

Supply chain management of fresh produce: Melons in western China

Yanrong Zhang

Associate Professor, School of Economics and Management

Gansu Agricultural University

Lanzhou, Gansu 730070, China

Tel: 86 - 931-7631510

E-mail : zhangyanrong@tom.com

Sherrie Wei

Professor, Department of International Business Administration

Chienkuo Technology University

Changhua, Taiwan 500

Tel: 886 - 4 - 7 111 111 ext 3716

E-mail : s.wei@uq.edu.au

Zhixia Qiao

Postgraduate student, School of Economics and Management

Gansu Agricultural University

Lanzhou, Gansu 730070, China

Tel: 86 - 931-7630499

E-mail : qiaozhixia@hotmail.com

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Abstract

The western part of China has a long history and reputation of growing a variety of quality melons largely due to its semi arid agronomic environment. In the past decade, the industry suffered from the interrelated issues of unreliable quality and intense price competition. Even though both the government and supply chain stakeholders are aware of the problems, there is a need to look at the issues from a supply chain perspective and new ways of managing the melon supply chains are to be explored. This paper analysed the melon supply chain in western China in the areas of logistical efficiency and supply chain relationship management. The results of the analysis offer insights for improving the efficiency of the melon supply chain and the competitiveness the industry. The results also shed lights for other supply chains of fresh produce in developing countries in general.

JEL classifications: O13, O5, Q13

Keywords: melon, China, supply chain, value chain

Introduction

A supply chain approach for food and fibre industries has been widely discussed and practiced with well-known success stories. Supply chain management (SCM) simply refers to the management of the entire set of production, distribution and marketing processes by which a consumer is supplied with a desired product (Woods et al., 2002). While a transactional or dyadic based orientation is traditionally used in conducting businesses in developing countries, the focus of SCM is on more coordinated supply among agribusiness units for desirable products. The approach is an opportunity for supply chain partners to see where they fit into this bigger picture and how they need to position themselves to take advantage of emerging trends and developments. (Wei and Zhang, 2004)

Research has identified several drivers in the external environment of developed countries contributed to a more consolidated approach between agribusiness units vertically involved in the same chain. They include cost-price squeeze in the larger environment of globalisation, traceability for food safety, and green ethical products and increasingly specific demand by consumers (Woods et al., 2002, Woods, 2004). In developing countries, interest in supply chain management has been growing in Brazil (Fehr and Romao, 2005), Indonesia (Wei et al., 2004), Vietnam (Chau, et al., 2004) and China (Huang, 2005; Qiao and Zhang, 2005).

After its accession to WTO, China has been under pressure to open up its agricultural markets even though this process is happening very modestly. The drivers of SCM in developed countries stated above are not imminent in China as yet (Wei and Zhang, 2004). Nevertheless, Chinese researchers (Huang, 2005, Li, 1999) have stressed that the perishability of fresh produce combined with increasing consumer requirements for quality and food safety requires supply chain management for logistical efficiency to reduce wastes and to maintain quality from paddock to table. To this end, supply chain stakeholders need to co-ordinate logistics, from planting decisions to preharvest and postharvest management to reduce wastes and improve quality. This kind of co-ordination can only be achieved through good and lasting relationship between supply chain partners who maintain a certain level of trust with each other (Batt, 2003).

This paper analyses the melon supply chain in western China in the areas of logistical efficiency and supply chain relationship management. The methods used in this

research include in-depth interviews with supply chain stakeholders and extension officers and survey of consumers in three of the major Chinese cities.

The western part of China, including Xinjiang and Gansu provinces, belong to semi arid temperate climate with long daylight and dramatic day-night temperature difference. Melons are widely grown in those areas where there are irrigation and soil conditions are suitable. With centuries of experiences, the areas are renowned for producing a variety of quality melons. However, for the last decade, this reputation has been threatened as a result of inconsistent quality, increasing competition from substitutes, and consequently higher risk and smaller margins for the stakeholders. Even though both the government and supply chain stakeholders are aware of the problems, there is a need to look at the issues from a supply chain perspective and improved ways of managing the melon supply chains.

Specifically, the study looks at the honeydew melon supply chain in Minqin prefecture in Gansu province. The area produces 100,000 tonnes of melons and 80% of them are sent to interstate markets. In-depth interviews were conducted with a mix of twenty collectors, wholesalers, and retailers. As it is not customary for Chinese to openly discuss their businesses, the interviewees came from a convenience sample that the researchers have some connection with, either directly or indirectly. Nevertheless, the interview results should not be biased as many supply chains tend to operate similarly and the information given by these business people with some kind of connection is rather reliable.

Melon logistical supply chain in western China

As shown in Figure 1, the melon supply chain involves input suppliers, farmers, collectors, interstate wholesalers and retailers. At the interstate wholesale market, melon can go through another step of local wholesalers before reaching retailers.

<Figure 1>

Input supply

Input suppliers include seed and chemical companies which may be publicly or privately owned. Input suppliers are far away from end consumers. They only sell products to farmers and are rarely involved in farmers' planning decisions. One main reason for this is that these companies are often short of specialized personnel to provide further information to farmers. Another reason is that there is no sufficient trust between input suppliers and farmers for them to plan jointly.

Farmers, preharvest and harvest practices

On the average, farmers grow about 10 mus (15mu = 1 hectare) of melon. Planting decisions are based on market prices for the past seasons, expected weather conditions and current soil conditions. Popular honeydew melon varieties include Huanghemi, Yujinxiang and Yindi. Some melons are planted undercover for early season premium price. Most farmers use chemical fertilizers and plastic mulch but do not use herbicides and pesticides before the problem is visible. As a result, it is often too late to control and the risk is high under this practice. The costs for seeds, fertilizers, taxes and irrigation account for 80% of the planting costs (Zhang and Wei, 2004). Farmers do not include labor in the calculation of their costs.

The actual timing for harvest is based not only on the maturity of the fruit but also market price. Melons can be harvested prematurely at times under the request of wholesalers when market price is good and too late when price is short of expectation. Harvesting is done by hand and sacked in bags of about 20 kilograms. This practice is often responsible for blemishes appeared later down in the chain. They are sold to collectors at farm gates or at collecting points.

Grading and packaging

Melons are graded and packaged under the direction of individual collectors and wholesalers. Common criteria are size, blemishes, and color. However, the criteria are not uniform between them and at different seasons. Packaging is made in two ways, bulk pack in 20 kilograms of netted bags for local markets, and individually wrapped in foam cover for 25-30 kilograms of carton boxes for certain interstate markets. Smaller cities of interstate markets, comprising 90% of the interstate honeydew markets, accept bulk pack. Larger interstate markets require individual wrap and high quality carton boxes. Type and price of packaging material are shown in Table 1.

<Table 1>

Consolidation, collectors and wholesalers

Consolidation is made by interstate wholesalers and collectors who live in the village. There are just a few collectors in each village. They are usually people with some capital and information sources. Collectors often build simple undercover storage nearby the production area or roads where the wholesalers would pass. They sell to

interstate wholesalers through introduction or by their exposure to wholesalers at their conveniently located collection sites.

Interstate wholesalers travel around the production areas in Xinjiang, Gansu and Inner Mongolia in different seasons. In the beginning of the season, they often call collectors, if they know any, to learn about yield and exchange price information. They generally make one or two deals at each production area. Each deal consists of one or two truck loads, or 14 or 28 tons albeit 10 tons being the maximum truck load. Most melon wholesalers are experienced buyers and the most important link between local stakeholders and interstate markets.

Transport

About 80% of the melon transport in China is made by truck, the rest being by rail. As there is no rail in Minqin prefecture, all melons from the region are transported by truck. Nearly all melons are transported without refrigeration. Cost for transportation from Gansu to Shanghai is about 10,000 Yuan or 0.3-0.5 Yuan/ton/km.

Through mapping the melon supply chain, losses were estimated at each step as shown in Table 2. Preharvest losses were about 9.1%, mainly due to blemishes and damages caused by pests and diseases. As these problems do not show up in large scale before harvest, farmers often do not treat them until it is too late to save the crop. Under normal conditions of transport, and fair pest and disease problems, losses during transportation were about 3.75%. Total losses for interstate wholesalers were about 11%. Retail losses were generally about 12% though they depend on how fast

the fruit moves through. Spoilage at the consumer level was about 5% due to over purchasing and late consumption.

<Table 2>

Consumer preferences

Surveys at three major Chinese cities, Shanghai, Wuhan and Beijing, indicated that consumer preferences are slightly different. As shown in Table 3, most consumers prefer medium-size, relatively crisp, sweet and aromatic melons. Compared with other consumers who prefer oval shape melons with light yellow skin, Shanghai consumers prefer round melons with light green skin. Beijing consumers prefer melons with netted appearance, but other consumers prefer smooth skin ones. While Wuhan consumers do not mind flesh color being light green, other consumers prefer pink flesh color.

<Table 3>

Another study also offered some understanding of consumer preferences for Hami melon (best produced in Xinjiang) in the largest city in China, Shanghai. It found that Shanghai consumers prefer Hami melon of medium size and to keep Hami melon under room temperature for more than 3 days (Phan-Tien et al., 2005). Xinjiang Department of Plant Protection also has quality control at major interstate export check points for size, maturity, diseases and pests. However, the program is yet to be implemented with determined will.

Melon relationship supply chains in western China

One key to develop a supply chain methodology is to understand the network and the environment of chains. In other words, the success of supply chains hinges on the nature of relationship between chain members (Taylor, 2004; Harland et al., 1993). Collaborative working relationships, characterized by mutual understanding of shared goals, frequent information exchange, trust between members, make logistical issues easy to coordinate. This section looks at the nature of the relationship, return on investment for each supply chain level and the distribution of values in the melon supply chain in China.

Melon supply chain partner relationship in western China

Melon supply chain relationship is complex as members are free to change suppliers and move to different customers based on short term calculations as diagrammed in Figure 2. Occasionally forward contracts were made between farmers and collectors, however, farmers often did not honor the contract when another collector offers a higher price. Similar situation happens between collectors and wholesalers. Collectors will almost surely turn away from the existing wholesaler whose offer is 10% lower than another wholesaler for a particular deal. There is little exchange for information and technology among chain members who generally act opportunistically under the rather fragmented and decentralised industry structure.

<Figure 2>

Return on investment for chain partners

Average weekly return on investment at each level for the Gansu-Shanghai supply chain is shown in Table 4, collectors had the highest return on investment, followed by retailers and wholesalers. Farmers had the least return. Also note that farmers

spend close to four months for the product while collectors spend 3-4 days for a deal (Zhang and Wei, 2004).

<Table 4>

Melon value chain analysis

Value chain refers to the distribution of value among supply chain members. It is an indication of the relative power of chain members. Table 5 shows the Gansu-Shanghai value chain. A total of Yuan 0.482 was created from the chain. Among this, retailers had the lion share of 41%, followed by wholesalers for 28%, 23% for farmers and 8% for collectors (Zhang and Wei, 2004). While retailers had the highest return, they operate on a small scale. In contrast, wholesalers manage a large quantity and are considered larger players in the chains.

<Table 5>

Conclusion and discussion

This paper looked at the melon supply chain in western China from both the logistical efficiency and relationship perspectives. To improve the logistical supply chain, a quality assurance program needs to be in place for all supply chain partners to follow. An outline of such is shown in Figure 3. This may be implemented through developing a common language embodied in a manual. A complete trial pilot supply chain may be set up as a model chain. One crucial antecedent to this development is some kind of horizontal integration at the farmer level. As the average farm size is less than one hectare in Gansu, postharvest activities, including packaging, grading and treatment, are difficult to implement. Due to their collective history, Chinese farmers can be organised in a short period of time with the facilitation of local

government (Sun, 2005). The key is to establish cooperatives that function by themselves and are sustainable. Currently, melon farmers hope to get effective assistance from the government needed market information and quick technology transfer. Horizontally integrated farmers will be able to improve these problems significantly. Establishing cooperatives is also instrumental for farmer groups to build long term relationship with collectors and wholesalers and to foster a bigger picture of supply chain management.

<Figure 3>

Wholesalers are the key link between local production and interstate markets. For any potential supply chain innovation to be successful, it should involve wholesalers.

These innovations may include developing and adopting new cultivars, plant protection measures and postharvest treatments. Like farmers, wholesalers also need to foster a big picture to drive supply chain innovation.

Analysis of the relationship supply chain indicated that chain members do not always maintain a stable relationship with a view to capture short term profit. Value chain analysis showed that retailers and wholesalers have the bigger share of the total value created in the supply chain. It is essential to include them for any chain innovation to be successful, especially wholesalers who are smaller in numbers and the key link between local production and interstate markets. The results of the analysis offer references for improving the efficiency of the melon supply chain and the competitiveness of the industry.

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Table 1: Type and price of packaging material

Type	Price Yuan*/each	Notes
Netted bag	0.40	Each bag holds 20 kgs of melon
High quality box	4.5	Each box holds 25-30 kgs of melon, usually 5~6 melons
Median quality box	3.8	
Low quality box	2.8	
Foam wrap	0.07	For individual 5-kg melons

* USD 1 ~ Yuan 8.3 in 2004

Adapted from Zhang and Wei, 2004

Table 2: Honeydew melon supply chain losses

Supply chain level	loss (%)
Preharvest	9.1
Collection, transportation	11
Retail	12
Consumer	5
total	37.1

Adapted from Zhang and Wei, 2004

Table 3: Consumer preferences of honeydue melons in Shanghai, Wuhan and Beijing

	Shanghai, N=131	Wuhan, N=142	Beijing, N=150
Annual consumption	10 kg	20-50 kg	10-20 kg
Size	1- 2 kg	1-2 kg	2 kg
Shape	Round	Oval	Oval
Skin colour	Light green	Light yellow	Light yellow
Flesh colour	Pink	Light green	Pink
Texture	Crisp	Crisp	Crisp
Sweetness	Sweet	Sweet	Sweet
Aroma	Light	Light	Light
Netting	Smooth	Smooth	Netted
Maturity	80%	80%	80%

Table 4 : Gansu-Shanghai melon supply chain members' return on investment

Supply chain members	Return for one truckload	Normalized weekly return on investment
Farmer	40% (4 months)	2.5%
Collector	10% (3-4 days)	20%
Wholesaler	9% (2 weeks)	4.5%
Retailer	11% (1 week)	11%

Adapted from: Zhang and Wei, 2004

Table 5: Gansu –Shanghai melon value chain

Supply chain member's cost and price	Price Yuan*/kg	Profit Yuan/kg	Value distribution %
Farmer's cost	0.270	0.110	23
Farmer's price	0.380		
Collector's cost	0.380	0.038	8
Collector's price	0.418		
Wholesaler's cost	1.463	0.137	28
Wholesaler's price	1.600		
Retailer's cost	1.803	0.197	41
Retailer's price	2.000		
total		0.482	100

* USD 1 ~ Yuan 8.3 in 2004

Source: Zhang and Wei, 2004

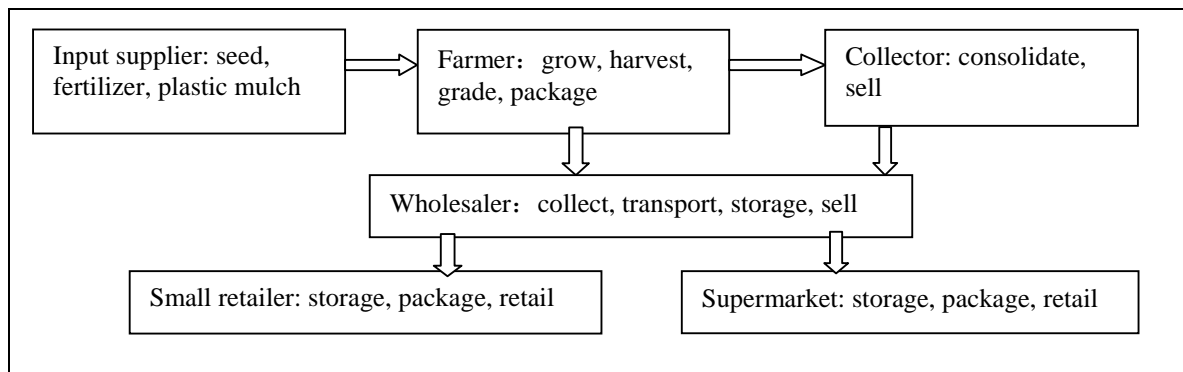


Figure 1: Gansu melon supply chain

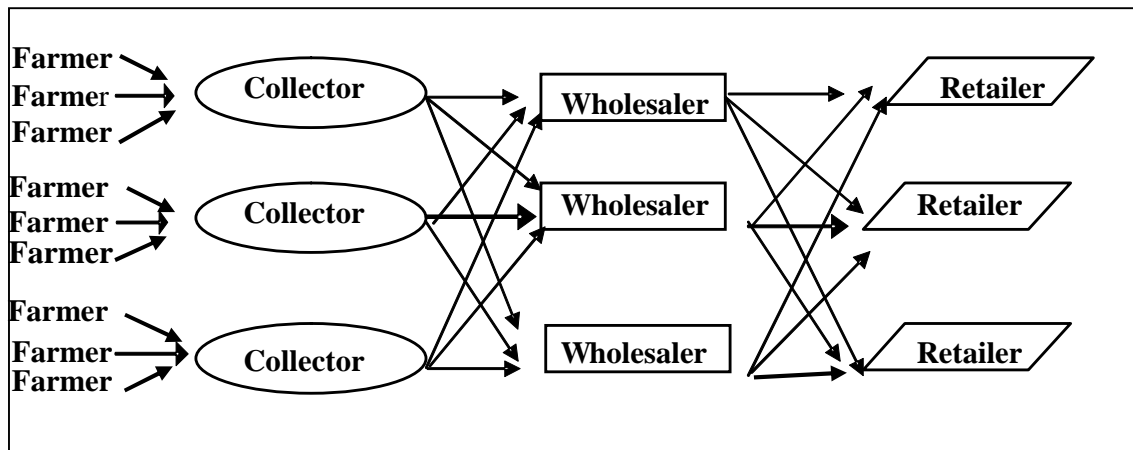


Figure 2: Melon supply chain partners

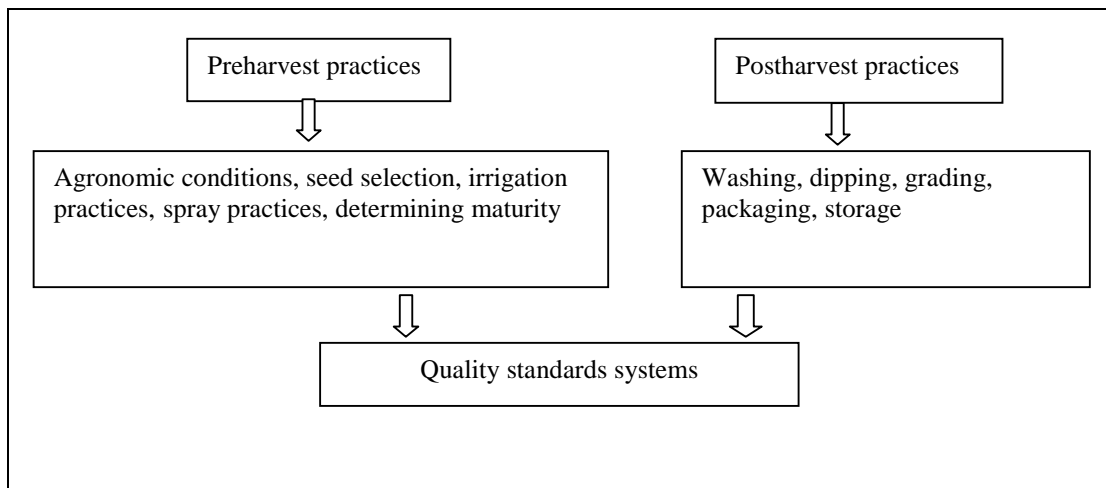


Figure 3: An outline for quality management manual