

Research on the Cross-border Overseas Warehouse Construction for Imported Fruits

Jingyu Zhang, Wei Liu*

College of Transport & Communications, Shanghai Maritime University, Shanghai, China

*weiliu@shmtu.edu.cn

ABSTRACT

With the vigorous development of Chinese foreign trade, China's demand for high-quality imported fresh fruits is rising. However, the high decay rate of imported fresh fruits has brought huge losses to the owner enterprise. In this paper, it is aimed to reduce the rate of rot and loss of imported fruits and improve the utilization rate of resources. For this purpose, the service mode of the cross-border supply chain is analyzed and the overseas warehouse layout of fresh fruits imported by enterprises is put forward. PESTEL model was used to analyze the factors influencing the location of target countries, and the specific location selection of overseas warehouse was analyzed and modeled from the macro and micro angles. According to the location for enterprises, choose the corresponding overseas warehouse construction mode. This study suggests that the enterprises should build the imported warehouse and pre-cool the fresh fruits in an overseas exporting country, and control the quality of fresh fruits from the source, so as to slow down the rapid decay and damage of fresh fruits.

Keywords: Imported Fresh Fruits; Cross-border Overseas Warehouse; Circulation Decay Rate; PESTEL Model

1. INTRODUCTION

In recent years, China has issued the "Internet + Circulation Action Plan", the "Notice on Adjusting Import Tariffs for Certain Consumer goods" and other policies to stimulate the development of import trade. The people's growing need for a better life and increased quality of food requirements causes domestic high-quality food supply in short supply. The demand for overseas famous and excellent products such as basal fish, South American white prawns, salmon, durian, avocados, and other agricultural products is on the rise.

Since 2011, China's imports of fresh agricultural products have continued to expand, with imports increasing from 73.426 billion yuan to 171.84 billion yuan in 2017. The average annual growth rate is 12.8%, and the import trade has increased significantly. The status of fresh agricultural products import trade has been steadily improved.

The structural features of imported fresh agricultural products are obvious and the sources are diversified. Public data released by the National Bureau of Statistics show that imports fruits, vegetables, livestock, and aquatic products accounted

for 26.79%, 0.14%, 46.06% and 26.98% of the total imports of fresh agricultural products respectively. Meanwhile, China has trade contacts with hundreds of countries and regions and the sources of imports are relatively scattered. Livestock products have been the primary import category of fresh agricultural products, mainly cattle products, and pig products from the United States, Brazil, Australia, and New Zealand. Fruit import categories are rich and relatively scattered, mainly bananas and durian from Thailand, Chile, Vietnam, the Philippines, and the United States. The largest import category of vegetables is sweet corn and the largest import category of aquatic products is fish. Vegetable main import sources are the United States and New Zealand and the top two sources of aquatic products import are Russia and the United States.

Figure 2 Circulation decay rate of three types of products in circulation in 2016

As a new market in the global cold chain, China has attracted extensive attention from the world's food production and trade enterprises. However, cross-border means long transport cycle, complicated logistics, commercial flows, financial flows, and

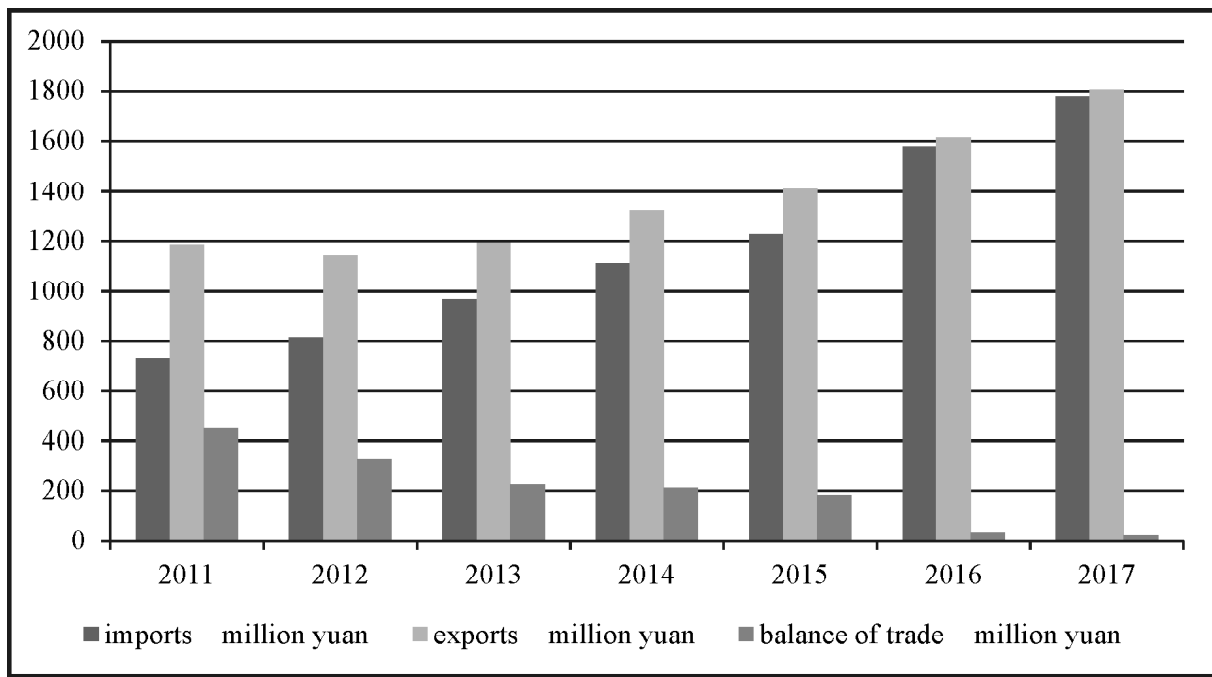


Figure 1: Trade scale of fresh agricultural products from 2011-2017

information flows. The superposition of “cross-border” on “fresh products” makes the cross-border transportation of fresh products more difficult and complex. A series of contradictions and problems in the cold chain have also emerged, mainly focusing on the low circulation rate and refrigerated transport rate of the cold chain, high circulation rot rate, backward application of cold chain logistics technology, and imperfect front-end facilities of the supply chain. The most prominent problem is the high rate of corrosion and damage to fresh products. According to the data from cold chain logistics network, fruits, livestock and aquatic products in China’s cold chain transport decay rate reached 25%, 12%, and 15% respectively. The amount of deterioration due to the backward packaging technology and preservation technology in the process of cold chain logistics is as high as tens of thousands of tons every year, causing more than 75 billion yuan of losses to the owner enterprises. The damage to fruits is even more severe when it comes to the import trade with developing countries with low levels of cold chain logistics transportation and temperature control storage. The deterioration of fruits is exacerbated by the problems of irregular operations and the lack of standardization of

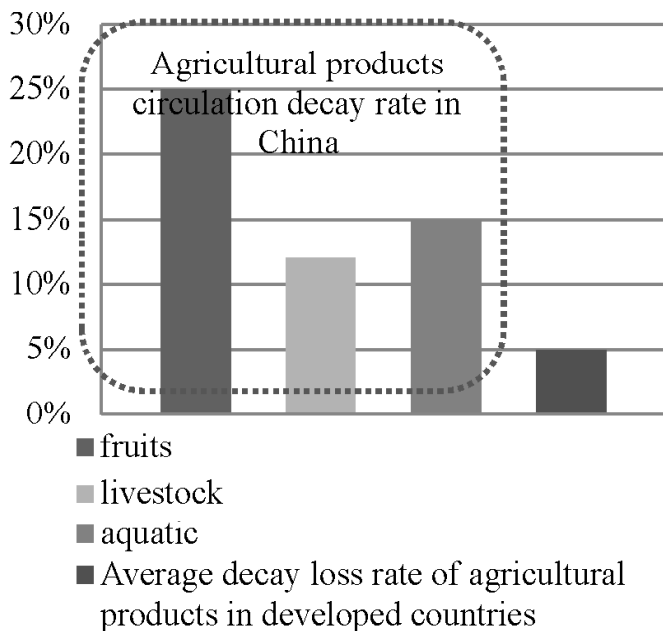
operating processes in most third-party logistics, freight forwarders and shipping companies in developing countries, as well as the low level of local cold-chain transport infrastructure, storage equipment, and processing processes. In developed countries with a high level of cold-chain logistics transportation and temperature-controlled storage, the decay waste rate is only 5-10%.

This research has theoretical and practical significance. Based on the demand for imported fresh fruits and the high decay rate of fresh fruits, this paper analyzes the import of cross-border e-commerce supply chain service pattern, and puts forward the idea of constructing the imported fresh fruits overseas warehouse for the owner enterprises (both owner of foreign fresh fruit trade and domestic supplier of fresh fruit trade) with a certain scale and the import demand of fresh fruits. On the basis of selecting the overseas warehouse model, the choice of the target country and target product was analyzed, and PESTEL model was used to analyze the factors influencing the location selection of the target country. From the macroscopic and microscopic perspectives, this paper analyzes and models the location selection of fresh fruits import warehouse, and further selects the construction mode of the warehouse based on the

specific warehouse location. It has made some contributions and provides a new direction for the reduction in the circulation decay rate of cross-border fresh fruits and the development of the fresh fruits import supply chain model.

2. STATUS AND LITERATURE

At present, the Chinese government is actively promoting and vigorously guiding the construction and development of cross-border overseas warehouses and encouraging e-commerce to actively participate in the construction of network economy and international trade (Internet Circulation Action Plan, 2015). The action plan proposes to build an overseas logistics system through the construction of overseas warehouses. Many domestic and foreign e-commerce and logistics enterprises are involved in overseas warehouse construction and development. For example, Jingdong officially launched its global purchase business in April 2015, actively opening the channel between cross-border e-commerce, customs, and bonded warehouse. American e-commerce giant Amazon has introduced many overseas products in clothing, bags, kitchen utensils, shoes, and other categories into China and cooperated in the construction of overseas warehouses. In addition, domestic logistics enterprises such as Shunfeng and Yunda are also actively involved in overseas warehouse market.



Mohua LUN (2017) analyzed the mode of cross-border logistics in China, then pointed cross border logistics has characteristics of long distribution time and lack of whole process tracking of package. Mohua L put forward the relevant optimization methods, including the establishment of overseas warehouses, increasing more international logistics lines, and improving the level of logistics enterprises information. Xiaojun Liu, et al. (2015) analyzed the operation characteristics of cross-border e-commerce logistics and existing problems in China. Then, they put forward suggestions on cross-border e-commerce logistics operation from the two aspects of macro level of cross-border e-commerce and micro level of cross-border e-commerce enterprise.

In terms of cross-border cold chain transportation, China's cold chain technology and cold chain system construction are still in the initial stage of exploration, with low application degree and low informatization degree of cold chain logistics technology. Most cold chain logistics enterprises are technologically backward, and many modern technologies and methods still fail to be popularized. The temperature control methods used in the actual transportation process are still primitive, which has a negative impact on the cold chain logistics and transportation of fresh fruits. Wenjing (2017) analyzed the key role of cold chain transportation of perishable food such as fruits and vegetables in global cold chain. Wenjing also purposed to study the effectiveness, efficiency and sustainability of synchronous transportation by using real-time information. Defraeye, T., et al. (2016) evaluated the cold chain performance comprehensively and applied to the environmental loading scheme of foreign citrus refrigerated container export. Environmental loading means that the fruit is packaged in a ventilated box and pre-cooled directly in the container. The technology provides economy and logistics advantages, which can monitor multiple related product and process parameters in the whole cold chain.

The methods of the site selection of cross-border overseas warehouse used in this study are the model of the weighted average method of macro factors such as PESTEL model and formula limit method. In order to transform the building energy efficiency

of existing residential buildings in northern China, Lv Shilei & Wu Yong (2009) combined with the results and cases of the National annual building energy efficiency project and analyzed the relationship between political, economic, social, technical, environmental and legal factors affecting the building energy efficiency transformation by using the PESTEL model. Al-Ruzouq, *et al.* (2018) used fuzzy membership and the analytical hierarchy process in a geo-spatial environment for landfill site selection in the city of Sharjah and considered macro- and micro-level factors. The macro-level contained social and economic factors and the micro-level accounted for geo-environmental factors. The weighted spatial layers were combined to generate landfill suitability and overall suitability index maps.

3. MODEL SELECTION OF SUPPLY CHAIN

There are three main service modes of China's import supply chain shown in Table 1.

The international direct mail mode means after consumers place orders and pay for the goods, enterprises obtain the goods required for orders from the international sources, and deliver them to the customs through overseas logistics providers such as postal parcels, FedEx, UPS, etc.. After entering the country, the supply chain service mode is then delivered to consumers by domestic logistics providers. This mode has the advantages of high flexibility and low investment. However, it lengthened the supply time of the entire supply chain and the supply chain is uncertain, and it is difficult to realize the whole supervision of the supply chain. It is suitable for the small-scale cross-border e-commerce.

The bonded warehouse mode means enterprises purchase goods from overseas suppliers, pass customs clearance by third-party overseas logistics providers and centralize storage in the bonded area. After consumers place orders, it will be distributed by domestic logistics to consumers. This mode has the advantages of fast delivery, large-scale efficiency, and high customer experience. However, its disadvantages are also very obvious. The bonded warehouse needs to be put on record at the customs and the procedures are relatively complex. The storage area is limited and there are few bonded warehouses specially applied to fresh food, which cannot fully meet the storage conditions of fresh fruits. In addition, the bonded warehouse has a high demand for demand forecasting. Once the forecast is inaccurate, it is easy to cause inventory overstock and increase enterprise costs.

The overseas warehouse mode means enterprises build or rent warehouses abroad to connect with foreign suppliers. After the consumer orders, it directly delivers goods from overseas warehouses and transports them to consumers through overseas and domestic logistics service providers. This mode can meet the needs of diversified commodity categories, multi-level storage conditions, and processing of commodities. It has the advantages of strong supervision ability and simple replacement process. However, the timeliness of the overseas warehouse is less than the bonded warehouse model, and the construction costs are high. Small and medium-sized enterprises are generally unable to afford it and are suitable for large import enterprises.

Under each service mode, the import cross-border supply chain has many risks in supply, demand

Table 1: Comparative analysis of import supply chain service mode

	<i>international direct mail mode</i>	<i>bonded warehouse mode</i>	<i>overseas warehouse mode</i>
service object	small-scale cross-border e-commerce	large and medium-sized vertical import enterprises	large import enterprises
timeliness	low	higher	high
construction costs	low	high	higher
regulatory	difficult	easy	easier
commodity	goods with low demand for timeliness	goods with low require storage conditions	goods with high require storage conditions
consumer experience	ordinary	great	good

forecast, cross-border transportation, customs declaration, and inspection. This paper mainly considers the demand of consumers for high life quality to choose the service mode of import cross-border supply chain for owner enterprises. Attention should be paid to the pain point of the large amount of rot and damage of fresh fruits in cross-border transportation, which is not only the pain of the owner enterprises but also the pain of the society. Therefore, high volume demand and timeliness of imported fresh fruits are regarded as the main competition point. The international direct mail mode cannot meet the demand for large quantities and timeliness of owner enterprises, and can not guarantee the freshness of fresh fruits in the transportation process. The bonded warehouse mode is possible to meet the demand for large quantities and timeliness. It also can use the entire cold-chain transport to ensure the freshness of fresh fruit during the transportation process. However, the bonded warehouse can not guarantee the continuous chain transportation of fruit cold chain, but this problem will greatly increase the decay rate of fruits, which increases the owner enterprises' losses. The import overseas warehouse mode can not only satisfy the demand for large quantities and timeliness but also can use the entire cold chain transport to guarantee the freshness of fresh fruits. It ensures the quality operation of overseas nodes and reduces the consumption for domestic node operations. These advantages reduce the circulation decay rate of imported cross-border supply chains.

Therefore, this paper innovatively proposes the construction of cross-border import fresh fruits overseas warehouse for domestic owner enterprises with large scale and fresh import demand. Overseas warehouses are established near the origin of the exporting country to control the quality from the source. In the overseas warehouse, the fruits are pre-cooled timely and the freshness of fresh foods is locked to reduce the pressure on subsequent transportation and distribution. Relevant technologies such as the Internet of things can also be used in overseas warehouses for temperature and humidity monitoring to ensure fresh fruits under the appropriate temperature and humidity and air composition.

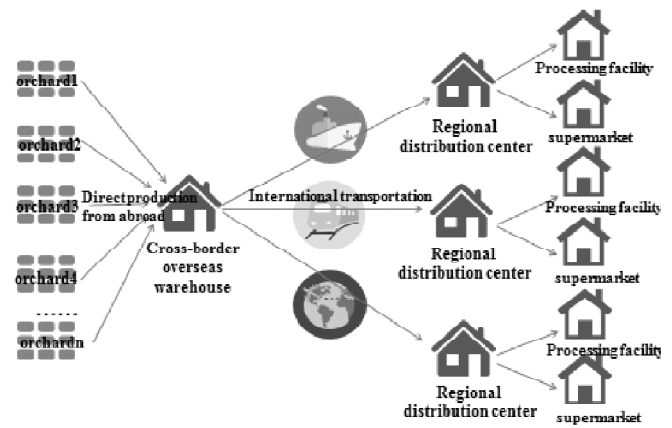


Figure 3: Cross-border supply chain network structure without overseas warehouse

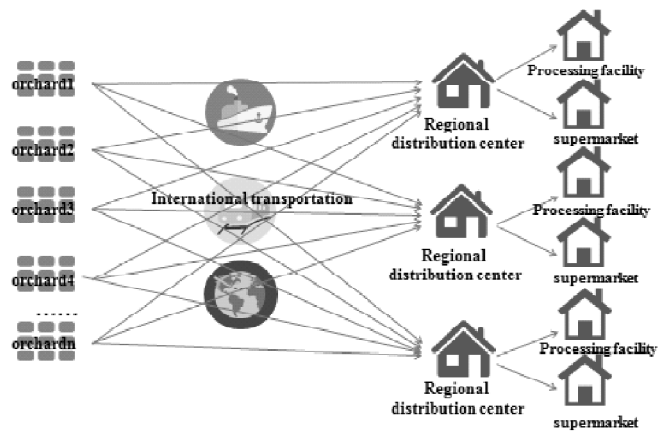


Figure 4: Cross-border supply chain network structure with overseas warehouse

In the two transport chains shown in Figure 3 and 4, the role of imported overseas warehouses in the cross-border transport supply chain of imported fresh fruits can be seen intuitively.

The traditional overseas warehouses are mostly arranged by large export enterprises in the exporting country. Cross-border electronic traders and international trade enterprises build or lease warehouse in the importing countries and use international transportation to store goods in warehouses in advance. When consumers place orders, the importer logistics and nearby consistent principle can be used directly from the warehouse to consumers. Different from the traditional overseas warehouse, the imported overseas warehouse mode proposed in this paper for the owner enterprises is mainly used to store imported goods and pre-processed goods (such as a pre-cooling operation of

fresh food, simplifying cross-border transport process, etc.). The comparison of traditional overseas warehouse and imported overseas warehouse is shown in table 2.

Table 2: Traditional overseas warehouse VS imported overseas warehouse

	<i>traditional overseas warehouse</i>	<i>imported overseas warehouse</i>
location	importing country	exporting country
client	consumers in the overseas warehouse country	consumers in the location of the enterprise
service strategy	exports dominated, imports supplemented	imports dominated, exports supplemented
applicable enterprise	cross-border e-commerce	owner enterprises, especially the development of fresh import trade enterprises.

On the basis of imported overseas warehouse conceived in this paper, the owner enterprise can easily collect the commodity information of fresh product supply place and control the storage quality of the fresh product of foreign nodes. The following three services can be provided by constructing imported overseas warehouses in the import cross-border trade of the owner enterprises: (1) The enterprises can control the quality of fruit products from the source and achieve the purpose of collecting and distributing products from different orchards. In the imported overseas warehouse, enterprises can complete the pre-cooling, processing, packaging, labeling and other operations to reduce the decay rate of fruits. (2) The establishment of key transportation nodes in the exporting countries can effectively control the level of the export domestic transportation section and reduce the complex network of the international transportation section. It also can shorten the transportation time of fruit products and reduce the logistics costs for enterprises. (3) The storage function of overseas warehouses can effectively relieve the shortage of supply caused by the seasonal production of most fresh products to achieve “seasonal production and annual sales”, which can improve the product exposure rate to create a brand effect.

4. LOCATION STRATEGY ANALYSIS

Firstly, political, geographical and cultural factors have a huge impact on the development of overseas warehouses. From the perspective of the development of international trade and political and diplomatic relations, cross-border trade is easily affected and restricted by the trade policies of the host country and the relations between neighboring

countries. At present, the world’s major countries are located in the northern hemisphere, the north of China. In order to reduce the impact of political factors on the economy, the enterprise has the advantage of locating the overseas warehouse in areas and countries south of China with good relation with China.

Secondly, in the choice of the original place, the preferred target is to take the origin of fresh products with the large variety and large domestic demand.

Table 3: Target cold-chain food types and target countries

<i>food types</i>	<i>fresh name</i>	<i>target countries</i>
fruits	Durian	Thailand, Malaysia
	Avocado	Mexico, Peru, Chile
aquatic	Salmon.	Chile
	Basal fish	Thailand, Viet Nam
	South American white prawns	Peru

In terms of fruits demand, durian and avocado are the two fruits with the fastest import growth rate in the past two years. Durian is mainly from Thailand and Malaysia. According to the 2017 national fruit sales ranking survey published by south China agricultural news, the No. 1 seller in south China is the imported durian. However, durian does not rank in the top 10 in other regions. It shows that residents in south China have strong consumption ability to purchase this expensive fruit and that durian still has a large sales space in the Chinese market. Avocados are mainly produced in Mexico and Central America. They can be eaten as raw fruits or as dishes and cans. In 2013, the annual sales of avocados in China were only 345 tons. However, by 2016, the Chinese had eaten 15, 000 tons of avocados in total, which has

rapidly expanded with sales of 400% per year in three years.

In terms of the diversity of fresh product types, Thailand is both the main origin of durian and the main producing area of basha fish. As the overlapping production place of two kinds of products, a cold storage site can produce economic benefits. For owner enterprises, this is the best choice to save the fixed cost of building the overseas warehouse and emit a series of complicated import procedures and other costs.

5. SITE SELECTION ANALYSIS

Based on the analysis above, this paper sets Thailand as the target country and durian as the target product, the unique king of fruits in Thailand.

5.1. Macro Analysis

In this paper, the weighted average method is used to analyze the location selection of imported overseas warehouses in Thailand. The model of the weighted average method of macro factors can improve the reliability of the location selection of overseas warehouses.

PESTEL analysis model was used to analyze the location of the overseas warehouse at the macro level and it is a powerful tool to analyze the macro environment. Each capital letter represents six major macro factors: P (Political), E (Economic), S (Social), T (Technological), E (Environmental) and L (Legal).

The weight of political factors should be 2-4 because the location of the overseas warehouse is closely related to the suggestions and support of local government. Only actively coordinate the relationship with local government and make full use of the basic conditions and operating order provided by the government, the construction of overseas warehouse can be carried out successfully. Economic factors are important elements that should be considered in the overseas warehouse location selection process. Its weight is generally 6-9, mainly including regional economy, industrial policies, service levels, and human resources costs. Social factors should be determined according to the actual situation, generally ranging from 1 to 3, mainly including human factors and labor conditions. The weight of scientific and technological legal factors

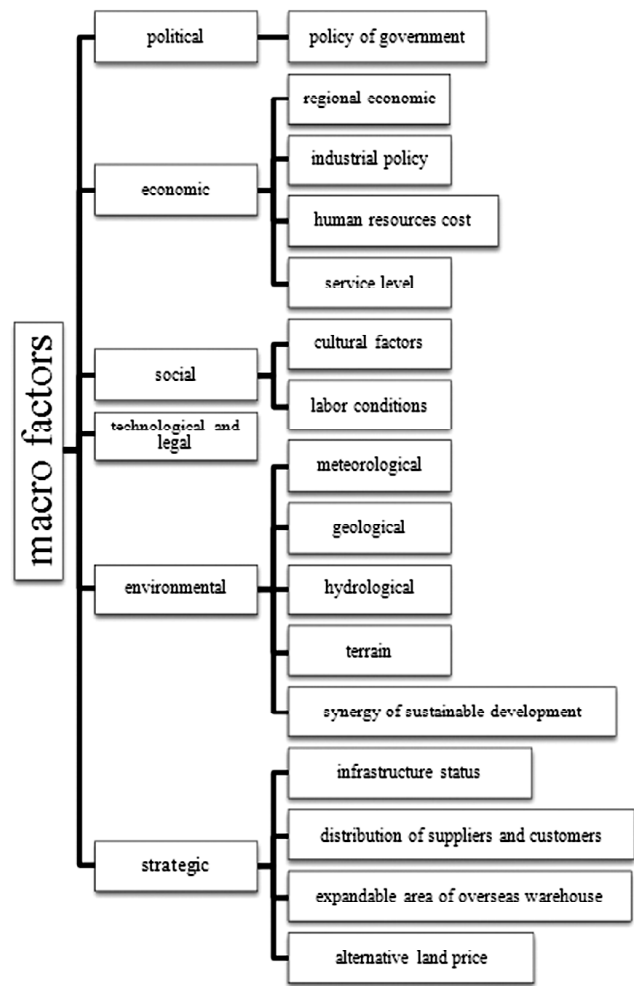


Figure 5: PESTEL model analyzes the macro factors that influence site selection

is generally 1-2, which refers to whether overseas warehouses have an effective cold chain storage and preservation technology and comply with relevant laws and regulations. The weight of natural environmental factors is usually set like 3-5, which mainly includes meteorological factors, geological factors, hydrological factors, topographic factors, and sustainable development. Natural environmental factors such as precipitation, humidity, and natural disasters may generate cargo loss risks, making enterprises bear higher storage losses. The importance of strategic factors is only due to economic factors. Strategic factors should take a large proportion in the overseas warehouse site selection evaluation with the weight set at 4-6. It mainly includes infrastructure status, distribution of suppliers and customers, the expandable area of the overseas warehouse, alternative land price.

Based on the preliminary study, four cities in Thailand are currently selected as the alternative overseas warehouse sites, namely Bangkok, Rayong, Chonburi, and Laem Chabang. The orientation diagram of the four cities is shown in Figure 6, and the red sign is Laem Chabang.

Bangkok is the largest city in the Thai capital and the second largest city in southeast Asia. It is the center of Thailand in all aspects. The economy accounts for 44% of Thailand’s total. Bangkok port is responsible for 90% of Thailand’s foreign trade and has convenient transportation. More than 50% of industrial enterprises and about 80% of universities are located here.

Laem Chabang is located along the eastern coast of the Gulf of Thailand, 110 km south of Bangkok. It is a deep-water international trading port directly under the port authority of Thailand. Now it has become a fully functional modern port that can implement rapid distribution throughout Thailand and its annual throughput is expected to reach 1.8 million tons. Laem Chabang solved the problem that the Bangkok port in the North was difficult for container ships with a length of 173 meters or more to enter due to the twists and turns of the Chao Phraya river waterway and insufficient water depth.

Rayong is located in the southeast of Pattaya with a population of about 430,000 and 208 kilometers

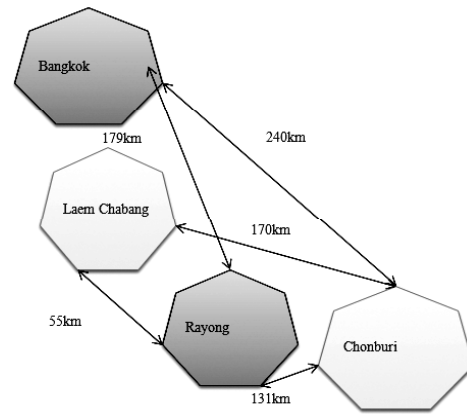


Figure 6: Orientation diagram of four cities

away from Bangkok. It is warm, humid and has abundant precipitation. Rayong is one of the largest durian producing areas in Thailand. There are four roads to Bangkok and the traffic is relatively developed.

Chonburi is located on the border of Cambodia, known as the city of fruits and the city of gems. It is also one of the main producing areas of durian in Thailand. It is a four-hour drive from Bangkok and has a population of 520,000.

According to the Table 4, we can find that the port of Laem Chabang is approximately the same as the port of Rayong. Therefore, we continue the microscopic site selection to determine specific warehouse sites.

Table 4: Weight analysis of each influencing factor in the target cities

Influence Factors		Weight	Bangkok	Laem Chabang	Rayong	Chonburi
Political	Policy of government	2	9	8	6	6
Economic	Regional economic	6	9	9	6	6
	Industrial policy	7	5	7	9	9
	Human resources cost	8	4	8	9	9
Social	Cultural	1	7	7	7	7
	Labor conditions	3	9	7	6	6
Technological	Storage technology	3	8	8	5	4
Legal	Law	1	8	7	6	6
Environmental	Meteorological	4	6	6	5	5
	Geological	4	6	6	6	6
	Hydrological	3	5	5	5	5
	Terrain	5	5	7	7	7
	The synergy of sustainable development	4	5	9	7	7
Strategic	Infrastructure status	6	8	7	6	4
	Distribution of suppliers and customers	9	4	7	9	8
	Expandable area of the overseas warehouse	4	4	6	9	9
	Land price	4	4	6	9	9
	total		429	529	540	516

5.2. Microanalysis

The leapfrog development of cross-border import trade has created a demand such as controlling logistics distribution cost and accelerating logistics delivery. Therefore, the microanalysis of overseas warehouse layout mainly uses the formula limit method to consider the logistics cost minimization. The basic idea of logistics cost modeling is to select the optimal solution with the lowest total logistics cost from the supplier to the overseas warehouse and then to the port in multiple alternatives. The site selection model should have the following assumptions: (1) Single source distribution, which only considers the transportation of one commodity; (2) Planning overseas warehouse construction only within a limited range of options; (3) The supply of each source is stable and known; (4) The transport cost of transport goods is positively related to the transportation quantity; (5) The fixed costs of establishing and operating overseas warehouses are known.

Figure 7 shows the service flow of importing overseas warehouse:

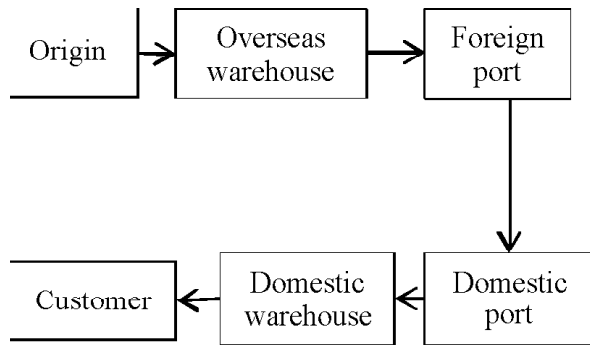


Figure 7: Import overseas warehouse service process

In foreign countries, the fresh products of the source area are transported to the overseas warehouse through cold chain transportation with overseas partners. After selection and microprocessing, the products are stored in the overseas warehouse and then transported to the nearest port. In the domestic segment, enterprises transport products from domestic ports to domestic transit warehouses and sell them to domestic customers.

The two main producing areas of durian in Thailand are Rayong and Chonburi and the output

of durian in the two regions is the same. The two major ports in Thailand are the port of Bangkok in the Thai capital and the port of Laem Chabang in the south of Bangkok. We find out that Rayong is about 179 kilometers from the port of Bangkok and 55 kilometers from the port of Laem Chabang. It is about 240 kilometers from Chonburi to Bangkok port and 170 kilometers to Laem Chabang port. Table 5 shows the distances between the four target sites.

Table 5: Distances between the four target sites

	Bangkok (i1)	Laem Chabang (i2)	Rayong (i3)	Chonburi (i4)
Bangkok (p1)	0	114km	179km	240km
Laem Chabang (p2)	114km	0	55km	170km
Rayong (j1)	179km	55km	0	131km
Chonburi (j2)	240km	170km	131km	0

The costs of overseas cargo transportation and storage are mainly divided into three parts, namely the freight cost of products transported from the source to the overseas warehouse (freight 1), the management cost of warehousing and the final cost of products transported from the overseas warehouse to the overseas port (freight 2). Therefore, the corresponding basic formula of logistics costs should be:

$$\text{Total cost of logistics} = \text{freight 1} + \text{storage management fee} + \text{freight 2}$$

Freight 1 mainly includes the delivery of products with the quantity of q_i from N supply places i to overseas warehouses, the transportation distance is d_i and the freight rate is k_1 . The freight 1 is:

$$T1 = \left(\sum_{i=0}^n q_i * d_i \right) * k_1$$

The warehouse management fee is fixed cost.

Freight 2 mainly includes the transportation cost from overseas warehouse to the port. The quantity of goods is Q and the distance L is between the overseas warehouse and the port. The freight 2 is $T2=k_2*Q*L$.

The objective function is:

$$\text{Min } Z = \left(\sum_{i=0}^n q_i * d_i \right) * k_1 + k_2 * Q * L \quad (1)$$

The constraints are:

$$0 < q_i \leq Q \quad (2)$$

$$d_i \geq 0 \tag{3}$$

$$L \geq 0 \tag{4}$$

The overseas warehouse is expected to deliver about 12,000 tons of durian in the first year. Assuming that the amount of durian obtained from Rayong and Chonburi is the same, both of which are 6000 tons. According to the freight rate table 6, the freight rate of refrigerated vehicles is 0.45 yuan per ton-kilometer. The logistics cost of each warehouse can be estimated respectively.

Table 6: Freight rate table of the long-term transportation

Cost categories	Calculating unit	rate	
		Level 1 road	Level 2 road
Ordinary cargo	yuan per ton-kilometer	0.28	0.35
Special cargo			0.35
Minivan under 2 tons			0.45
Minivan under 3 tons			0.42
Refrigerator car			0.45

The logistics cost of overseas warehouse construction in Bangkok:
 $= 179 * Q / 2 * k + 240 * Q / 2 * k + 0 * Q * k = 209.5 * Q * k$
 in Laem Chabang:
 $= 55 * Q / 2 * k + 170 * Q / 2 * k + 0 * Q * k = 112.5 * Q * k$
 in Rayong:
 $= 0 * Q / 2 * k + 131 * Q / 2 * k + 55 * Q * k = 120.5 * Q * k$
 in Chonburi:
 $= 131 * Q / 2 * k + 0 * Q / 2 * k + 170 * Q * k = 235.5 * Q * k$

Based on the above calculation, we find that the logistics costs of imported overseas warehouse construction are relatively lowest when it is built in Laem Chabang. It has convenient transportation and is close to the two sources of durian. The goods can be transported to China by sea the first time. In addition, Laem Chabang is close to Bangkok, which can attract more talents with higher education. Therefore, setting up an overseas warehouse near Laem Chabang is the best.

6. CONSTRUCTION MODE SELECTION

There are three types of overseas warehouse construction modes: equity participation and joint venture overseas warehouse mode, self-built overseas

```

1 /*****
2 * OPL 12.1.0 Model
3 * Author: 林一伟
4 * Creation Date: 2018年4月21日 at 下午3:50:34
5 *****/
6 //变量
7 {string} i={"i1","i2","i3","i4"};
8 {string} j={"j1","j2"};
9 {string} p={"p1","p2"};
10 int d[i][j]={[179,240],[55,170],[0,131],[131,0]};
11 int l[i][p]={[0,114],[114,0],[179,55],[240,170]};
12 int k=45;//单位(分)
13 int Q=12000;
14 dvar int x[i];
15 dvar int y[i][p];
16 //模型
17 minimize sum(i in 1..j in j)
18             k*Q/2*d[i][j]*x[i]+
19             sum(i in i..p in p)
20             k*Q*l[i][p]*y[i][p];
21 //约束
22 subject to
23     sum(i in i..p in p) y[i][p]=1;
24     sum(i in i) x[i]=1;
25     forall(i in i)
26         0<=x[i]<=1;
27     forall(i in i..p in p)
28         0<=y[i][p]<=1;
29     forall(i in i..p in p)
30         y[i][p]<=x[i];
31 }
0 0]
0] [0 1] [0 0] [0 0]]
    
```

Figure 8: Computational code 1

名称	值
数据 (7)	
d	[[179 240] [55 170] [0 131] [131 0]]
i	["i1" "i2" "i3" "i4"]
j	["j1" "j2"]
k	45
l	[[0 114] [114 0] [179 55] [240 170]]
p	["p1" "p2"]
Q	12000
决策变量 (2)	
x	[0 1 0 0]
y	[[0 0] [0 1] [0 0] [0 0]]

Figure 9: Computational code 2

warehouse mode and third-party leasing overseas warehouse mode.

The overseas warehouse construction mode of equity participation and the joint venture is two or more enterprises participate in the joint-stock and joint-venture construction of overseas warehouses to achieve a series of businesses such as overseas warehousing, customs clearance, tax declaration, and logistics distribution. Under this mode, overseas warehouse construction capital, overseas warehouse management, etc. all involved in the joint cooperation. The cost of warehouse construction is

relatively low and the risk is small. However, due to the participation of other enterprises in this mode, the freedom of trade is relatively reduced and the location of overseas warehouses is subject to other enterprises. It is not easy to find suitable enterprises with overlapping product areas or similar service characteristics. Some of the participating enterprises have competitive relations with each other, involving the distribution of benefits and other issues, which can easily lead to the slow development of overseas warehouse construction. In general, the enterprises' mastery of the whole system is between the third-party leasing mode and the self-built warehouse mode. Enterprises have already carried out overseas warehouse construction without effective results or have just finished the third-party leasing overseas warehouse is suitable. They are not willing to bear the risk of self-built warehouse or lack of self-built warehouse funds. In addition, it is applicable to American and European countries with mature overseas warehouse construction or regions with relatively difficult and high cost of land investment.

The enterprise self-built overseas warehouse construction mode refers to the enterprise invests in and builds a warehousing company within the territory of a major exporting country and completes a series of businesses such as overseas warehousing, customs clearance, tax declaration, and logistics distribution. With the large storage capacity of self-built overseas warehouses, enterprises can carry out construction according to the market demand and characteristics of goods. The types and cycles are not bound by other business related parties and are conducive to the establishment of enterprise brand image and effect. However, this mode has high construction cost, high operational risk and high requirements for transnational operation and management. It is suitable for import buyers with a large business scale, large cross-border traders with good brand effect, or large domestic enterprises that have carried out transnational operations. In addition, it is suitable for countries and regions with good prospects of overseas warehouse development and high rate of return on land investment.

The third-party leasing overseas warehouse mode is between the mode of equity participation, joint venture overseas warehouse and self-established

overseas warehouse. There are two ways of warehousing. One is that cross-border import enterprises directly rent the existing overseas warehouses of third-party logistics companies in the exporting country and manage the warehousing, processing, and distribution of imported goods with the management information system, human resources and business network of third-party logistics companies. Cross-border import enterprises need to pay warehousing costs and domestic logistics operating costs to third-party logistics companies. Another way is for cross-border import enterprises to cooperate with third-party logistics companies in the exporting countries to build overseas warehouses and establish a new warehousing and logistics enterprise. Cross-border import enterprises shall invest capital and equipment and third-party logistics companies shall provide warehouses, human resources, and service network for joint management and operation. Cross-border import enterprises only need to pay the international logistics costs of cargos and do not have to bear the logistics costs in the exporting country. Both two ways have relatively low storehouse cost, low risk, and easy management. The existing logistics service network in the exporting country is used to solve the localized operation of cross-border import enterprises, which greatly reduces the operational risk and cost. However, the operation quality of this mode is subject to third-party enterprises and the logistics service and management level of third-party enterprises will directly affect the final economic benefits of the overseas warehouse. It is suitable for enterprises that have already implemented brand building and have a large scale of import. In addition, it is applicable to countries with immature overseas warehouse construction or regions with low land return rate.

According to the results obtained in chapter 5 on the construction of overseas warehouses for cross-border import of fresh fruits near the port of Laem Chabang in Thailand, corresponding to three different overseas warehouse construction modes, this paper proposes to construct overseas warehouses with the second service mode in the third-party leasing overseas warehouse mode. Cross-border import enterprises cooperate with third-party logistics companies in exporting country to build overseas

Table 7: Comparison of three overseas warehouse construction modes

	<i>Equity participation and joint venture overseas warehouse mode</i>	<i>Self-built overseas warehouse mode</i>	<i>Third-party leasing overseas warehouse mode.</i>
Overview	Two or more enterprises participate in the joint-stock and joint-venture construction of overseas warehouses to achieve a series of businesses	Enterprise invests in and builds a warehousing company within the territory of a major exporting country and completes a series of businesses	Enterprises cooperate with foreign warehousing or logistics companies. Foreign companies provide directional, long-term overseas warehousing and logistics distribution services
Advantages	Low cost of warehouse construction, small risk, complementary talent, easy management	Large storage capacity, multiple storage types, good brand image and effect	Low storehouse cost, low risk, easy management
Disadvantages	Less freedom of trade, limited location, competitive participating enterprises	High construction cost, high operational risk, difficult transnational operation, and management	Limited operation quality, limited logistics service, and management level
Suitable enterprises	Logistics companies with ineffective overseas warehouse construction	Import buyers with a large business scale, large cross-border traders with good brand effect, large domestic enterprises that have carried out transnational operations	Enterprises with an implemented brand and large scale of import
Suitable area	American and European countries with mature overseas warehouse construction, regions with relatively difficult and high cost of land investment	Countries and regions with good prospects of overseas warehouse development and high rate of return on land investment	Countries with immature overseas warehouse construction, regions with a low land return rate

warehouses. Cross-border import enterprises invest capital, equipment, etc. and third-party logistics companies provide warehouses, human resources, service networks, etc., which are jointly managed and operated by both parties. The reasons are as follows:

- (1) The level of cold chain storage in Thailand is low and cold chain logistics technology is not widely used. Cross-border import enterprises can control the quality of fresh fruits from the source by investing in refrigeration, temperature control and pre-cooling processing equipment of imported overseas warehouses. If you choose the equity participation and joint venture overseas warehouse mode, it is difficult to reach a consensus on the construction in this respect, because the cost of pre-cooling processing is higher than that of an ordinary overseas warehouse.
- (2) Cross-border import enterprises only need to pay the international logistics costs of goods and not bear the logistics costs in the exporting country. This solves the problem of overseas localization management and

reduces the risk and the cost of overseas warehouse management.

- (3) Land privatization in Thailand makes it difficult to measure its land price correctly and large land investments do not yield high returns. The third-party leasing mode will have advantages over the self-built overseas warehouse mode.

7. CONCLUSION

This paper compares and analyzes the service mode of cross-border supply chain and selects the overseas warehouse mode for the owner enterprises. Through macro and microanalysis, the location of the overseas warehouse is set in Laem Chabang in Thailand and the construction mode of third-party leasing overseas warehouse is selected according to the actual situation of Thailand.

As cross-border trade has become a new growth point of national economy, the high rate of decay and damage of imported fresh fruits has brought huge losses to the owner enterprises and the whole society. The construction of such an overseas warehouse for the cross-border import of fresh fruits is conducive to reducing the rate of decay and damage in the cross-

border circulation of fresh fruits, simplifying the cross-border transport process, and reducing the cross-border cold chain logistics cost. The use of its warehousing function can achieve “seasonal production and annual sales” to improve the consumer experience. In addition, it can promote the healthy development of Chinese import trade and is an important guarantee to improve the quality and quantity of Chinese imports and promote economic growth.

Global economic integration and the arrival of the era of network economy bring new opportunities and challenges to the development of cross-border trade supply chain. To actively promote the integration and coordinated development of cross-border trade and logistics is the consensus of the majority of cross-border trade enterprises. Therefore, we firmly believe that the integration of trade and logistics under the development of cross-border trade is overwhelming. As the core focus of cross-border import and cross-border logistics, the overseas warehouse of cross-border trade import will have a broader development prospect.

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