The Cool Supply Chain Management for Cut Flowers

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Abstract

This dissertation submitted in partial fulfillment of the requirements of the Birmingham City University, United Kingdom for the degree of Master of Science in Logistics and Supply Chain Management. The project provided the analysis in the cool supply chain management for cut flowers, improve the temperature control supply chain in order to serve the longer perishable of cut flowers to the end customers and also identify the liable threats and opportunities to improve the supply chain efficiency for shorter lead time. Identifying the importance of handling temperature control along the process of moving flowers from production to the end retail is critical for preserving the quality of cut flowers and it has been found some challenges and threats that impacts on the flower quality and lead time based on the literatures and the survey by author. This project has been found that the threats of execution the effective cool chain management involves the insufficient of cool chain facilities, cool chain standard, and cool chain knowledge. The study found that lead time reduction in flower chain for retail flower shop could be reduced by stock checking regularly for forecasting the demand and select the suppliers based on reliability. It can be said that the extensive information sharing among the sectors in flower chain in term of cool chain awareness and knowledge, demands, supplies, and forecasting leads to successful in cool chain management for better flower quality, shorter lead time and protecting the wastes.

Keywords: Cut Flowers, Flower Supply Chain, Cool Chain Management, Lead Time Reduction

1. Introduction

1.1 Background

Nowadays, cut flowers industry is dynamic, fast-developing, and global which contains the major flower supply chain of growers, wholesalers, and retailers. The global trades for cut flowers have always been the main groups within worldwide floriculture trades that are traded more regionally in addition as geographic development of cut flower production along with further improvements in logistics make long haul transportation more feasible, the portion of cut flowers in floriculture trade will prospective grow (Rijswick, 2015). The rise in floriculture export from 2001-2013 are liable to change rapidly and unpredictably from 2009 onwards (Rijswick, 2015).

However, fresh cut flowers are extremely perishable because it preserves mere limited life-supporting processes by taking water up through its stems. Currently, flower industry is extremely international and dynamic. The international trade is mainly organized along regional area. The main global trade for the major Flower suppliers are EU, Columbia, Ecuador, and Kenya. It has been shown that African and European countries are the main suppliers to the main European markets; the North-American cut flower market is largely supplied by Ecuador and Colombia and; and Japan and Hong Kong source mainly from Asia-Pacific countries (including China) (Hortiwise, 2012).

1.2 Significance of the study

However, the importance of quality at the point of sales will determine price of cut flower not when it harvested in order to decrease the risk of flowers losing their value, the temperature issue necessity to be sensibly considered (Hulst, 2004). SADC (2004) state that cut flowers are extremely perishable produces and can solitary preserve exact limited life-supporting practices, therefore significantly rely on effective and rapid distribution channels, and outstanding cold-chain management systems. During the transportation of cut flowers from the grower to the end customers from around the world, cool chain management is essential for preserving the quality of cut flower (Musoke, 2010). Moreover, the

supply chain management for temperature sensitive products requires fast decisions making; products are transported within hours (Garcia and Lunadei, 2010). Consequently, the flower market is the critical challenge for supply chain to manage the temperature control and time constraint for cut flowers as high perishable goods. Though, there are many flower supply chains depend on the end markets but this paper will focus on flower supply chain for European flower markets from grower in Africa through flower auction in Holland to the end retail in European countries including the UK.

1.3 Objectives

1) Be able to demonstrate significant descriptions of cut flowers, general flower supply chain in the global trade, and cool chain management.

2) To review the current situation of main traditional flower chain which focusing on the elements of growers in Africa, transportation, flowers auction in the Netherland, whole sellers, and retailers in European countries.

3) Identify the importance of handling temperature control along the process of moving flowers from production to the end retail in order to preserve the quality of cut flowers.

4) To analyze the benefits and challenges of operating cool chain management and criticize the sections within the supply chain affected.

5) To evaluate the current challenges of cool supply chain management which distinguished by the sectors involved and propose the recommendations to improve the cool chain management for cut flowers for serving the longer perishable and shorter lead time.

1.4 Limitations

1) This project will study on flower supply chain for European flower markets from grower in Africa through flower auction in Netherland to the end retail in European countries including the UK.

2) The cool chain operating for cut flowers of grower, transportation, auction, and wholesaler will be collected by secondary data from existing documents.

3) The primary source of the end retail in European will focus on the random sampling flower shops in Birmingham, United Kingdom

2. Literature Review

2.1 Cool Chain Management

Cold Chain Management (CCM) could be defined as the distribution options and network of facilities that executes the typical functions of a regular supply chain cycle however it concern with temperature and humidity control through the supply chain stages and persons Last (2009) cited in Tamimi et al. (2010). Kazmi and Naaranoja (2014) argue that cool chain management system is defined as a logistic solution generally for perishable products and goods, in which temperature sensitive cargo or shipment is supposed to maintain the integrity and credibility throughout multi-stages movement and the goods are kept in enclose facilities to certify the originality, product's 100% quality, freshness, and the accomplishment of maximum ´customer satisfaction´. Moreover, nowadays cold supply chain has become more significant within the changing global economy as a result of the massive growing demand on the products of temperature controlled trades, essentially fresh agricultural products, chemicals, manufactured food, medical vaccines and military services (Tamimi et al., 2010). Heap (2006) claim that the cold chain is normally considered as the storage and transport chain among the primary production and the final consumer of temperature-controlled perishable goods.

2.2 Flower Supply Chain

Nowadays, flower supply chain contains the various elements to transport from farm to the consumer such as grower, freight forwarder, airline, flower auction, wholesaler, and retailer. Hortiwise (2012) claasified the main methods for Kenyan flowers inflowing the European market are:

1. The Traditional Supply Chain: Cut flowers are transported from the plantation to a handling agent at the airport then the flowers are flown to Europe and collected by a handling agent at the airport. The products are handled by an importer to prepare for auctioning then cut flowers are bought by a wholesaler to sells them to retailers, where customers compound the end buyers finishing the supply chain.

2. The Auction Import Supply Chain: This type of SC is shorter from SC no.1 by cutting the importer. The import department of the auction itself obtains the flowers, unpacks and arranges the products to auction.

3. The Auction-Retailer Supply Chain: Indistinguishable to Supply Chain no. 2, on the other hand the wholesaler

is removed. Retailers buy the flowers directly by themselves at the Dutch flower auctions.

4. The Traditional Direct Supply Chain: The cut flowers are collected by a handling agent who straight forwards the boxes of products to a European wholesaler that works for of import handling and conceivable processing (for example bouquet arranging), before trading the products to domestic and foreign customers.

5. The Mass-Market Direct Supply Chain: This is the shortest presently supply chain that decreasing the total distance of the traditional supply chain in no. 1 by one third. The retailers selects their own importer to import their cut flowers in most cases are large supermarket chain.

2.3 Cool Chain Management for Cut Flowers

In order to preserve the quality of cut flowers, cool chain management is significant though the processes. Nordas et al. (2006) state that global trade for cut flowers needs a cold storage, cold transportation facilities, and well-organized in land and air-freight distribution system for remaining the flowers freshness. Gebreeyesus and Sonobe (2011) argue that cool chain management play significant role for preserving the quality of cut-flower exports besides; it involves a farm level pack-house, cold transportation, and airport cool storage.

Musoke (2010) claim that after harvest, cut flowers needed effective cool chain management begins and keeping the product at the greatest possible temperature during the processing, packing, store, and transport to the end retail market. There are usually many breaks in the chain though the processes which have addition impact on dropping the possible quality and shelf life of the flowers. Growers are the first priority to reduce these breaks in the cool chain so as to have the maximum quality and shelf life of cut flowers and foliage.

2.4 Lead Time Reduction

Cut flower business is concerned about freshness and time because flowers have short product-life cycle. It is not only the cool chain management but lead time reduction is also the critical issue that needs to take into account. Kuhlang (2011), cited in Munster and Vestin (2012) state that lead time definition is "that period of time (minutes, hours etc.) required by any process to transform the inputs (materials, customers, money, information) into outputs (goods, services)." Nordas et al. (2006) argue that lead time is the total time between the placement of an order and the receipts of the goods ordered, in addition, it is influenced by the type of the product (such as whether it is a "from the shelf" or made to order product and it also depends on supply chain management and planning, logistics services and obviously distance to suppliers and customers. Lenderink (2014) discussed the category of lead time that includes order handling lead time, delivery lead time, supplier lead time, and manufacturing lead time while Antonin (2014) conclude that there are two kinds of lead times in supply chain management: Manufacturing Lead Time and Information Lead Time.

3. Methodology

3.1 Research Philosophy

The research methodology of this study also use deductive methods to review the existing literature about cool chain management, flower supply chain, cool chain management for cut flowers and lead time reduction in order to answer the research question and meet the project aims and objectives.

3.2 Data Collection

The elements of the flower supply chain consist of the wide information which this project could not be collected by only primary data collection. Therefore, the data collection process in this research contains the combination of secondary data and primary data. It can be divided by the data of grower, transportation, flower auction in the Netherland, and wholesalers will be used by secondary data. Moreover, the primary data collection is collected by the flower end retailers in Birmingham.

1. Secondary Research
    The secondary data will be researched from published books, journals, websites, magazine, working paper, and conference reports about the growers in Africa, transportation, flowers auction in the Netherland, and whole sellers for study about cool chain handling. In addition, the data which published by the professional flower export and import countries such as Kenya and Netherland contains the observation and problems detected between their flower chains.

2. Primary Research
    The primary data collection of the end retailers will be conducting the 'self-completion questionnaires'. In term of questionnaires design, the targeting of 10 sampling flower shops in Birmingham are handled to do the questionnaires form that contains ten question in term of cool chain handling for cut flowers to ask for the useful information from the experienced-retailers. In addition, the structured form of asking questions will be carried about

their flower supply chain, cool handling awareness, cooled facilities, problems about flower trading and other questions which are useful to answer the research questions. Notation, the interview questions form will be attached in the appendix.

3.3 Data analysis

1. Secondary Data

Afterwards, the secondary data collected will be analyzed the data analysis section in order to detect to problems of operating cool chain management in each sector of growers in Africa, transportation, flowers auction in the Netherland, and whole sellers. Furthermore, some critical issues will be discussed for identifying benefits and challenges of operating cool chain management and criticize the sections within the supply chain affected based on the deductive reasoning. Finally, analyze the collected information to test the existing knowledge and suggestions from the literatures in order to review the current situation of cool chain for cut flower and study the opportunities for improvement.

2. Primary Data

The collected data from questionnaires of the 10 flower shops will be analyzed to study that their currents supply chain as the representative of EU retailers with the published literature. In addition, all the questions are closed-end questions which contains the some given possible answers. For example, the question that asks about elements of their supply chain contains the answer of grower, freight-forwarder, airline, flower auction, wholesalers, and Logistics Company.

4. Data Analysis

This study conducted with the secondary sources and primary source. It was divided by the elements of flower supply chain from the beginning of grower in Africa, transportation, flower auction, wholesaler, and end retails in European countries. Firstly, the secondary data that collected from various literatures about grower, transportation, flower auction, and wholesaler were demonstrated the current challenges and problems for implementing cool chain management in each sector of flower chain based on the observation of specialists in flower industry. Secondly, the questionnaires collected from 10 flower shops in Birmingham which consist of 10 questions are analyzed in order to review the current situation of supply chain and study cool chain handling by the sample group of end retailer of flower chain in EU.

4.1 Secondary data analysis

• Growers

Production occurs in the greenhouses where flowers are planted, tended and harvested. The greenhouses that planted the flowers are not necessary to be climate-controlled; the cool chain is needed when the flowers have been harvested until they reach the final destination. Preferably, temperatures in the series of 10-14 degrees Celsius must be maintained during processing, storage and transport. Flowers are cut and conveyed to packing houses for processing, bundling into bunches and then packing into the box ready for storage and transportation in refrigerated trucks to the airport (Evers et al., 2014). Gebreeyesus and Sonobe (2011) state that all farms require a constructing of pack-houses within their sites and incurred substantial investment costs to do so; moreover the farms require to buy their own refrigerated trucks to transport their flowers to the airport, while the rest of the farms will rent the cool trucks from other farms.

• Transportation

The packed flowers need refrigerated trucks to transport the airport cold storage where they stopover until re-loaded into the plane (Gebreeyesus and Sonobe, 2011). Hortiwise (2012) state that local transporters transports the flowers to the freight forwarders at the airport, some larger farms brought their own trucks, some forwarders offer trucks to collect the flowers, poor roads in farm areas cause the delay distribution and deterioration of quality due to insufficient allocation of funds for road maintenance and development in production zones. Some cases, unrefrigerated and regularly slow transport to airport.

During the air transport, Hortiwise (2012) report that temperature setting in the cargo compartment of airplanes are too high (at best 4 ˚C, >10 ˚C also happens), in case of flight delays, and quality effect of transit flights routes that lead to warming flowers. Moreover, there are lack of transparency on how airlines are educated to set the temperature and who is responsible for this situation. Some airlines barely execute any temperature measurements and provide some feedback.

Hulst (2004) observed the flower moving through auction and state that most of the flowers incoming in the Netherland from Ecuador or Kenya arrive at 10-15 ºC. Occasionally, temperatures can be slightly higher between 15-

20 ºC or even above. The flowers received at temperature between 15-20 ºC are frequently conditional on one or more of the abovementioned quality remarks. At temperatures exceeding 20 ºC, the foliage of the flowers can certainly turn brown cause of the flowers with no value at all.

• Wholesaler

Wholesalers are the critical links in the supply chain that connecting growers to retail and the end customers by auction the flowers for trading with retailers. Cool chain management in wholesaler still has some issues to detect. These includes cooling before departure is not a mutual practice, product qualifications are not planned for the specific needs of the wholesaler but for common auction purposes, cold stores are used for the distribution process, but are not real storage facilities, optimum storage temperatures are not attained, and moreover, short notice ordering makes fluctuations in demand, an increase in commitment (fixed quantities for fixed terms) will stabilize the supply in the chain and will encourage to an improved cold chain.

4.2 Primary Data Analysis

• Retailers

The end retailer in the flower supply chain includes flower shops and supermarkets. This research targeted on the 10 flower shops in Birmingham (n=10), conducted 10 questions of questionnaires that completed by handle in the salespersons. In each question provided the answer choices in order to ease to answer and analyze the data. It has been shown that flower retailers still follow by the traditional flower chain which trading flowers through flower auction, wholesaler, and suppliers. Most of them answered that their flower chain starts from importers and wholesalers who supply the variety of flowers from many countries around the world rather than direct trade from farm. It can be concluded that the florists still buy the flowers from auction by wholesalers and suppliers according to the literature review. It has been found that 60% of retailers have no idea about this while only 40% of them knew it. This issue is important for retailers to have basic knowledge within the field and know how to manage the quality of cut flowers as the last sector within flower supply chain. The data collected show that the main method adopted by respondents is stock checking then forecasting and supplier selection. Carrying the stocks causes the costs of holding stock and risk of flower damage and wastes, stock checking regularly can help the retailers to know amount of flower needed and using forecasting to know the demands then select the trustworthy suppliers to supply the right amount. Other potential methods are using information technology such as website and making contract with suppliers.

5. Discussions

However, challenges of implementing effective cool chain management can lead to a benefits and drawbacks that affected to sectors in flower supply chain. There are several issues will be analyzed which includes Current State of Flower Supply Chains, The Essential of Cool Chain Facilities, Cool Chain Knowledge and Awareness, The Impacts of Ineffective Cool chain management, and Lead Time Reduction for Flower Retailers.

5.1 Current State of Flower Supply Chains

According to the literature reviews, Hortiwise (2012) and Evers et al (2014) conclude that the current state of flower supply chains includes the trading flower through flower auction in Netherlands and direct trade by supermarket retailers in the UK. Based on the survey by author, flower retailers still follow the traditional flower chain through flower auction which starts trading flowers by 60% of importer and flower auction and 80% of wholesaler and suppliers. In term of the factors influencing choosing good quality of cut flowers for retailers based on the survey, the most important factors behind flower shops' decision are freshness and reliability of suppliers. Most of the flower shops push the demand of flower varieties to the wholesalers and suppliers in order to supply them the kinds of flowers that they need based on the customer demands rather than choosing the direct trade with farm which supply the limited species of flowers. The reliabilities of suppliers are not only punctual delivery time which supplies the flowers within the time limit to preserve the freshness of flowers but it also includes sourcing the variety, reasonable price, amount of cut flowers to response to the demand that may increase in some special occasions such as Valentine's day and mother's day. It can be said that the small flower shops in European countries prefer the auction trade than direct trade by the reason of volume of the flowers sales are not enough to do the direct trade with the growers.

5.2 Cool Chain Knowledge and Awareness

Implementing cool chain management for cut flower, the knowledge and awareness of temperature requirement are the main idea for keeping the flower freshness. There are some literatures that there is insufficient cool chain

knowledge among people involved. Commonly, flower freight is usually based on volume instead of weight, growers frequently over-pack their boxes in addition the result is a rounded box that does not dump properly (Reid, 2009). These issues has shown the insufficient knowledge and awareness of the correct packing methods that performed by the growers. Besides, according to Reid (2009) that possibly the frailest link in the flower cool chain is at the airport that freight forwarders might be handled roughly with late arrivals flower before aircraft departure for instance no time to pre-cool the warm flowers, pallets are gathered hurriedly, and boxes are managed casually. In additional, it has been discussed about issues of flight delays, quality effect of transit flights routes and temperature settings in the compartment of airplanes are too high at best requirement of 4 °C but sometimes are set at 10 °C. At the wholesalers sector, cooling before departure is not a mutual practice (Hortiwise, 2012).

At retail section, the results from the survey have been found that 60% of flower retailers have no idea about the phase 'cool chain management'. It was the evidence that some of the retailer still lack of knowledge in specific nomenclature but they keep working by the routine of normal working practice to keep the flower fresh such as keeping the flowers in cool storage and changing the water regularly cool chain. Supported by the question of how their business will be improved by implementing cool chain management. The result has been that 55.6% of them are not sure that it can improve their business. This data can result in lack of knowledge, awareness, and importance of cool chain management in the opinions of retailers.

5.3 The Impacts of Ineffective Cool Chain Management

The problems includes lack of cool chain facilities, insufficient packing knowledge, ineffective or pre-cooling, lack of refrigerated trucks, poor road pavement, Ineffective and costly re-cooling service at airport, and incorrect temperature setting in aircraft compartment. The obvious of this practice will result in warm, bruised flowers, with a reduced potential vase life of flowers (Reid, 2009).

Due to the price of cut flower is defined by its quality at point of sale not when it harvested, the temperature factor must be concisely considered to decrease the risk of losing flowers value (Hulst, 2004). The first point of sale that flowers are valued and auctioned is in the flower auction in Netherland. During flower auction, quality controller put the remark on the damaged flower when they are selling. The minor remark can lead to a decrease in price of 5-10% and two minor remarks or one major remark cause a reduction of 20-50%. Obviously, the last sector who receives the impacts from ineffective cool chain management by making some mistakes along the way is the end retailers. The survey of this research found that vital problems which have been faced by flower shop are short product life cycle and high competition. They challenged by selling flowers within the time constraints which have the obvious flower quality to be the most important factor that need to be demonstrated to customers. The flower quality are always decreased by the time on shelf, the retailers need to offer the discounts in order to finish their stock for shorted product life. If they could not sell within the vase life limit, the damage, wastes, and loss in profits are the unavoidable situation.

Hence, it has been said that the farms, transportation, auction, wholesalers, are the sectors who influencing the effective cool chain managements in term of maintaining flower quality and value of cut flowers. In the other hand the end retails are the one who affected by operating the effective or ineffective cool chain as the role of the last sector in flower chain before trading cut flowers to the end consumers. However, all sectors in supply chain have the responsibility to operate the best practices for cool chain in order to serve the longer product vase life, quality, and price for the customers.

5.4 Lead Time Reduction for Flower Retailers

In term of retail flower shop in this project, the survey has found that the main methods adopted by retailers for lead time reduction are stock checking followed by forecasting and supplier selection. In general, carrying the stocks causes the costs of holding stock and risk of flower damage and wastes, stock checking regularly can help the retailers to know exact amount of flowers needed and using forecasting to know the demands by daily, weekly, monthly and also the special occasions then select the trustworthy suppliers to supply the right amount to meet their demand.

It can be said that lead time reduction for flower retailers lead time reduction is not only improvement the customer demand but also reduce the waste which may result from over stocking due to limited product life cycle. The flower shops that are the indirect trade thru auction and suppliers uses stock checking to forecast the demand and order the products through the suppliers that may lead to longer lead time than direct trade. Nonetheless, the responsibility of sales forecasting by retailers and the on time delivery performance of suppliers can lead to reduce in lead time for overall process. All sectors within supply chain require the collaboration to exchange the information for better lead time management and protecting flower wastes.

6. Conclusions and Recommendation

6.1 Conclusions

In conclusion, this study has reviewed the current situation of main traditional flower chain which includes the elements of growers in Africa, transportation, flowers auction in the Netherland, whole sellers, and retailers in European countries. According to the 'post-positivism' approach that believes that the cool supply chain operation in the real situation is patterned and it can be discovered the knowledge among flower supply chain parties and test the existing. The understanding the causes of the increase in temperatures provide the opportunities for development, which every in the cool chain has to be prepared to take responsibilities for optimizing the conditions under which the cut flowers are kept (Hulst, 2004). It has been discovered from the research that operating cool supply chain management still has some bottlenecks that may causes of temperature rising and improving cool flower supply chain for better flower quality and shorter lead time is related to all sectors in flower supply chain. It can be classified by main supply chain elements which include grower, logistics, traders, information, and retailers. These elements need a corporation to achieve the successful in cool chain management and providing the best quality, prices and shorter lead time to the end customers.

6.2 Recommendations

As the with the research path, this project have studied only in the cool supply chain management for cut flowers from the grower in Africa to through auction in Netherland to the end retailer in European countries including UK, aimed to improve the temperature control supply chain for serving the longer perishable of cut flowers and shorter lead time, In depth of the relevant issues that might be pursued in future research regarding the flower growers in another continent, sea transport which have lower cost and carbon foot print, Quality Controlled Logistics, RFID and GPS (Temperature Real Time Location Sensors) to monitor the flowers temperature along the process for shelf life improvement, issuing the protocols, and the sampling group of ten flower shop in Birmingham could not enough to conclude the same result for other countries in another countries.

Acknowledgements

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