

Research on Chinese fresh cold chain supply chain problems

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Abstract: With the continuous development of Internet technology, the rise of e-commerce industry, and the rise of new sales models and channels of various fresh products, the construction and investment of fresh cold chain logistics service capacity have attracted the attention of the industry, which provides a good opportunity for the current development of fresh cold chain logistics in China. From the freezing preservation of fresh products, frozen storage, frozen transportation, to the market sales, this whole quality preservation of cold chain logistics is a complex process, every link plays a vital role. The application of supply chain in fresh cold chain logistics has made great changes in the procurement, transportation, storage and other fields of fresh cold chain logistics. In recent years, the surge in consumers' demand for the quantity and quality of fresh products has promoted the sustainable development of the cold chain industry, and China's cold chain logistics has made fruitful and effective innovation and exploration in the operating procedures. However, China's cold chain logistics industry is still in the initial stage of development, and the relevant infrastructure and equipment cannot meet the requirements of the cold chain. On the whole, China's cold chain logistics industry lacks reasonable planning and integration, as well as effective connections between upstream and downstream enterprises. Companies focus on improving their own competitiveness and leads to vicious competition in the industry. This paper analyzes the problems of fresh cold chain supply chain with imperfect facilities, low marketization, low-price competition leads to low industry level, lack of overall planning and rationing. Put forward the solutions to promote the construction of cold chain logistics guarantee system, vigorously update and develop cold chain logistics equipment, third-party logistics, talent training, and accelerate the transformation of cold chain mode, so as to achieve more comprehensive improvement on the whole.

1. Introduction

In recent years, China's economic development has developed rapidly, and the reform and opening up has been continuously improving, which makes people's requirements for the quality and level of life in daily life increasingly increasing, and people's demand for various fresh agricultural products that were not easily accessible due to the season in the past. The fresh cold chain management corresponding to fresh agricultural products is one of the more difficult areas of the whole logistics industry, because fresh products have the characteristics of fresh and easy loss, which is more difficult to store and transport general goods, and more difficulties encountered in logistics activities. Therefore, fresh cold chain logistics service has become a relatively weak part of China's current logistics industry service capacity [1]. From policies in recent years, it can be seen that the Chinese government supports and encourages the development of related cold chain logistics, so that all kinds of fresh products in the market demand can reduce the cost of waste in the transportation process and reduce resource consumption. At present, there are still many shortcomings in the transportation of

cold products in cold chain products. For example, in the process of transportation, there are problems of high deterioration rate of fresh products, difficult to achieve full low temperature control, and high transportation costs. And during the epidemic, many places in China have reported that imported cold-chain products have detected the novel coronavirus. Most of these problems are due to China's imperfect fresh cold chain operation system and its ineffective response to the epidemic. To solve these problems, China has to improve the supply chain as the starting point, in order to change the existing fresh product supply chain in the management and operation system, technology and other aspects.

Wan Yulong pointed out that the epidemic may exist for a long time in the future. The construction of a fresh cold chain logistics system under the epidemic situation needs to build a more perfect information supervision plan, and the whole-process information flow, information standardization, and information traceability are the decisive factors [2]. This paper analyzes the development situation of the fresh cold chain in China through the literature review, the case analysis. This paper aims to find out its existing problems and put forward the corresponding solutions to achieve the purpose of optimizing China's fresh cold chain logistics system.

2. Current situations of cold chain in China

2.1 Demand surge

In recent years, the agriculture and sideline food processing industry has developed rapidly. The number of planting bases for certain kinds of agricultural products grows quickly. Distributors like supermarkets are willing to increase their purchase volume on these products. In addition to the high demand of fresh agricultural products, people also pay attention to the quality of these kinds of products. According to China Statistical Yearbook 2021, the total consumption of fresh agriculture products in China during the 7 years (from 2013 to 2019) increased from 266 million tons to 309.6 million tons with 1.16% annual compound growth. The percentage of fresh vegetables was the biggest, up to 43% in 2019. The consumption of fresh fruit fluctuated to 72 million tons in 2019. there was also an obvious increase in the consumption of dairy products, which accounted for the smallest. The consumption of fresh agriculture products in China in recent years is shown in Figure 1.

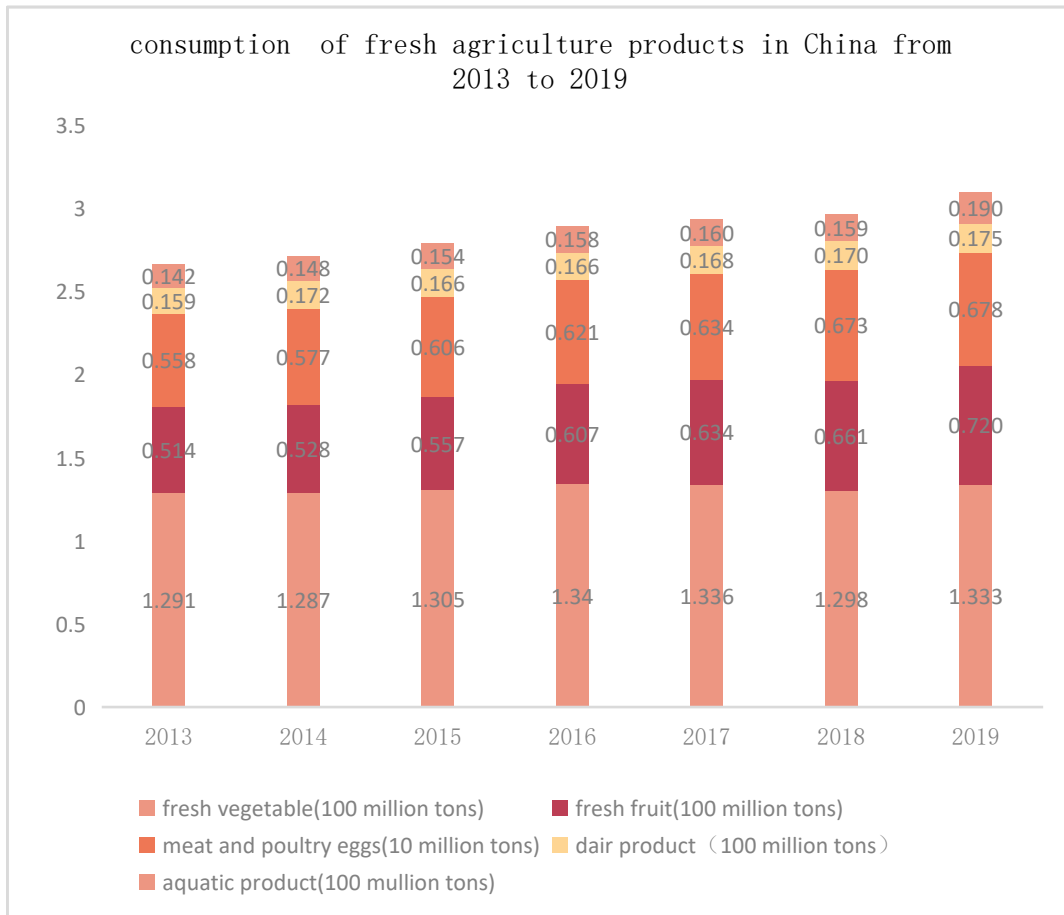


Figure 1. Consumption of fresh agriculture products

2.2 The standardization of the operation process

With the cold chain logistics industry developed in recent years, the Chinese government has put more effort into market supervision in order to ensure the quality of fresh agriculture products, which is highly related to population health[3]. Some distributors realize the high business value behind fresh cold chain logistics, thus they establish a professional department to interconnect and outsource logistics to TPL. Under the impact of world economic integration, many international technology standards of cold chain logistics have been introduced and accepted, which prompt the standardization of the domestic cold chain operation process. In addition, after the integration of the world economy, many foreign third-party logistics enterprises such as Canada Thomson Group, application three-stage refrigerated transport vehicles with automatic temperature control and satellite monitoring function, greatly improve the safety and quality of fresh food; storage, European countries use advanced technology and other gas regulating storage technology[4]. these enterprises brought related cold chain logistics technology standards are recognized by consumers, promote the adjustment in laws and regulations and relevant policies and systems, make the standardization of cold chain logistics standardization, standardization has a substantial, the national unified progress, the industry in such promotion, is stable and high-speed development.

Under the guidance of China's policies, all provinces and cities began to build imported cold chain traceability platforms. According to the arrangement of Qian Zhan Industry Research Institute, the Beijing Cold Chain Food traceability platform was officially launched on November 1, 2020, and then the imported cold chain traceability platforms of various provinces and cities were launched. Chinese government will comprehensively carry out the traceability management of all kinds of imported and refrigerated and frozen fresh products, so as to realize that the "sources of imported and refrigerated and frozen fresh products and the whereabouts can be traced".

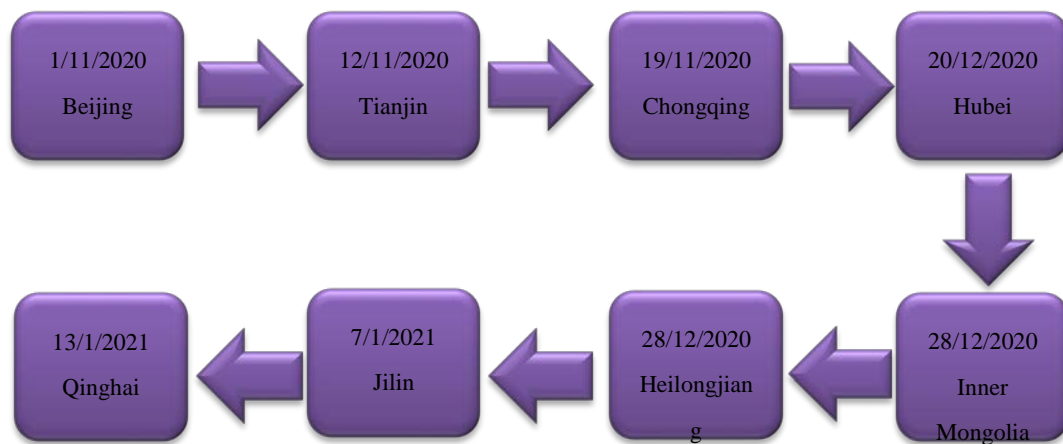


Figure 2. Construction of import cold chain traceability platform in major provinces and cities in China by January 2021

3. Problems in Chinese cold chain supply chain of fresh products

3.1 Cold chain logistics facilities and equipment are not perfect

Nowadays, among the fresh cold chain logistics enterprises in China, the professional facilities and equipment necessary for most of cold chain logistics are generally at a relatively old and backward level. Due to the imbalance of development between different regions, the development degree of the cold chain logistics industry is different, and some regions do not build the cold chain logistics required by the cold chain now [5]. Most of the refrigerated and refrigerated warehouses still in use are completely unable to meet the hardware requirements of the cold chain, and even some areas are still using the old refrigerated and refrigerated warehouses established in the early days of the founding of China in the last century for the storage of spare grain, the warehouse is already more than it can use the biggest fixed number of year. However, there is no new, technically standardized refrigerated warehouse, so it is still in use.

From the data [6], in 2019, east China's cold storage capacity is the largest, accounting for 41% of the total national cold storage; Followed by North China, accounting for 15%; As the main producing areas of agricultural products, the combined cold storage capacity of northwest and northeast China only accounts for 13% of the national total (see Figure 3 below). The uneven distribution of cold storage enterprises is another big phenomenon. In 2019, the number of cold storage enterprises in China was about 1832. East China has the largest number of enterprises, 686, accounting for 37%; The second region is South China, with 296 enterprises, accounting for 16% (see Figure 4 below), reflecting the different development degrees of cold chain logistics in different regions of China. Refrigerated vehicles are the most important means of transport for cold chain logistics, but data from the Cold Chain Committee of China Federation of Things showed that the number of refrigerated vehicles in China in 2019 was about 214,700, an increase of 34,700 compared with 2018, only reaching the level of the United States, Japan, and other advanced countries in 2013, which is not only absolute insufficient, but also low in a technical level. Not only the number of refrigerated vehicles is low, but also the refrigerated transportation rate is low. At present, the cold chain transport rate of primary agricultural products in China is always low compared with developed countries, which have reached the level of 80%-90%. However, the cold chain transport rate of fruits and vegetables, meat, and aquatic products in China is only 15%, 57% and 69% respectively (see Figure 5 below).

Regional distribution of Cold Storage Capacity in 2019 (%)

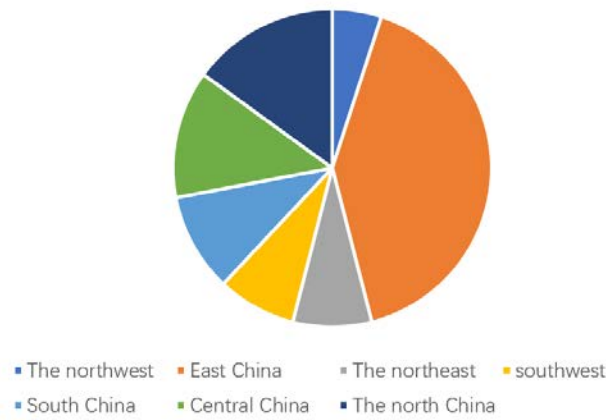


Figure 3. Distribution Map of Cold Chain Logistics Enterprises in China [6]

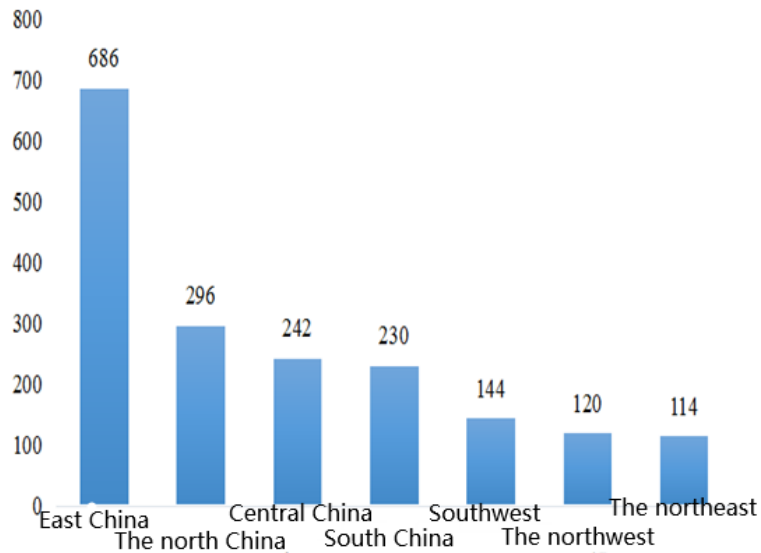


Figure 4. Regional distribution of Cold Storage Enterprises in China in 2019 [7]

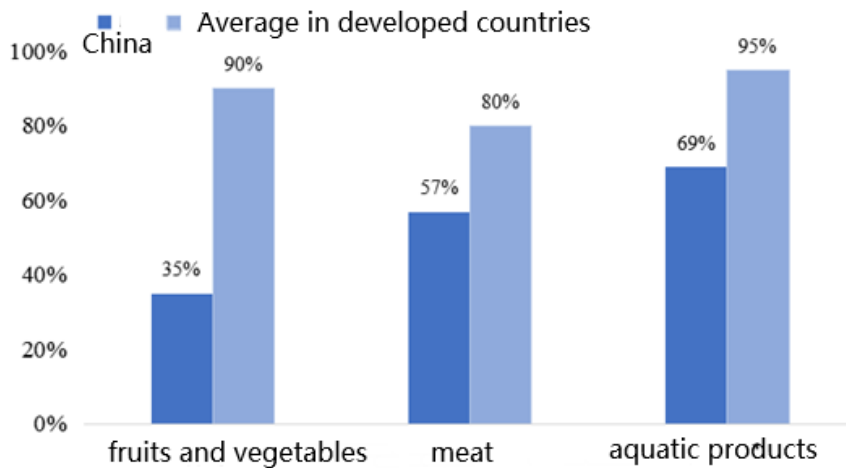


Figure 5. Comparison of cold chain transport rates between China and developed countries [7]

3.2 The marketization degree of cold chain logistics is low

In China's current fresh cold chain logistics market, because did not form a cold-chain logistics leading enterprises, or enterprise benchmarking, makes each between region and region on the market, although each has a cold-chain logistics network system, but each region between the system and not able to produce a relatively standardized, there is a requirement for a uniform system works, This makes in the process of domestic cold chain logistics market operation, the situation is different in each region, some area by a third-party cold chain logistics enterprise to cold chain logistics distribution, such as east China, north China, south China, and central China, these areas are heavily populated with top cold chain enterprises, such as SF Express is extremely professional third-party logistics services, Cold as the launch of motion along with abundant business, relying on strong-motion controlling air and ground transportation network. For example, SF Cold service launched by SF Express relies on SF Holding's powerful air and ground transportation network, cold chain storage and transportation strength, professional temperature control technology and advanced system management ability, integration of the motion controlling existing stores, branches, and distribution of resources, at the end for the fresh food industry clients to provide professional, custom, highly effective, the entire visual control of cold chain services. And some local and regional between cold-chain logistics distribution business, or by the production of fresh agricultural products processing enterprises, or downstream segment of the dealer to undertake cold-chain logistics business, these are not professional enterprises, the cold chain logistics transportation methods adopted by the more multifarious, under the lower operating mode, are responsible for a large number of fresh the wastage of the products, In the process of logistics activities, a lot of costs are consumed, and a lot of resources and capital are wasted.

3.3 Low price competition leads to low industry level

Since China's cold chain logistics industry has just started, all logistics enterprises are still in the groping stage on how to improve their competitiveness. However, due to the increasing market demand, all logistics enterprises abandon the development of their own logistics operation level and begin to focus on grabbing market share. Low labor force and rapidly growing market demand make logistics enterprises start a cost struggle. Various companies with low cost, meager profit but high turnover, suppression of rivals, but the growing market demand make did not have too much enterprise to be eliminated. This can make the cold chain logistics market, form a vicious circle, between enterprises on the run at a lower cost to obtain more market share, competing with each other, cold chain logistics operation cost has been compressed.

3.4 Cold chain logistics lacks overall planning and integration of upstream and downstream

For the formation of the cold chain system, in the supply chain of each node is an important part of a supply chain, than the middle to connect and responsibility of a third-party logistics enterprises, China's cold chain is a bigger problem is that the upstream product supplier, middle reaches of cohesion, and downstream distributors, It is difficult to form a close supply chain with a clear division of labor [8]. Among them, the main problems are caused by upstream producers. China's agricultural production is not dominated by large farms, planting, and breeding bases as in foreign countries, but scattered farmers occupy most of China's agricultural production, which makes it impossible to closely cooperate with one or two fixed upstream producers. Only from scattered farmers get products or small production cooperatives, which creates a supply chain operation process, the tremendous uncertainty and instability, middle transport distribution companies cannot get quantity and supply on time, make up, middle and downstream, long time, the low efficiency of loose is not stable, It takes up a lot of resources and doesn't get the benefits it deserves. Midstream and downstream sales enterprise, logistics enterprise, because of the middle reaches of the enterprise level are low, low degree of marketization, and industry could not deliver the goods immediately, with good quality, to the downstream, the downstream enterprises, by contrast, tend to not supply chain of sales way, between the three parties,

failed to form close and efficient supply chain system, the three parties resources can be integrated, As a result, China's cold chain logistics lacks the overall connectivity of upstream and downstream.

4. Optimization scheme of Chinese fresh product cold chain supply chain

4.1 Promote the construction of a cold chain logistics support system

Relevant government departments should cooperate sincerely between logistics industry organizations and third-party cold chain logistics enterprises. In cooperation with foreign enterprises, actively draw lessons from large developed countries cold chain logistics enterprise management development experience, and combined with the development of China's existing market and economy, planning suitable for China's national conditions of cold chain logistics supply chain development strategy, create a suitable for Chinese fresh product cold chain logistics development policy environment, support and help the cold chain logistics enterprises in terms of national policies, and introducing the corresponding encouraging measures can accelerate the independent innovation and development of the local enterprises, and form the government and enterprises to jointly promote the development of the food cold chain logistics in China.

4.2 Vigorously update and develop cold-chain logistics equipment

Given the lack of advanced technology and equipment in the current operation process of the cold chain logistics in China, the development and update of the cold chain refrigerated transportation equipment in China should start from the following two aspects, and develop from independent innovation and adapting measures to local conditions:

First, improve and update the existing outdated facilities and equipment still in use in the market. For the cold chain logistics facilities and equipment in China that are still relatively backward, more attention should be paid to the development of cold temperature and refrigerated transport vehicles, fast refrigerated distribution vehicles, and related cold chain transport equipment to meet the needs of China's existing cold chain logistics, especially the small and medium-sized urban distribution special refrigeration vehicles with wide controllable temperature range, flexible volume, suitable for multi-batch and small-volume transportation, and various modes of transportation and equipment for different batches, different distances, and different transportation requirements.

The second is to improve a large number of relevant cold chain logistics facilities and equipment that are widely used in the market. Whether learning from foreign advanced technologies or making independent innovation, the ultimate purpose is to update the existing cold chain logistics facilities, so that a unified equipment utilization rate with high standard and low loss is formed in the market. Because China's existing refrigerated transportation equipment in refrigeration and refrigeration mode, adjustable fresh product preservation technology development, refrigeration, and temperature control equipment reliability, body internal sealing and low temperature keeping capacity, load cargo weight mass volume capacity, emerging cold chain materials, cold chain logistics distribution center and refrigeration warehouse ground facilities construction, compared with the development of cold chain logistics in developed countries, there is still a big gap. So we should strengthen the cooperation with international mature cold chain logistics enterprises, learn from the internationally high level of management mode and facilities and equipment update, improve the speed of Chinese cold chain facilities and development and update, but also pay attention to the development of cold chain logistics country introduction and design suitable for wide China, large demand, a variety of cold chain logistics development facilities and equipment, from science and technology and technology to improve the overall level of the existing cold chain logistics transportation.

4.3 Accelerate the development of third-party logistics

Most of the goods served by cold chain logistics have the nature of perishable. In the process of transportation and distribution, the professional constant temperature environmental control and operation requirements in circulation are much higher than that of ordinary logistics. At present, China's cold chain logistics activities are mostly by producers or dealers themselves, has not formed

with a third party professional cold chain logistics enterprise market consciousness, compared with the professional third party logistics enterprises, separate enterprises to implement logistics activities, often because not professional enough, only distribution as additional services and not enough attention, eventually let logistics activities are neither realistic nor economic. Moreover, some enterprises, because of logistics and distribution, have to deliver due to market demand, but there is no fine management, resulting in self-built physical system redundancy and occupying a large number of resources and funds of the enterprises, which makes the enterprises miserable.

In this case, it should use third-party logistics to carry out professional cooperation in distribution and transportation, and third-party logistics should use its logistics resources, facilities, and equipment to help enterprises integrate the overall link of logistics. It can be said that third-party logistics is an indispensable intermediate link in the cold chain, but also the main functional bearer in the future logistics demand market. Because of the rapid development of China's economy, future enterprise development will surely pursue specialization and mutual cooperation. Therefore, third-party logistics enterprises are required to master social logistics resources, and provide more professional, more efficient, and more low-cost logistics services for enterprises or individuals in demand, so as to establish a cold chain system with third-party logistics enterprises as the connection, and integrate suppliers and dealers.

4.4 Strengthen the training of cold chain logistics professionals

At present, there are many shortcomings in cold chain logistics, one of which is that talents from relevant aspects are not enough to support the existing cold chain development needs. Therefore, at present, Chinese education departments and university management institutions should adopt various ways such as encouraging schools, adding logistics majors, and increasing students from related majors, starting from education and talent training, and fundamentally make up for the shortcomings in terms of talent training[9].

4.5 Accelerate the transformation of cold chain mode

The outbreak of COVID-19 in 2020 has broken the calm of the fresh cold chain market, which is both an opportunity, but also a challenge. Due to the policy of home isolation, the volume of fresh orders exploded, resulting in the low distribution efficiency, the "last kilometer" problem is difficult to solve; at the same time, the increase in the demand for cold chain food also makes the safety problem of imported cold chain food particularly important.

Therefore, on the premise of ensuring the safety of fresh food to meet residents basic guarantee, need to accelerate the transformation of epidemic era cold chain mode, in terms of distribution, do with high-end technology, such as using intelligent robot to complete contactless delivery, ensure the quality of life while ensuring the safety of merchants and users, during the outbreak, Meituan, Jingdong and other Chinese enterprises have taken the lead in contactless distribution, after the epidemic era, with advanced Internet technology dominated by contactless distribution will be the trend of The Times; In the cold chain logistics operation link, reduce unnecessary transportation process, such as frequent open box check and replace employees, but also strengthen the supervision of staff personal health and protective equipment wear, to minimize the exposure risk of fresh food, at the same time, the government and enterprises should use the Internet technology as soon as possible traceability system, transportation process transparent, let consumers rest assured.

5. Conclusions

With the rapid development of economy, the people's living standards have been rapidly improved, and the development of the supply chain has also met the needs of consumers. However, consumers not only have requirements for the number of fresh products but also pay more attention to the quality of fresh products. Due to the imperfect development of China's cold chain market and the lack of cooperation among relevant logistics enterprises, the cold chain logistics industry is still in the primary stage of development. This paper analyzes the current situation and Development Countermeasures of

China's cold chain logistics industry, which is of great significance to promote the development of China's cold chain logistics.

Firstly, this paper defines the future development direction of China's cold chain logistics, analyzes the relationship between individual logistics enterprises, logistics enterprises, and the overall development of the market, finds out the main problems, and obtains the measures to solve the problems according to the relevant literature, monographs, and research methods.

The purpose of this research is to promote the benign development of logistics enterprises and ensure the effective establishment of cold chain logistics systems throughout the country. Another purpose is to provide a reference development direction for future theoretical and practical research.

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