Perceptions of Supply Chain Management for Perishable Horticultural Crops: an Introduction

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Abstract
To ensure that the highest and appropriate quality of product is available for consumers, it is critically important that all parties involved in the production, packing, storage, transport, distribution and marketing of fresh fruits and vegetables do everything correctly in the chain from farm to plate. Over the past decade a major transformation has occurred in the way firms undertake business. Those that understand how the supply chain can be optimised and logistic processes can be improved have obtained enhanced customer satisfaction and loyalty, lower costs and improved market share and profitability. Supply chain management [SCM] has become a key business process; adopting key principles of developing strategic alliances; optimising organisational structures; developing the human resource to embrace the corporate vision and commitment to excellence; continually improving tools available in information technology have all had a major impact on company success. Can such principles be applied to the fresh fruit and vegetable industry that tends to be characterised by large numbers of small growers in dispersed locations with disparate products of variable quality, and who exist in an environment of mistrust and dubious loyalties? Examples from New Zealand of success (ZESPRI™ International Ltd) and opportunity (the stone fruit industry) are used to demonstrate some of the difficulties that must be overcome to bring about necessary changes in the chain. It is suggested that those sectors that do not implement appropriate SCM systems run a real risk of failure in the foreseeable future.

INTRODUCTION AND WELCOME
On behalf of the President of the International Society for Horticultural Science (ISHS), Dr Norman Looney, and the ISHS Board, I welcome you all to this the third meeting of your international, multidisciplinary group concerned with fruit and vegetable quality.

As Chair of the Quality and Postharvest Commission I am delighted that you decided to bring your meeting into the ISHS fold. We are a cross commodity Commission with more than 200 members who have interests in fruit and vegetable quality from orchard to plate, from physiology to pathology and from molecular biology to modeling. It is hoped that this meeting will become a regular part of our postharvest series, joining general postharvest horticulture, Controlled Atmosphere Storage, Postharvest Unlimited (which had its first meeting in 2002), and Model-It, each of which has a meeting every 3-4 years. Our Commission now sponsors at least one major international Postharvest Symposium each year.

I would encourage you to become a Working Group within the Quality and Postharvest Commission. Working Groups are the heart of the ISHS. They are made up of keen, enthusiastic and committed individuals from a diverse range of professional backgrounds, who want to organise regular symposia on their specialised field of interest. I want to encourage the multidisciplinary activities of our Commission and build up
strong networks among members. When we are involved in the business of applying our knowledge and skills to help alleviate poverty and increase food safety and security for people in developing countries, then we have to be able to apply a broad cross section of knowledge and wisdom to arrive at creative and practical solutions to their problems.

I congratulate the organisers of this meeting for the excellent programme they have arranged. There is no doubt that the horticultural industry urgently needs to move into this new millennium by utilizing the integrated processes and information technology innovations that are now common in Supply Chain Management [SCM] systems used by successful and emerging companies in many parts of the world (Bowersox et al., 1992). Quality is such a difficult attribute to define, but in the final analysis it is the consumer of the products who must be serviced and satisfied so that they want to make repeat purchases. Everything done within the chain from producer to consumer must be geared to presenting products with the best flavour, texture and visual quality attributes. ‘Quality in Chains’ is an apt and appropriate title for this Symposium as it builds on the success of its two preceding meetings. It will be interesting to find out if the attempt by Shewfelt and Tijskens (2000) to define various terms related to quality and shelf life have been widely adopted by the participants at this meeting. I have no doubt that the combined skills of the participants have the potential to push forward the technologies and methodologies required by the horticultural industry to succeed and thrive in the years ahead.

At the beginning of the 21st century consumers are demanding that fresh fruits and vegetables be increasingly safe, nutritious, tasty and available year round. This is occurring at a time when the producer of horticultural crops receives less than 30% of the market value; in an era of globalisation that sees reducing numbers of larger, global supermarket chains; when the balance of power in the horticulture food chain swings further away from the grower to international corporate entities; when more people are eating meals away from home; when more complex and ‘easy to prepare’ meals are available for the meals at home; when food safety has become a critical issue in developed countries; and when food security is the critical issue in developing countries. These and other recognized trends indicate that it is opportune and important to develop and implement strong, robust SCM strategies in horticulture so that product quality is ensured and that consumer satisfaction and profitability of participants is sustained and enhanced.

During the past decade major advances have been made in SCM in the manufacturing, distribution and service sectors of business. New businesses that adopt the basic concepts of modern SCM are succeeding at the expense of traditional firms that have not embraced change. By adhering to the basic principle that servicing customer needs is the key objective of the business, such companies have achieved growth in market share, profitability and consumer support by improvements in quality service, often accompanied by reduced prices, across numerous fronts.

Has the fresh horticultural industry moved with the times enough to be able to apply SCM to its business? Is it possible for this industry, generally made up of many growers with relatively small production volumes, with multiple players in the supply chain, able to apply the SCM concepts to products that are living, very perishable with short shelf lives and where deterioration rate is influenced so much by temperature, atmosphere and physical environment?

WHAT IS SUPPLY CHAIN MANAGEMENT

There are many definitions of supply chain; in fact the term is regarded as being synonymous with value chain or demand chain. Sangam (2002) defined a supply chain as: ‘a chain of events which initiates the process of Source, Make and Deliver a product from ore to store to satisfy the ever changing needs of a customer in the Market place’. According to Ricks et al., (2002) supply chain management [SCM] ‘represents a collection of management activities exercised between vertically related firms to improve efficiency, vertical integration, and overall performance of the participating firms within
Bowersox et al., (2002) defined SCM as ‘consisting of firms collaborating to leverage strategic positioning and to improve operating efficiency’.

The term Logistics has become a popular key word in recent years and often there is confusion between its meaning and that of SCM; in many cases they are used interchangeably. However, Logistics contrasts with SCM, in that it is ‘the work required to move and position inventory throughout the supply chain’ (Bowersox et al., 2002). The recent (1998) definition from the Council of Logistics Management is: ‘logistics is that part of the supply chain process that plans, implements, and controls the efficient, effective flow and storage of goods, services and related information from the point of origin to the point of consumption in order to meet customer’s requirements’ (Anon 2003a).

There has been a revolution in business over the past 15-20 years as the benefits of SCM have been realised and the information technology revolution has exploded. Successful new companies have used increasingly sophisticated SCM and logistics management systems to grow their businesses. Development and permeation of the Internet has facilitated this growth, as has the development of compatible systems for sharing knowledge within and between partner companies in dedicated supply chains.

KEY SUPPLY CHAIN ENABLES/DRIVERS

There are four main enablers of successful supply chain management, some of which require significant paradigm shifts in traditional organizational thinking. These are:

• Development of strategic alliances of firms with specialised skills;
• Creation of organizational structures that facilitate communication, information sharing and transparency between partners;
• Human resource partnerships with all levels of staff in all firms in the chain having a common vision and commitment to excellence;
• Utilisation of advanced information technology systems including electronic media, bar coding, GPS systems and appropriate software that allows instantaneous and timely feedback.

If companies have all these elements in place and are operating successfully then the following factors are likely to apply:

• Satisfied customers are loyal customers
• Consistent quality delivered 100% of the time
• Guaranteed delivery on time
• Lower costs, improved service
• Increased outsourcing of non-essential core businesses
• Strong strategic long term alliances with collaborative partners
• Enhanced use of increasingly sophisticated information technology
• Increased transparency of information sharing among partners
• Re-engineering of partner businesses to maximise customer service and hence increase profitability.

Are there many horticultural examples that have successfully adopted SCM and Logistic management systems in attempts to gain greater market share and increase profitability for major stakeholders?

IS HORTICULTURE READY FOR SCM?

The horticultural industry is characterized by many small producers, often in dispersed regions throughout a country with many different market outlets, ranging from road side sales to domestic market stores, to international chains of supermarkets in diverse countries. The supply chain is complex and challenging with numerous parties involved often not having knowledge of best practices to optimise quality of their perishable cargo (Fig.1). Growers tend to be of an independent mindset, selling their products to agents offering the best price. Horticulture is an industry that experiences fluctuations in volume and quality between seasons, much of which is driven by variations or extremes in weather patterns (such as frosts, floods, or drought).
Relationships within the industry are often poor, being segmented and tinged with suspicion. Every grower knows that they produce perfect produce and consequently expect to receive optimum prices. When they don’t, they tend to blame factors beyond the orchard gate such as poor retailing, inadequate cooling, or rough transportation; somewhere or someone down the chain is responsible for ‘cheating’ them out of their due rewards, by poor handling, inadequate promotion or marketing or untimely sales, or anything! Those responsible for purchasing the product (for supermarket chains) have to buy product at a price that will enable them to make a profit and they tend to be suspicious of growers who do not show consistent loyalty, who cannot provide consistent quality within and between seasons, who are considered to be wealthy because they own lots of land, and who always moan about low prices received.

It is only when the two parties get together and talk do they begin to understand the realities of their respective businesses. The buyer appreciates the true cost of production and the break-even point for the grower (often above current market prices) and the devastating effects of extreme weather patterns. The grower also develops awareness of the demands of the customer, the importance of product quality and maintenance of optimal postharvest shelf life conditions to ensure maintenance of quality for the marketing period.

It is a sad indictment on our horticultural industries that greater mutual dialogue does not occur on a regular basis among all those involved in the supply chain from the orchard to the consumer. In 1997, Prussia (2002) organised the first ever meeting in Georgia, USA, (which had been a major horticultural production state for many years), between all parties involved in the growing and handling of fresh fruit and vegetables. If more meetings of this kind occurred in different areas then it is possible that there could be an emergence of true supply chain management incorporating all players within and/or between states and countries.

NEW ZEALAND EXAMPLES

i. Fruit to Europe

New Zealand producers are furthest from their major markets than any other producers in the world. Located in the deep Sth Pacific, it takes at least 30 hours by plane, and up to 5 weeks by sea, to transport perishable horticultural crops to major markets in Europe (Fig. 2). Yet the kiwifruit and pome fruit industries have developed a highly sophisticated system of supply chain management to grow, harvest, pack, store, transport, store, distribute and market their crops very successfully and generally profitably. These industries have set international benchmarks for quality and service, yet continue to innovate, develop and improve their practices and processes. This is particularly so in the kiwifruit industry which has recently created a new “Global Supply Chain and Systems Department” responsible for all aspects of planning, procurement, quality assurance and logistics, all supported by efficient information systems and replacing the Operations Division (Anon, 2003b). This move builds on the ZESPRI™ System that recognizes its success will ‘depend on integration and cohesion of people, systems, investments and relationships- a fusing of human factors into a common sense of purpose; a coalescing of processes, practices and programmes to deliver consistent, traceable quality from orchard to market; and a prudent but committed marshalling of resources to ensure advancement’ (Anon, 2002.) all of which constitute the essence of successful SCM. Adoption of such a system has enabled ZESPRI International Ltd to supply consistent premium-quality fruit to more than 60 countries around the world, and to provide 12 months supply by implementing rigorous systems for production and quality control for fruit produced under their brand in other countries such as Italy and Chile.

ii. Stone fruit

Stone fruit growers in Central Otago, New Zealand, produce the majority of sweet cherries and apricots in the country. This region is located 1500 km and 48-60 hours from the main population centre and major market Auckland (Fig. 3). The current process for getting fruit to Auckland is: harvest; cool to <2°C; pack (cherries into polyliners, apricots
loose fill); transport in refrigerated curtain sided trucks to Christchurch overnight; consolidate loads; refrigerated curtain sided trucks to Picton; freight/passenger ferry across Cook Strait; refrigerated curtain sided trucks to Auckland. Fruit temperatures on arrival range from 4-15°C depending on degree of precooling, transit time and ambient temperatures. In order to ensure that apricots have some shelf life when they arrive in the market, fruit is harvested relatively immature with background colour green to turning yellow.

As a consequence of the inadequate temperature control maintained during the transport chain, fruit softening and water loss are often enhanced with reduction in shelf life. In addition, the ‘immature’ fruit does not achieve the texture and full sweet flavour characteristic of tree-ripened apricots. In other words they have a negligible flavour life as defined by Kader (2001).

More than 15 years ago scientists and growers undertook a collaborative trial shipment demonstrating that if apricots were harvested more mature, precooled immediately and transported to Auckland in hard sided refrigerated containers, then the fruit arrived at the market within temperature specifications (<2°C) having an acceptable shelf life (5-7 days) and a much improved taste, texture and flavour than those harvested less mature and transported in curtain sided refrigerated trucks. Because the supermarket buyers were not part of the experiment and mutual trust between the parties was absent, no special promotion or in store marketing was undertaken. Growers did not receive price increases to cover the additional costs involved in this ‘new’ form of transport, and after 2 years the improved system was discarded. This year consideration is being given to use hard sided refrigerated containers that will maintain desired temperatures during transit. What opportunities have been wasted in the intervening years?

There is a real need for this industry to implement known technologies, both postharvest and information, to improve the supply chain for apricots and cherries moving to the main Auckland market. It will require creation of new alliances, commitment to change and creative, stable and transparent partnerships by those involved at all stages of the supply chain. The opportunity for a successful outcome exists; however, it needs a champion to make it happen to the mutual benefit of all, not least the consumer.

With the recent amalgamation among supermarkets, only two major chains exist currently in New Zealand. Competition for product is becoming quite intense and at least one chain is seriously considering re-organising its fresh produce supply chain. Pressure is coming from a logistics manager within one of the trading (broking) companies to increase the efficiency of all components of the chain. To do this attempts are being made to involve growers, transport operators, coolstore/packhouse operators, supermarket buyers and the fruit trading company. Resistance exists, some of which is within the initiating company, where some key persons in senior management are dedicated to the traditional way of doing things rather than embracing opportunities for change. However the time is right for such initiatives to be undertaken, otherwise the pressures confronting growers traders and supermarkets will all compound to the detriment of their businesses as well as consumers.

CONCLUSION

It is anticipated that if horticulture adopts standard protocols of supply chain management commonly applied in other businesses then the outcomes should be:

• improved fruit quality, better service and possibly lower relative costs for the consumer,
• larger sales volumes, faster throughput, sustained prices and potentially greater profits for the retailer,
• better control of inventory, higher fruit quality and increased returns for the fruit trader and
• better prices for the grower.

If wastage and poor quality fruit can be eliminated by use of tried and proven postharvest technologies and a highly efficient integrated supply chain, then prices to the...
consumer could be lower and those to the grower higher than is traditionally anticipated with those within the chain benefiting from enhanced commissions or margins. In other words it is a “win:win situation” for all parties.

Bowersox et al., (2002) have identified ten major trends that are likely to dominate businesses in the next decade (Table 1). Some or all of these need to be adopted by the fresh fruit and vegetable industry to make sure that the right product, of the right quality, is delivered to the right customer at the right time and right price. There will need to be major re-thinking of organisation structures and re-engineering will have to take place; traditional secrecy that has permeated the industries will need to be relaxed and shared fully with partners. None of this will be easy or comfortable. Yet it will be essential for future success. Principles established in other businesses can be adopted and adapted for the perishable produce trade.

I suggest that it should be imperative for producers of fresh fruit and vegetables to become involved with long-term strategic partners in the cooling, packing, transport and marketing of their products. Whether this is achieved by an individual farmer (and this may well be a function of size), by a co-operating group of farmers or by the creation of grower cooperative structure, does not matter. Failure to do so may well result in a continual diminution of their power in the chain with resultant lower prices and ultimate business failure. What matters is the ability to work together successfully and profitably with partners to ensure marketing success. As stated by Bowersox et al., (2002),” in the final analysis, the challenge is to rise above the traditional incremental thinking in an effort to help capture and promulgate the need for businesses to reinvent what they are all about- SERVING CUSTOMERS.

It is axiomatic that this applies just as much to horticultural businesses involved in the production and marketing of fresh fruits and vegetables as it does in any other form of business. The customer deserves our best efforts to present them with a safe, healthy, nutritious product and we must use all the tools at our command to ensure that their needs and demands are satisfied.

Literature Cited
Table 1. Major megatrends occurring in supply chain management (after Bowersox et al., 2002)

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<td>Experience dictates behavior</td>
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<td>Strive for quality</td>
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<td>Lip service paid to environmental issues such as energy and ecology</td>
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<td>Food safety taken for granted</td>
<td>Customers demand safe food</td>
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Fig. 1. Supply chain from Orchard to consumer (after Kerr et al., 1998)
Fig. 2. Supply chain to Europe for horticultural exports from New Zealand.

New Zealand to Europe is 18,350 km
27 hours flying
4 weeks by sea

Major crops exported by sea to Europe include:
Kiwifruit
Apples
Wine
Onions
Fig. 3. Internal transport route for stone fruit from Central Otago to Auckland, New Zealand.