Original Research Article

Collaborative Decision-Making on Preservation Cost Control of Litchi Supply Chain in Zhangzhou

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Abstract: Litchi is a kind of fruit with high demand for freshness, and the freshness of litchi is lost very quickly. There is no cooperative decision-making mechanism for litchi supply chain in Zhangzhou, and the members of the supply chain make decisions independently in most cases. The members of the supply chain make decisions based on their own interests, so that the freshness of litchi cannot be well controlled, and the overall benefit of litchi supply chain cannot be maximized. On the basis of analyzing the supply chain structure and the preservation cost of litchi supply chain in Zhangzhou, this paper demonstrates the necessity of collaborative decision-making on preservation cost control of litchi supply chain in Zhangzhou through an example, and put forward to implement the collaborative decision-making on preservation cost control of litchi supply chain in Zhangzhou by constructing the collaborative decision-making platform of litchi supply chain in Zhangzhou.

Keywords: Litchi supply chain; Freshness; Preservation cost; Collaborative decision-making.

1. Introduction

With the improvement of people's health awareness and living standards, people have higher and higher requirements for the quality of fruit and vegetable agricultural products. However, most fruit and vegetable agricultural products are not easy to preserve after picking, so it is difficult to maintain their freshness. Litchi is a fruit that requires high freshness, and its freshness is lost very quickly. The loss of freshness will lead to a sharp drop in litchi demand, resulting in a decline in the overall benefits of litchi supply chain. Zhangzhou City is the main litchi producing area in Fujian Province. However, Zhangzhou litchi supply chain lacks the collaborative decision-making mechanism of litchi supply chain, and the members of the supply chain mainly make decentralized decisions. Supply chain members make decisions from their own interests, which cannot best control the freshness of litchi and maximize the overall benefits of litchi supply chain. By establishing a stable litchi supply chain, constructing a collaborative decision-making mechanism of litchi supply chain and making collaborative decision-making of litchi supply chain, we can reduce the circulation links of litchi as much as possible, slow down the loss of litchi freshness and reduce the cost of litchi preservation, so as to improve the overall benefit of litchi supply chain. Therefore, it is very necessary to explore the collaborative decision-making method of preservation cost control in litchi supply chain based on the iterative relationship of freshness factors, and construct the framework of collaborative decision-making support platform for Zhangzhou litchi supply chain.

At present, in the aspect of preservation and loss control of agricultural products supply chain, most studies mainly focus on the construction of ordering model and inventory decision model considering the cost of preservation technology, as well as the loss control method of agricultural products logistics. For example, Hsu et al. proposed an optimal ordering cycle, ordering quantity, shortage period and preservation technology cost to maximize the retailer's total profit per unit time[1]. Lee et al. took the preservation technology cost as the decision variable, constructed the relevant deterioration inventory model, and obtained the retailer's optimal preservation technology cost and optimal replenishment time[2]. Dye et al. established an inventory model of fresh agricultural products with deterioration rate varying with time, and aimed at maximizing the profit per unit time, obtained

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the retailer's optimal replenishment plan and optimal preservation technology input cost[3]. Shukla et al. used ARIMA model (autoregressive moving average model) to analyze the market demand of fresh fruits and vegetables[4]. The prediction is made to help fruit and vegetable growers determine the amount of fruits and vegetables to be collected every day, so as to ensure the accuracy and timeliness of fruit and vegetable supply. Ren Yan analyzed the current operation mode of fruit and vegetable logistics in China from the perspective of fruit and vegetable circulation loss, analyzed the loss factors from three aspects: the loss of fruit and vegetable logistics sites, the loss of each logistics channel, and the loss of logistics sites and logistics channels, and reconstructed the new operation mode of fruit and vegetable logistics in China[5]. Tan Feng, Xu Yang, Brian Revell, Lu Cheng researched on the management mode, supply way and loss reasons of fresh vegetables in supermarkets and analyzed the loss control ideas and methods from many angles[6].

In terms of freshness of agricultural products, many scholars have described and characterized the freshness of agricultural products. For example, Chen and Dan constructed an exponential freshness attenuation function, which uses freshness to characterize the loss of value, and well describes the change of freshness of fresh agricultural products with time[7]. Lin, Yang and Dan constructed the freshness and loss proportion model depending on the transportation time in the transportation process to calculate the optimal expected profit and income of members at all levels of the supply chain respectively and profit distribution under the coordination of benefit sharing contract[8].

In terms of agricultural supply chain coordination, most studies mainly focus on the analysis of the power of agricultural supply chain coordination and the construction of supply chain coordination mechanism. For example, Xu and Zhang discussed the meaning of "agricultural product supply chain coordination" and analyzed the "agricultural product supply chain coordination mechanism"[9]. Their relevant research results show that the key to agricultural supply chain collaboration lies in the matching of collaboration methods, and the main technical means to realize agricultural supply chain collaboration is information sharing. By analogy with Cobb Douglas function, Tan and Zhu discussed the action mechanism and influence characteristics of the influencing factors of the development of green supply chain of agricultural products under the synergy theory, and constructed the green supply chain system of agricultural products[10].

It can be seen from the existing literature that there is still a lack of research on the collaborative decision-making of fresh-keeping cost control in agricultural product supply chain considering the factor of freshness. Therefore, taking Zhangzhou litchi supply chain as the research object, this paper constructs a collaborative decision-making model of Zhangzhou litchi supply chain preservation cost control considering freshness factors, and puts forward the method of implementing collaborative decision-making of supply chain preservation cost control.

2. Introduction to Zhangzhou Litchi Supply Chain

At present, the sales mode of Zhangzhou litchi is still the traditional sales mode, that is, fruit farmers (including orchard contractors) sell litchi to wholesalers, wholesalers sell litchi to retailers (supermarkets, fruit retail stores and small vendors), and then retailers sell litchi to end users. Therefore, Zhangzhou litchi supply chain is mainly composed of litchi growers, litchi wholesalers and litchi retailers. Zhangzhou litchi supply chain is shown in Figure 1.

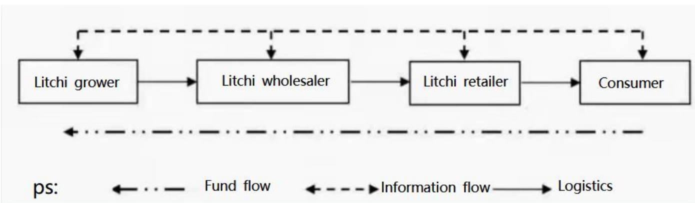

Figure 1 Schematic diagram of Zhangzhou litchi supply chain.

3. Analysis on the Fresh Keeping Cost of Zhangzhou Litchi Supply Chain Considering Freshness Factor

3.1 Overview of Litchi Freshness Factors

Freshness refers to the freshness of fruit and vegetable agricultural products. It is the direct external embodiment of the quality of fruit and vegetable products. Fruit and vegetable freshness is affected by various factors, such as fruit and vegetable life cycle, output time, logistics loss control technology and so on. The freshness of fruits and vegetables needs to be measured and characterized in a certain way. This paper describes litchi freshness by constructing litchi freshness factor.

3.1.1 Iterative Relationship Analysis of Litchi Freshness Factor

Litchi freshness will be lost level by level with each node of the supply chain. Whether each subject of litchi supply chain adopts fresh-keeping technology and what kind of fresh-keeping technology will be affected by the freshness of fruits and vegetables at its upstream nodes. Therefore, the litchi freshness factor (expressed by i) used to measure and characterize litchi freshness satisfies a certain upstream and downstream iterative relationship, that is, the freshness factor of a node in the litchi supply chain depends on the freshness factor of its upstream node. This iteration can be expressed as:

$$\theta_i = f(\theta_{i-1}) \tag{1}$$

i represents the freshness of Litchi at the i^{th} node of the supply chain, and i-1 represents the freshness of Litchi at the $(i-1)^{th}$ node of the supply chain.

3.1.2 Mathematical Expression of the Litchi Freshness Factor

Since the litchi freshness factor satisfies a certain upstream and downstream iterative relationship, this paper believes that the litchi freshness factor should be expressed as:

$$\theta_i = e^{-\eta t + \mu_i x_i} \theta_{i-1} \tag{2}$$

Among it, $i = 1, 2, \cdots n$, representing the nodes of litchi supply chain;

i represents the freshness of Litchi at the i^{th} node of the supply chain;

$i-1$ represents the freshness of litchi at the $(i-1)^{th}$ node of the supply chain;

η represents the decay rate of litchi freshness with time. $\eta > 0$. The greater η is, the faster the decay rate of litchi freshness will be.

t represents the time from the time when the litchi supply chain node i purchases litchi from the upstream node $i-1$ to the time when node I sells litchi to the downstream node.

i refers to the degree that the supply chain node i uses preservation technology to slow down the attenuation of litchi freshness. $i > 0$. The greateri is, the better the effect of preservation technology to slow down the attenuation of litchi freshness will be.

x_i is the decision variable of litchi supply chain members whether to adopt fresh-keeping technology. x_i is a {0, 1} variable. When $x_i = 0$, it means that node i does not adopt preservation technology. When $x_i = 1$, it means that node i will adopt preservation technology.

$-\eta t + \mu_i x_i < 0$ refers to that the preservation technology can only maintain the freshness of litchi, but cannot improve the freshness of litchis.

3.2 Analysis on the Freshness Cost of Litchis

3.2.1 Cost Composition of Fresh Litchis

The preservation cost of litchi supply chain consists of the following two parts:

1) The cost of using fresh-keeping technology.

The use of fresh-keeping technology needs to consume certain resources (human, material and financial resources). In this paper, this kind of cost is called the cost of using fresh-keeping technology. The cost of using fresh-keeping technology in node i can be expressed as ciq. c_i is the unit cost of node i adopting the fresh-keeping technology, and q is the sales volume.

2) Opportunity cost caused by not using preservation technology.

The freshness of litchis is the key factor affecting the price of fruit and vegetable products. To some extent, it can be said that the freshness of litchis at each node of the supply chain determines the litchi sales price of each subject of the supply chain. The fresher the litchi is, the higher the sales price and the income are. Therefore, the functional relationship between litchi freshness and price is expressed as:

$$p_i = a\sqrt{\theta_i} + k_i \tag{3}$$

In the formula, $i = 1, 2, \cdots n$, representing the nodes of litchi supply chain.

a is the influence coefficient of freshness on price, $a > 0$;

p_i is the selling price of Litchi at the supply chain node i;

i represents the freshness of litchi at the i^{th} node of the supply chain;

k_i is the profit bonus of the i^{th} node of the supply chain.

If fresh-keeping technology is adopted, node i can obtain certain benefits due to slowing down the decline of freshness. If the preservation technology is not adopted, node i will lose the opportunity to obtain this benefit. Therefore, from the perspective of cost, node i does not adopt fresh-keeping technology, which will produce a certain opportunity cost.

The opportunity cost of node i without fresh-keeping technology refers to the difference between the income of adopting fresh-keeping technology and that of not adopting fresh-keeping technology. Therefore, the opportunity cost of node i due to not adopting fresh-keeping technology can be expressed as:

$$ae^{\frac{-\eta t + \mu_i |x_i - 1|}{2}} \sqrt{\theta_{i-1}} q - ae^{\frac{-\eta t}{2}} \sqrt{\theta_{i-1} q} \tag{4}$$

Therefore, the total fresh-keeping cost of litchi supply chain (expressed in TC) is the fresh-keeping technology cost plus opportunity cost, that is:

$$TC = \left(ae^{\frac{-\eta t + \mu_i |x_i - 1|}{2}} \sqrt{\theta_{i-1}} q - ae^{\frac{-\eta t}{2}} \sqrt{\theta_{i-1} q} \right) + \sum_{i=1}^{n} c_i q x_i \tag{5}$$

3.2.2 Construction of Litchi Fresh Cost Model

In order to control the whole fresh-keeping cost of litchi supply chain and minimize the total fresh-keeping cost of litchi supply chain, this paper constructs the fresh-keeping cost model of litchi supply chain. The model can be expressed as:

$$\min \sum_{i=1}^{n} \left[\left(ae^{\frac{-\eta t + \mu_i |x_i - 1|}{2}} \sqrt{\theta_{i-1}} q - ae^{\frac{-\eta t}{2}} \sqrt{\theta_{i-1} q} \right) + \sum_{i=1}^{n} c_i q x_i \right]$$

$$s.t \begin{cases} \theta_i = e^{-\eta t + \mu_i x_i} \theta_{i-1} \\ x_i = 0 \text{or} 1 \\ -\eta t + \mu_i x_i < 0 \\ 0 < \theta_i < 1 \\ 0 < \theta_{i-1} < 1 \\ a > 0, \mu_i > 0, \eta > 0 \end{cases}$$

Since most of Zhangzhou litchi supply chains are three-level supply chains with few nodes, the enumeration method can be used to solve the model, so as to obtain the total fresh-keeping cost of litchi supply chain under different conditions, as shown in Table 1.

Table 1. Total fresh-keeping cost of fruit and vegetable green supply chain.

	x_i value	Benefits of the fresh-keeping technology in supply chain
Case 1	$x_1 = 0, x_2 = 0, x_3 = 0$	$ae^{\frac{-\eta t_1}{2}}\sqrt{\theta_0}\,(e^{\frac{\mu_1}{2}}-1)\,q+ae^{\frac{-\eta(t_1+t_2)}{2}}\sqrt{\theta_0}\,(e^{\frac{\mu_2}{2}}-1)\,q+ae^{\frac{-\eta(t_1+t_2+t_3)}{2}}\sqrt{\theta_0}\,(e^{\frac{\mu_3}{2}}-1)\,q$
Case 2	$x_1 = 0, x_2 = 0, x_3 = 1$	$ae^{\frac{-\eta t_1}{2}}\sqrt{\theta_0}\,(e^{\frac{\mu_1}{2}}-1)\,q+ae^{\frac{-\eta(t_1+t_2)}{2}}\sqrt{\theta_0}\,(e^{\frac{\mu_2}{2}}-1)\,q+c_3q$
Case 3	$x_1 = 0, x_2 = 1, x_3 = 0$	$ae^{\frac{-\eta t_1}{2}}\sqrt{\theta_0}\,(e^{\frac{\mu_1}{2}}-1)\,q+c_2q+ae^{\frac{-\eta(t_1+t_2+t_3)+\mu_2}{2}}\sqrt{\theta_0}\,(e^{\frac{\mu_3}{2}}-1)\,q$
Case 4	$x_1 = 0, x_2 = 1, x_3 = 1$	$ae^{\frac{-\eta t_1}{2}}\sqrt{\theta_0}\,(e^{\frac{\mu_1}{2}}-1)\,q+c_2q+c_3q$
Case 5	$x_1 = 1, x_2 = 0, x_3 = 0$	$c_1q+ae^{\frac{-\eta(t_1+t_2)+\mu_1}{2}}\sqrt{\theta_0}\,(e^{\frac{\mu_2}{2}}-1)\,q+ae^{\frac{-\eta(t_1+t_2+t_3)+\mu_1}{2}}\sqrt{\theta_0}\,(e^{\frac{\mu_3}{2}}-1)\,q$
Case 6	$x_1 = 1, x_2 = 0, x_3 = 1$	$c_1q+ae^{\frac{-\eta(t_1+t_2)+\mu_1}{2}}\sqrt{\theta_0}\,(e^{\frac{\mu_2}{2}}-1)\,q+c_3q$
Case 7	$x_1 = 1, x_2 = 1, x_3 = 0$	$c_1q+c_2q+ae^{\frac{-\eta(t_1+t_2+t_3)+\mu_1+\mu_2}{2}}\sqrt{\theta_0}\,(e^{\frac{\mu_3}{2}}-1)\,q$
Case 8	$x_1 = 1, x_2 = 1, x_3 = 1$	$c_1q+c_2q+c_3q$

In this formula:

Θ_0 indicates the freshness of Litchi in the picking place;

η indicates the degree to which the freshness decreases with the passage of time, and $\eta > 0$;

t_1 represents the time between picking and selling litchi by farmers;

t_2 represents the time between the wholesaler purchasing litchi from farmers and selling litchi to retailers;

t_3 represents the time interval between the retailer purchasing litchi from the wholesaler and putting litchi on the shelf for sale to consumers;

μ_1 indicates the degree to which the freshness preservation technology provided by farmers delays the decline of freshness;

μ_2 indicates the degree to which the freshness attenuation is delayed by the freshness preservation technology provided by the wholesaler;

μ_3 indicates the degree to which the freshness attenuation is delayed by the freshness preservation technology provided by retailers;

c_1 is the unit cost of farmers adopting fresh-keeping technology;

c_2 is the unit cost of wholesalers using fresh-keeping technology;

c_3 is the unit cost of retailers adopting fresh-keeping technology;

q is the sales volume of litchi. It is assumed that there is no unsalable situation, that is, each node q of the supply chain is the same.

4. The Necessity of Collaborative Decision-Making of Preservation Cost Control in Zhangzhou Litchi Supply Chain

Through field investigation, this paper obtains the preservation cost data of Zhangzhou litchi supply chain. Taking Zhangzhou supply chain Z as an example, this paper uses an example to compare the preservation cost of Zhangzhou litchi supply chain Z under decentralized decision-making and collaborative decision-making, and demonstrates the necessity of collaborative decision-making for preservation cost control of Zhangzhou litchi supply chain.

4.1 Introduction to Main Bodies of Zhangzhou Litchi Supply Chain Z

4.1.1 Litchi Grower A

Litchi grower A planted 100 “black leaf” litchi trees in Jiuhu Town, Xiangcheng District, Zhangzhou City, with an annual output of 30000kg of litchi. Litchi gradually matures and goes on sale in mid-June every year, and the sales period can last until mid-July. Litchi grower A sells most of the litchis to litchi wholesaler B, and a few are sold directly in the plantation.

4.1.2 Litchi Wholesaler B

Litchi wholesaler B is located in Beihuancheng Road, Xiangcheng District, Zhangzhou city. It is a fruit seller supplying litchi, honey pomelo and other fruits to Zhangzhou supermarket. The wholesaler now has three fruit wholesale departments, a large distribution warehouse, a transportation fleet and a modern constant temperature cold storage with a storage capacity of 5000 tons. The wholesaler is constantly expanding its fruit import and export business.

4.1.3 Litchi Retailer: Supermarket C

Supermarket C is a large comprehensive supermarket in Xiangcheng District, Zhangzhou ci t y. According to the author’s visit and investigation, during the litchi sales period (from mid-June to mid-July every year), the daily litchi sales volume of the supermarket can reach 1200kg, with an average daily sales volume of about 1000kg. There are two types of fruit shelves in supermarkets: normal temperature shelves and low-temperature refrigerated shelves.

4.2 Analysis of Preservation Technology Selected By All Members of Zhangzhou Litchi Supply Chain Z at the Present Stage

At present, there are many preservation methods for litchi, mainly including sulfur fumigation, chemical preservation, low temperature refrigeration, controlled atmosphere preservation, irradiation preservation and so on. As it is sold in the same city, the preservation technology adopted by all members of Zhangzhou litchi supply chain Z is relatively simple and the preservation time is not long. Moreover, the litchi supply chain makes independent decisions on whether to adopt fresh-keeping technology and what fresh-keeping technology to adopt. In the consciousness of most litchi growers, do they adopt fresh-keeping technology.

Technology has nothing to do with other supply chain members. When litchi is sold from their own hands, whether litchi is fresh has nothing to do with themselves. Similarly, litchi wholesalers will make litchi preservation decisions themselves and will not pay attention to the preservation decisions of other members. Retailers will also make fresh-keeping control decisions independently.

4.2.1 Preservation Technology Adopted by Litchi Grower A

Litchi grower A is mainly responsible for maintaining the freshness of litchi from picking to selling to litchi wholesaler B. Litchi grower A determines the maturity of litchi according to the size and color of litchi, and picks Litchi at the eighth and ninth maturity. Put litchi leaves between the picked litchi fresh fruits to buffer and preserve fresh, and put a little ice at the same time.

4.2.2 Preservation Technology Adopted by Litchi Wholesaler B

Litchi wholesaler B is mainly responsible for maintaining the freshness of litchis from purchase to sale to litchi retailer supermarket C. Because it has modern constant temperature cold storage and cold storage vehicles, the preservation technology selected by litchi wholesaler B is low-temperature cold storage.

4.2.3 Preservation Technology Adopted by Litchi Retailer—Supermarket C

Supermarket C is responsible for maintaining the freshness of litchi from purchase to sale to consumers. In terms of transportation, supermarkets use refrigerated vehicles for transportation. In terms of storage, supermarket C will store 1000 kg of litchi in the low-temperature cold storage, and put litchi on the shelves in batches according to the sales situation.

In terms of shelf storage, supermarket C has low-temperature refrigerated shelves and normal temperature shelves. Due to the origin of Litchi in Zhangzhou, the selling price of litchi is not high, and the short interval from picking to selling on the shelf, supermarket C chooses to place litchi on the shelf at room temperature for sales.

4.3.1 Fresh Keeping Cost of Litchi Grower A

Litchi grower A's fresh-keeping measures are only to put litchi leaves and a little ice. This part of preservation cost includes ice cost and labor cost. After field visits, the cost of this part of preservation is 0.1 yuan per kilogram.

4.3.2 Preservation Cost of Litchi Wholesaler B

Litchi wholesaler B keeps fresh by low temperature refrigeration. This part of the cost includes the use fees of refrigerated warehouses and refrigerated vehicles and labor costs. The distance between growers and wholesalers is about 30 kilometers, and the average storage time of Litchi in the refrigerator is 1 day. Based on the purchase of 1000 kg of litchi per day, the train needs to start once a day. It is estimated that the preservation cost of litchi wholesaler B is 0.15 yuan per kilogram.

4.3.3 Fresh Keeping Cost of Litchi Retailer—Supermarket C

Supermarket C uses refrigerated vehicles for transportation and refrigerated warehouses for storage. The fresh-keeping cost also includes the use fee and labor cost of refrigerated warehouses and refrigerated vehicles. The distance between wholesalers and supermarkets is about 30 kilometers, and the average storage time of litchi in the refrigerator is 1 day. Based on the purchase of 1000 kg of litchi per day, the train needs to start once a day. It is estimated that the preservation cost of litchi wholesaler C is 0.15 yuan per kilogram. According to the daily sales of 1000 kg of litchi, the daily preservation cost of Zhangzhou litchi supply chain Z is 400 yuan.

4.4 Analysis of Preservation Cost of Each Member of Zhangzhou Litchi Supply Chain Z under Collaborative Decision-Making

For litchi grower A, according to its own conditions, the preservation strategies that can be selected mainly include: no preservation strategy, preservation strategy of litchi leaves and ice, and pre cooling preservation strategy. Without any preservation strategy, there is no need to spend the cost of preservation technology, but there is a certain preservation opportunity cost. The fresh-keeping cost of the fresh-keeping strategy of putting litchi leaves and ice is 0.1 yuan per kilogram, and the degree of slowing down the decline of freshness is 1 = 0.03. The preservation cost of precooling preservation technology is 0.2 yuan per kilogram, and the degree of slowing down the decline of freshness is 1 = 0.05.

For litchi wholesaler B, the preservation strategies that can be selected mainly include:

no fresh-keeping strategy, low-temperature refrigeration strategy and chemical fresh-keeping strategy shall be adopted. Without any preservation strategy, there is no need to spend the cost of preservation technology, but there is a certain preservation opportunity cost. The fresh-keeping cost of low-temperature refrigeration strategy is 0.15 yuan per kilogram, and the degree of slowing down the decline of freshness is 2 = 0.04. The fresh-keeping cost of adopting the pharmaceutical fresh-keeping strategy is 0.1 yuan per kilogram, and the degree of slowing down the decline of freshness is 2 = 0.03. For supermarket C, according to its own conditions, the optional preservation strategies mainly include: no preservation strategy, low-temperature refrigeration and normal temperature shelf placement strategy, low-temperature refrigeration and low-temperature refrigeration shelf placement strategy. Without any preservation strategy, there is no need to spend the cost of preservation technology, but there is a certain preservation opportunity cost. The fresh-keeping cost of adopting the strategy of low-temperature refrigeration and normal temperature shelf placement is 0.15 yuan per kilogram, and the degree of slowing down the decline of freshness is 3 = 0.06. The fresh-keeping cost of adopting the strategy of low-temperature refrigeration and low-temperature refrigeration shelf placement is 0.2 yuan per kilogram, and the degree of slowing down the decline of freshness is 3 = 0.08.

The circulation time between litchi grower A, litchi wholesaler B and supermarket C is 1 day, so t1 = t2 = t3 = 1. The initial freshness of litchi was 1. The attenuation coefficient of litchi freshness is about = 0.1. The functional relationship between litchi freshness and litchi price is expressed as:

$$p_i = 10\sqrt{\theta_i} + k_i.$$

According to the collaborative decision-making model of litchi preservation cost constructed in this paper, aiming at minimizing the preservation cost of the supply chain, the best litchi preservation strategy for the three members of Zhangzhou litchi supply chain Z is: litchi grower A still adopts the preservation strategy of putting litchi leaves and ice, while litchi wholesalers can choose a relatively simple chemical preservation strategy, supermarket C still adopts the strategy of low-temperature refrigeration and normal temperature shelf placement. At this time, the total daily fresh-keeping cost of litchi supply chain Z is 350 yuan.

4.5 Comparative Analysis of Preservation Cost of Zhangzhou Litchi Supply Chain Z under Decentralized Decision and Collaborative Decision

Under decentralized decision-making, the daily preservation cost of Zhangzhou litchi supply chain Z is 400 yuan. Under collaborative decision-making, the daily fresh-keeping cost of supply chain Z is reduced to 350 yuan. Collaborative decision-making saves the preservation cost, and makes the supply chain members begin to care about the preservation strategy choices of other partners in the supply chain. Therefore, it is necessary to implement the collaborative decision-making of preservation cost control in Zhangzhou litchi supply chain.

5. Realization of Collaborative Decision- Making of Preservation Cost Control in Zhangzhou Litchi Supply Chain

The realization of supply chain collaborative decision-making needs to build a collaborative decision support platform. This paper proposes to build a collaborative decision support platform for preservation cost control of Zhangzhou litchi supply chain to realize the collaborative decision-making of preservation cost control of Zhangzhou litchi supply chain. Taking Zhangzhou litchi supply chain Z as an example, litchi grower A, fruit and vegetable wholesaler B and supermarket C can collect information through the collaborative decision support platform Set and transfer, and exchange opinions in real time, so as to realize the collaborative decision-making of fresh-keeping cost control. The frame structure of the platform is shown in Figure 2.

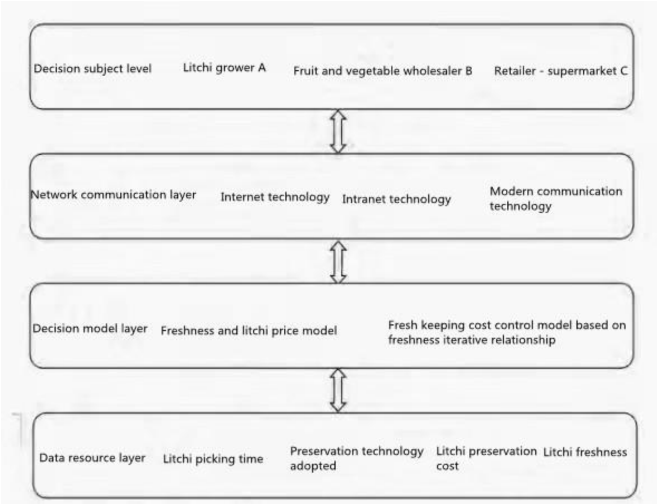

Figure 2 Litchi supply chain Z preservation cost control collaborative decision-making platform.

6. Conclusion

The cost control decision of litchi preservation is affected by the freshness of litchi. There is a certain iterative relationship between litchi freshness. This determines that the preservation cost control decision of litchi supply chain members needs to be made according to the preservation strategy adopted by their upstream partners. Therefore, the decision-making of fresh-keeping cost control cannot be completed alone by the intuitive feeling of supply chain members. Members of litchi supply chain should establish a collaborative decision support platform for litchi supply chain to implement collaborative decision-making, so as to better control the preservation cost.

Conflict of Interest

No conflict of interest was reported by the author.

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