information do you exchange?

That is when we sit down with the exporter and talks on what market requirements are, inventory management and forecasting, special packaging requirements that goes advance the season. Let's say you have been looking at around harvest maturity for kiwi berries. You can also talk at a higher level on what the plans are for the next year and destinations up to 12 months up but in details you don't want to talk too far in advance because that sort of things may change pretty quickly. It could be early it could be late.

How much time in advance you need to receive the order to organize transportation?

Air freight is pretty flexible, so same day, the day before. It depends on the size of the order. But it is not a problem we will just work with the customer to get that volume. Our business has got to be focused on that relation. You know whether there is a minimum order or not and we just work on it together or if there is a large order it is just a discussion with customers.

How is calculated the freight rate per Kg? Per dollar?

It is calculated per kg and then there is per market to market. Typically you may have an handling fee and an export documentation fee in nz and then you have a freight cost per kg. Documentation fee is fixed for the season. So documentation is fix per air consign, we may have some constraints around that which will be that the rights may be valid for certain air lines which could always happen for airlines like Singapore airlines services and those discussion will happen in advance of the season with the customer so they knew what the right were but with the income of the backup option. So yeah ideally we have the rights fixed but... These fees depends on where are you going, generally 2 dollars per kg or 2.50. You have to pay that for each shipments so approximately 150 per shipments and then you have the variable costs per kg for your air freight on top of organization. The documentation fee is fix for all markets while the variable costs per kg depends on the market.

Does the price change according to how much in advance you book the service?

No. The prices will be settled at the start of the season for the season regardless of when the booking is made. So what the airline would do is to put a commodity right based on the time of the season. So tomato right, capsicum right, kiwi berries right....so because the nature of those perishable have different time frame and seasonality the airline have been looking of what cargo they have available and then make the right.

Is the rate for kiwi berries higher in comparison of other fruits?

I have to take a look actually but I may find out for you.

Do you have fluctuation in prices depending on the season? If yes, when? (Impact on quantity, order size February/march)

No not so much on the season of the...cause what we are doing is to have those price set up for the season. There is price differences throughout the season or throughout the period of the year depending on what has been exported. So from November December we have what we call pay seed so when there is a lot of products that are moving and prices can come up but that process for the product will be relative to the time of the year that is shipped. In February march it will be less. But I will get you some costs.

What about international trade balance?

NZ is pronominally an export country so our wealth is generated primarily from product of export. So there is a little bit of imbalances. Especially because the majority of the product we import is from sea freight. So it can do is constraint at peak times of the year capacity to get on the air craft because it is not enough volume of the air freight coming in to match the volume of product to go in and that can also force up the price. It could change if Nz will start to import more stuff by air freight but I don't think that could physically happen.

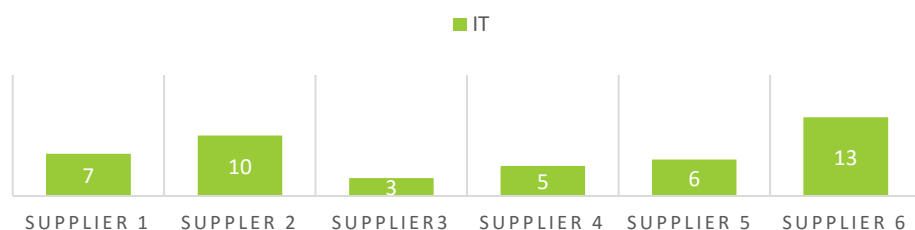
VAUGHAN JUDKINS - SUPPLY CHAIN ZESPRI DEPARTMENT

Zespri operate now with a single point of entry model, so we have a contract with 13 suppliers, a scheduled to contract which dictates all the terms around us sourcing and supply kiwi fruits and incorporates the commercial framework around what we supply and order. So for example with your kiwi berries scenario understanding how the supply will fit into Zespri is a very key. Is an interesting concept with Zespi kiwi fruits as in new Zealand we are required to receive and sell in market all the kiwi fruits supplied through to us while for kiwi berries we want hove this obligation. Is a very unique mechanism of contracting supply.

Do you adopt any special inventory policy for kiwifruit? How do you think it would change for kiwi berries? (explain harvest, order size, order cycle...)

Okay so for example imagine that these are our contracts with suppliers that supply kiwi fruit to Zespri and must be contracted with us. Supplier 1 2 3 4....This is the TI volume so this could be lets say 1 million trays...123456 m trays. Zespri has nothing whatsoever to do with inventory management of kiwi fruits. Suppliers decides by their own what kiwi fruits to supply to through Zespri.

INVENTORY RIGHT PER SHARE EXAMPLE



So when you have got your suppliers you have got commercial arrangements around when the season first start and when the season finish it so it will be about kiwi start scenarios. So when the season start getting into market for the first time we

want to get there early and so we shipped kiwi fruits at modified maturity so when you harvest kiwi fruits they have to be at a particular brix level, we say that we want that at a less brix level but we will condition on the way to the market so that fruits gets there earlier and so we can get the shelf space. How we do that is, incentives growers because when growers that has packed kiwi fruits they get payed by taste and size. If we pick it early they are not going to get full payment on taste and size because it is already been picked. So what we do is that we provide a kiwi start payment at the beginning of the season so that the earlier they pick it we would gave them an extra payment to compensate for taste and size forgone. That is called kiwi start policy. And then there is the time rates, so the longer kiwi fruits is kept in the cold store the more the supplier is payed because if you are taking fruits there for longer you are going to incur more costs and fruit losses. So say we are in June and we want one pallet of kiwi fruits and also in December that we want one pallet of kiwi fruit. In June is fine to ship that off while in December if they want to ship that off a pallet of kiwi fruit from supplier they have to take maybe two pallets of kiwi fruits throughout one pallet as fruit losses to get one full pallet to ship, because the quality deteriorate over time the supplier has incurred more costs, so the supplier will get payed more at the end of the season to ship kiwi fruits that it would get at the beginning. So in Zespri policy of ordering, we have to make sure that when we supply orders to our suppliers we get them equal percentages of supply so that their volume is all drawn down at the same time. So if the supplier might get 10% of orders, this one here might get 30% of orders, 20 % of orders so that when it comes to packing at the beginning of the season, each suppliers knows its percentage share of kiwi fruits. But the difficulties that we run into is what about if supplier here has kiwi fruit quality not really good? We are going to get him a percentage share equal to anybody else even if its quality is not good, we are going to give all your orders now and get your fruits out to the market because otherwise they get spoiled at a later point. So Zespri is constraint to order each supplier by their share and different time buckets that we have. The supplier then has to manage their own inventory. So the current practice and the current model we have is probably not the best for optimizing quality results. Because the contracts the suppliers have we are bound to those rules. We have to treat each suppliers equally. Into this kiwi berries scenario I imagine that we do not have the rules that we currently have under kiwi fruits. There will be a rule but it will be different variation with kiwi berries. So for kiwi fruits they harvest that all, they put it into the cold store and it is all done and then we have a long time to load that out and give to the supplier two and a half weeks window or two weeks window to supply this fruits to market. So when you say that for kiwi berries then it will be very important to make sure that we understand our faces demand for the market as to when they require it and I do not really understand that one for kiwi berries. So you have one they to pick it and one to put in the plane?

Yes this is the current situation. What do you think about reefer containers?

I guess it will comes down to what the market requirements are and what customers require as well because if you have that kind of volume then you may have such a lead time to getting the product ready.

The problem is that they have to pick the fruit at the very last moment, and keep it on the vine before consigning the order to the pack house...

It is an interesting point because I imagine to have that kind of volume and looking at Zespri scale and what we do it will all be around on making sure that we give the supplier adequate lead time for them to be able to manage it. Because I don't know if I will be able to understand how the communication will work because if it is up to the supplier to manage the grower and that part of it. So it will be making sure that they will have an adequate lead time which you know could be 2 weeks or a week and a half to plan to packing and make sur...you know even if they all pick it in one day we would have to give them sufficient lead time to make sure that it does happen. The lead time is one aspect and to make sure that I guess the order do not change along the way. Because when you do kiwi berries I guess they come along different sizes or...What is the differentiation? Because with kiwi fruits it is all different sizes different pickups...

The first sort is in the vine in order to get all fruits of the same sizes...So at the end they comes all at the same size...At the end the only classifications in the market is between class 1 and class 2

If it is like that...because for kiwi fruits we have all the changes along the way from supplier and from demand and so those changes cause a lot of challenges in the supply chain. So when it comes to kiwi berries if there is only one actual product with no differentiation in size or packaging then the demand will not swing as much as for kiwi fruit and this is absolutely positive. So for example to go Japan you have 1 ton of kiwi berries or a thousand kg or 500 kg of kiwi berries all that kiwi berries will be packed in the same format and they are exactly the same as they are distributed. No changes or differences. If they go into the ship the only change will happen if Japan will say once is loaded oh we did not wanted 500 kg but 300kg. But we already loaded 500 kg. Well if it is on the ship you have to take it so make sure that you program place in the market we are developed to insure that the changes...because I guess with your lead times you have to have or limit the changes that you offer to your customers and it cannot be the same for kiwi berries.

I guess the challenge is the different shelf life which makes hard to readjust for kiwi berries.

Once kiwi fruits it is in the containers or on the ship there is no changes but we can diverted to different markets. But with kiwi berries it will be exactly the same. Once it is loaded on the vessel you need a long lead time so that suppliers knows what is going on, then you have a short window of execution and then it will arrive on the market so during that time from order to execution of the product arriving in the market we need to make sure that the changes from the marketing are limited. You know the bull whip effect right? A little change here may cause a big change...big impact. And that is costs and waste and there is not point in going to that with kiwi berries to occur costs and waste because the bull whip effect will be higher.

So the market will require small order size and higher order cycle to reduce inventory obsolesces...so just in time orders and frequent...How would you deal with that?

But the would have been shipping wouldn't? because with shipping you are not going to have ships that have ship everyday and arrive every day. So you have to go through air freight and so you have to get air consolidation point in bay of plenty or te puke or here to make sure that the fruit will channel into and that will fit that out into air freight forwarder in Auckland.

What if Zespri will have a place to stock kiwi berries in the market, for example Japan, and the distribute the small orders to customers.

It is going to work in both sides. It is going to work in here where it is send it up to the market and then in the market they will manage their distribution as well. You have to have in any case a long lead time so a week before you let grower to know the order. So if the order has to go in two weeks time every day your shipping say 10 kg of kiwi berries then you would have an order plan that it say the date of arriving, that it needs to arrive in Japan and then the supplier will work backwards to ensure that he meets that. But you are going to give them some lead time to be able to do that, that what I am saying that the changes are very key from the market place so yes they would maybe turn the order around in the day so they received the order a week ago but at least it gives them sufficient time for their planning to be able to put everything into place and then what happens if you get weather interruption of harvest problems you know...how does this impact on the demand... Three days time they wont double the order because you know they miss that..you know and they have been responsive in demand respect...

Which are the differences in inventory management between STO and DSO? Which one would be the most appropriate one for kiwi berries?

For inventory management by supplier it is an interesting one because with our STO market we have what we called in market supplier accountability and some of our DSO market have supplier accountability. So supplier gets a premium or

penalty out there in market and that depend on the fruit they sent to what market. Currently for Zespri we have incentives for how the fruits arrives in market and that is into Europe and into Japan where Zespri is the importer but also into China as well where Zespri is the importer which is DSO market. So it does not really matter if Zespri is the importer. I guess what they can do in Japan and in Europe is understand the arrival in the market and then direct the stock to preferred customers around what they can receive so this customer can receive this pressure or a slightly less pressure so that they can manage and not send out fruit that had bad quality. While for DSO markets, Taiwan for example, the container is going to turn out and it go straight to the customer, or straight to the retailer and we cannot control that.

What about from a retailer point of view?

So from a retailer point of view, so from the DSO, we can receive a mix bag of containers of quality whereas an STO in Japan to a retailer, Zespri has already checked the fruits so that the fruits going to retailer is okay.

Which model would you see more suitable for kiwi berries?

It is all about the market. With a direct DSO we can manage inventory in market if our retailers or customers works closely with us and there is a good relationship with us. It is about trust and then it comes down to the volumes that you put down to each market and the values...

We already discuss about the most important variables while managing inventories but do you think that for kiwi berries it will be different?

Absolutely. For kiwi berries we want be limited to...it is what we call equal draw down when we draw down inventory level equally and they are all at the same level. For kiwi berries it will be a very different model.

How do you differentiate inventory control according to the market?

When you have kiwi fruits what you have over the top of that is taste. So you know about the taste we only send high taste to Japan, so when fruits has a maturity test and it is tested in the orchard they would test it and class it into taste bandings so that we know which is the high taste and the low taste and that is classified through the IDI channels so that fruits has always taste characteristics, so is either high or low... So when we place order we ordered to the taste characteristics so for Japan it must be the highest taste other markets can take lower tasting products. Also over the top of that we have market excess so you know over the buds that are on the fruits you can not always control what the fruit is going to be and is suitable for. So when you look at inventory management it is not just about quality but is all around you market excess and around you taste characteristics as well. And then once has been packed with kiwi fruits it may go into a pack type that can only goes to this market, it cannot go to this market so you know those boxes they can go to Europe but if it was to ITS it cannot go to Europe. So we don't have that flexibility...with some of course we have flexibility across but not complete flexibility. So it comes down to market excess I imagine with kiwi berries also you cannot have all fruits that can go to all markets. Because you have some fruits that are okay to go to Korea but are not okay to go to Japan. Or some fruits they can go to Singapore but not all fruits because there are phytosanitary requirements...

If you think about Hong Kong, Singapore, Japan and Taiwan which would be the easiest market?

So Hong Kong and Singapore I don't think you need a phyto to get in there because you know they are small and they do not grown anything but Taiwan and Japan would be the harder market. Well I do not know what kind of bugs go on kiwi berries.

How would you manage product variety?

For gold and green you have exactly the same so equal draw down for green and gold. Kiwi berries will have different contract or arrangement in place around supply.

What do you think it will be the effect of having a higher level of inventories to manage at Zespri just during February and March?

Yeah will be fine absolutely. We certainly have got the resources and skilled people that are not all wrapped up on kiwi fruits and have a little bit of time to focus on kiwi berries so it is a good synergy. Is a very quiet period because we start to harvest end of March, beginning of April for kiwi fruits. There is a lot of planning that occurs and season set up in February and March because you have to negotiate all the contracts with suppliers and make sure that everything is in place and ATI team have set up all the expects they require and the market team has done what they are doing. So there is a lot of season set ups but certainly there is not kiwi fruits exported.

To scale up the production the volume should reach 5 m trays in 6 weeks, which effect would it have? Will it be a challenge? Each tray has 12 punnets of 125g...

It is a lot...5 m trays....in six weeks...wow. Well anything it would be a challenge, of course it would be especially in season 1, because there is always a learning and understanding (allora forse è meglio iniziare piano piano)...Is a big volume...%m trays will require extra people required and people who learn and understand how this process work, when we run Zespri Kiwi fruit through the airfreight system it is difficult but we would be able to do it and then learning. About hiring more people or not it depends, I would not think so but it depends...

Do you collaborate with pack houses in managing inventories? Which kind of information do you exchange? (how will the collaboration w pack houses look like if changes in variety and volume)

Yes constantly, every day. Phone calls, emails, meetings... so we have our own on-line ordering system called Waka. So it is a real based application where all orders are supplied to suppliers entity with this online collaboration network, daily they receive the orders and along the way there is always checks that the right pallet is going to the right customer and into the right market. So you know with the market access that we have talked before you cannot have sent some product to Japan if maybe is not allowed to go to Japan, so you need checks along the way and these checks takes place in our SAP managing system.

Do you also exchange information on fruit quality while managing inventories?

Yes. So suppliers understand and know their fruits a lot more than what Zespri does. When the fruit goes through the wolf and load on the charter vessel, ACPI checks their own checks on fruits quality so we can see the profile of the quality that supplier is loading to the market. Also we have in market checks so we can see what out turns like and we fit that results to suppliers. The suppliers when they control, has to meet the minimum standards for load fruits out for Zespri so as long as they meet those standards we are happy. So we do quality blooms that blows up and then we have to manage it with suppliers.

Which order policy did you adopted?

Within Zespri contract we give them an order according to the lead time that has been agreed. Then outside of that lead time we have to pay the supplier some extra money because we did not meet the time.

Do you know about DIFOTES system premium and penalties? Say we give the supplier an order and it is late, the supplier get a premium. If we give the supplier an order and then we changed, we have to give the supplier a premium. Any changes and late in order means extra work for the suppliers to do. If the suppliers comes and changes their order and they cannot

supply what we are giving them, they may get a penalty. So there is commercial factors in place which we call it DIFOTE demand in full on time expect, which enables the market to get the best or what they require.

Do you think a smaller order size will be a problem to this system?

I think it does not really matter. We have a ship to Europe that is 6000 pallets that we load and they can provide as much as use as say three containers of 60 pallets that we are loading to our market and middle east, so it does not really matter form and order quantity for us is numbers that comes down to the supplier.

How do you think that a high perishable nature of the fruit affect planning activities for distribution of kiwi berries?

Absolutely it will be a challenge because you will not have time for mistakes corrections. If any mistake happens, plus you have other factors that will impact on being able to deliver the required product into market. Ensuring the flexibility, as I said before like rain or market access or if you have transportation delays in your shipping or in your airport you cannot get the space required. All those changes along the way will then affect your upstream orders and so these upstream orders for anything that you have to change because of what happen you know a week ago...

How would capacity constraints affect planning activities?

Well I do not know what the capacity is that suppliers have to manage for kiwi berries...

Well it depends because if all the pack houses will go for kiwi berries then there is enough capacity but many of them do not want to invest in such a risky fruit.

Certainty there will be capacity constraints especially when it comes down to the time of harvest, we have to make sure the orders are constants, planned and measured.

Do you also have these problem with kiwi fruits?

Of course we do, especially when season start. Because when season start we would require a lot more fruits than what suppliers can supply for us, plus when it comes through its requirements are around what temperature they can export the fruit. So they harvest in the field and it can be 30 degrees outside but we have to ship it at one degree. So the fruits has to go through the cold store. It has to get cold down the temperature, it has to be packed and the you have residues test associated with that and all these takes time to get things so...

Do you think that air freight transportation will change planning activities?

Airfreight we will be working with freight forwarders party I think for the shipping and making sure that they have close relationships. And that will come around to the lead time obviously we will discuss as well.

The lead time for airfreight is very short, also the same day...

Yea this is what they say...But even get the fruits from here to Auckland when they require it in a consolidated lot making sure that it is on the truck and they have specific time so its receive the market...you know all you need is a specialized people working on it that work on that aspect of getting the supply to Auckland to...yeah

According to the pack house this is not a problem...

Of course not, 5 million trays hey! It is a lot...and as soon as you start to have issues and they do not have time to be able to resolve things that is were issues becomes bigger.

How would be planning activities affected by high variability in supply? And shorter seasonality?

We have that for kiwi fruits as well, you know it is just for us the case of understanding and communicating what is going on so that there is no surprises for the market. You know within supply chain it is all about making sure there is no surprises in our communication aspects because when we are doing what we are doing we just rely on information. So we have to make sure that this information channels are clear and open to deal with these any of...

So even with shorter seasonality there will not be any problems for planning activities?

Oh yes we just need to adjust because you are only going to probably find out when you are in it so that is the issue...

Do you jointly plan distribution with growers and pack houses? (in terms of volume, timing of transportation..) Which type of information do you exchange? (eg technical)

So Zespri comes up with an optimized sales plan, so supply entities knows by weeks what the plan is. So in total they know the faced by week, by size to which is the market or is it going to go. Suppliers then individually receive the pack plan, and so is an equal percentages of all the different packs we have and so to each of suppliers. So we do not have the phased supply plane, we have a supply plane which phase the total of what we have to pack. So it is overall but we give each suppliers an individual one but then we give all our supply entities our total departure plan or arrival plan. Which gives all market by pack type, by size by volume when that fruits is going to go but that is the total industry not the supply share. We do it with 13 registered suppliers but within that supply entities for example Seeka, they have all different pack houses but we only deal with one group. So individually with the supply entity we tell them what we require because of share.

How do you make forecasts?

So the crop estimate goes to Linda, you know Linda Mills, and then she optimizes it by market by size . The market then creates faced forecasts so by week they would tell us when they require this fruits and the pack time. Then is given into the supply team and from that shipping contracts, the capacity then what packaging is required the supply team create the pack plans for the suppliers and then send them out. It all comes from the crop estimates which always changes because you never know how much fruit you will have till the end because you have fruits losses along the way so then estimating how much volume is hard.

Do you also cooperate with retailers and importer for market forecast?

We don't so our market teams do, so they talk to them. They receive an amount, say for Hayward variety you have got 5 m trays and you say these are the sizes that you are getting then the market team will then talk to the importer, wholesaler, retailers saying look this is what we are getting when do you require that? What pack type do you require it? And that is what build up to make forecasts.

What about if there is a mismatch between actual and estimate production?

So we are trying to align that but because I said kiwi fruits are perishable we never know how much you will have between it is shipped because the cold store might be full and we gave them an order but when they are in the cold store the quality might be rubbish and we then chucking that out and we do not get supply that order.

So then what happen?

It depends because market needs time to be able to put orders into place and we do not want to be promising products that they can't then deliver. So we have products then in the past and said okay we are giving you this product now and they were arranging all the TV promotions commercials to be able to run the program and then we said hey sorry we are

not able to supply with the product. It is a challenge and it is all about communications and giving the most up to date communication is the key. But change is going to happen and everyone needs to be aware of, even the best plans change but you have to make sure that everybody communicates so they know and understand how to cope with that.

In which aspect does planning activities change in relation to MTO/MTS? Order specification? (labelling and packaging)

Because Zespri and being an SPA we have to take all the fruits so we are governed by supply, it just comes down on how we optimize that amount of fruits and to what markets we send that to. So market may ask what they want but if we haven't got that. So it is all produced anyway, so it is a push and I guess for the market at the very start it is a pull, give me as much as you can because I cannot get enough but then what happen if we full the market we fill the pipeline and the we manage for the northern hemisphere the summer fruits come on and the market say stop! We don't want that anymore and then like in September they say come on give me some more. So it is a kind of mix.

Would you be able to operate on a MTO bases?

Of course, is the best to minimize waste and make the product in enough time but have the sufficient lead time to be able to do it and communicate to reduce uncertainties.

MIKE TORR- KIWI BERRIES GROWER

-explanation of the project-

Is a very interesting project. It is a young crop in nz and one of the biggest problem is learning to grow it economically. My family and I we start producing kiwi berries the year before the last. We have 5.2 hectares of kiwi berries.

Which is your productivity per hectare?

Oh I don't have quantity at the moment but there has been a problem with pollinations but this year will actually be a good year in terms of productivity but we still not have a full canopy. We grafted on a Hayward vine but one block in particular is not very well adapted so there has been problems beyond there is actually an engineer that is now interested in kiwi fruits so the block we ran down we got it was 2 hectares. The other block would be grafted over 2012 and it is probably getting close to full canopy What I do now is that someone that has been growing these threes since the last 10 years is now being able to prune them in a very small block of a hectare and they have consistent yield of about 40 000 kg per hectare, their biggest yield was 33000 kg per hectare.

Which are the reasons that made you decide for this particular KiwiBerry variety? Do you think the choice of variety have an impact on distribution? (ex. Storage life, market orientation, transportation, less uncertainties, productivity...)

Just K2D4. It was pretty much decided on trials and we had the longest life stand on the shelf you know economic life. So in this case the storage life is up to 8 weeks I think they probably get it to 10 which is quite more than any other crops so the projects state that at a certain point we were looking around shipping arrangements against air freight because air freight is very expensive. So the main reason is the storage life and I think the marketers for the same reason are focusing on K2D4 for the same reasons. They get a lot less losses. But the price and demand they certainly still have some other varieties in particularly the Margi red, but once again, they have a very sort storage life and they have get it to market between 48 hours and have a well managed offshore. There are few people growing takama green and Margi Red and few other varieties but I feel that they would probably (vein) a little bit

***Which are the most important cultivation practices that impact the distribution of Kiwiberry? (eg preservation technique)
Which are the differences with kiwi fruits?***

An yeah there is a lot of work that needs to be done, but I think you know a small punnets is a very expensive way of transporting and a very expensive packaging system when you only produce a small punnet. Of some demand of flow of fruit and I think there is a good argument for selling over a bigger box because in China they certainly there are the best prices and you know they do a lot of engineer marketing and just because they need to re-pack fruit any way an especially marketing packaging they think there is a lot of need for bigger packaging, even 500g or even another method.

Do you also grow kiwi fruit?

Not anymore but I have been in the kiwi fruit industry for 45 years so I am with his history and on how to grow them. To be quite honest the two are polar apart, well there are similar part but you know yeah...

Okay so which major difficulties did you encounter for kiwi berries in comparison with kiwi fruit from an agronomic point of view?

They are basically more expensive to maintain the plant itself. So the maintaining costs are exceptionally high the density of the cane is much higher when you lay down for winter and the cane is smaller more prolific, a lot of tangling and it can cost you considerably more, 3 times more to prune the kiwi berries in the winter time than a Hayward. It can cost up to 20 000 per hectare to prune a fully grown kiwi berry and certain people recognize that they can easily spend 25 thousand dollars per hectare for winter pruning kiwi berry. There is some debate about other pruning and I a know other growers that are trying to grow them now and they are trying to assimilate kiwi berry so as other varieties of kiwi fruit but based on cost is my estimation that we are not doing any summer pruning at all and the reason beyond is that anytime you touch the canopy you have the potential to damage the fruit and the fruit seems to be quite happy to have a certain amount of canopy to be protected. The only problem of doing that is that you increase your winter pruning cost because the vine grow than vigorous. You have to do a trade off at the end but you may want to go to the Bahamas on holidays and if the fruit has left untouched ...I mean there is always variations in that, if you have damnd vary you need to lighten that up better because this things to get light specs and blush for the vine opposite you got to be careful to get them thin enough to get the spry treat.

Do you also use hi-cane for your kiwi berries?

I did last year and I said myself do not do it again because this year my bud break is not as good as last year and every one has decided last year that we have no financial advantage in spraying hi-cane so I pretty well follow like a ship. In the really we all go like 6 - 8 % hi-cane. The pure reason is that does clean up wintering tangle problems because is highly acidic and helps the bud break in early spring and it is expensive but in my view I will do it from now on. I will use hi-cane.

Did you encounter any problem with hi-cane? Like it burns the cane or so..

No no it is just that I noticed the differences in time of bud breaks, I have used 2 weeks later then last year, the object was for kiwi berries to have it as early as we can and put it in the market before the main harvest for kiwi fruit and the hi-cane does do the same that does for kiwi fruit. It brings forward the buds borne between 5 and 10 days, in this case probably 5 days in advantage.

Do you use also other technologies to increase distribution performance?

No. This things you know there is trials and there is room for doing that when you have canopy and you have a cash flow. The biggest problem is that a lot of growers including myself have problems to get an orchard into productive capacity, you have got to get a canopy to deal with first before you spend a lot of money in taking the risk, there is no difference than any other commercial enterprise. You need to pay attention to pack early on so that you survive actually.

Which is your OGR? in comparison with kiwifruits? Do you think the production could be further increased by any agronomic techniques? (refer to breeder..) which is your prod. Trays kg

About 15.60 \$ per tray and there is currently 8 exporters. I am contracted directly to Freshmax with their kiwi berry licence where actually I was the first one to sign with them directly, few are with Seeka. With Freshmax direct now and Seeka there are fifty fifty. But there are 8 exporters of kiwi berries. Seeka and Freshmax are working together in fact last year I used Seeka as post harvest provider under Freshmax as my marketer. And because it was young...yeah the relationship was dicey so I jointed the Seeka pool last year and it costed me about 2\$ for the tray. And that wont be happening again. Freshmax at the moment has always viewed as the highest tray return, they certainly yield the highest value per tray because they have the northern Asian market, particularly China.

Kiwi produce of Geoff Oliver certainly is an option but for whatever reason he is exceptionally expensive per tray to pack it, somewhere the order are 2 dollars more than Seeka. And Seeka is also expensive based on my sums and based on industry average for any other produce, everybody for this particular year they pay for its development, because is so young there is a different packaging and grading and machinery requirement for kiwi berries than for kiwi fruits.

Can you provide an example of this different packaging and machinery?

Well the kiwi berry they pack the punnet for start so the logical thing is to mechanize the selling to the punnet. Being in a punnets and all this kind of start. None of them happened for the normal kiwi fruit arrangement. There is more return to cherry tomatoes in terms of its packaging. If you go to a supermarket you see that cherry tomatoes has a nice little punnet. Apparently those people are packing on about nearly half the right they are charging for packing kiwi berry. So the developer of post harvest facilities are paying...yeah they are charging handsomely at the moment to pay for their R&D. And so there is an option for me to actually pack my own fruits but a packing machine will cost me something around 100 000 dollars plus you would need a cold store with two rooms, a chilled room and a cold room. So the investments involved in a post harvest facility for kiwi berry it is not as much as kiwi fruit because is much less smaller and takes much less room and the fruits has quickly moved on and air freighted within 48 hours so there is no need for huge cold store like for kiwi fruits. But it is still a big capital cost

Do you think that by increasing production you will be able to reduce these costs?

Oh absolutely, at the moment we have from 9 dollars to 12 dollars per trays to pack this stuff in 1.4 kg trays of kiwi berry which holds 12 punnets. I expect that it will come down to 7 \$ per year.

Would an increase of production affect kiwi berries quality?

It is the same for every crop, if we have an increase in volume in somehow we dedicate our selves like Mr Olives dedicates himself but what he is charging is like a winter ball, he still propagates because he is the only one that serve other than Seeka. Generally is exactly to do it, so if growers come on and I think for this current year that we had fifty hectares odd and that would be if the growers all produce it or certainly being developing kiwi berry.

Do you have an idea of the overall amount of hectares for kiwi berries in New Zealand?

I understand it is about 50 hectares odd but that would best to ask to the NZ kiwi berries association. I am also part of this association, I mean it is expensive and there is a lot of levies. There are lots of things to pack kiwi fruit, for kiwi berries is that we are partied including all the levies for MPI or...there is a lot little things that cost on kiwi berries because is kiwi fruits that would be nice that we did not... you know as a developing product we had anywhere for a euro or two so that we can actually air freight it for because it is more expensive than everything else.

What are major uncertainties you have to deal with (weather, harvest, quality, uniformity....)? How does it affect distribution? In comparison with kiwifruits?

We did not have a canopy so the biggest uncertainty is sun, I mean in the states kiwi berry are growing for 25 years and they actually produce the crops so that is exposed to sun. I don't know if you are familiar with the light of an apricot or something...All what they do is expose it to sun to get a nice red sun blush and the sun is important for the quality of the fruit and many other things.

I thought sun was also dangerous..

Yes correct, you know with nz sun it is too harsh and actually scars the fruits so what happen if you have a punnet full of fruits, we don't want to have 6 different colors in that punnets it makes it unattractive. For all the varieties. When you are in the first 3 4 productive years and the canopy...the sun damage the fruit and create a damage on it and in some cases it will burn the fruit particularly early on we had like in November sometimes you have very hot days, if there is not leaf protection the fruit will get scared by the sun and it will change its color and in the last few years the biggest reject factor has been sun damage which is the biggest physical damage for kiwi berries.

From which organizations do you receive technical support?

Well pretty much..freshmax agency has a team leader name of Roger baily, he is actually being a kiwi berry grower with his family since 15 years. My father was one of the first to put in kiwi fruits originally and Baily was also one of the early planter of kiwi fruits in early packages of kiwi fruits. So Roger is a very expert of kiwi fruits, he has several hectares of gold he has property in Australia so technically he and his twin brother are very good, there are also two or three growers around that are very good in tilling one or two kiwi fruits vine and taking notes and stuff like that.

Are they part of fresh max?

Yeah and Seeka they have a series of trials going on. The problem of this trials and the problem with this industry is that there is not enough around to get enough trials to have an extension of data base to make it real. It may will change the next year because early in the days of collecting this data. Hard to say, you just listen to everybody but the thing that I am missing too is a grower that has been growing for a while and it does not matter what varieties he does and he is consistently getting a good volume of kg per hectare. And there have been few growers that has been doing this crop for many years without technical assistance and essentially they just develop their own system and at the moment that system for me it works. I align my self with the experience of this growers and following them because it works.

Which kind of information do you exchange for example?

Oh constantly, you know Seeka has regular meetings and Roger Baily is extensively talking very stable. It is a very early crop where there is a lot of talk and you have a stage where everybody is saying doing whatever. I probably have a different attitude to Seeka because they grow it like a kiwi fruit. The problem if you grow that as a kiwifruits is that it is very expensive to grow, and I have decided I am just keep low my fix costs to an absolute minimum till I get a full canopy. I produce as much as I can without spending twice as much as I do. Before trying things too early you need a mature canopy before you can do reasonable trials you need three to five years before you can have something that comes out of it.

I can barely hear you, I am about as far as you can get from anywhere I am doing a job ripping out abandon kiwi fruits orchard in Tiki Tiki which is right around the east coast. For kiwi berries a lot it is just identify a problem and dealing with that. So you would try something for a period of time up to five years. And after you try different systems and you compare different systems among other growers for five years you will achieve different results. I just tell you a little bit of history, Mr Oliver has been growin the crop for quite a long time and there are lots of politics that are going down over the last couple three years and in particular after freshmax bought the license. It has been a very very shallows sharing of information because have commercial pack house and a commercial series of properties and he has been very reluctant to share any information. And he is also the executive of the kiwi berries growers association, and so we do have a very jusng industry where information sharing, particularly with mister Oliver because he has commercial pack house and makes a lot of money out of his packing and post harvest facilities and he has been very reluctant to share. So potentially we learn by doing the kiwi way, we jump offence by not to see how he is doing. We learn by the experience because we have been growing other kiwi fruits for a long time and we have been growing other thins. It would be lovely if do not have to re-invent the wheel.

Do you think this type of information sharing are more important for Kiwiberry than for kiwi fruit in order to increase performance?

Oh absolutely, at the end of the day with any crop it does not matter what new crop has been tried in new Zealand. The early trials you know they learn and they learn by their mistakes and it would be nice if a new grower came the information are available so that he did not make the same mistakes again. And unfortunately this is probably the key of every one that comes involved on kiwi berries he has free access of what not to do.

In comparison with kiwi fruits do you have many waste? How do you think it could be avoided?

Yes and once again this is probably a situation where the info I will give you are probably inaccurate. As you get a canopy you get more protection from the weather events and the sun so for us over the last few years the biggest problem we had because we had to develop a canopy is to check the fruit from wind and sun and other things and so the info will change in the next two seasons. The first year you are going to lose half of your crop. The first productive year you got to graft it, first season you will lose btw 40 to 50 % of your yield. The sun damage, wind damage and all sort of things, the second year you are gonna be still 42 % of the last year and that has nothing to do with the canopy but the plants just decides to bud break did not grow like everyone has expected. So they try to prune it like a kiwi fruit and cut for greenery to zero cut so they get two ... then one because it did not come. So all of the fruits ae still expose.

At which grade of ripening do you harvest?

Last year was 6.5 but the previous year was 6.2. There are differences in harvest time. At the end of the day I think that 6.2 is the better way to go for but you know I haven't heard what this year the brix level will be.

How do you think the measurement of the brix level is accurate?

Ah I really could not say at the end of the day it would seem that the smaller fruits and the bigger fruit stand to the same time so it seem that they come along exactly the same time no matter about the size of the fruit so if you want to have to get slightly bigger average size of the fruits you have to leave it on the vine so that it can grow and the brix level will actually increase. So who knows, at the end of the day when the trials has been done and I am aware of the smaller fruits of 6 grams or 5.5g may have a brix of 6.5 the ..next door which is 7 8 g fruits would have the same brix so size is not an indicator of maturity for whatever reason but however you leave the smaller fruits on the plant for a while for another week maybe it will increase to maybe 8 brix and increase in size a little bit but you will increase your productivity. So that lays to a selected pick so at the first pick you raise around and grab once you have your brix pass by the pack house of 6.5, you are going to pick the big one first and you raise around to pick the biggest fruits and then you came back and you pick the rest.

Would you prefer to have a lower or higher brix level?

No no because brix is a indicator of the quality of the fruit for sale along with dry matter and things like that and I think we should pay attention in not picking fruit too early but it is a berry fruit it comes on very early and so people suffered last year by not picking quick enough and so they had issues with too many ripening fruits on the vine. Because by the time you harvest at the brix level test of 6.5 you may have 5% reject on soft fruits that early ripened on the vine.

Do you also have limitations on dry matter?

Lots of time seems to be critical, the dry matter is always above of the brix level so it is not like for kiwi fruits where we might wait for dry matter, it is the other way around here where the dry matter appear against the brix so you are waiting for brix only. Kiwi berry dry matter is always on target before brix so is a bit different particularly for kiwi green.

How do you harvest?

Because the volume it is a lot less you pick into small container because the fruit is more similar to a berry than a kiwi fruit so you pick it by hand into a much smaller container. You know maybe a ml box. Seeka use a specific plastic container which holds about 4kg of fruit and pack one on top of the other inside a van so the fruits is not damaged, there are lots of photos to show you. I think it is a good system but you know you cannot just pick it as a kiwi fruit, you cannot just chuck it in a bun and so the costs are greater than that.

Which is the cost of harvest in proportion?

Harvest for kiwi berry is extremely expensive you know. We harvest 3 000 trays last year and it costed me nearly 19 000 dollars just for harvest. I am sure this cost will reduce after I will reach a full production with a full canopy because this was just the first year.

In comparison with costs for winter pruning?

Winter pruning is a little bit less than a harvest costs but not a lot less. Those two are the biggest costs.

Which is the overall transit time from harvest to the post harvest entity?

Is daily, last year it was waiting too much in the sun and it needs to be out of the field and about 10 12 degrees as quickly as possible and slowly bring down the temperature of the fruit. And in this a little bit of work has been done by the post harvest entity where you have got to slowly bring down the field temperature from the kiwi berries. This temperature can be 25 degrees and needs to go down to 12 within 20 hours and then down to 4 degrees before it is put on the plane.

At which temperature does the packaging occur?

Depends on the supply and the pack house and who is packing what when and where but this year once again because the volume is so low there are lots of things that are going to change in the coming years because the volumes will be significantly increased. But the reality is: you pick that, you pack it and you put across the plane within 12 hours sitting at 12 degrees so there will be a huge learning curve for the cold chain. You know at the end of the day you got to put the temperature down to 4 degrees before it gets to the plane. Likely it is sold within two weeks and the new engineer's varieties are very good in looking after their products before it reach the cold store at 4 degrees and it is delivered straight to the shop with enough volume per day. If you are delivering this product to some other parties you know, they will try to have to sell it for several days and it will fail. So except from the engineers of product, the new marketing systems are working very well to promoting and get a good deals but the reality is that the cold chain is space for work to. Particularly I would like to say, kiwi fruits started with a high shipping season and things like that but I mean, I can see this things sitting in a ship for a week or so as long as the cold chain on his end was well managed and the fruits was slowly brought down to 4 degrees into containers and keep it at 4 degrees for a week to get to Asia. And that is an expensive trial process but it has to be done in conjunction with this fruit and done in conjunction with other products that are going offshore, lets say Hong Kong where half container is full of kiwi berries and half container is full of other fruit. Because air freight is one of our biggest killer on costs.

Do you think your relationship with the pack house, which I guess is Seeka.....

At the moment the relationship with the pack house is a bit dicey because they are too expensive, they are profiteering and I am not happy about them personally. Seeka was last year, this year I have an option to pack it myself and along with another grower that has been doing that. You know fresh max now has a grower buying hectares of kiwi berry, so he might have 2 or 3 thousand trays this year and he also grows lemons and things like that so he would probably have to pack our berry, he would have different set of costs and he will be a direct competitor of Seeka.

What would you then change in the relationship you had last year with seeka for example?

I don't know for example a couple of bugs per tray, and you know a couple of bugs per tray are important. So at the end of the day is mainly about costs. The only reason Seeka might be a value is because of technical expertise and in sharing experience among the growers but the reality is that because, like Oliver, he charges too much and his profiteering at the moment is unacceptable based on the crops young status plants. They are putting in plant and they are try to pay for ..., so they are going to invest couple thousand dollars they want to pay for three years, that is not commercially acceptable when the grower is taking out of the sales the risk.

Do you feel any pressure during the harvest time from the pack house?

Yes absolutely, unfortunately the nature of the game is to...well mister Oliver has his own export parameters, he deals with salers, including Freshmax which have the license to grow this. Freshmax is actually haven't to buy fruit from mister oliver under his conditions because a lot of his growers, particularly for varieties like Margi red and a couple of other varieties,

they produce earlier. So he does a lot of whole sale and then repack. Some of other growers who want to harvest, it is reasonable to expect that the marketer he has, which sells his produce, may anyone that has only sold 15 pallets for example which is enough for each grower to pack seven buns if you understand. So what people are gonna be worried about is that the fruit still sitting there where they only pick 7 buns per day and they wanna pick the whole lot today but they cannot actually go to Fresh max and sell it to them as they want to and this is the problem he get and the relationship between Fresh max and the variety, they are taking 4 varieties under the K2D4, so for 4 varieties the hold the exclusive license. Some of the other varieties, what they call public licence, and unfortunately with those varieties you really have no protection. You have got to get what the marketers wants and they say, we cannot sell that I am sorry, so they sit on the vine till they can sell it.

Because of this reason, do you have any difficulty to plan your harvest?

Well, as I said before, K2D4 is becoming the major variety, has become the focus of marketer because there is a longer life stand, has become a focus of everybody of the industry of kiwi berries, because it is seen as a sort of a base to start from. And I am sure when other varieties will come out it will be better but in the main time you have to be the supply chain marketer, you have to market something that has the continuity with some shelf life and K2D4 seem to be the advanced at the moment.

How much in advance did you received the order from the pack house?

Oh you don't, you do not receive the order. But at the moment supply seems to exceed the demand so everyone is waiting to get their brix level up to get it off to pack and enter cold store and offshore as quickly as possible. I would say that it is more when it is ready than waiting for a demand because the demand is there. So when your fruit is ready, you call Seeka and Freshmax and they would take it. There is a market for it. How you pick that has becomes an issue between this year and last year, we still pack what we could last year the size on the 6. something grams it was, we put all of them into the system and all of them went offshore, so this year I think there might be differences. It does not seems like there is a demand issue, there is only a supply issue and size issue. At the moment the choice of the picking time is still up to the grower. But at the moment growers like kiwi fruits where the ripening has gone because when it softening in the supply chain is less likely to get damages or interferes with cross tail or whatever so when it is ready it is nice to get it off but for kiwi berries I think there is certainly being or going to be select picking at least two times say also three so you get a better size kiwi berries and it continuous to grow and you may even have a beautiful kiwi berries at 8 brix and weeks later you go around and pick again and so is like...

Isn't it hard to handle later on a kiwi berries at a 8 brix level?

No but I am aware of, lets say 6.5...the reality is that kiwi berries once it is chill down the cold chain is very important in that respect. In that maturity, you can have a 4 g of kiwi berries that have a 6.5 brix but it may grow into an un-exportable fruit after 2 or 3 weeks and so is still overripe.

What do you think it will happen to your harvest activities if you receive an order two weeks in advance at the pack house?

To do that you need to be your own pack up not only to grow them and harvest. Just like a small cherry growers, if you are packing on demand you need to pack it yourself. The industry at the moment, in the bay of plenty in particular is looking for an affordable way of selling kiwi berries, when you pick it you must market it. So at the moment there is too much out of control of the grower to make those choices. Normally, Freshmax, as an exporter have soo many orders and they try to figure out what is the best way to transport them. In this case is air freight and they are waiting for the fruit to be ready rather than the other way around like that the fruit is ready waiting to be marketed. I think if the hectares will scale up and it will be the packing licence of Zespri, the spread in a much better market territory with not as huge volumes but in comparison with kiwi fruit but it is fresh and it is here and nobody knows about it so over time is going to work. So at this stage it is not possible but is a growing industry that requires a lot of coordinations. There is also huge infrastructures that are way redundant, full capacity, huge people capacity, lots of people are doing nothing at that time of the year so that is saving costs.

In the industry the biggest risk is for growers himself. The reality is that to grow in the industry, like of what happened originally, you do need sometimes support of Zespri or.... They could be in control of figures so that the industry is well controlled without profiteering. Because now people are leaving the risks to growers and try to make as much profit as possible. For the benefit of the whole kiwi fruit industry and not just kiwi berries, if kiwi berries comes out 1 month before the main harvest of kiwi fruits it is the perfect marketing opportunity to lead into to the main kiwi fruit season. Zespri could take a more accurate or precise role in it to stop profiteering in it and sharing information without any political issues.

I think economies of scales can be reached very easily, I just have to buy a pack house and I can do 20000 trays myself and there are few redundant cold store and places around the bay, If I have a little bit more of capital I am gonna do that. I just employ, you know there is huge demand of workers. It is not a problem to find work force, facilities and anything you need because it starts right before the main kiwi fruit season starts.

Would you increase the production of kiwi berries^

You know it is a capital game, it is a huge expense if you want to have, even if you want to convert a kiwi green orchard into a kiwi berry orchard to give into the stage where is feasible. So yes I would, and I will take the risk on it and I think there is huge opportunities. 15\$ OGR to start you know....so good money on it but it is a whole different process from kiwi fruits. It is more comparable to a strawberry or cherries, is a high perishable and much harder to grow than kiwi fruit. There is a potential of an OGR of 120 000 per hectars of kiwi berries, I think the best you might found out of the gold might be 90 000 per herctar and the green is 50 000 OGR per hectar so at the end of the day there is money in it. So it is considerably better than any other variety.

The worst part of kiwi berries is that it is highly perishable, it is not like sitting in the cold store for seasons without having to be repacked and checked...and the only reason why the kiwi fruit industry is good is because there is a huge storage life in it which is about 9 months in a year, this last for 2 months in the year and then you get payed.

Do you get any premium depending on the period of harvest?

Not yet, I do see that happening but at the end of the day it is such a short marketing window. You harvest and you sell it and they pay for it. It is like squash or whatever other product.

Do you get different prices depending on the quality of your product?

No, I think there is room for improvement but the industry is so young and want to protect quality and export product. The second grade market has hardly been touched in fact over 3 thousand of trays that I got last year, I got payed for 106 trays...and it cost you the same amount to pack as it is an export product. So I actually lost money.

The grade of the fruit is pretty much dictated by the kiwi berry growers association because mr Oliver once again is making the roles. So they are saying lets not sell anymore second grade fruit, lets just look after export fruit. And I don't actually disagree with that until we have a ministry that...I mean the majority of people that I talket till now they don't +even know about kiwiberries, they have never eat one, never seen one...they don't know what it is!

Which is the transit time from your field to the pack house?

It is only few km, maybe four...

Which difficulties do you have in planning harvest? To know in advance your quality, quantity...to the respect of kiwi fruit?

It is twice as difficult, for all of the berries you just do not know what it is gonna be... It is mainly related to experience. In three years from now I might be able to give you the answer but at the moment it is 2-3 thousand trays this year...

The fact is that I have got enough canes for 15 or 20 thousand trays. When it comes out like that I budget like six.

I worked for Dole for 17 years and I am working for Zespri for kiwi fruit for another 10 years and my company is a source for Zespri here. My team is specialized for Zespri and I was looking for something that I can sell myself and I focused on kiwi berries because it is in right season and it is not handled by Zespri so we can freely operate.

Are you already importing kiwi berries?

Yes we started last winter with kiwi berries from New Zealand and that was an important trial and important fact was that before that we eat not kiwi berry at all in the Japanese market. No one had not even seen kiwi berry. Is a new product.

How was the reaction of consumers?

It depends but people saw it as something very new, very beautiful and very sweet. Surely they are very expensive product but they are very high end product in Japanese market. But what we have sold in one package of 125g of kiwi berry is for 500 yen which is probably 4 USD so it is actually the most expensive fruit and ordinary supermarkets do not sell expensive fruits for the average consumers. We are trying to push them to sell because it is something new but we do not have a lot of volume anyway so we can focus on the very high end people which are looking for something new and special. People how have some ideas on how to use the fruits for example for some desserts or cakes, for example is very good for cakes because when you cut it is very beautiful so you can use it instead of strawberries.

Did you encounter any difficulties in selling this new product?

Yes we do, we have some difficulties to arrange for this product but one of the main advantage for us, because we are a sales agent for Zespri Kiwi fruits from new Zealand, we have a very good relationship with retailers for kiwi fruits. So we could sell kiwi berries thanks to this very strong relationship.

Which challenge did you encounter in the supply chain?

We did have some problems. We ordered to the grower in Tauranga in New Zealand, directly from kiwi produce, Geoff Oliver. He arranged the product for us and the freight forwarder in Auckland since it arrive to Japan. And the difficulty is that after it arrived to Japan, because we had so many customers, we dropped it to Japan port warehouses because. It is a big cold storage located on the port because most of the imported fresh fruits is shipped by boat so our customers goes to port warehouses to pick up their fruits. Because we have so many distributors to sell we needed to truck the kiwi berries that arrived to Tokyo warehouse to all the retailers and this is a big cost. And also we have a risk of the temperature management in the truck and when it arrived it was already crashed or rotted. The truck was refrigerated but still.

Which was the transit time from the port warehouse to the customers?

The nearest one from Tokyo is 6 hours but there are some more far like 1 or 2 days. So there are quality changes in the transportation. From airport to cold storage from cold storage to the distributor...So it is very important that when the product arrives I am in the place and I check the quality together with the customers. It is possible that when the product arrives to customers place it is ready after that but our customers cannot check all the fruits and they insist that it was packed when it arrived. It is a very difficult program actually to write together because we always have to check the quality with customers in many steps during the transportation. It is very weak actually, very weak.

Do you think the step up of Zespri in the supply chain will be an improvement for you to handle kiwi berries?

Yeah, I think the problem arises from the quality of kiwi berries, even if we have an optimal logistic cold chain the fruit is very weak especially for the transportation. Even if the temperature is generally controlled, we have some points for example when the fruit is trucked from here to here we have to transport another truck for another day and if we do not have transport the product you need to pick up the product here for short term even few minutes it dictate the quality of

the fruit after that. So I would say Japanese distribution system it is not very good. In Europe it is very good I think and very advanced in comparison with Japanese. Japanese market like distributor, retailer...each one is very small and fragmented so when we try to distribute this weak product, even if we really take care it is almost impossible. So my idea now it is that we check the quality of fruits right before we deliver it to customers otherwise it is too risky.

How was the size of the order?

Was very big order, there is no size but there are some varieties but we cannot indicate the name of the variety on the punnet because it is, when you grow kiwi berry the variety isn't X and you do not know, we cannot clearly identify that this is the variety. It is easily genetically hybridized.

Did you also import a variety with a red skin?

Actually we did some. When I was talking with Geoff Oliver he really recommended Margi red because it is tasty but our opinion is that we understand that he highly recommends it. It is surely tasty when you eat it but it is really risky because it is so weak. If you eat it in the right handling surely it is the best tasty variety because it is so sweet. But we prefer the green one because it is stronger. Our scenario is that we import the green variety and it arrives to Japan not really mature because it has to stay in the cold store and keep the eating quality. Otherwise if the fruit is nicely mature when it arrives to Tokyo airport that is too late. (suggest shelf life tests at different degrees). Based on our experience, last winter when we handled the fruit, we had three times arrivals and we focused on the quality of each arrival. We had no big issues for the first and second arrival but we had problems with the third arrival. What I mean is quality problems for consumers, it is not quality problems or issues when it arrived. The first one arrived I think February 20 to Tokyo airport and it was not very matured. It was not so immature that we couldn't eat it but we thought it was not really matured. But after we transported and it arrived on the store spaces maybe you need 2 or 3 days or maybe 1 week if it is a very remote place in Japan the eating experience becomes best. The third time, when they arrived to Tokyo airport they were very good to eat and we were very afraid to deliver it to customer space because till the moment they are finally eaten by consumers it takes too long.

How many trays did you purchase the first time?

We did not...let me see.....totally 3200 trays last winter overall. So maybe for one arrival lot was 1000 trays.

When was the third arrival?

Mid March I think.

So your order cycle was about 2 weeks?

Right

So you had overall 6 weeks selling window?

Yes right.

To which kind of retailer system did you sell the fruit?

Actually we tried to approach very high end fruit shops, not on average normal supermarket but high end shops firstly. Some of them were interested. We also approached normal supermarket and I would say 20% of the company agreed to handle it. It is interesting because it is something new and very seasonal, and everyone tried to sell something new. Actually they wanted to sell the fruit for one month or longer but we were able to sell it for just 3 weeks maximum at the store.

So consumers were able to see kiwi berries at the store for just three weeks? I thought was 6 weeks...

Yes. Actually what happened is that they arrived three times. After each arrival it was sold out in few days so we could not continue to trade for three weeks. So from the beginning to the end I would say three weeks. They had a stable supply for total three weeks or one months but actually we cannot expect a stable demand for consumers, we are not really able to predict the demand of retailers to sold at stores. So it is very risky to place a lot of punnets on the store. So we have to plan to sell in just few weeks without any discount. Because if we have the discount is a financial loss and we have to pay for that because is a quality program.

Did you had many waste?

Yes we did. Many distributors have sorted the product because we delivered to retailers. They checked the punnets and if there were any problem they repacked the product.

Was it too expensive for you?

Yes but we had to do it because it was a new product and if customers are not happy is a problem. So we are loosing money we know but for the future we did it.

Will you buy again Kiwi berries next winter?

This winter we will try again. We will import more than last winter not too many but something like 5000 trays. Because it is risky this is the maximum volume to try. Because we had challenges last winter we has some tricky and some consumers tend to know that such new product exist so we expect to a have a larger orders. There is the demand but the problem is in the supply chain. Some Brokers have received an order from Japanise retailers and ordered from New Zealand but they did not have enough volume from New Zealand and enough sells to retailers and they had no idea to how to indroduce it to the market. But last winter because we had major relationship with retailers for Zespri Kiwi fruits we succeeded to introduce kiwi berries in those stores and it was sold on the shelf space. So maybe consumers came to know that there is such a fruit from new Zealand.

What was the position of kiwi berries on the shelf?

It was close to berries like blueberries and strawberries. But wesaid to our customers that even though it looks like a small kiwi it is a berry. So we said the it tasted like a sweet berry.

Did you had to invest money in promotion activities and marketing?

Not really, we put it in the industry newspaper as a new product and due to this we came to distributors retailers. And we have prepared for a nice advertisement sign POP for the sales of fruits because we have about 20 sales staff in my team that actually did a demonstration at stores because we didn't have a deposit to prepare for a special demonstrators for kiwi berries. So my staff went to the stores to do the demonstration. Zespri could use its promotion team for kiwi fruits during winter time.

Do you think is better to have smaller orders from New Zealand or you are satisfy from a two weeks order cycle?

I would say once a week is the best option.

And what is better for retailers?

Maybe weekly as well because what is very true is that we cannot receive the product that we ordered if we are beyond to have it on Monday. Three times, this Monday, next Monday and next Monday. We ordered that way but the product cannot catch up to the airplanes we were planning to use so it goes to the next. We can only run one flight from Auckland to Tokyo so if it gets to the next day flight it is really messy. So stable supply is not very easy. We adjusted very quickly to what happened. So once in a week is a very good time for arrival.

What if it is on the other way around? so bigger order size and less frequent...For example just two arrivals in the season bby sea freight..

The point is about how retailers think about our supply timing because if we make it from 3 times to 2 times....If the first arrival arrives on time and the second one arrives late, in that case we have a long between these two arrivals and if there is no supply time between them the retailers will not buy the second arrival. If we have a more stable supply orders is easier. It is a tough work but... If there is no delays than it may work.

Next season it is possible that we do not use port warehouses and instead we truck the fruits directly to customers. Not to all customers because we have a lot of small customers but at least to the major customers we can truck and when it arrive to the customer place we can check the quality.

Do you have to organize the transportation to the retailers?

Right, but let me tell you why last winter we have used port warehouses. I was afraid that we had quality problems. So if you have the product there we can check the product there and also sell the product there. Anyway it is a cost and so it is better if we can truck the product to the customer and together check the quality. If the quality is bad when it arrives maybe we should pay for that yeah.

How does it work for kiwi fruit?

Is much more easier, we use port warehouses and same system. (recommendation! No adaptation)

Was it difficult for you to plan the the distribution? How was the communication between parties in planning?

Actually I ordered to Geoff and he organized the forwarder and they informed us so we transferred the information to the retailers to when they can have the product in the cold store. There are many people at different stages. When we had the fruit in the stores we told them this is a very unstable arrivals with unexpected delays and quality issues so we cannot fix the time to sell it so we gave them always the latest information but finally we said them when we wanted to sell it. This is a very important problem for us but it is possible because for retailers it is not a very important product that changes the store turnover and sales. So they are flexible.

I always wonder how is going the handling in Europe because Geoff Oliver always tells me that there are no issues in Europe and he always tells me that he does not understand why such quality problems happens in Japan.

The problem in Japan is that we have a lot more distributors and high number of stores.

Which are the major uncertainties that you see for kiwi berries market?

The uncertainties that I would like to know is that if we do not have big quality issues to what extend this product is accepted by consumers. It is sure that is a very high end product and not a very popular product because it is only 120 g and not big volumes.

How would you see a bigger punnet?

Actually in Japan we have a small volume of Chilean kiwi berries but not many retailers have them maybe only Tesco, the big American retailer. But as a quality and taste, the New Zealand one taste much better. Chilean Kiwi berries are very hard when they arrives and even when they store so they are not good to eat.

Do you think consumers would by bigger punnets?

I would say you need both, because small punnets even if it is small it sounds too expensive. So the big punnet even if is expensive like 10 dollars is very big so it sounds special even if is expensive. For people living alone we need the small punnet. I would say the big punnet for New Zealand Kiwi fruits is again too risky because in the big punnet the pieces of fruits in it get smashed. With Chilean fruits they can do this because they are hard and immature.

How was the reaction of consumers with the red kiwi berries? Did they recognized the difference?

Actually because the red one has arrived with the third arrival in the end, we did not have time to say this is green or red. The first and second time we had the green one. The red, if we don't have quality issues it taste good but we had many claims because it was too mature it crashed...

Actually Japanese consumers don't know kiwi berries and the different varieties so we had small indications in the punnet. Some fruits have a red skin, it means mature, but it is not a quality issue so it is safe and you can enjoy it! So there were this small indication in the punnet otherwise Japanese consumers think is a quality issue and also a difficult point is that even if is a Margi red is not sure that all pieces arrived red, some pieces are not even mature and green. So we had to tell that it depends on the piece even in one punnet. So high variability.

Did you also mixed the red and green varieties in one punnet?

No no.

What was the label specification?

It says that is only kiwi berry it doesn't specify the varieties because Geoff says that he cannot guarantee that he has only takaha green of K2D4 or Margi red because kiwi berries are easily hybridized naturally. So we know the variety but we never tell to customers. We only say that some varieties are mixed in one punnet. Because my understanding is that even if is not margi red some fruits becomes red when they gets mature so we cannot separate this is red and this is green is just kiwi berries.

Any other specifications?

We just say is a kiwi berry from New Zealand, some sentences says "looks like a kiwi but taste like a berry". Is very important also to have a picture on the top of the punnet of a half kiwi berry because is very beautiful.

TRACEY BURNS – DIVISION MANAGER EXPORT FRESHMAX

When did you started to market Kiwi berries?

Few years ago we started, probably not to produce them but it is really an event of the 2012 we used to have a lot more and to be stronger you know recent wise...

Why did you entered in this business?

You know it is something unique but also you know globally the berry category has huge potential as one of the category that retailers are excited about that and we very much see kiwi berries as part of the berry category and not as part of kiwi fruits or tropical fruits category. We believe to market it as a berry. So there is excitement from customers but also it is something new into the market and also there is a lots of exciting marketing. That was one of our key driver. And also there are people that want to buy it.

Which is the volume you are marketing?

New Zealand industry has been setting around 70 to 100 thousand trays that we export last few years and a 120 thousand in 2015. New Zealand will grow from 120 000 up to a half a million in probably 4 or 5 years and we will get a significant share of that.

Are all of this kiwi berries packed in Seeka?

No. Not all of them. A big portion will be packed in Seeka but that is just one pack house. We have pack houses probably in down east in other locations. But not all just go to Seeka.

Do you know the total amount of hectares cultivated on kiwi berries?

No there is not good robust data but my opinion is that it would be 60 to 90 hectares in the ground now. And that will double within a few years.

That 60 hectares are all commercialized by Freshmax?

No we get now 30 hectares commercialized by our party.

How many growers are cultivating these 30 hectares?

Amm...if you count Seeka one of them then is less than 15 growers. But Seeka is actually way the umbrella grower and they manage the orchards of multiple parties so there is actually 30 or 40 individuals growers are growing Kiwi berries but a bunch of them do fruits to SEeka system

Did you adopted any special sorting procedure for kiwi berries in the packhouse?

Yes and that is still evolving. Again is not very go across with grading equipment it is reasonably manual but about automatic punnet fallers, and then back into a tray and in the pallet so it is not super automated. It needs to be automated as volumes increase. Having said that, one of our pack houses in the east coast is looking to get a grader cluster booked this year based of what partly some cherry tomatoes people do...so it is a customized model.

Do you see the necessity to have more collaboration of breeders with technological scientist?

That is one of our obligation with our PVR deal, so that we must communicate with the variety breeder, we have an annual sort of catch up to discuss about quite specific issues so that in our attention is to take into account that they look into breed plant and food varieties, they take into account some of the weaknesses and constraints.

To what extent do you think technology helps to increase uniformity in the punnet of Kiwi berries?

In 2016 harvest we will introduce a berry sizer because we did not have in the past and that was an issue. We got inconsistent berry size so with electronic sizer that would become particularly helpful.

So how are you classifying fruits at the moment? For example in class 1 and 2?

Up to date we only have for our class 1, there has only been one specific size. But in 2016 we would have probably two sizes for our class 1 because we will have smaller berries and larger berries.

Why this choice?

Customer demand. Some demands smaller berries. But it is also about uniformity, you know in a punnet you got small and large berries, but if you have got uniform sizes it looks better.

Doesn't then become hard to manage inventories?

Yes if and what you do with the undersize berries there is a whole argue...It is a very positive thing from a market point of view but we there is a lot to work on from a logistics point of view and those are some of the unknown and risks you have with a product like a kiwiberries that is new.

Do you use any other preservation technologies? Like pre-cooling, modified atm...

Yes we are currently doing a lot of science around that because kiwi berries shelf life we wanted out to be 12 weeks from a marketing point of view, which is very challenging so we are looking at things like smart fresh treatment, CI treatment and various things like that. Which are at a very little level of adoption. Some of them are looking promising and some of them are really hard to get on a commercial scale.

Which are the criteria and reasons in the choice of the packaging?

I guess when the pack has been start has been based on traditional berries packing system because they were first commercialized in a punnet. And that is reasonably working for some fruits, it is reasonably cost effective packing but we are looking to go for something with a lot more innovation for 2016 and beyond. We need more volumes, because customers in some markets they want more than what we can provide. We want something very different, so that stands out and yes as the pack house want to go up we want something that is also cost effective because when we have big volumes through a short time frame. A big concern is that the fruits matures properly and it is going to come out the vine go to the pack house and be packed and so on...

Do you pack the product already in the market format before it goes in the cold storage?

There are big theories depending on the weather. If we have had a bit of a bad weather we might picking and packing in the packhouse within 24 hours. If we had five or 6 days of proper sunny weather during harvest we might have lots of picking going on and packing once size is good so fruits settle down in a cold storage for 2 or 3 days before packing. After the cold environment from harvest and then from then on it maintains the cold chain.

We only pack once. It is picked into 4 kg buckets and then gathered into the cold room and then it goes across the grader and once has gone into the grader it goes into finish packing format and stays in the cold room till it reaches the market space.

Did you had any capacity constraint in the existing pack house facilities?

In the pack house definitely. And again that it is partly around kiwi berries maturity, there is not years and years of science behind that. And we had sign of evidence of maturity moving really rapidly so we had got to move the fruit off the vine in the pack house. In the way we are working at the moment we had not have capacity to pack all that fruit within 2 or 3 days if all growers were harvesting simultaneously so they had to harvest separately.

Actually one of the limitations as well is the internal maturity of the fruit, we have been really strict on maturity standards of the fruits because we want the fruit to eat well. And historically people just pack it immature. The minimum maturity standard must be 6 level brix and black seed. In the kiwi fruit industry there is a science and we arrived at the point to know which part of the vine would mature first and the canopy structure...but with Kiwi berries we does not get the same amount of History data so Freshmax is putting a lot of money into the science so that we cannot just have what we gonna be we harvest the fruits out the canopy to start and I think three days later you go back you know till the biggest part of the canopy...

Did you had any problems related with the accuracy of the measurement of the brix level due to this multiple harvest?

In fact we would do several maturity test. Once the fruit gets up to the minimum brix maturity we want to test back at the ...and if we test it and it is not high enough it would go in a re test in a few days later. This is a combination of exporter pack house and grower and different parties would do it slightly different. It is supposed to be random you know you would think you pick the large berries but you wouldn't necessarily pick the large berries.

Thank you. Going back to the facility constraints do you think it is a big constraint for the current industry?

Not really a big constraint because at the moment the pack house are doing right because I expect that they will do some very significant investments over the next two three years to cope with that increased production. And then we would say that if they want to collaborate with us you need the right capacity and the right technology because berry is an expensive fruit so they have to have the necessary equipment.

With which pack houses are you currently collaborating?

At the moment Seeka do some of it. We also work with Geoff Oliver and then we have got a couple of new other packhouses that are getting involved.

How do you deal with inventories according to the higher deterioration rate?

Again it is a little bit unknown. There is not 30 years of science so there is a lot to experiment about. Some of it is...We probably adopted first in first out system. Some goes based on the history of crops so for example we know that one particular grower have very good canopy cover, this fruits will probably be stronger while if it is from a very young canopy with a very light cover we would probably need that the fruits move more quickly.

Don't you have any constraints due to growers shares as for example happens in the kiwi fruit industry?

Amm...The industry hasn't really got big enough to have those kind of issues. So I guess as the industry grows toward, that 4 5 or 6 hundred thousand trays then we might also look at something like equity sharing to decide what fruit goes first but at the same time we will get this kind of volumes it might be the time where post harvest technologies improve and we will get ways to store these berries and have 12 – 14 weeks marketing windows.

Do you see feasible to reach a production of for example 5 million trays in NZ one day?

Ahaha no no! that is too much. I will pass long time before you even got to 2 million trays. But yeah it is not a 5 million trays industry.

Which the effect of multiple harvest on inventory management is for instances?

Ahhh it is more becomes an issue at our turn because you get mixed maturity on arrival you have loaded into China today and tried by costumers today and it is great, it is still quite firm, it can travel well but we do a lot of e commerce business so

that is quite for that because it can cope with all the displace system in China but then tomorrow side we might be able to get it more mature and once travel is long that is when it becomes an issue because the customers are playing with the customers evidence because you are not delivering consistent fruit pressure or maturity but because it is a new fruit I guess we can get away with that because it is all part of new lessons and learning from that and then change.

Would you prefer to just have one harvest?

Oh from a marketing point of view that would be perfect, that would be ideal from my perspective but haven't been involved in logistics and post harvest technologies, I know that this is an unrealistic dream so we take the deal with multiple harvest.

Don't you see multiple harvest as a benefit to extend the selling window?

Yes because there will be orchard practices that we will initiate to manage harvest maturity plus the post harvest tools that we will use. So the combination with all work in post harvest sales will give our self good sales .

What is the effect of multiple harvest in the order process?

Air freight business is always more responsive, reactive for a lot more variables than sea freight. So we just have to go on with the season with this intent air freight shipping plane but of course we depend on the harvest volumes, you just got to manage it. There is no differences to cherries, you know cherries are a high value product from NZ and they are all air freighted and in the short time frame, with weather sensitiveness and they go to a similar market than Kiwi berries and they go well.

How do you match forecasts with inventories? I can imagine is very hard...

We guarantee a certain level so it is just a matter of changing the sales plans. So again it just comes down to the marketing planning.

What about planning activities?

Am it is hard because it stay unknown till the end but again this is the case of a high value high perishable air freight business and again one of the challenge is that kiwi berries are grown in the bay of plenty and the bay of plenty is full of kiwi fruit people and those people in their subconscious thin about kiwi fruit long shelf life and high flexibility and if their subconscious change across the berry mind set...because now they think they changed but they have not. For example in pruning they have to accept that they have to spend more than for kiwi fruit but many of them just don't.

So... because of what just said do you plan activities differently than for other fruits?

Absolutely. If you think to the harvesting to the packing to the marketing and logistics.

What about the elements of uncertainties for kiwi berries?

I guess for this fruit a lot of it is purely because there is not a lot of industry to get knowledge in comparison with kiwi fruits. As a company we were as much into the industry of kiwi berries than anyone would have but there is not such a new product, there is not technology to pull on when you have different situations to came up.

How the actors in the industry collaborate for activities like planning and order process?

It varies depending on the pack house and how we work with them but a lot of that it is just daily contact and you know keep every body updated. For example everything start on pollination and then we constantly reviewed as we are close to the harvest, you know how the season is going which heads are in light what problems are what is the weather long term

forecast and we all constantly change from that. Fresh max directly goes into the orchard to monitor the situation looking at the canopy, doing some maturity test and see how is shrinking and.... It tends to be... know it is not growers picking to my shipping to the harvest result. So there is market demand there but we make market demand match to what comes out of the field.

What would you think it will be the impact of an increase of Kiwi berries production?

Ask me that in five years, yeah I think there just would be more automation and there would be probably less flexibility for the grower around harvest maturity and harvest timing and cold chain and limitations.

How is your level of waste in the chain?

There is a lot of waste and sometimes it is related to the unpredictable maturity of the fruit on the vines and at the same time when you account for the high amount of waste from the field to the market it is still a very high productivity gate return. The return of kiwi berry compensate for the fact that you are not necessarily harvesting all of the potential.

Which is the OGR?

There is a big variability between a new grower versus an established grower and the variation between different roof stocks. But it is significantly better than the green kiwi fruit and also a bit better than the gold.

Does the operation of sorting, packing and storing occur in the same facility?

Yes. So the initial grading is made down in the field during select harvesting in the field or even with automation in the field. It is similar to asparagus, you are picking and sorting together in the field so when you get to the pack-house it is priority to put the fruit into the snack format punnet and again as the volume will scale up there will be significant technology investment that we are looking in already.

Did you recognized different type of ownership in packhouses and differences in the way they operate with Kiwi berries?

Yes there are big differences you know you can have corporate model pack house like Seeka and there are huge differences with a grower that owns the orchard and the packhouse so kiwi berries requires a systems to work well. For example the small grower may have different attitudes to put in the system a 150 000 dollars machine but they hands on a logical to make understand the whole system from A to Z where somehow you get to a big corporate pack house like Seeka and one man understand one piece of the chain another man understand another segment of the supply chain and another man another segment and so on but they do not get actually the overview of the whole so to try and get a new product like a kiwi berry we can smoothly as a company prefer a company with a kiwi fruit mind set than where you do not have any one to have an overview of the product, that create challenges.

From a logistic point of view, which are the major difficulties for kiwi berries from your point of view?

Just the short selling period of the product. You know air freight is expensive and it takes part of the margin.

In comparison with other product like cherry tomatoes and cherries?

Just the fact that there is not a science behind that for kiwi berries, you know we still are researching the best cold chain and the optimal maturity and the effect on the shelf life if the cold chain is compromised. And we don't know that. There is a science that analyze for each hour of cold chain lost there might be another day of shelf life lost. So the effect that the cold chain has on the product.

Do you exchange any technical information with growers?

Yes certainly we have many discussion about spraying and cold chain. You know how quick they get the fruit out of the vine from the field out to the cold store but we also have discussion about pruning, canopies...

With growers do you mean the nNZ growers associations?

Ummm...The NZ growers association comes a bit but then we take that and one colleagues would make appointment with individual growers. The industry recognizes their fruit programs but actually we know for example we have a maturity issues depending on differences between orchard .So we are trying to personalize what kind of recommendations are recommended to match with individual needs. Every grower is different.

Did you use hi-cane for example?

There has been some hi-canes trials down there with kiwi berries but it is not widely used but we have got some successful results.

Do you think it will help in increasing the uniformity of bud breaks?

Yeah, There was enough positive science out of some trials we did 12 months ago to know that we have done hi cane recently and then it will be one of the matters when we get closer to the harvest to know the benefits to comes. So yes that is a possibility.

Did you never considered see freight?

Yes, we would love to use see freight into some market particularly. But again we do not have the science, the technology to know that containers will arrive successfully. Because NZ is far from all over the world, it takes 3 or 4 weeks to get to most of the markets other than across Australia.

How do you see Australian market?

The market in Australia is actually quite good but the air freight in Australia is not expensive so it is better to go with air freight because it makes not the difference. The difference see freight will come to play is in case we will go to Europe. You know the cost of air freight from New Zealand to Europe is really high.

So to which markets are you exporting?

We have done it primarily into Asia and then Australia. We will increase into Australia this year. We have done with success into China, Singapore, Taiwan Malaysia Hongkong

Which is the most demanding market?

They are pretty much all as demand as each other. Singapore has been the most demanding but then it was also the market that got involved first so that is probably that has become more fussing, another one is China.

Did you had any problem with clearance procedure for China?

No more than any other product, China is normally negative market for compliance but again because Kiwi berries are high value as well as a huge cost effective business but we experienced how to arrange the logistics around the flight of kiwi berries.

Which is the market format?

Some of the market are asking for greater volumes definitely. So normally is 125g as Nergi does. But we are looking into bigger packing size.

How do you make a marketing plan?

My marketing plan has to be a mix of retail and online sales programs that are quite fix because is on promotion base and advertising but it is quite fix and hard to change. And we always want to get a share of the crop on a fix way. Some of the most traditional Asian market distribution channel..with those channels you can adjust the volumes easier. You cannot easily say to a big retailer “oh sorry I have got any fruit despite we put in the news paper that it is gonna be there but no fruit”. Because it can happen that you have got short supply. But with Traditional channels you are might sure wait the other to the retailers...

So which is your marketing model? Do you sell directly or you are also the importer at the destination?

Freshmax is not an importer in any market but we have got a very strong relationship with key customers in each countries and those relationship are often quite transparent with Freshmax and the import for the retailers. We always discuss before the season about agreements on packsizes, timing, volumes. It is the same with cherries. So it is a pretty transparent.

Do you think this markets requires a smaller order cycle and larger order size?

Especially if you select something of the online business, particularly China where we have done a lot of that, their lead time is a bit longer because they need to let it come into the distribution centre and they doesn't seems to rely on online orders it has got to be sorted and then packed types and then distributed into customers so that takes a bit longer time than perhaps going to a market gets to the distribution centre in Australia and then sell. So there is a different ideas. But again that when it comes into our marketing mix. It has to encompass customer necessity so that we need to deal with the variability of supply which is due to the harvest changes.

Isn't hard to guarantee this big lead time and to communicate it to the growers?

Well no because we say to growers “ just pick it and get it at the maturity grade and then pack and get it ready and we will manage it with the market variability”. Because if we start saying to the grower, do not pick today because sales are not up, they would be very upset and you know growers get ...for harvesting and packing. Growers limitation are more dictated around pack house capacity rather than market demand. Freshmax deals with market demand and the packhouse is more the limitation to when a grower can get the fruit off the vine.

So can you say that your production is driven from the market or it is more on the other way around so it is market push?

No no no Freshmax is very strong on being market lead and so our production increases is driven by our believes that we have huge opportunities with kiwi berries globally. It is based on around that and it also coupled with the interest of growers to grow something different, you know something new. We want allow production to increase and we will control that. So we manage the production to meet demand.

What if there is a mismatch between demand and supply?

Well it is something we need to manage, it is one of our challenges. But if we have significant undersupply it comes down to our role to marketer. We have got to deliver the message through those customers explaining why there has been short deliver and you know just try to get them understanding. For fruits like kiwi berries, cherries and oranges the message to

the customers is so important because it is not like you know manufacturing computers, you do not just let them in the plants and wait for demand. So it is all about balancing supply and demand over uncontrollable factors like the weather.

What is the minimum order size?

With air freight we tend to do a minimum of 500 trays because from an economic point of view cost wise freight rate you really got to find ways to at least transport 500 trays at the time. We primarily work with importers that have got their cold stores so that at the arrival fruits can stay at the proper temperature from the arrival at the airport to their cold store properly. Lots of markets that we have been into a part from China it is not proper winter temperature so we had a lot of issues related to temperature and delayed. (!!!)

So is it air freight the biggest cost for kiwi berries?

At the moment? No! the biggest area that needs to be looked is the post harvest cost. Picking is...Picking and packing are very very expensive.

Do you think that if the production will increase you will be able to reduce this kind of costs?

Yes because we will put more technology in and also increase efficiencies and time constraints. So technology will help a lot since labour cost in New Zealand are very expensive and we don't have sufficient labor force so we have got to go to technology to become cost effective and time efficient.

If you go into a cherry pack house and you look at how many people are there in comparison with few years ago...it is the automation that allows that.

Could you provide some percentages of the different main expenditures?

amm...A grower of the money that they...lets put as supply side for kiwi berries nearly half of it would be picking and packing costs over half, nearly half is just the picking cost and then the packing cost is over half and then the rest is for production and distribution.

Do you see a difference in price for the domestic market and the export market?

Ye ye ye definitely!! And the export market is growing a lot rapidly than the domestic market. Having said that, when fresh max has gone into the kiwi berry business growers were exporting all...because in New Zealand we are not like you Italian people where fresh fruit is such a big part of eating, is getting better but in New Zealand because so many people live in a house with a garden where they can get a lot of fruits for free they don't spend money into fresh fruit as some of the European nations. Moreover making them spend money for an expensive fruit like kiwi berries is very hard and they don't even know what kiwi berries is. So it is hard to get kiwi people to try something new so when the fruit has been exported the growth has been very strong. We want to get a domestic market ready for take off but the current infrastructure cost of the pack house don't allow those costs to allow kiwiberries to be sold to kiwi people.

Do you have an estimation on a possible domestic and export costs?

No it is very difficult to make. But you don't have all the costs you would have for transport and deliver from the New Zealand market.

Why did you selected the green variety instead of the Margi red?

Annn...we believed it was a better variety. More consistently eaten quality, it taste better and has got very consistent yield history from a growing production point of view. It has been a very well segment for market, because the margi red has been viewed bad from consumers because it has a sort of brownie muddy red they think that it must be rotten or in same way damaged. For an expensive fruit they expect to have the best and with the green one you don't have the red blush.

Don't you think that the red variety taste better?

Over the last two years we have done a certain percentage of Margi red but the customers have always preferred our green varieties over the margi red.

Don't you think that the red variety is more associated to the berries category by consumers?

Amm it might be. I guess if it was totally red or totally purple but I guess it just comes down to the market. It is all about marketing and the information you gave to consumers. It tooks a while to make consumers realizing that the green little piece of fruits could be a berry. Just because it is not a raspberry or blueberry it doesn't mean that it is not a berry. And againg this is part of the opportunities you will have. If you look at the apple category for example and what they have done...a green apple a red apple...is still apple! So it is the same concept with berries! And then you would have multiple colours of kiwiberries, so you would have many different opportunities.

Did you had to advertise a lot this new product?

We haven't done a lot of consumers advertisement but we focused on educating with trials and stand to educate consumers. And the we opted for emotional marketing and consumers labels. Once we will reach higher volumes and better results we will invest more.

Do you normally associate kiwi berries in the shelf close to berries?

Mostly we have put that close to berries and we have done that because they need the chilling department. Some of the nZ retailers did not and some of the Asian retailers too but generally yes. You know we are trying to pack it in the next season as a snack cup so that you can also have them in the car. So for this kind of staff you might have them in the petrol station so if you are a little bit hungry you don't buy an ice cream or a chocolate bar but an healthy choice.

When you select markets do you normally also look at the proportion of modern retailers and traditional retailers?

Because we are quite predominately to Asia we still have a proportion that goes to traditional channels and then modern retailers. Traditional retailers are not a problem you know they just have bought a pallet of them and then give them away to customers to try so customers came back the next time and they buy six trays within a week. But it is pretty a challenge.

DAN PEACH-CHAIRMAN OF NZ BLUEBERRY ASSOCIATION

Which are the major uncertainties that you have to deal with in the field?

I guess the issue that we have had is the same of other crops we have because we all have to deal with environmental conditions which are changing all the time. You know and that is the same no matter what is the crop whether it is argute or blueberries. You know rain and wind and frost...

What about from an agronomic point of view?

Yeah I think blueberries are really different to kiwi fruits and apples and grapes and also they are a very small industry and there is not a lot known in terms of agronomic held. There is no book or rules that help to plant a blueberries orchard or to continue to grow...it doesn't work like that. Every grower has to make their own judgment and this things over time which is quite difficult. And I think that when people comes to this industry when they comes from kiwi fruits or avocados or apples they find it very difficult because they comes from industries where there is a book, there is advice on how to do this things. You know when it comes into spraying they look into books and they know exactly how to spry. When they want to do pruning they ask to a number of contractors and the contractors knows what to do and they do the job for you, you don't have to train them, they know....For blueberries there is no such help, experience and manuals...you are on your own.

When did the industry started in New Zealand?

So they industry from the very very first has been here since 1970...

Oh okay, it pretty a lot of time. Didn't you had possibility to increase this knowledge and share it?

Most of that early work was more at a research level and not commercial. But commercial level maybe the late 1990...

Al the growers produce also other fruits?

Most of the growers mostly grows blueberries...there are few that have other crops as well but most just grow blueberries. When the industry started in 1990 a lot of people got involved at that time they where looking to a crop to get involved and a lot of people thought that it was a good way to make easy money. A lot of people got into it who though it was a weekend activity and a fancy place to took family for a picnic, you know...Of course it didn't work like that. Most of that people went broke, some of those farm are still in operation today but they are very small farm and are operated by other ones and they can do more than one so they can do some economies of scale. So it is a crop that requires a lot of attention.

Which are the major costs for the current industry?

Labor is our biggest cost for sure. Labor for harvesting and pruning. And also packaging.

Do you have an estimation of the costs?

No I don't have this staff on my head sorry...

Do you have multiple harvest for blueberries?

Yes, so for each variety we go through four/five times. So each grower would usually grow five to ten varieties and so the harvest can be quite long and many individual harvest for each variety so usually the picking is every day or you know...

Which is the harvest window?

For me personally we have 6 months...

This is quite a lot. Do you think that having multiple harvest is an advantage for the market window?

Yes and no. It is an advantage for continuity of labor, it is an advantage for access to the market place but having said that during a period of time where the market place is not the same you know it might start in November and it might be local market but only certain buyers for the local market. And then once we reach certain volume it changes to a more commercial retailers in domestic sales and then once you get to February and March then it will be export focused. And then in may

June it probably goes back to more domestic again so the advantages that we might get from a longer season it is not necessarily true because we are shifting from a market to another.

Do you have an idea of why it is like that?

Amm... for me is because the export is where the more money is but the local market usually is not paying as well and there are some growers who are just focusing on the local market and those guys are just leaving to do the local market. so every grower has a mix of different varieties depending on where the farm is and what varieties have got and and therefore the market would be different.

Do you think consumers recognizes those varieties as different?

No, a blueberry is a blueberry for consumers. When they eat it they can tell differences but there can be differences within one variety as well. Differences from farm to farm.

And the price?

Yeah the price is variable as well.

On what does depend?

Time of the year mostly, about the supply and demand.

Do you have an estimation of the price per kg?

That is really difficult...maybe 15 dollars a kg generally in average for both market. If you are only growing fruits in August September and October, his prices may be 15 dollars per kg because he is in a window when anybody else has any fruit. You know every grower have different timing when they supply and therefore different average prices. Even within that you would have some varieties that are oldest selections and the quality would be recognized as not as good maybe the shelf life is less or smaller berry and therefore you have a smaller price. So you have got to make an average.

So retailers recognizes the varieties but not the final consumers?

Correct.

Which are the criterias for growers to select the varieties?

There is really no criteria. It kind of depends where you grow so there are lots of places where you cannot grow lots of the varieties so you are quite limited and it might be that the ones that you can grow are not the best flavours or shelf life but it is all you can grow and but maybe the timing is such that the local market is such that the consumers are still paing good money for a lesser quality simply because there is nothing else around. And this is an advantage of having just one perceived varieties by consumers. Every grower so it is able to find a little bit of a niche where everyone can find a return. If a variety is not good and they cannot sell easily then they have to look at other ways to extract value from those berries and so they get involved in making ice cream for example or juices.

Do you think that having multiple harvest creates problems during packing activities?

Not necessarily confusion, it just requires more organization. I mean I have a pack house as well and it is a good thing I can employ more labor for a longer period of time because I can get them work for a longer period and they get used to that rather than just short one month window when I have to change people up to do a complex job.

What about issues with pack house capacity and harvesting period?

I guess some people might have problems, we have put a lot of energy in knowing what is going to come and in making sure that we can handle that not only from a packing point of view but also from a sales point of view.

From a sales point of view why is it hard?

It is more challenging for sure but is just one of the things to do.

How do you sort the product?

We have some automation in the pack house, we have color sorter and sort of sorters where we can do defect sorting and then we have automated packing which weight the punnet. This is a huge way to reduce costs and also continuity in terms of quality output. For berries is very important. Before it was a lot more by hand and there are still some growers that does by hand and it is more difficult for them for sure.

So at the end you sell to the market just one class of blueberries?

We do not differentiate by size although is you have got a particular kind of fruit you can find a good market for these things. We don't recognize classes of fruits quality but there is definitely quality which is better than others. And probably determines the destination of the fruits more than anything so if probably if we define class one for the export, class two is does not necessarily means a bad quality it does still the export but just to a destination which is closer. It depends on why it is class two. It might just be shelf life issues or it might just be a berry size issue or...yes so it depends on the reason.

For example, if it is a size issue, to which market do you sell the product?

Amm...it would still go to the same market but we just have got to look of premium in terms of price and making them aware of that sizes are better than the competitors product which will give him sales advantages and therefore we would expect a bit of return for it.

Going back to the process, did you adopted special technologies that helped the distribution? Like bbc and smart fresh..

Yes so we took on bbc technology because they are recognize blueberries world class machinery provider.

Did it worth the investment?

Am...instead of investing in R&D we just buy the product. These machinery though are very expensive and you need a lot of product to go through to justify the cost and that's why I became a packhouse that pack also for other growers.

Which advantages did you recognized by bbc?

Well I think that at the time when I was buying them they were the only provider but because they were local I felt that there were some advantages in service and maintenance. Better if they were from America.

And in terms of effective technical help in the distribution?

I think bbc probably is better than competitors but I don't think that in the market place anybody can recognize that a fruit has been packed by blueberry country machinery rather than ianb or laincourt.

Does it makes the process faster?

Yes faster and gives mainly uniformity.

Which is the laps of time from harvesting to packing?

Ammm straight after. We do pre-cooling, there is no washing, we get the failty remove and we try to pack it the same day. And then pre-cool and if it goes to export we will afumegate with a ... and then it will be to the fright forwarder for further pre-cooling and ready for distribution. They would sell straight away so if we are gonna get that today and they would put it on a plane tomorrow and then to the market place straight away.

Do you put the product in the cold store already in the market format?

Yes. We have trays of 12 punned by 125g and I think it is the same for kiwi berries. Sometimes sizes can be different around the world but that is New Zealand size. But we normaly do not store the product for longer than one night or a couple of days.

Which is the average distance between the pack house and the grower?

For me is probably 15 km, maximum of maybe 30 km in any case it does not really matter that much for that short distance.

Could you please provides me an estimation of the total volumes of blueberries in New Zealand?

Nz would produce about 2 and a half thousand tonnes. We would export about 1 thousand tonnes, less than a half. The domestic fresh production would be 800 tonnes. We have the advantage of being able to process the fruit, it gives us more flexibility against the perishable nature of the fruit. In any case the stuffs that goes into the freezer for processing which is the difference between the total volumes which is 2 and harlf thousand tonnes minus export minus domestic would be processed production. But that stuff has a really small margin of return and not a good way to make money. We just do it in case of necessity.

How many hectares are present in new Zealand?

I don't know, to make an estimation 800 hectares but we don't really have a good figures.

To which market do you normally export blueberries?

Australia because it is probably one of the only one we have got because most of the other market where we used to go now there is too much competition from south America so actually Argentina and Chile. They are way cheaper than new Zealand. We used to send a lot to Asia but not anymore. We used to send to Japan and America but no longer.

Not considering this competition, which do you think are the most demanding markets?

In terms of the one we want to send the fruits to Australia. Because is the only one we have but also in general.

From a logistic point of view did you never considered see freight?

Yes we tried but we haven't have god result for that. New Zealand is really too small for that to get enough for see freight containers. You now you need to get enough..pretty much all the same varieties picked and packed the same days and new Zealand it is really too small to produce these kind of numbers. When you do max shipments of varieties or growers or days you get a very packed out terms.

How many growers are present in nz?

Registered growers in NZ are 70.

Does they have costs of certifications?

Just as any others crops, we have costs that we spray daily you know requirements and then requirements in the packhouse.

Do you see uniformity in the adoption of new technologies between growers?

No. in the last couple of years some growers adopted bbc technology, most of them by buying second hand machineries because it is cheap you know.

Do you think this not uniformity is a problem of the industry as a whole or it is just their problem because it is harder to reach economies of scales?

Well it is a problem for those who cannot implement technology but it is good for me because it makes my product better than anyone else.

How technical information are shared among growers?

They are not really shared, it is more individualistic. I mean we do some field day with some sharing of information but a lot of people would keep their idea for their selves.

How do you manage inventories? In which aspect do you take in consideration the perishable nature of the fruits?

We do not have shares as in the kiwi fruits industry. I know how much fruits is gonna be coming and I make sure that I sell all of it. There is no percentages but I just make sure that I sell all of it in a short time. To do that it is not just day to day you know we have five year projection for each grower, for each varieties so we know where things will go in the future and we are sharing those informations with our marketer and also in the market place so they know what is coming. In regards to inventories management for the most part we adopt first in first out depending on the particular market that want that fruit that day.

How do you make market forecast?

In terms of demand I don't need to do that, my marketer does that, well they do it in conjunction with the buyers in the market.

How do you deal with the mismatch of D and S?

You know NZ is a very small producer, 1000 tonnes is very small and so we have been very luck in the past 5 years to haven't got the issue. S and D has been in our favour. I know in other years we had problems with that and usually it might be for just one or two days and then we sorted out and is gone. Given a little bit of shelf life you know we can handle that problem, we haven't got any issues we had a nice situation.

Which is your shelf life?

Depends on the variety and the conditions on the orchard...but probably I would like to think that after the ship has left from nz there are probably 2 weeks of shelf life. So overall 3 weeks including the time in the household. But some varieties can be just 3 days and obviously that determine where the products will go. For example that would be where there are no long distance shipping requirements, not even to Christchurch for instance because it takes two days. We need Hamilton or Tauranga...It is still class one but is not class one for Australia.

Who is your exporter?

Ad8 but there are many different exporters.

Do you cooperate with your exporter in sharing information for example?

Yes for everything, we talk multiple times per day.

And what about the importer in Australia?

He has began an arrangement with the importer in Australia as well so the informations that I am sharing with my exporter I am also sharing with the importer in Australia. And I visiting him multiple times per year and he visited my farm in Australia. We know each other very well, relationship is important.

How do you deal with the size of the order?

I guess because the demand has been more than supply for the most part, you know whatever we can pack the size of the order...But I already let them know for February March and April an estimation on how many trays per week we will be delivery so they have this information already. This information are divided by week by variety and we just keep them updated so they have a long understanding on how our system works. Regarding the order size they doesn't keep any stock in Australia it pretty much goes straight away but they know what is coming so they can make sales to suit and price to suit as well. So for example last year we had a problem and we didn't supply as much as we though we were going to for maybe three weeks and they were maybe expecting 10 units so they arranged for 10 units and we only supplied for 8 units and we effectively undersold. We should have got more money because we should have give better information on how much you are going to have.

When did you send the product from Auckland?

Yes.

How many times per week do you ship the product?

Every day.

How is the impact of the freight cost on the final price?

Yes it is very expensive but it is just one of the things we have to do but it has a huge impact on the final return yes.

Are you still happy from the blueberry business?

I wouldn't recommend to anybody because you know I think the mistake that most people make is...is you know because blue berries is an industry where we spent quite a little bit of money to promoting our product and we had a lot of good publicity about our blueberries and I think that a lot of people have taken this and assumed that growers are taking a lot of money. So they go hey I am going to buy a blueberry farm or hey I already have a block of land and I am gonna put blueberries in it and they rush out and they put blueberries in it and after 2 or 3 years time thay say uhm we are running out of money you know...They doesn't consider how hard it is and I think that people that knows that they would actually not start. So if you don't have a marketing plan you really go into trouble, at least to have a very good price to cover you cost. That is really important for this business.

I thought that because consumers already included blueberries in their habit and is a very well known product for its health benefit, The demand is not pretty much present and stable...

Yeah I don't think that consumers buy them because they are good for health but just because they taste good. I don't think they attribute another value to doing that. I think that when they go to the supermarket and they look at the price they think hey that is more expensive than banana or more expensive than strawberry. I don't think many people would think hey but they are a lot more healthy.

Did you never export blueberries to Europe in the past?

Yes. We had no quality issues but we only had two weeks window opportunity between one country having a strong arrival and another country and because is such long way going to that market we did not have too much time to organize shipments and getting into the market. You know it makes it quite hard.

What do you think it is the biggest competitive advantage in comparison to New Zealand?

Genetics and labor costs. A lots of the farms in Chile have got American finance behind them to found genetics. So they have a bit more quality than New Zealand. New Zealand is maybe 20 years behind.

So do you think this is the reason why they are able to ship blueberries around the world instead of using air freight?

Correct. Investing in genetics and increasing the connection between technology and genetics is the key to be competitive. The issue for us is to get genetics down here, it is hard because this is owned by private breeders and they expect you to buy the genetics and try to enlarge the area every year and also to pay a fruit royalty to them. So the costs are very high and because nz is pretty small the amount of plant for variety won't be strong enough for those breeders to be interested in materials for nz.

ROMUALDO RIVA – ORTOFRUITTA ITALIA COMMERCIALE

Quando avete iniziato la produzione di kiwi berries?

Abbiamo iniziato a vendere nel 2013 ma avevamo iniziato a mettere le piante già nel 2011.

Quanto è la vostra produzione?

Quest'anno abbiamo venduto circa 600 mila punnets. Abbiamo stimato che è circa 1/5 di quanto produrremo il prossimo anno.

In quante organizzazioni vendete kiwiberries come Nergi?

Allora, praticamente siamo un club all'interno del quale operano tre aziende: Fruitworld a Breda in Olanda, Prim'land in Francia e Ortofrutta Italia. Fruitworld e Ortofrutta Italia sono altamente specializzati in berries. Noi trattiamo specialmente mirtilli e lamponi.

Dove producite Kiwi berries?

La nostra produzione è divisa tra Portogallo, versante Atlantico del sud della Francia, Belgio e Piemonte in Italia.

Quanti ettari avete?

140 totali. Solamente in Piemonte abbiamo 70 ettari. È iniziata come una valida alternativa alla produzione di kiwi.

Vendete in confezioni di 125g?

Sì, abbiamo anche considerato l'ipotesi di vendere in confezioni più grosse ma non per il momento. Le mettiamo in cassette da 12 cestini di frutta.

Qual'è il vostro numero di cassette per EURO pallet?

196 per pallet.

Quali varietà coltivate?

Principalmente Rua, Tahi e Toru.

Le vendete miste nei cestini?

No mai. Anche perché La Rua ha una forma più allungata e pesa 14 g per frutto mentre la Tahi è più rotonda e pesa 10 g per frutto. Ci sarebbe troppa variabilità nel cestino.

Qual'è stato il motivo della scelta di avere più varietà?

Volevamo sperimentare. Principalmente possiamo allungare la stagione di qualche giorno. Infatti la Rua germoglia e fiorisce circa una settimana prima della Tahi il che ci permette di raccogliere 6 giorni prima. Crediamo molto nell'importanza di avere una buona varietà per questo Rua e Tahi sono brevettate. La varietà ci permette di avere una qualità superiore riconosciuta dal consumatore sotto il nome di Nergi. Per questo abbiamo investito molto nel marchio Nergi.

Quanto dura il periodo di raccolta?

Qualche giorno, iniziamo nei primi 10 giorni di Settembre e cerchiamo di finire il prima possibile.

Raccogliete in diversi momenti?

No tutto insieme e poi selezioniamo subito e impacchettiamo e mettiamo in stoccaggio per l'affinamento a 2 gradi.

Non avete problemi di sfalsamento della tempistica dei germogli e quindi frutti con diversi gradi di maturazione sulla pianta?

No abbiamo tutti frutti uguali sulla pianta.

A quale grado brix raccogliete?

Raccogliamo a 7 livello brix e con una sostanza secca superiore a 12.

Quali sono i vostri criteri di selezione dei frutti?

Selezioniamo i frutti per calibro e difetti. Abbiamo 3 diversi calibri che vendiamo allo stesso prezzo. La ragione è per avere maggiore uniformità nei cestini. In questo siamo aiutati dalla tecnologia. Per noi la qualità percepita dal consumatore è molto importante dal momento che mettiamo il nome Nergi. Un altro criterio di selezione invece riguarda i difetti. Vendiamo due diverse qualità, Premium e Medium. Entrambe a nome Nergi ma con la specificazione sull'etichetta.

Una volta che avete impacchettato ha detto che stocate il prodotto a 2 gradi, per quanto tempo?

Può resistere per tutto il periodo di vendita. Noi consegniamo un prodotto pronto al consumo, quindi il frutto ha bisogno di un affinamento per trasformare l'amido in Zucchero e per arrivare ad una durezza accettabile. Una volta consegnato il

prodotto può stare 10 giorni prima di essere mangiato. Dopo 10 giorni nessuno lo compra perchè il colore diventa verde scuro e vedono dal numero di lotto che ha più di dieci giorni.

Quindi dalla consegna avete una shelf life di quanto?

10-12 giorni se tenuto in banco frigo, a temperatura ambiente ci aspettiamo circa 7-8 giorni.

Vendete solo kiwi berries a nome Nergi?

Noi sì. Nella stagione invernale fruit world vende anche kiwi berries cileni ma non a nome Nergi. Il prezzo è molto inferiore.

Qual è il vostro prezzo?

Proponiamo un prezzo DDP dall'Italia all'Olanda di 1.50 euro per cestino quindi 18 euro per cassetta. Tutti i nostri prodotti sono certificati Global Gap. Parliamo di un prodotto molto diverso dai kiwi in termini di prezzo. Se pensi lo scorso anno i kiwi Zespri venivano venduti dai 3,50 ai 3,90 euro al kg mentre Nergi viene venduto a 1,99-2,19-2,29 per 125g.

Lo associate quindi più ad un berry che a un kiwi?

Sì decisamente anche se 15 produttori certificati GG fanno anche kiwi.

Quanto dura la vostra stagione?

Dai primi dieci giorni di settembre a Novembre. Circa 2 mesi. L'hanno scorso avevamo tutto sold out ad Ottobre.

Come è stata la prima reazione del mercato?

Abbiamo investito molto in comunicazione e promozione. Molto spesso anche con stands nei supermercati per far conoscere il frutto. È stato fondamentale far sì che i consumatori lo abbinassero ad un berry. Dal 2016 inizieremo a provvedere nei retailers anche all'estero.

Avete in programma di aumentare la produzione nel 2016?

Nel 2016 vorremmo arrivare a vendere per almeno 2 mesi e raggiungere i 2 milioni di cestini che significa 20-25 mila quintali quindi 2 milioni di kg.

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