GEORGE MORRIS CENTRE

Canada's Independent Agri-Food Think Tank

Ipsos Canada
CANADA'S MARKET INTELLIGENCE LEADER

Consumer Market Research Strategic Study for Fresh Grapes and Fresh & Processed Apples & Tender Fruit

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2008 Orchard Fruit & Vineyard Quality Assessment throughout the Value Chain

Final Report Appendices E through L

Date: October 30, 2009

Value Chain Management Centre

Appendix E Peach Suppliers, Inputs, Process, Outputs, and Customers (SIPOC) Diagram

The SIPOC acronym stands for Suppliers, Inputs, Process, Outputs and Customers. The purpose of the SIPOC diagram is to provide a high level overview of the value chain, including its stakeholders (customers and suppliers), and the inputs and outputs critical to its operation. In this instance, it provides an overview of the peach value chain that was evaluated in detail during the execution of the project.

The starting point is the 'Process' section or column. Here we have set out the high level sequential elements or steps in the value chain. To the right, we identified the key outputs of each value chain element and who receives them, the “Customer(s)”. Next we worked to the left of the “Process” column and identified the key inputs for each value chain element and where they came from/who provided them, the “Supplier(s)”.

Thus, if a particular process input, such as maturity testing prior to picking was not well or consistently executed, this would be a potential weakness in or threat to the chain.

SIPOC Diagram: High level Peach Value Chain

SUPPLIER(S)	INPUTS	PROCESS	OUTPUTS	CUSTOMER(S)
• Industry • Grower	• Varieties • Density • Irrigation • Spraying • Pruning • Thinning • Age of Trees	**Orchard Husbandry**	• Size • Volume • Colour • Quality	• Packer • Retailer • Consumer
• Grower	• Pressure • Brix • Acid • Colour	**Pre-Harvest Testing**	• Quality • Shelf Life	• Packer
• Grower	• Training • Supervision • Safety • Ladders • Maturity Testing	**Picking**	• Quality • Volume	• Packer
• Grower • Packer	• Handling • Picking Rate • Cool Chain	**Post Harvest**	• Quality • Storage	• Packer
• Packer	• Cool Chain • Fruit Quality • Equipment • Training • Rate of Pack • Grower Interest	**Grade and Pack**	• Volume • Quality • Reports	• Retailer
• Retailer	• Time in Storage • Cool Chain • Demand for Fruit • DC Practices • Receipt Inspection	**Retailer DC**	• Volume • Quality • Schedule	• Retailer
• Retailer • Consumer	• Produce Standards • Display Size • Demand	**Retail Produce Department**	• Volume • Margin • Customer Satisfaction	• Consumer

Appendix F Process Failure Mode and Effects Analysis (FMEA) Overview

The Process Potential Failure Modes & Effects Analysis (PFMEA) was developed several years ago by the food processing industry as a tool to assess risk and improve process controls based on the level of risk. The first task is to consider and assess the risk of the current state process or situation. This is analyzed on the 'left side' of the FMEA form.

For each high level step in the process, consideration is given to what could potentially go wrong (failure) and what the effects of that failure might be. The severity of the failure is scored on a scale of 1 to 10. A score of one is inconsequential while a 10 is the most severe outcome.

Next potential causes are identified and scored based on potential or actual occurrence, again on a scale of 1 to 10. A score of one is an infrequent occurrence while a 10 is a very frequent occurrence. Finally the degree of process control is assessed. This is addressed in terms of either preventive actions (that prevent causes of failure from occurring) or the potential to detect when a problem has occurred. Again the scoring is on a scale of 1 to 10. A score of one is excellent process control, there is little chance a problem could occur or go undetected; while a 10 indicates no process control, no prevention of a problem and every chance a problem could escape undetected.

The severity, occurrence and detection numbers are multiplied and the resulting product is called the risk prioritization number (RPN). For multiple step processes, the RPN indicates areas with the highest risk, which should be worked on as a matter of priority.

Example
Consider the process step of deciding when to pick peaches. Picking them too early would mean that the fruit either has a low shelf life or is too hard when it reaches the retailer / consumer. Since this outcome would cause retailer / consumer not to be able to eat the fruit when they wanted, we might score the severity in the area of a 7 or 8. We will pick 8.

Next we consider some of the causes as to why fruit might be picked to early or too late. Causes might include a lack of quantitative testing by some growers. If we considered the number of growers who did not conduct any kind of structured test to make a decision to pick, and found it very high, we may choose a high occurrence score of say, 7.

In considering the current methods of deciding when to pick and found them to be subjective and based on experience, we might score detection at around a 6 or 7, we will choose 7. Thus the RPN for picking decision is 8 x 7 x 7 = 392

Let's compare this process to a differentiated peach grower in California who conducts ongoing testing as part of their picking process. The severity of picking fruit that is too hard or too ripe is still the same, 8.

However, by formalizing a pick decision testing process across several contract growers, the degree of process control has been increased. Thus we might score detection at a 2.

As a result of using a formalized picking process, the occurrence of picking fruit too early or too late has decreased significantly, such that we might score Occurrence at 3.
Thus the RPN for the Californian growing area is 8 x 2 x 3 = 48, indicating a more robust process with less risk of causing dissatisfaction to retailers/consumers

One can debate whether a score of 7 should be a 6 or even an 8 – it does not really matter, the fact is there is a difference in the degree of risk to both growers and their customers. In the case of the California growers the risk is reduced because of better processes and controls.

The Future State FMEA

This is built and analyzed on the 'right side' of the FMEA form.

Those with process knowledge will decide what actions they might undertake to either increase prevention and/or implement by way of process controls and detection. Generally when process controls are improved, the level of occurrence is reduced. Severity of failure mode will generally remain the same. As ideas are generated and action plans developed, the future Occurrence and Detection scores are estimated. The proposed actions should be sufficient to make an order of magnitude to the RPN number. Once the ideas have been actioned and implemented, the (SOD & RPN) scores are reviewed again to determine if the actual met the estimate. As such the FMEA becomes a living document.

Suggested Scoring Criteria

A number of industries have developed their own standards for generating FMEAs; this includes scoring criteria specific to their industry. The scores below are intended as a guide to the tree fruit and table grape value chains.

Severity	
9 to 10	Potential to cause a food safety issue, breach regulations
7 to 8	Potential to cause consumers/retailers to stop buying product
5 to 6	Potential to upset consumers/retailers and cause them to complain
3 to 4	Some degree of consumer/retailer dissatisfaction
1 to 2	Minimal inconvenience to consumer/retailer
Occurrence	
9 to 10	Issue occurs on a frequent basis – daily
7 to 8	Issue occurs often – weekly
5 to 6	Issue occurs sometimes – monthly
3 to 4	Issue occurs occasionally – once every 3 months
1 to 2	Issue may happen once a year
Detection	
9 to 10	Very low Potential to prevent or detect a problem
7 to 8	Low Potential to prevent or detect a problem
5 to 6	Some Potential to prevent or detect a problem
3 to 4	Reasonable Potential to prevent or detect a problem
1 to 2	Very robust prevention and detection measures in place

Peaches PFMEA (1 of 2)

Peaches: Potential Failure Mode and Effects Analysis

Current state												Future state					
☐						☐											
Item / Function	Potential Failure Mode	Potential Effect(s) of Failure	S	Potential Cause(s)/ Mechanism(s) of Failure	O	Current Controls		D	RPN	Recommended Action(s)	Responsibility & Target Completion Date	Actions Results					
						Prevent.	Detect.					Actions Taken	S	O	D	RPN	
Orchard husbandry	Inappropriate or inadequate	Poor yield, poor quality, low margin, customer dissatisfaction	8	Lack of processes and shared data/information to make decisions. Each grower believes they know best	8	None	Poor quality is detected at the packer, distributor, retailer or consumer if pears are too green or too ripe	8	512								
				Older trees not replaced, yield and quality decline	4	Process peach replant program introducing new stack		3	96								
				Inadequate prune, thin or spray	4	grower knowledge and commitment		4	128								
Pre harvest testing	Pre harvest testing is not performed or results are incorrect	varieties are picked either too early or too late, leading to poor shelf life and low quality	8	lack of resources and/or lack of desire to invest in and/or share testing equipment	8		subjective decisions by grower based on experience, may be influenced by downstream demand	9	576								
				not interested grower knows best	8	education and standards		8	512								
Picking	Volume and quality of fruit picked are inappropriate to customer and consumer needs	Wasted packing costs, low quality, low margin	8	low quality fruit is produced	8		None until peaches arrive at packer or distributor, or retailer DC or consumer complaints	10	640								
				inadequate picker training	3	Some growers use casual labour hired for a few days		4	96								

Peaches PFMEA (2 of 2)

				inadequate grading reports and feedback to grower	8	most grading and packing is done on the farm. Very little data maintained . None		9	576							
Post harvest processing	Inadequate cold chain	Retailer shrink ~3 x imported fruit. Variation in consumer experience	8	Significant variation in (and/or lack of) cold chain stresses fruit and reduces shelf life	9		None	10	720							
Grading and packing	variation in quality of peaches, equipment, training and standards	variation in quality of peaches packed, ripeness,shelf life, visual appeal and customer satisfaction	8	variation in orchard husbandry and picking decisions	8		No standard approach or required controls	9	576							
				Variation in investment and type of equipment	6	large packer operations. equipment is adequate for purpose		4	192							
				inadequate grader/packer training	2	Training is generally adequate		2	32							
				grader/packer fatigue	2		Process is largely automated - therefore likely not an issue	2	32							
Retailer distribution process	inappropriate receipt inspection criteria and/or inadequate product handling	good loads rejected/bad loads accepted. Good product is spoiled	6	Lack of inspection standards and training	4	Dedicated and experienced personnel		5	120							
				Poor internal handling processes	3	Retailers own product and are accountable for losses		2	36							
Retailer produce department	inadequate storage, handling and display maintenance	High rate of shrink, consumers walk on by, low margins	8	Lack of standards and inconsistent produce dept practices	8		lagging indicators, sales are down, displays look poor, shrinkage is high	9	576							

Appendix G Quality Management and Strategic Alignment in Ontario Fruit Value Chains Interview Guide

Research Objectives

1. Determine the quality of Ontario vs. imported fruit from a consumer perspective – and the effectiveness of quality management systems from orchard through to purchase. For instance, do any weaknesses exist in Ontario vs. others' production and shipping practices/processes that impact down-stream stakeholders and result in consumer dissatisfaction?

2. Do foreign exporters such as US and Chile do a better job at marketing and distributing product compared to Ontario? If so, what does Ontario need to do to compete against the imported product?

Target interviewees

Given the typical time constraints of participating businesses, the interviews should target all of the high priority chain participants listed below

- Agricultural input suppliers
  - Including co-operatives, agronomists, consultants
- Producers
  - Sufficient to provide a representative view of differences in growers' size/resources and capabilities
- Packers / graders
  - Sufficient to provide insightful perspectives on factors associated with harvest, grading, storage, transport which ultimately determine quality
- Wholesaler / distributor / shipper – *sought interviewees*
  - Senior management
  - Procurement
  - Marketing
  - Quality control
- Retailers
  - Senior management / executive
  - Category manager
  - Procurement
  - Quality Assurance
  - Store / department manager

Interviews

The interviews need to gather sufficient evidence to assess the extent of quality management practices and quality related issues occurring along the value chain. They also need to gather sufficient evidence to assess the level of strategic alignment that occurs along the value chain. The preferred approach when interviewing is to include respondents' initial reaction to the questions, then ask them to elaborate using specific examples. Unsubstantiated opinions are less valid.
At the start of the interview explain:

- the project's objectives
- the interview's primary objectives are to assess:
  - The extent of current quality management practices and the impact that current practices/outcomes have on business performance;
  - The potential for improving upon current quality management practices and how this might translate into improved performance;

- The level of strategic alignment between the business being interviewed and their suppliers/customers

- That all interviews are being conducted anonymously

Context questions

1. What is your role within your business and the chain? (If grower, include size of farm; management structure; mix of enterprises)

2. How long have you been in your present role and what are your responsibilities?

3. How do you define and measure quality?

4. How to you define and measure performance?

5. What does success look like from your perspective?

Strategic alignment

1. How significant in (type) of Ontario fruit to your business? eg in terms of volume, value, contribution to growth etc.
    a. How does this compare to imported fruits of the same type?

2. What are your priorities when dealing with Ontario suppliers / customers of this (type) of Ontario fruit?
    a. e.g., improving efficiency; maintaining or growing value or volume; developing existing markets or expanding markets; improving environmental responsibility?
    b. Are your priorities the same when dealing with importers?
        i. If not, why?

3. To what extent are these priorities discussed with, and shared by your suppliers and customer(s) of this type of fruit?
    a. In what context, and with whom, do these discussion take place?
    b. What differences (if any) exist between your discussions with Ontario versus importers?

4. What, if any, benefits do you see from greater collaboration:
    a. Upstream with suppliers (both direct suppliers or indirect suppliers further upstream)?
    b. Downstream with customers (again, direct and further downstream)?

5. What issues or hurdles do/have you face(d) in trying to increase the extent to which you collaborate with suppliers/customers?

Operational culture and structure

1. How is performance, particularly in terms of managing quality in relation to set targets, communicated with suppliers / customers?

2. What contact do you have with suppliers and customers at an operational level?
    a. Who are involved at these meetings?
    b. How often do they occur?
    c. What is discussed? i.e. medium/long term expectations and plans; recent or foreseeable changes in the competitive environment and their consequences?

    d. Do differences exist in your contacts with suppliers of Ontario (fruit type) versus importers

3. In terms of the opportunities that you see to improve the quality and performance of Ontario (fruit type) and the benefits that they could provide you as a business, what are your greatest frustrations and disappointments?
    a. What barriers or hurdles exist to achieving those opportunities?
    b. Do you have suggestions for how those barriers could be addressed?

4. What is your businesses' investment strategy? Has it been discussed with others in the chain? How well does it fit with their strategies?

Questions for distributors and retailers only

1. How would you describe your relationships with Ontario suppliers of (fruit type) versus importers?
    a. On a scale of 1-10, how would rate those relationships, and why?
    b. On a scale of 1-10, how would you describe their comparative capabilities, and why?

2. Is there anything that importers of (fruit type) do better than Ontario suppliers of the same fruit?
    a. E.g. quality management, consistency, delivery, packaging, service, consumer research, category management, promotion?

Trust and commitment

1. Do you like to keep your options open through having different customers? Why? How often do you significantly switch output to different customers?

2. Do some or all of your suppliers try to keep their options open? How often do they switch to other customers? What causes this, and what impact does it have?

3. Does the customer in this value chain keep its options open? How often does it switch significantly to other suppliers? What causes this, and what impact does it have?

4. Do your suppliers and customer(s) deliver on their promises to improve product or service performance? Give examples of when they have &/or have not (NB: ensure this includes when example comes from).

5. Can you give examples of when you have given or received sensitive commercial or technical information from a supplier or customer in this chain? Has a request for such information ever been made to or by you and been refused?

6. Have you developed any assets (products; infrastructure; expertise; information etc) solely for this chain? If so, did you fund this yourself or with help? Did you receive due recognition and reward for this investment?

7. Have there been any joint ventures within the chain? e.g. involving joint funding and ownership?

8. Are there any exclusivity agreements within the chain? e.g. of a variety or product, or from a particular source?

9. What lengths of relationships and contracts do you have with suppliers and customer(s)? Are different suppliers dealt with differently, and why? If the contracts with customers and (some) suppliers are of different lengths, why? How does this reflect spreading risks/benefits of commitment within the chain?

Co-operation

1. Do you think there is mutual understanding with suppliers and customers in the chain about each other's businesses? If not, what examples are there of adverse consequences?

2. Would you describe your relationship with your suppliers and separately with your customer(s) in this value chain as being:
    a. High challenge driven by customer
    b. High challenge and high support (give examples of support)
    c. Mutual development (give examples of joint projects)

Performance management; sharing risks and rewards (incentives)

Performance management

1. What Key Performance Indicators do you have
    a. For suppliers,
    b. Internally,
    c. With customers?

    Are these consistent? If not, why not?

2. Is regular feedback held with suppliers and customers on performance? What is discussed? What sort of suggestions for improving performance are made, either for you or them? Were they implemented?

Sharing risks

3. Are risk and uncertainties identified with suppliers/customers? e.g .
    a. variability in yield/quality of supply or in volume of demand; changing market competition or consumer preferences?
    b. What use is made of foresight, eg identifying causes of change; discussing what the long term future might look like and how to prepare for it?

4. How are these risks managed? e.g. are risks managed collectively and in the interests of the whole chain; are there mutual contingency plans?

Incentives

5. What incentives are in place with your supplier(s) in this value chain? What incentives do you have from your customer in this value chain?
    a. What are the nature of these incentives? (financial/non-financial)
    b. To what extent do they reward commitment/collaboration, quality, volume, reliability, efficiency &/or adding value? Do they reflect each partner's added value, costs and risks?

6. [If relevant] What incentives are there within the firm for employees? What do these incentives reward, and how significant are they?

Emphasis on consumer value

1. What market data is available on what consumers value in the product(s) and how this affects their purchasing patterns? Does the data cover specific consumer behaviour (eg, supermarket loyalty card); general purchasing figures (scan data) or intentions (market research)?

2. How is this information gathered and shared in the chain?

3. Give examples of how consumer insight has been used in any/all parts of the chain, especially in terms of generating new product ideas.

4. How is performance/investment in the chain incentivised to increase the value of the product in the eyes of the consumer?

Capacity for innovation and continuous improvement

1. Do you systematically examine the causes of success and failure? How? Can you give examples of changes you or your chain partners have introduced as a result?

2. Are you, your colleagues, your suppliers and customers all encouraged to think creatively? Give examples of ideas which have been taken up.

3. What examples are there of you and suppliers/customers working together to introduce new products, systems etc? e.g. which involved mutual commitment of time, money, knowledge/expertise. Were the rewards of this work shared fairly?

4. In your experience, are customers/retailers realistic about the time required to develop and establish a market for a new product, and to recoup the development costs?

5. Where is the greatest scope for improving your relationship/performance with
    a. Suppliers in this value chain?
    b. Customers in this value chain?

   Have these issues ever been discussed? If yes, with what outcome?

6. What are the major threats facing your firm and this chain?

Appendix H Benchmarking and Quality Assurance Schemes from around the Globe

This appendix describes various benchmarking and quality assurance schemes that were found either through a literature review or by recommendation. Each subsection describes the scheme, identifies some of the key performance indicators that are measured, whether they are leading or lagging indicators[1] and provides any description of some of the industries utilizing these tools and schemes.

1. Hortbench, Food Chain Centre, UK

Hortbench is a benchmarking program that was established by the Food Chain Centre in 2003 specifically for fresh produce growers. This benchmarking program focuses on comparing costs of production of a number of fruit and vegetable growers.

Hortbench gathers all of the cost of production information from participating growers, aggregates it to get industry averages and then analyses it against individual grower data. It is the cost of production data that is the key performance indicator, therefore all of the measurements analyzed using Hortbench are lagging indicators. The program ensures confidentiality of individual grower data and establishes smaller grower groups that get together to discuss their comparisons and what may be causing their differences. It provides valuable information for growers to compare as well as a platform to discuss underlying issues in each of their operations that may be causing cost of production differences, including discussion of labour, machinery and energy costs. In 2008 Hortbench worked with twenty smaller business clubs including tree fruit, tender fruit and field vegetable producers. These business clubs made up of approximately six growers each meet annually to conduct their comparisons.

Participation in Hortbench requires a high degree of effort from the producer. Direct and indirect costs are collected in a detailed template to ensure consistency in information so that Hortbench can utilize it. The Food Chain Centre will provide consulting to new Hortbench participants to help organize their records and data for collection. Hortbench also provides training for business clubs in order to be able to analyze the data that they receive (Food Chain Centre, 2005). Participants in the program have praised its value and have stated that the discussions have led to more than simply learning about costs but also consumer trends, risk assessment and marketing (Food Chain Centre, 2007).

Hortbench also works with Marks and Spencer and Sainsbury's. Sainsbury's became involved in the program because they saw the benefit and potential quality improvements of the products they buy by participating in the program (Food Chain Centre, 2005). Sainsbury's provides producers with customer feedback as an additional data component to discuss when they get together (Food Chain Centre, 2005).

2. Optimal Agricultural Business Systems, Deciduous Fruit Producers Trust, SA

In 1997 the South African deciduous fruit industry[2] underwent deregulation and restructuring. Instead of operating under Unifruco that was a single-desk seller, the industry became more competitive with over 200 fruit exporters and 2,500 fruit producers vying for export markets (Thelwall and Thelwall, 2006). As a result of this fragmentation the Deciduous Fruit Producers Trust (DFPT) was formed with the aim to continue collection of industry data that had been dissolved (Thelwall and Thelwall, 2006). Having foresight and realizing the benefits of timely and real industry data in which marketing strategies could be built, the industry bodies – including the DFPT, Fruit South Africa, and joint

[1] Lagging indicators: Most often countries measure financial ratios and performance – financial measurements are lagging indicators because they cannot be directly influenced (Balanced Scorecard, 2008). Leading Indicators: are measurements that can be directly influenced such as employee training, customer service, quality measurements prior to harvest etc… These indicators "reflect how well you are executing your strategy" (Casey and Peck, 2004).

[2] The deciduous fruit industry includes pome fruit (apples and pears), stone fruit (plums, nectarines, peaches and apricots) and table grapes.

marketing forums made up of exporters and producers – developed a co-operative industry plan. Optimal Agricultural Business Solutions (OABS) – an agricultural economics firm - approached the industry to provide the data collection and benchmarking services on a continual basis (Thelwall and Thelwall, 2006).

OABS analyzes the pome fruit, stone fruit and table grape industries in a three-year cycle (Thelwall and Thelwall, 2006). Data is collected from approximately 150-200 individual producers of varying sizes and the majority of the exporters in order to ensure that the data truly represents the industry (Thelwall and Thelwall, 2006). For their willingness to participate, participants can receive financing and planning services from OABS. The types of information collected for the detailed benchmarking study includes cost of production data, land and water use, labour and wages rates, yields and prices received (Thelwall and Thelwall, 2006).

OABS cost of production study is made available to the entire industry. The individual producers who provided the data are given a report that benchmarks their individual operations against the total industry average. The majority of key performance measurements included in the OABS study are lagging indicators since the study focuses on cost of production, however, labour and living conditions as well as water availability would be considered leading indicators because these variables can be adjusted and can affect the operation's performance.

OABS also manages a separate information database on behalf of DFPT that includes production volumes, and weekly harvest intake, export destinations of fresh and processed product and competitor volumes into export markets Thelwall and Thelwall, 2006). In addition, OABS also talks with exporters to gain an understanding of their assessment of the industry and to further understand and help to analyze competitive issues in export markets (Thelwall and Thelwall, 2006).

The industry continues to support the cost of production benchmarking initiative through the payment of a levy to cover the costs of the data collection and analysis due to the value that it has gained from benchmarking and a better understanding of its export competition (Thelwall and Thelwall, 2006).

3. GlobalGAP (formerly EurepGAP)

A number of quality assurance schemes have originated out of concern for food safety and therefore key performance indicators are focused on food safety measures and ensuring that food can be traced back from consumer to farm. Food safety issues are not just an increasing concern for consumers they are also a growing concern for governments and industry. In 1990, the United Kingdom implemented its Food Safety Act requiring buyers to take all "reasonable steps" to ensure that the food they receive from suppliers is safe (Fearne and Hughes 1999). It also meant that upstream firms needed to monitor their food handling system to satisfy their downstream customers. Fearne (1998) stated that the Food Safety Act has been the single most important factor contributing to the growth of partnership agreements, as the act compelled retailers to take control by instituting stringent quality assurance programs with their suppliers with particular emphasis on traceability. Today supermarkets in the UK require all fresh produce to come from suppliers who are members of the Assured Produce scheme (see Section 1.2.6). In essence, risk management took over from value added as a key driver for greater coordination in the supply chain.

In response to the Food Safety Act and other food safety concerns of consumers, retailers making up the Euro-Retailers Produce Working Group established EurepGAP in 1997 and drew up codes of practice covering all aspects of crop management by "harmonizing their varied and different standards" (GlobalGAP, 2008) and gave them to suppliers – these codes of practice make up the standards in GlobalGAP (formerly EurepGAP).

GlobalGAP "is a single integrated standard, with modular applications for different product groups" (GlobalGAP, 2008), including fruit and vegetable production. These common standards made it easier for producers to satisfy more than one retailer by reducing overlapping but differing requirements (GlobalGAP, 2008). Producers must become certified through an annual audit process. With the increasing demand for quality schemes and increasing interest in becoming EurepGAP certified by other countries exporting into its markets, EurepGAP changed its name in 2007 to GlobalGAP to reflect the global nature of the standards (GlobalGAP, 2008). Currently, industries and organizations in more than 80 countries have become GlobalGAP certified (GlobalGAP, 2008). There are also group certification requirements if a group of producers wants to be certified together.

The GlobalGAP program revolves around Control Points and Compliance Criteria. The control points under the GlobalGAP system are areas within the production cycle where information regarding production methods is required. There are Compliance Criteria for each of the Control Points and each Control Point is ranked based on whether it is simply recommend, a "minor must" or a "major must". All of the Control Points are audited during both the external and internal audits. For all Control Points ranked as "major must" proof of dealing with that Control Point must be shown during the audit. Also, all legislative requirements would be ranked 'major must'.

GlobalGAP has developed Control Points and Compliance Criteria (CPCC) for all farm types, more specific CPCC for crop farms, in comparison to livestock farms and then even more specific CPCC for fruit and vegetable farms. Figure 2.17 lists the major control points that are standards producers must comply with and provide details regarding their method of compliance.

Figure 1: Various Control Points required for Certification of Fruit & Vegetable Farms

All Farms	• Record keeping and proof of internal self-assessments • Site history and use • Worker health, safety, welfare and training • Waste management • Environmental management • Energy use • Consumer/Customer complaint procedures • Traceability procedures
Crop Farms	• Quality and health of propagation material • Pest disease and resistance • Chemical treatments and dressings • Sowing and planting • Soil management and mapping • Fertilizer use and storage • Crop rotations • Application machinery • Irrigation • IPM techniques • Plant protection products
Fruit and Vegetable Farms	• Propagation material • Soil and substrate management • Irrigation risk analysis • Harvesting products – transportation, hygiene procedures, equipment used, harvest worker conditions and training, product inspection, storage conditions, packaging materials used • Produce handling – hygiene, worker training, signage requirements, storage of chemicals, equipment maintenance, storage of packing materials, animal and bird control, quality control requirements, record keeping • Post-harvest washing – water quality and use • Post-harvest treatments – registration of chemicals and waxes, proper labelling and record keeping

GlobalGAP, 2007a; GlobalGAP 2007b; GlobalGAP 2007c

The Control Points listed in Figure 2.17 are all leading key performance indicators. These indicators can all be directly influenced by actions of the operator or employees.

GlobalGAP also has a benchmarking procedure where other on farm food safety and quality assurance schemes can be benchmarked against the GlobalGAP standards (GlobaGAP, 2008). These schemes and programs can be audited by certified independent GlobalGAP auditors and be recognized as equivalent to the program (GlobalGAP, 2008). This benchmarking is essentially a comparison of the technical standards of the other scheme and GlobalGAP standards. This process also includes a peer review of the schemes and programs by GlobalGAP members (GlobalGAP, 2008). For example, ChileGAP (below) has been independently benchmarked against GlobalGAP and recognized as equivalent.

4. ChileGAP

Over the last two decades, the Chilean agriculture industry has focused on growing its export markets with a small group of products in which it has a comparative advantage, including fresh fruit. Between 1996 and 2004 its food export growth was the highest in the world at 99% absolute growth. Fresh produce sales from Chile entering Ontario have been growing over the last few years and Chile is becoming an increasingly important competitor to the Ontario tree fruit and table grape industry.

Figure 2: Primary Chilean Food Exports, 2006

Sector	Share of Food Exports	$US
Fresh Fruit	29%	$2,755,000
Salmon	21%	$1,995,000
Other Seafood	16%	$1,520,000
Processed Food	15%	$1,425,000
Wines	12%	$1,140,000
Meats	7%	$665,000
Total Food Exports	**100%**	**$9,500,000**

CORFO, 2008

ChileGAP was developed in 1995 by Fundacion Chile Para el Desarrollo Fruiticola (FDF)[3] at the request of the Chilean fruit industry and fruit exporters. The parties wanted to streamline the quality certification requirements of a number of Chile's export markets into one system so that they could satisfy more than one export market but avoid duplication of requirements and reduce costs of compliance.

The program ensures that fruit quality is more than satisfactory and that food safety standards and/or regulations have been met. The program was developed to ensure that exporters would meet the requirements of export markets including GlobalGAP standards US food safety standards and domestic agricultural regulations and technical protocols that cover food safety, environmental management and worker health and safety (ChileGAP, 2007).

The areas covered by the Control Points and Compliance Criteria are similar to that of GlobalGAP and include among other things propagation material, soil preparation, fertilizer use, irrigation, plant protection and pest management, post-harvest handling of the product, welfare and environmental issues. The CPCC areas cover off regulations, traceability, record keeping, training and corporate social responsibility (ChileGAP, 2007). Again similar to GlobalGAP the control points and compliance

[3] FDF was created by a group of fruit producers and exporters in 1992 with the primary purpose of solving specific fruit quality problems for the joint good of both parties. The FDF is now the Executive Secretary of ChileGAP.

criteria are all leading indicators. There is no benchmarking of financial data that is included in this system at a formal level.

The ChileGAP program has been audited and benchmarked against other programs. It is recognized as equivalent to GlobalGAP in Europe and in the United States by NSF Davis Fresh, a US third party food safety organization (ChileGAP, 2007).

This program was developed and implemented on a national scale; however participation in the program is voluntary. Like GlobalGAP, this program requires certification and annual audits by accredited certification bodies, including Davis Fresh. In 2008, 143 Chilean growers were certified and audited (ChileGAP, 2008).

FDF produces an annual ChileGAP yearbook that is distributed to domestic growers and international clients and potential clients. This book is used as a promotional and marketing tool to increase awareness of the certification system to potential new clients and new farmers and also to reassure existing clients. Also to reassure clients and provide as much information as possible, the ChileGAP website contains an information page that lists the certification and audit records of all of the participating growers (some information remains confidential). This information can be accessed by buyers, exporters and growers participating in the program.

5. Nature's Choice, Tesco

Nature's Choice is an Integrated Crop Management System (ICMS) developed by Tesco that all fresh fruit and vegetable suppliers must meet and become certified in order to conduct business with the grocery chain. Growers must become certified and audited to continue as a registered supplier for Tesco. For example, the Norfolk Fruit Growers Association, a co-operative of apple growers in Southwestern Ontario have become Nature's Choice certified in order to continue supplying Tesco with fresh apples.

This standard was developed in 1991 as a way to demonstrate to consumers that the produce purchased at Tesco is safe and as high quality as possible and was grown using environmentally friendly practices. Tesco requires that all suppliers, both domestic and international are certified. Therefore this is an international scheme and is independently audited. The scheme requires that producers and suppliers are audited annually, based on various standard levels. As continuous improvements are made at each operation, higher standard levels are completed. The program is based around 'seven pillars' of management and record keeping (O'Neill, 2005; Tesco, 2008).

1. Rationale for and use of chemical inputs: only certain products are allowed to be used and the grower must demonstrate the reduction of use wherever possible.
2. Rational use of fertilizer.
3. Pollution prevention all potential pollution points throughout the production stage must be identified and monitored.
4. Wildlife and Landscape conservation: each producer must develop a farm conservation plan.
5. Recycling, re-use and energy conservation: producers must develop energy plans that show optimal water and energy efficiency.
6. Human health protection: employees must be trained in job requirements, chemical handling and other training.
7. Codes of practice: these are steps from the production, harvesting, packing and distribution of the produce.

The areas which require management and record keeping are all leading key performance indicators and are similar to GlobalGAP in the areas that they cover.

Tesco also manages an ethical standards program and quality product program that are not directly part of Nature's Choice but are other requirements of Tesco. For example, every produce supplier is assessed on ethical standards (Tesco, 2008).

Specific product quality specifications are agreed upon between the supplier and Tesco and are not specifically part of the Nature's Choice standard. Tesco also randomly tests a variety of fresh produce products every month through the Quality Shopping Basket program (Tesco, 2008). These tests include tastings of the products, the look of the product and other quality variables. Tesco also has a large team of Quality Assurance Personnel that oversee the quality of fresh fruit and vegetable shipments on a continual basis.

6. Assured Produce Scheme, Assured Food Standards, UK

The Assured Produce Scheme (APS) is an industry-wide integrated crop management and quality scheme that was developed to address the needs of all participants along the value chain to ensure the production and consumption of safe, quality produce.

All of the major supermarket and grocery chains in the UK support the APS. Many of the supermarkets support this scheme because it has been developed by combining and streamlining requirements from other schemes required in the UK so that growers only have to comply with one scheme. Any producer that is APS certified can sell to any of the grocery chains or suppliers. In order to be certified, producers must be independently audited. In preparation for certification, growers receive a list of requirements and protocols and adapt their operations accordingly to comply, and then independent certifiers will visit the farms and assess them based on the requirements. This assessment along with grower notes and documentary are included in the certification package. Once certified, the operation is audited annually.

There are two key factors to becoming certified: Critical Failure Points, in which 100% compliance is required and Strongly Recommended Points which are included in the requirements and protocols. These protocols are updated annually based on new technical information and other factors.

Currently 49 vegetables and fruits have APS requirements and protocols that have been developed, including top fruit (apples and pears) and stone fruit (peaches)[4]. Each crop must follow the generic protocols for all produce as well as the crop specific protocols. The Generic Protocols and Crop Protocols are similar to those of GlobalGAP, ChileGAP, and Tesco's Nature's Choice schemes, however the Crop Protocols also include a number of quality measurements that should be taken at various points along the production chain (included in Figure 2.19) and suggested production methods to ensure quality is maintained.

Figure 3: Assured Produce Protocols for Apples

Generic Protocols	• Planning and record keeping for traceability, recall procedures and complaints • Internal audits are required • HACCP requirements • Risk assessment and risk control • Crop rotations

[4] APS Certified Fruits include: asparagus, aubergine, broad beans (fresh and processed), green beans (fresh and processed), runner beans, beetroot, blueberries, broccoli, brussel sprouts, cabbage, carrots, cauliflower, celeriac, celery, Chinese cabbage (field and greenhouse), courgettes, marrows, squash and pumpkins, cress, cucumbers, fennel, bush fruit, cane fruit, stone fruit, top fruit, garlic, herbs, hops, leeks, lettuce (field and greenhouse), mushrooms, onions (bulb and salad), parsnips, peas (picking and processed), peppers (sweet and chili), potatoes, radish, rhubarb, spinach, strawberries, swede turnip and kohlrabi, sweet corn, greenhouse tomatoes, watercress (Assured Produce, 2008)

	• Site management • Soil management • Land drainage systems • Planting procedures • Variety, rootstock and seed selection • GMOs • Nutrient management • Fertilizer use • Application equipment • Irrigation • Crop protection • Pesticide storage • Harvest and storage management and facilities • Waste management • Energy management • Worker health and safety • conservation
Apple Quality Measurements	• Mineral analysis of apples prior to harvest to determine storage capability • Random in-storage sampling techniques in Controlled atmosphere to look for: o Blemishes or storage disorders (lenticels, blotch-pit, carbon-dioxide injury, senescent breakdown) o Colour is assessed o Shrivel and greasiness tested by squeezing o Firmness is tested using a Effige penetrometer • Internal disorders are examined in random checks: o Internal browning, corky lesions o Bitter pit needs to be recorded as present or absent o Core flush, low temperature breakdown and brown heart • Apples should be tasted for eating quality and any taint and ranked on a scale of 0 – 5.

Assured Produce, 2008

The Assured Produce Scheme includes both leading and lagging key performance indicators. The good agricultural practice generic protocols are all leading indicators because these are factors that can be manipulated to improve quality of the product. A number of the quality measurements listed in the bottom half of Figure 2.19 are also leading indicators because some pre-harvest quality measurements can influence the overall quality by determining picking time, whereas some post-harvest quality measurements are lagging indicators because they will have no influence on the quality of the current fruit that has already been picked but can have an influence on the next crop.

7. Safe Quality Food (SQF) Program, Food Marketing Institute, United States

The SQF Program is a quality assurance scheme that focuses on risk assessment and prevention. The SQF program has separate and specific protocols for primary producers (SQF 1000) and processors (SQF 2000). This program is the only on-farm program that is recognized by Wal-Mart's Global Food Safety Initiative (LaCalamito, 2008).

SQF 1000, the on-farm portion of the program, is made up of three areas of food safety: 1) food safety fundamental control points, 2) food safety plans based on HACCP that must document risk assessment of the product and its production process as well as an action plan for any safety hazards and 3) a quality management system plan that will help with ensuring consistency throughout the process (LaCalamito, 2008). If a producer completes all three levels of SQF 1000, then he/she is allowed to utilize the SQF 1000 logo on products and packaging.

To begin a producer can develop a plan of action with a SQF consultant. Once the plan has been finalized and implemented then an independent third party will audit the operation.

The SQF 1000 program applies basic HACCP principles and requires action in the following areas (LaCalamito, 2008; Lauve, 2006):

- Identification of critical control points of risk and management
- Document all procedures and record all actions
- Raw material specifications
- Finished product specifications from the customer
- Process controls
- Personnel training
- Corrective and Preventive actions
- Regular internal audits must be completed
- Ability to trace-back and an annual practice recall
- Third-party audits

The SQF 1000 program contains a number of key performance indicators. Many of the indicators are leading indicators including ensuring specifications of raw materials and process controls. Corrective and preventive actions including dealing with consumer complaints would be a lagging indicator.

A significant proportion of Washington Apple Growers and packers, competitors to Ontario, are SQF certified. Figure 2.20 shows the proportion of packers and shippers in Washington that were SQF certified in 2005 by fruit type.

Figure 4: SQF Certified Fruit Packers/Shippers in Washington State, 2005

Apples	Total WA Production: 100,000,000 cartons SQF Certified Production: 58, 200,000 cartons = **58.2%**
Pears	Total WA Production: 8,500,000 cartons SQF Certified Production: 7,900,000 cartons = **92.9%**
Cherries	Total WA Production: 14,500,000 cartons SQF Certified Production: 7,300,000 cartons = **50.3%**
Stone Fruit	Total WA Production: 3,500,000 cartons SQF Certified Production: 2,250,000 cartons = **64.3%**

Lauve, 2006

7.1 SQF Examples

E.W. Brandt and Sons Inc.

E.W. Brandt and Sons is a growing, packing and shipping operation of apples, pears, cherries and stone fruit in Washington State. E.W. Brandt and Sons was the first operation in the United States to become SQF 2000 certified in 1998 (E.W. Brandt, 2008). This company is also EurepGAP certified.

E.W. Brandt and Sons have a nine-point quality control check system in place as part of their SQF certification. It is summarized below (E.W.Brandt, 2008).

1. Fruit Maturity/Harvest: to determine harvest date and storage life
2. Incoming Bin Fruit: check on arrival to determine storage life and quality
3. Bin Fruit In Storage: to determine quality and storage life
4. Pre-Sort: to determine defects in individual batches
5. Cull Line: to find defects and relay results to growers
6. Table: to check the ability of sorters in the phases above
7. Final Box: to ensure that the fruit meets the grade

8. Packed In Storage: to ensure continued quality
9. Customer Order: both a visual check is conducted first to determine if a more formal quality check is required. If required, then the fruit is formally checked again to ensure it meets the quality standard

Stemilt World Famous Fruit

Stemilt World Famous Fruit is a family-owned grower, packer and shipper of apples, pears and sweet cherries in Washington State. In 1998, the packing end of the operation was SQF 2000 certified and in 2003 the grower arm of the operation followed suit with a SQF 1000 certification (Lauve, 2006).

Stemilt wanted to participate in a quality and food safety assurance scheme that was practical, easy to maintain and proactive (Lauve, 2006). Some of Stemilt's larger customers, as well as other packers and shippers recommended the SQF program. Stemilt's has been satisfied with the program because it is a proactive management tool, it allows the company to hold employees responsible for their duties and it includes a traceability program (Lauve, 2006). Benefits incurred by Stemilt's as a result of participating in the SQF 1000 and 2000 programs include improved efficiency in production processes, established record keeping processes, improved staff training, increased customer confidence and overall improved quality of product (Lauve, 2006).

Appendix I Physical Processes Impacting Fruit Quality

Quality, Defined

There are different types of quality (Batt, 2006; Collins and Mowat, 2000). They are: functional quality, the quality of delivering products (as desired) to customers and consumers, and service quality. Being able to deliver what a customer wants, when they want it, involves many inter-related activities such as production scheduling, storage, warehousing logistics, ordering and invoicing. Service quality, which is doing the extra things to retain a customer's business for example, credit arrangements. Batt (2006) also describes quality as "...being responsive, being proactive and reactive and about being able to meet customer's special requests."

What makes the discussion on quality even more complex is that it also means different things to different people. Consumers for instance, most often express quality in terms of freshness, appearance, colour, low chemical residues, country of origin, taste, seasonality, salubrity, price and shelf life (Batt 2006; Borsari 2003; Collins 2003b; McGarry Wolf et al 2003; Walsh 2006). Clements et al (2008) also reported that good quality produce for consumers is seen in terms of continuity in supply, good appearance (shape, size and colour) and free from blemishes and damage. Consumers also perceive branded products to be safer, fresher and of higher quality than non-branded products (McGarry Wolf et al 2003). When consumers are dissatisfied with the quality of produce, it is often because of the flavour and texture or because of inconsistent "quality". Poor quality may be perceived by consumers when there is excess product ordered and held for several days, when there is an empty shelf, or variations in price (Batt 2006; McGarry Wolfe et al 2003; Prussia and Mosqueda 2006; Shewfelt and Henderson 2003). It is the consumer's judgments about these attributes, in combination with price that determine their perception in relation to value for money which then drives their purchase decision (Collins, 2006).

Growers' definition of quality varies slightly from that of the consumers to include resistance to pests and diseases, along with varietal hardiness and suitability for storage (Collins 2003b). Compared to consumers, they can also differ in the relative importance they place on factors such as taste, seasonality, salubrity, freshness and locally grown foods (Collins 2003b; Colins and Mowat, 2000).

Physical Processes Impacting Fruit Quality

Physical practices that occur along the chain that impact the quality of fruit purchased by consumers can be assessed through objective measures including orchard management and other pre-harvest activities, quality, food safety, sorting operations, stress physiology. Despite the variety of factors impacting quality, or perhaps because of it, there exists a need for more knowledge to be gained about the mechanisms that drive quality and the practices that are required to develop and maintain quality at all stages of production, processing and distribution. Especially since fresh produce is high profile with products that are highly perishable and very sensitive to mishandling and damage at all levels of the supply chain. Without a greater understanding on what affects fruit quality and how, there is great potential for product loss and wastage (Batt 2006; Kleinhenz et al 2003).

Plant physiology and harvesting impacts on quality

One challenge faced by the fruit industry is understanding the relationship between pre-harvest and post-harvest factors and how they impact quality in terms of taste, flavour and texture, as well as nutritional and health properties. The ability to identify and manage pre- and post-harvest operations in relation to overall marketing strategies can increase consumer appeal and loyalty. Potentially translating into willingness to buy, perhaps at a premium, understanding how pre-harvest factors can influence post-harvest quality through improved management of the physiology of the plant, including harvesting techniques, can be a powerful differentiating tool (Hewett 2006).

Premiums are sustained through innovation. For instance, an Australian study into the relevance of harvest maturity on the quality of Pink Lady apples showed that fruit harvested earlier in the season were more suited to controlled atmosphere storage as ethylene production did not begin until after day 4 and starch levels were low at 1.5, compared to apples harvested at their maturity. "Harvest 2 was [in contrast], well suited to the fresh market as ethylene production and ripening had begun…and the starch index was high at 3.5. This would mean that the final consumer would receive a tasty, quality apple" (Jobling, 2002).

Another example of where approaches linking pre and post harvest practices has been applied to improve overall quality is how the U.K the Farm Advisory Services Team created a new picking index that challenged conventional picking cycles and identified ideal growers and orchards where the fruit is picked for a specific marketing period. The result is a point of differentiation for the retailer, a better quality product, improved sales for the retailer (in this case Marks and Spencer) and increased profit for Worldwide Fruit and its growers (Food Chain Centre 2005).

Post-harvest impacts on quality

While freshness plays a major role in the consumers' decision to purchase fruit, it is a complex component of quality in the post-harvest chain. During post-harvest, fruit is subjected to different environmental conditions and climatic stresses that influence its marketability. This is due to transpiration, degradation of internal compounds and respiration that all affect the extrinsic as well as intrinsic quality of the fruit. For example, depending on the properties of the fruit at harvest, environmental conditions in post-harvest chain can cause either water loss or loss of value adding substances that limit marketability. Manipulating or controlling storage conditions then, in terms of temperature, humidity, gas conditions affects the metabolism of the product and its ability to retain its quality and hence its marketability (Hertog et a 2003; Linke et al 2003).

It is known that temperature plays a key role in maintaining the quality of fruit. Temperature along with the initial mass and firmness at harvest, are values that are used for calculating the percentage of change in quality parameters. For instance, fruit will lose mass and firmness when stored at higher temperatures such as when on the loading dock. Although it is known that temperature affects quality, fruit continues to receive temperature abuse at varying degrees and various time periods across different links in the supply chain, passing through numerous refrigerated or non-refrigerated links.

Fast cooling and maintaining temperature prior to and during shipment are essential to protecting fruit from quality deterioration. Decreasing the temperature reduces the rate of the physiological reactions, thus extending the shelf life of quality fruit (Aggarwal 2003; Crisoto et al., 2006; Nicolai et al., 2003; Prussia and Mosqueda 2006). Pre-conditioning is a treatment that can be used to ensure that tree fruits arrive at the retail stores 'ready to buy'. Crisosto et al (2006) reports that pre-conditioning limits the internal breakdown of fruit, which enables companies to offer a considerable volume of high quality fruit to domestic and overseas consumers. Pre-conditioning is a controlled delayed cooling treatment that will extend the market life of fruit even when exposed to temperatures between 36 and 48 ^{0}F during post-harvest handling. A well-applied preconditioning treatment extends market life by about one to two weeks.

In the pack house, quality can be maintained by applying standards and specifications as precisely and consistently as possible to as much volume of product as possible. Achieving handling quality in an operational sense is a means of satisfying a number of higher order supply chain management objectives: food safety, product consistency, shelf life, product acceptability and availability and repeat sales (Collins, 2003). Interestingly though, the quality of a product leaving the packing house may not predict quality as delivered to the consumer, which indicates that there are factors at the retail end that effect quality. In response to this, Shewfelt (2006) suggests that quality monitoring systems be

implemented to determine how the product changes during handling and what the consumer sees at purchase.

SmartFresh™ resulted from North Caroline State University researchers studying the naturally occurring plant substance ethylene and its effects on the ripening process in the mid 1990's, searched for ways to slow ethylene production and make plants less susceptible to its external sources that stimulate ripening. During this research, they discovered 1-MCP, the active ingredient in SmartFresh™.

SmartFresh™ has been successfully used on a wide range of horticultural crops to reduce postharvest ripening and deterioration in storage, in turn increasing pack-out rates. This quality management system boosts apples natural resistance to ripening so the fruit stays fresher, firmer and more nutritious longer, thereby meeting consumers' quality expectations and requirements for top quality fruits and vegetables year-round. SmartFresh™ has registration in over 25 countries including the European Union, Israel, New Zealand, South Africa, the U.S., Canada, Chile, Argentina, and China (www.smartfresh.com).

Some of the benefits growers and packers receive when storing their fresh apples with the SmartFresh™ Quality System are reduced shrink, marketing flexibility and increased pack out yields. This system also provides a buffer against breaks in the cold chain during distribution.

Appendix J Alternative Approaches: Lean Thinking and Efficient Consumer Response

Lean thinking has become widespread in the United Kingdom and, as reported by the Food Chain Centre (2006), has delivered some dramatic improvements over a three year period including a: 90% reduction in defects; 90% reduction in response time to customer orders; 75% reduction in inventory 50% reduction in space and; 50% reduction in variable costs. Facts such as this do little to support the argument made by Duffy and Fearne (2004) that the publicized benefits have referred primarily to the value chain as a whole or to the retailer's operations, not to the benefits that producers can gain through the application of lean thinking techniques. This is not to say though that lean thinking is a quick fix, or the miracle cure. It simply promotes a culture of continuous improvement. It only works if there is strong support from senior management (Food Chain Centre, 2006) who put in place the processes, tools and systems required to maintain lean efficiencies.

Lean thinking is based around a set of principles that aim to improve the value chain process, like those discussed earlier by Collins (2003b) to analyze chain effectiveness. It begins by specifying product value, not though from the perspective of individual businesses but rather from that of the consumer. Consumer value is the first principle of lean thinking. The next step is to make distinctions between the actions necessary to create the identified value and those that simply add cost, and then make the product flow through the chain with minimum interruptions between steps. However, it is easy to become trapped in the quality-cost-delivery improvement approach where undue focus on efficiency improvements for creating smooth flow, reducing inventory levels, zero defects, shortened lead times and full-on-time deliveries distracts the chain from focusing first and foremost on how effectively it is delivering to consumer perceptions of quality and value. The desired result is to, as closely as possible, produce product at the same rate at which consumers' take the product from the shelf (known as 'consumer pull'). And, in pursuit of perfection, continuously ensure that the chain is configured to so that it can efficiently respond to consumer demand (Food Chain Centre, 2006; Zokaei and Simons, 2006).

Lean thinking has five building blocks:

1. Greater emphasis on collecting and acting upon operational data;
2. Agreement between supply chain partners to establish shared key performance indicators and targets and jointly work toward their achievement;
3. More internal communication so that all employees know what the targets and performance measurements are;
4. More attention devoted to small, workplace based improvements;
5. Analysis to identify the root cause of problems. The latter is particularly important as many companies do not allow sufficient time or invest the resources required to solve the root cause of problems, which leads to them continually 'fire fighting' rather than finding permanent solutions.

While part of what makes lean thinking so attractive is its adaptability, it tends to work best when a particular consumer product is focused on (e.g., a bag of carrots). Taking this approach reduces the complexity of applying lean thinking techniques. It also increases the likelihood that improvements will be sustainable. Partly through having a team pulled together from each of the businesses in the supply chain (e.g., grower, processor, and retailer) that first identify the need for change, then champion the implementation of new processes, which lead to increases in profitability and the probability of ongoing success (Food Chain Centre, 2007).

According to Christopher and Towill (2001) lean thinking is most powerful when the goal of the chain is to reduce costs. However results from the Food Chain Centre's research (2007, 2006, 2005, 2005b) also show that lean thinking is a powerful approach for improving service and customer value through providing the agility necessary to identify then implement change on multiple critical

dimensions along the value chain. The agility in part coming from minimizing total lead times as defined "...as the time taken from a customer raising a request for a product or service until it is delivered". Lead time, according to lean thinking, is by definition excess time and therefore a waste that can impact quality and cost (Christopher and Towill, 2001).

In addition to lead times, lean thinking defines *all* activities that are disconnected from consumers' definition of value as waste or non-value adding. Part of improving the value chain process, especially in the perishable food sector, is to examine the level of product waste.

Product waste, as defined by the Food Chain Centre (2007) is any item that was damaged, scrapped, lost or down-graded such that it could not be sold at its intended price. The ability to track waste at every stage of the chain, planting, growing, harvesting, processing, packing, transport, warehousing and retailing, is an important part of cost savings and quality improvement. While product managers tend to accept certain levels of waste, which at any given point are often relatively low, the aggregated levels can be alarmingly high. Sharing information on how much of the product is wasted, and why, allows the companies along the chain to identify the root causes of problems and develop plans to reduce losses caused by poorly designed or implemented processes (Food Chain Centre, 2007; Wilson, 1996; Zokaei and Simons, 2006).

For this process improvement to be effective there needs to be a radical shift in the mindset of the companies involved. For example, focusing on reducing fruit damage during harvesting, or reducing losses during storage, may result in less volume being packed within a given period of time. Despite the reduced volume, less waste could increase the overall profitability of the chain. Achieving this would require a shift, realizing that there will be a lower overall volume of product, but the result will be a higher volume of undamaged product delivered to the pack house, the retailer, and finally the consumer (Food Chain Centre, 2007).

Waste can also result from over production, which occurs in small amounts on a daily basis due to, for example, customer schedules being received at the wrong time of day. Wastage in terms of time and human resources can also occur due to double handling of products, unplanned downtime, operator or machine inactivity, unnecessary motion for operators, and scrape or defective product.

Appendix K The Characteristics of Strategic Alignment

As discussed in Section 2.6, strategic alignment to create value consists of a number of components:

1. Shared vision
2. Culture and leadership;
3. Compatible structures and processes;
4. Mutual benefits through the alignment of ability, resources and motivation, and open communication;
5. Trust and commitment;
6. Open Communication; and
7. Continuous improvement, in particular through innovation in products, processes and systems.

The characteristics of these components in terms of what chain partners should aim for and how they should behave if they wish to achieve strategic alignment is described below. Equally, the existence of these procedures and behaviours can be used as indicators in assessing the extent of strategic alignment that exists along a value chain.

The list described below is comprehensive and ideal. Very few partnerships within chains will show all these features. Accordingly, the assessment also evaluates a chain's intent and progress toward the model situation.

1. Shared vision

Firstly, the alliance needs a shared vision and leadership, based on common objectives, or at least compatible goals (Spekman et al 1998; Whipple and Frankel 2000; Sabath and Fontanella 2002; Barratt 2004b). Partners need to have similar motivations around:

- Increasing market orientation: knowing what their consumers value, then focusing on that in all decision-making;
- Improving profits through effectiveness (doing the right thing) as well as efficiency (doing things right);
- Strategic planning; and
- Enhancing innovation.

2. Culture

Partners need, or should develop, compatible cultures (Stank et al 1999; Ireland and Bruce 2000; Mentzer et al 2000; Whipple and Frankel 2000; Barratt and Green 2001; Sabath and Fontanella 2002; Barratt 2004a). The success factors include:

- Market orientation;
- Using foresight and recognizing bounded rationality (accepting the limits to knowledge);
- Thinking strategically, simultaneously at macro- and micro-level;
- Sharing risks and rewards;
- Developing a management style which encourages:
    - Empowerment and strategic thinking from everyone;
    - Openness and transparency;
    - Flexibility and adaption; and
    - A long term view of forces shaping the commercial environment.

3. Compatible Structures and Processes

Partners need management, information and operational systems that work in harmony (Stank 1999; Ireland and Bruce 2000; Barratt and Green 2001; Barratt 2004a; Simatupang and Sridharan 2007). This involves:

- Multi-level (senior management to operations) and multi-functional relationships, including boundary spanning roles, e.g. inter-firm teams;
- Joint decision-making procedures;
- Integrated supply chain processes;
- Collaborative performance systems; and
- Mutually re-enforcing resources (production and processing capacity and information) and investment strategies.

4. Mutual benefits

Sharing the benefits of alignment is essential to the sustainability of the relationships (Stank 1999; Ireland and Bruce 2000; Mentzer et al 2000). However, it can be a significant challenge because it is such a step change from opportunistic behaviour. One of the key indicators is incentive alignment (Sabath and Fontanella 2002; Simatupang and Sridharan 2007), both extrinsic (e.g., financial rewards and punishments, which typically are effective in the short term) and intrinsic (non-financial and more likely to instil a longer term commitment). Incentives should reward collaborative behaviour, and reflect each partner's added value, costs and risks.

5. Trust and Commitment

Trust is the belief that value chain partners will forego opportunistic behaviour, and meet their responsibilities consistently. It can be measured at individual and inter-organizational level. It is valuable in all trading relationships (Ireland and Bruce 2000), since all formalization bears a cost, yet it is difficult to formalize in contracts every aspect of transactions or every potential circumstance. In developing strategic alignment, trust is essential (Mason-Jones and Towill 1997; Whipple and Frankel 2000). It is also self-re-enforcing. When two or more partners in the chain act in unison toward a common goal, it leads to a sense of belonging to the relationship, and hence greater commitment and trust (Spekman at al 1998).

Trust is built through (Spekman et al 1998; Mentzer et al 2000; Whipple and Frankel 2000):

- Competence and sustained effort;
- Dependability – acting in the chain's best interest; having reliable systems and processes;
- Predictability, including consistency of behaviour, and of words and actions;
- Open communication, and
- Faith (not acting opportunistically) and honesty, including mutually acknowledging the opportunities, risks and alternatives within relationships.

Trust is based on corporate and individual experiences. Since people's most recent experiences are the most influential in decisions, there needs to be continual delivery of good experience, not a reliance on past history which is rapidly discounted. Actions not promises lead to trust, and so there must be ongoing mutual promise fulfillment (Rashid, 2003). At its most basic, the supplier must deliver consistently in full, on time and to quality (DIFOT(Q)), and customers provide prompt payment. Thereafter, greater trust evolves as partners agree and deliver on more significant promises, in terms of enhanced service performance and product value.

Co-operation is an important facet of trust. It includes understanding partners' businesses, and hence the impact of a firm's actions upon the others. This would be reflected in supplier/customer performance assessments, feedback and resultant actions. An example of co-operative behaviour is seeing information as something to share, rather than a source of power (Mentzer et al 2000).

Commitment is the intention to continue the relationship, shown by ongoing investment into activities that are expected to enhance it (Rashid 2003). For example, is there evidence of prioritization of the value chain being examined compared to others? Has there been a programme of relationship-

specific investments, or even joint strategy (Spekman et al 1998; Stank et al 1999; Ireland and Bruce 2000; Sabath 2002)?

A pre-requisite for strategic alignment is that the relationship/chain is of significantly high importance to at least one partner (Mentzer et al 2000; Sabath 2002). However, the structure of the agri-food sector means that many value chains include a dominant partner, which is part of multiple chains (Hughes 1994). Accordingly, mutual inter-dependence is rarer than in some other sectors. The imbalance of size/power can be threatening to the smaller partner(s), and means the larger partner can appropriate disproportionate value. Nonetheless, this structure need not preclude the development of trust and commitment. While the onus may be on the dominant partner to establish the environment for collaboration, smaller firms as often more agile and innovative, and so can redress some of the power imbalance by developing the capacity to make themselves preferred suppliers through value creation. This allows the dominant partner to differentiate itself through a more diverse and valuable product offering, and since more value is created overall, in theory at least it can be shared more equitably without detriment to the dominant partner.

6. Open Communication

In terms of alignment, open communication incorporates strategic dialogue. While a detailed Value Chain Analysis would involve an evaluation of the information flow in terms of usefulness, accuracy and timeliness etc, in this context, communication refers to the overall nature and content of the dialogue. So while it should be underpinned by a general assumption that information should be shared at an operational/tactical level, it focuses on whether partners are open about their capabilities and intentions, and whether there is an early and frank discussion when either are likely change. This extends to discussions on whether the chain's current strategy retains its relevance when its commercial environment changes (Mason-Jones and Towill 1997; Stank 1999; Ireland and Bruce 2000; Barratt and Green 2001; Fearne et al 2008).

7. Continuous Improvement and Learning

Finally, the Roadmap highlights the importance of ongoing, interactive learning. This striving for continuous improvement is seen through (Spekman et al 1998; Mentzer et al 2000; Barratt 2004a; Barratt 2004b):

- A willingness to undertake self-examination, e.g. evaluating the causes of success and failure;
- A corporate culture and management system that gathers and applies lessons learnt, and understands the firm/chain's changing context, in terms of customers, consumers, competitors and technology;
- Exchanging knowledge with partners in the chain, and
- Constantly challenging the boundaries of the firm.

Appendix L Information to be shared within an Effective Value Chain

There are two types of information that must be shared within an effective value chain, performance information and market information.

Performance information

Effective information flow allows businesses to improve their processes, leading to increased quality and reduce costs (refer to Appendix J: Lean Thinking). It enables all the players to make decisions on what constitutes a value adding activity, by asking questions such as: Would you pay less for the product, or be less satisfied with it if a given step was removed? Do some activities add more cost then value? Are there activities that add absolutely no value to the consumer that can just be eliminated? This exercise is best done by starting with the consumer, at the point of the chain where an order enters the system, so that the information flows in the opposite direction to the product (Food Chain Centre 2006; Zokai and Simons 2006).

Providing information to each and every member as required allows value chains to position themselves strategically in relation to other chains to maximize potential benefits such as: minimized distribution and inventory costs; long-term innovation; improved service; increased consumer satisfaction; improved communication; clarification of organizational goals; stability of price/returns and; maximized market opportunities (Wilson, 1996).

Without the proper information flowing along the chain, and the ability to incorporate information into the chain's strategies for growth, the entire system could stall or collapse due to it competing no better than the open market. It is important then, to collect data on key performance measures such as time taken for the product to flow through the chain, percentage of product that is not right the first time, delivery schedule achievement, people productivity, overall equipment effectiveness, value added per person, floor space utilization, etc. Providing these measurements to a chain's participants allows them to identify than examine problems for opportunities to improve, and create a vision of an ideal chain for the future (Food Chain Centre 2006; Mowat and Collins 2000). The information that is collected needs to be highly reliable and not based on supposition of any kind. The more reliable the information, especially when it comes to evaluating performance related to consumer buying habits, the higher the probability that it will help "...transform a new agricultural industry from individualistic production orientation to whole chain marketing orientation" (Mowat and Collins; 2000).

As all participants in the chain need to be able to recognize the economic benefit that can result from collectively focusing on meeting consumer needs, financial information flow (such as profit margins) provides transparency along the value chain and can therefore be a prerequisite for encouraging greater cooperation amongst the participants. It is also a prerequisite for retaining members' commitment to remaining part of the chain. This kind of transparency is also an attractive aspect of value chains, particularly from the producers' perspective, because it often results in payments occurring considerably faster than if marketing through traditional channels (Collins, 2003b; Mowat and Collins, 2000).

Market information

In order to truly understand the customer and to be able to deliver on quality, the value chain requires market information. In order to gather high quality information that is valuable to the chain there needs to be a systematic approach to market research. Too often the task of understanding the consumer is left to the retailers. However, since they handle such a wide range of products, there is often an absence of detailed consumer research about individual products. As the packer and/or producer(s) would benefit from more detailed consumer research on their particular products (Food Chain Centre 2007), they should proactively take a greater role in gathering and utilizing information on consumer behaviour and choice (Collins, 2003b; Mowat and Collins, 2000). According to industry

interviews, retailers agree. They perceive their role as understanding industry trends but expect growers to be responsible for understanding and sharing consumer data.

The sharing of market information along the value chain provides distinct opportunities for participants from along the value chain to identify inefficiencies that may be costing them money. It also provides distinct opportunities to identify how the value chain can capture greater value from the market. The Food Chain Centre (2007) provided an excellent example of how market information can impact the value chain's operational efficiencies in terms of production, planning, inventory levels, resource requirements and product wastage (which results in mark downs or shrinkage).

For instance, it is widely accepted that that the variability in weekly volume of sales is to due to uncontrollable factors in consumer usage, such as the weather or special events. When, however, there are small increases in consumer demand due to, for instance, a promotional activity, the variability in consumer demand quickly becomes exaggerated as demand signals are passed up the chain. The result is 'demand amplification' which impacts ordering policies, inventory policies and leads to managers having a tendency to over-order 'just to be on the safe side'. While some major chains are proactive in evaluating the effectiveness of their promotional activity, surprisingly, some chains do not track the impact of how demand variability affects overall effectiveness and efficiency.

An example of where sharing market information with the value chain has led to improved revenues for all members of the chain comes from Hughes and Merton (1996). In 1995 J. Sainsbury established a "Partnership in produce" agreement with the English Fruit Company ENFRU Ltd. The strategy behind the agreement was to share information from one season to the next. By doing so it was believed that not only would the immediate needs of the marketplace be met, but also when seasonal factors required an imaginative response to specific availabilities, new directions and opportunities can be mapped out for the future. While up until 1995, small sized Cox apples had been classified as Class 2 and sold in lower value markets, the sharing of information led to improvements in how such apples were marketed and delivered to consumers. A combination of high quality and an abundance of fruit enabled the value chain partnership to structure a special promotion to the benefit of consumers, retailers, ENFRU and its growers. Sainsbury's access to consumer buying trends providing the basic data that led to developments in repositioning the product and new packaging.