

A Review of Research on Cold Chain Logistics and Distribution of Fresh Agricultural Products in China

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Abstract: At present, China, as the second largest economy in the world, is in the new development pattern, that is, to build a new development pattern with the domestic macro-cycle as the main body and the domestic and international double-cycle promoting each other, which has high requirements for the smoothness of the circulation system, urgently needs the circulation system to have a high degree of smoothness, and urgently needs to accelerate the upgrading of the logistics distribution industry, so as to realise the synchronous development of the logistics distribution industry and the economy of the country. Moreover, under the background of China's rapid development, people's needs for fresh agricultural products and other cold-chain products, as well as product quality requirements have gradually improved, therefore, under the background of rapid changes in the market, the management of China's cold-chain logistics should also be further improved to meet the market requirements. Based on this, this paper takes cold chain logistics and distribution as an entry point, and through the current development status of cold chain logistics and distribution of fresh agricultural products, the distribution mode status quo, the current research status of the constraints of fresh agricultural products logistics and distribution, as well as distribution optimisation strategy research, etc., it is hoped to draw the research direction and research focus of future cold chain logistics and distribution of fresh agricultural products, with a view to providing reference opinions to promote China's fresh agricultural products in the cold chain logistics development and improvement, so as to meet the market's requirements. In order to provide reference opinions to promote the development and improvement of the cold chain logistics of fresh agricultural products in China, so as to meet the higher requirements of the people for fresh agricultural products.

Keywords: Fresh Produce, Cold Chain Logistics, Distribution.

1. Introduction

Since 2010, when the National Development and Reform Commission issued the first cold chain plan, the concept of cold chain has gradually gained popularity, stirring up a pool of spring water in the market. During the decade from 2008 to 2017, people in China have attached more and more importance to food safety and freshness, and the fresh and frozen food industry has been developing rapidly. At the same time, China's agricultural products storage and preservation technology, cold chain logistics development conditions, cold chain logistics development environment rapid development and improvement, so that the domestic fresh cold chain logistics industry to get faster development, the industry began to organisation, scale operation, and information technology level, the market nationwide warehousing and distribution network layout. 2018 has been continued to date, China's fresh cold chain logistics market has been further developed. However, due to the characteristics of fresh agricultural products and the late start of the development of cold chain logistics in China, the cost of fresh agricultural products in China's logistics and distribution remains high, and the loss rate in the distribution process is also more serious, which seriously affects the development of cold chain logistics, as well as the direct interests of consumers and producers. Therefore, this paper takes the cold chain logistics and distribution of fresh agricultural products as the research object, and hopes that by studying the current situation of the development of cold chain logistics and distribution of fresh agricultural products, the current distribution mode, the current situation of the research on the logistics and distribution of fresh agricultural products and the

optimisation strategy of the distribution, we can come up with the fundamental reasons restricting the development of its development, and hope that it can provide reference opinions for the promotion of China's fresh agricultural products in the development and improvement of the cold chain logistics.

2. Research Status

2.1. Development Status of Cold Chain Logistics and Distribution of Fresh Agricultural Products

Globally, Europe, the United States, Japan and other countries and regions in the cold chain logistics originated even earlier compared to China. With the invention of the freezing machine in the first half of the 19th century, their cold chain logistics began to gradually take shape. In the 1930s, the cold chain system for fresh food in Europe and America was initially established. As of now, fresh food cold chain logistics has been very mature in developed countries such as Europe, America and Japan, and the history of their industry development has existed for more than 150 years. Due to the high threshold of fresh produce cold chain logistics industry, expensive operation cost and long return cycle, compared with foreign countries, China's fresh produce cold chain logistics industry started late, the domestic cold chain logistics industry only started in the 1960s, and the fresh produce cold chain logistics industry only began to sprout at the end of the last century. However, at present, fresh produce cold chain logistics and distribution in our country is also in the stage of rapid development. It can be concluded from the following three aspects: firstly, from the point of view of the people's growing desire for good, people's consumption

habits, consumption concepts and so on have changed, which provides a development impetus for the cold chain distribution; secondly, from the point of view of the social environment, the relevant national policies are constantly introduced, which provides a very good development environment for the cold chain logistics of fresh agricultural products; thirdly, from the point of view of the technology, the continuous increase of the cold chain industry companies, constant updating and upgrading of facilities and equipment, as well as the technical specialisation of relevant personnel, provide the operating conditions for the industrial end.

X.C. Zhang and H.L. Li [1] pointed out that although the development of cold chain logistics in China is very rapid, but the same consumers in the demand for cold storage products, is also showing a trend of continuous improvement. Secondly, many enterprises in China due to the lack of scientific guidance in cold chain logistics distribution mode selection is not accurate. These all lead to the cold chain logistics distribution in China in the depletion rate is relatively high, and higher than the United States and other developed countries. L.W. Yang [2] pointed out that we should focus on the two markets with great development opportunities, i.e. the "first kilometre" and the "last kilometre". Moreover, with the improvement of related technologies in the cold chain market, China's cold chain logistics is expected to show the development trend of networking, standardisation, scaling and grouping. W.H. Xia [3] pointed out that although the current development trend of China's fresh food e-commerce service enterprises is better, but due to the backwardness of the cold chain logistics equipment of many enterprises in China, the cost of cold chain logistics is too high, as well as the serious loss of fresh products on the way due to their own characteristics of the problem, which leads to the profitability of more enterprises is not good. C.Y. Wang [4] and others pointed out that China has not yet formed a cold chain logistics system that can meet the needs of the people, the specific reasons are: at present, China's cold chain logistics investment cost is relatively expensive, technology and equipment is relatively backward compared to other countries, so that the development of China's cold chain logistics industry is constrained by it. X. Zou and T.J. Wang [5] that, at present, the degree of marketisation of fresh cold chain logistics is not high, fresh agricultural products using cold chain logistics and distribution of profits generated by the entire enterprise's profitability is not high, only accounted for a small part of the enterprise. X.X. Shao [6] pointed out that there are more problems in the cold chain logistics of fresh agricultural products in China. The development of third-party cold chain logistics industry has a large lag, the organisation of logistics of fresh agricultural products and logistics information technology and technology level is not high, and, China's cold chain logistics in the construction of infrastructure is not particularly perfect, the level of logistics and distribution services is not high enough, and the cold chain system has not been improved. M.M. Sun [7] and others pointed out that in the study of the current situation of cold chain logistics in China, it is concluded that there are many problems in the cold chain logistics of fresh agricultural products, such as unhealthy competition in the market, the seriousness of the wear and tear of fresh products, the laws and regulations are not perfect enough, and there is no unified management standard, so that it is difficult to meet the needs of the consumers in the logistics and distribution of fresh agricultural products at present.

2.2. Current Research Status of Cold Chain Logistics and Distribution Models for Fresh Agricultural Products

Do Although the sprouting time of fresh produce cold chain logistics industry and the distribution of fresh produce cold chain logistics in China are relatively late compared with foreign countries, but under the drive of domestic and international double cycle, with the improvement of the current new crown epidemic and the beginning of the global economic recovery, the demand of our people for fresh produce gradually increases, which provide a great space for the development of fresh produce cold chain logistics. Therefore, how we should go to build the distribution mode of fresh produce cold chain logistics, so as to make it possible to realise the industrial upgrading of China's fresh produce cold chain industry is a topic that should be of concern to today's society, and it is also the focus of many scholars' attention today.

X. Si [8] pointed out that for fresh agricultural products, according to the different logistics and distribution providers, the logistics and distribution mode can be divided into five, and according to the different characteristics of the five modes to give the applicable practical scenarios, which also affirms the indispensable role of the main body of logistics in logistics and distribution. X.J. Niu [9] pointed out that from the perspective of the dominant logistics system, the cold chain logistics and distribution of fresh agricultural products can be divided into the logistics and distribution modes dominated by wholesale markets, supermarkets, outsourced logistics service providers and four co-distributors respectively, and this author believes that these four modes will be the main operation of fresh agricultural products in China in the coming period of time. G.C. Wei [10] pointed out that the existing logistics such as self-managed logistics and self-managed distribution/consumer self-pickup, self-managed logistics and third-party logistics, and self-managed logistics have the scope of application and the necessity of their existence, while the author believes that the third-party logistics and consumer self-pickup/third-party distribution in this model is a better model for the small and medium-sized e-commerce enterprises in the choice of the cold chain logistics of fresh agricultural products. F. Li [11] pointed out that the small and medium-sized category of e-commerce fresh produce logistics enterprises can take the outsourcing method, will focus more resources on its main business, and further can achieve high-quality development and low-cost, and ultimately can be able to obtain a larger competitive market in the fresh produce market. J. Wu and H. Du [12] pointed out that the agricultural super compared to other models, has great advantages, its connection can be linked to the production, the next can be linked to the consumption. It can satisfy and adapt to the personalised and diversified consumption of consumers, as well as adapt to and meet the new requirements put forward by China's modern agricultural development. L.F. Zhang [13] pointed out that the O2O logistics and distribution model is a better model, which can better solve some of the problems, such as the high cost and low profit caused by the cold chain logistics technology. D. Wang and F. Lin [14] pointed out that for some large-scale fresh food e-commerce companies, they can adopt the mutual cold chain logistics distribution model to improve the lack of resource utilisation, small and dispersed customer orders, and high cold chain logistics costs. H.B. Qu [15] proposed to build

a new type of logistics distribution mode - "front warehouse + crowdsourcing", and its combination with the "front warehouse" distribution mode, combined with the characteristics of fresh agricultural products, can improve the resource utilisation rate, reduce the cost of cold chain logistics. It can improve the utilisation of resources, reduce distribution costs and improve customer satisfaction.

The above summary and analysis of the above scholars' research shows that there are four main logistics and distribution modes adopted by fresh produce e-commerce enterprises, i.e., self-operated cold chain logistics, third-party cold chain logistics, mutual cold chain logistics and mixed cold chain logistics mode. And scholars generally believe that it is very important for enterprises to choose the appropriate cold chain logistics and distribution mode according to their current situation and target demand. By combining the current situation of cold chain logistics of enterprises and selecting the suitable cold chain logistics distribution mode for enterprises on this basis, the current problems in cold chain logistics of enterprises can be alleviated, thus saving the logistics costs of enterprises and increasing the interests of enterprises.

2.3. Current Status of Research Constraining the Logistics and Distribution of Fresh Agricultural Products

With the continuous development of China's society, the improvement of people's material life, as well as the continuous improvement of the experience of purchasing goods, leading to the cold-chain logistics and distribution of fresh agricultural products will inevitably become a development trend of modern logistics, but in the actual operation of fresh agricultural products there are still a lot of constraints on the development of the factors that hindered the expansion of the market for cold-chain logistics and distribution of fresh agricultural products and its development.

Y. Le [16] pointed out that, under the uncertainty of the social environment, the supply and distribution of fresh agricultural products are easily affected by many uncontrollable factors, which can easily lead to abnormal fluctuations in the market and supply tensions, which will have an impact on economic development and social stability. Niu Xiaojuan [9] pointed out that the current fresh agricultural products in the supply chain lack of effective integration, the degree of information technology of fresh agricultural products distribution is also relatively low, in logistics technology is also relatively backward, the level of service is relatively low, the distribution of loss, distribution efficiency is low and other aspects of the problem. W.G. Shao and S. Kang [17] pointed out that the main problems of fresh products in the transport process are: first, the depletion rate of agricultural products in the transport process is higher; second, the logistics cost is higher and the transport time is long. Thirdly, there is a lack of a standardised set of standard models for fresh produce in the packaging and distribution process. All these problems lead to the high selling price of the products, which seriously affects the development of e-commerce enterprises in the fresh produce market. J. Wu and H. Du [12] pointed out that due to the cold chain logistics and distribution, there are mainly some objective factors affecting the development of fresh agricultural products and hindering the structural reform of the agricultural supply side. And these objective factors mainly include: intermediate links layer by layer price increase, many circulation links, the existence of

the complex structure of the channel and information asymmetry, etc. W.G. Shao and S. Kang [17] pointed out that the logistics and distribution of fresh agricultural products in the city, there is the problem of insufficient cold chain logistics infrastructure construction. J.J. Zhang [18] pointed out that China's cold chain logistics distribution mainly exists in the distribution information asymmetry, logistics and distribution equipment is difficult to meet the requirements, and the lack of perfect cold chain logistics and distribution standards and other problems.

J.Y. Chen and H. Huang [19] pointed out that the cold chain logistics of fresh products has the problem of insufficient coverage area. Merchants aim to reduce logistics costs, less consideration to the distribution of remote areas, their services are mainly concentrated in the closer consumption or production areas, resulting in insufficient logistics services in remote areas, so that many remote areas can not get the fresh agricultural products cold chain services. J.Y. Yang [20] and others pointed out that at present in the society, almost every enterprise has problems such as high distribution costs, untimely distribution and irrational design of distribution routes. L.W. Yang [2] pointed out that, due to China's cold chain logistics in the management level, cold storage rate and many other aspects are relatively backward, in which the "broken chain" problem is more serious. Y.Z. Mo [21] pointed out that, with the rapid development of cold chain logistics, a large number of demands in driving the development of cold chain logistics at the same time, will inevitably bring a series of technology, staffing, energy saving and environmental protection problems!

By analysing the research of the above scholars, it can be concluded that there are still more problems in the distribution of fresh produce cold chain logistics in China.

2.4. Optimisation Strategies for Cold Chain Logistics and Distribution of Fresh Agricultural Products

As a result of the literature summarised by the authors above, it can be concluded that at present there are many factors restricting the development of cold chain logistics and distribution of agricultural products in China, as well as some unavoidable objective factors. However, fresh agricultural products directly affect the material life of consumers and the livelihood of farmers. Therefore, combining the development status of China's cold chain logistics industry, as well as the characteristics of fresh agricultural products themselves, social scholars and experts are actively exploring strategies to optimise cold chain logistics and distribution, in order to break the existing situation of the development of cold chain logistics and distribution of fresh agricultural products.

X.D. Jia [22] pointed out that, in the vehicle path planning of fresh agricultural products cold chain logistics and distribution, considering the carbon emission factor can effectively reduce the total cost of distribution and carbon emissions, which is of certain reference value for the transformation of cold chain logistics enterprises to environmentally friendly enterprises and the realisation of green economic development. H.J. Wang and P.Y. Chen [23] pointed out that under the guidance of national agricultural policy, rural e-commerce has been rapid development, in this context should, should pay attention to the study of e-commerce of rural fresh agricultural products. J. Wu and H. Du [12] pointed out that each level of government around the world should advocate, support and encourage the

development of information service platform in fresh agricultural products intelligent cold chain logistics, integration of many circulation units to deal with the function of the commodity, the smooth go to create a third-party distribution centre, the organization of the common distribution model. Z.G. Wang [24] pointed out that for the serious problem of cargo loss caused by the unreasonable choice of cold chain logistics distribution mode of agricultural products in China, the common distribution cold chain logistics distribution mode can be considered as a solution. X. Zhou [25] pointed out that for the problems of high logistics cost, less coverage area and higher logistics requirements of fresh food cold chain, the method of adjusting the cold chain logistics and distribution mode and the method of realising the specialisation and standardisation of the cold chain logistics and distribution process can be considered as a solution. J.J. Li [26] and others pointed out that if China's fresh food e-commerce industry wants to achieve further development, it is necessary to optimise the cold chain distribution mode, solve the many problems that exist in cold chain distribution, develop the mode of mutual use of cold chain logistics and distribution as well as the development of third-party cold chain logistics. X. Zou and T.J. Wang [5] pointed out that the official government media should also join in the logistics and distribution process of fresh agricultural products, and the relevant media should actively encourage enterprises involved in fresh agricultural products to use cold-chain logistics in the distribution process, rather than warm distribution. In addition, the relevant departments should also carry out branding construction of cold chain logistics, and promote the social recognition of cold chain transport by improving the market mechanism of cold chain logistics. G.C. Wei [10] pointed out that the current problems in cold chain logistics have affected the development of fresh food e-commerce enterprises, and he believes that enterprises should achieve the function of resource sharing, establish cooperation between enterprises to jointly solve the problems in logistics, and the use of interoperability of the cold chain logistics and distribution model, in order to improve the efficiency of logistics. J.Y. Yang [20] and others established a model by genetic algorithm with a company as an example, solved it, and proposed a method that can improve the distribution efficiency of enterprises and increase customer satisfaction. That is, increasing investment in cold chain logistics infrastructure, optimising the path of cold chain logistics and distribution, and controlling the logistics costs incurred in the distribution process. B.B. Lu [27] gave suggestions on how to choose the cold chain logistics distribution mode for different types of enterprises. In addition, he lays the foundation for the quantitative selection of his industry by determining the indicator system of logistics and distribution mode in the selection of fresh agricultural products. Y.Z. Mo [21] pointed out that the control of logistics costs is the key point in the logistics and distribution of fresh agricultural products, and fresh cold chain goods should be scaled up and coincide with the development concept of the country.

3. Conclusion

By studying the development status of cold-chain logistics and distribution of fresh agricultural products, the distribution mode, the constraints on the logistics and distribution of fresh agricultural products, and the distribution optimisation strategy, it can be concluded that there are still many problems

in the cold-chain logistics and distribution of fresh agricultural products in China. Combined with the academic research on the logistics and distribution of fresh agricultural products in China, it can be concluded that in order to improve the problems of fresh agricultural products in logistics and distribution, to enhance the fundamental interests of the relevant enterprises and personnel, to enhance the social acceptance of cold-chain logistics, and to promote it to break the limitations of its development, the relevant governmental departments should be involved in the construction of cold-chain logistics, and formulate specific strategies and development goals according to the development of different regions and terrain, and take the lead in the development of cold-chain logistics. Relevant government departments should participate in the construction of cold chain logistics, formulate specific strategies and development objectives according to the development situation and terrain of different regions, and take the lead in establishing a standard market evaluation system for fresh produce cold chain logistics. Relevant enterprises should also choose suitable logistics and distribution modes according to their own development characteristics. Relevant technical personnel should endeavour to explore innovations in cold chain logistics technology, with a view to improving the renewal of China's cold chain logistics infrastructure, promoting the development and growth of China's cold chain market, and enhancing people's sense of well-being. In view of this, we hope that this paper can provide reference opinions for promoting the development and improvement of cold chain logistics of fresh agricultural products in China.

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