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RESEARCH ON THE OPTIMIZATION OF FRESH AGRICULTURAL PRODUCT COLD CHAIN LOGISTICS DELIVERY PATH

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Abstract:

Due to the improvement of the economic level, people's living quality is getting higher and higher. Fresh agricultural products are part of our lives and closely related to each other. However, the cold chain logistics system in China is not yet mature. Fresh agricultural products deteriorate, causing severe waste. In order to improve this phenomenon, the cold chain logistics distribution path of fresh agricultural products should be optimized, the efficiency of cold chain logistics should be improved, and the delivery cost of fresh agricultural products should be reduced to meet people's demand for fresh agricultural products. This article analyzes the problems in the cold chain logistics distribution of fresh agricultural products and explores the optimization strategy of the supply chain logistics path of fresh agricultural products.

Keywords:

Fresh Agricultural Products; Cold Chain Logistics; Delivery Path.

Introduction

With the development of the economy and the improvement of people's living standards, society's attention to fresh food is increasing, and the requirements for cold chain logistics are

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getting higher and higher. Fresh agricultural products maintain their freshness, color, flavor, and nutrition to the greatest extent through low-temperature circulation. Cold Chain Logistics Delivery Center is a flow center of information, products, funds, etc., which is essential for the operation of the entire supply chain (Zhang et al., 2021). The cold chain distribution center is generally close to the origin, which is conducive to classifying, storing, processing, packaging, and freezing fresh agricultural products. However, compared with developed countries, China's cold chain logistics start late and are not mature in terms of technology. The delivery cost of fresh agricultural products is high, and the corresponding fresh-keeping equipment is not perfect. Once the food is deteriorated or rotten, it will affect the surrounding environment.

Overview of Fresh Agricultural Products

Concept

Cold chain logistics has not been uniformly defined in the logistics industry. Generally speaking, cold chain logistics refers to the appropriate temperature and humidity from production to the end of consumers. During the transportation process, the logistics business is fully preserved and minimizes the loss of goods. The cold chain logistics of fresh agricultural products is essential to the entire cold chain logistics system. Agricultural products must be kept fresh and safe in various aspects such as production, processing, and distribution, and each link must be effectively connected. These links together constitute the supply chain of agricultural products, but the cold chain supply chain is not independent and needs to be effectively combined with other supply chains, such as storage, processing, sales, etc. These together constitute a complete cold chain logistics network (Dong et al., 2020).

Features

Fresh agricultural products have high requirements for transportation conditions and time during circulation. Compared with ordinary logistics, the cold chain logistics of fresh agricultural products have the following characteristics.

Cold Chain Delivery Requires High Timeliness

The life cycle of fresh food is short. Due to the length of the transportation time during the transportation process, the quality of food is reduced, and people cannot distinguish it from the surface when purchasing. However, from another perspective, for fresh food with a shorter life cycle, if the transportation time increases, although the quality does not reach the point where it is unavailable, the probability of being sold of these products will be reduced, and sales will decrease. Although this part is the loss of the seller, the loss of sales due to the delay of the transportation time should be borne by the logistics distributor. Therefore, to reach a higher level of service, fresh food sellers often have time window restrictions when the goods reach the sales terminal (Liu et al., 2018). Restrictions must be delivered within the agreed period in advance. Therefore, planning the distribution route can not only reduce the operating costs of the transportation enterprise but also improve the seller's service level and meet the customers' needs.

The Characteristics Of Easy Rotten For Fresh Agricultural Products

Fresh agricultural products are easy-to-rot foods. During the transportation process, the goods' quality will gradually decrease for various reasons. The lower temperature for fresh food stored during the distribution process, the longer the quality can be maintained. In changing the quality of fresh food over time, "temperature" is the most important factor affecting its quality. From production to consumption, frozen foods have been manufactured, refrigerated, and

transported by the factory, when the temperature at all stages is different. If the relationship between the time that may be maintained with the food quality and the refrigerated temperature can be quantified, it will be pretty convenient in the actual operation. The impact of the United States with a considerable amount of frozen foods is aimed at a variety of foods. The impact of investigating the temperature and the time passed on the food quality is "The quality under the change of time-temperature." In actual operation, the quality of frozen foods can be calculated in a simple formula (Guo et al., 2019).

High Requirements For Transportation Technology

In the cold chain logistics system, in order to ensure that fresh agricultural products are always in a suitable temperature and humidity, it is necessary to use GPS and other technologies to track and monitor the transportation environment of fresh agricultural products time by time, control cargo damage as much as possible, reduce distribution risks, and improve Delivery efficiency (Weng et al., 2019). In this way, it provides consumers with fresh agricultural products and better service, thereby improving customer satisfaction.

High Requirements For Organizational Coordination Ability

In the cold chain logistics distribution of fresh agricultural products, in addition to the timeliness of distribution, attention should also be paid to distribution organizations' organization and coordination capabilities. In the specific distribution process, the distribution vehicle and product distribution are often delayed. If the coordination and management ability of the distribution company is not strong, failure to communicate with customers in a timely manner will lead to deterioration or rot of agricultural products, resulting in economic losses (Guo et al., 2019).

Exploration of Problems Existing in the Current Cold Chain Logistics

Macro level

For the cold chain logistics at the macro level, in general, the current and existing logistics problems are analyzed, and the countermeasures to solve these problems are found through research. According to the current research situation of the cold chain in China, it is still in the initial stage of development, and its specific problems are as follows.

The Implementation Standard Is Not Clear

At this stage, the implementation standards of foreign cold chain logistics systems are clear and unified, which can effectively ensure the refrigeration rate of food. However, the adaptability of China's cold chain logistics implementation standards is currently weak, and unified standards have not restricted it. Some enterprises seek personal gain, which leads to hidden dangers to food safety (Jin et al., 2017).

Slow Development Of Infrastructure And Backward Technology

China's cold storage facilities were established between the 1980s and 1990s, with large investments and a high cost of capital. Due to time and space constraints, the buildings can no longer meet the current cold chain needs. Meanwhile, they are affected by external factors such as road, water transportation, and railways. The lack of technical connection in various transportation has seriously affected food temperature. In addition, temperature control technology can not provide a specific temperature for food (Gao et al., 2021).

Cold Chain Logistics Informatization Construction Is Relatively Backward

Cold chain logistics is mainly about temperature control, which is implemented under scientific and advanced information technology. The industrial management of electronic analog information technology ensures that the goods can be tracked time by time, and the information is networked under dynamic monitoring to ensure that the logistics information can be delivered in a timely manner (Liu et al., 2018).

Micro Level

Chinese scholars have studied the agricultural products in cold chain logistics and found that in developed countries, the cold chain logistics of agricultural products have a higher refrigeration rate and a complete system. However, in the development process of China's cold chain logistics, the government's quality of agricultural products is at this stage. Specifically, current China's logistics network is relatively scattered (Minard et al., 2019). Affected by factors such as technology and equipment, there are many problems in the cold chain logistics and distribution of fresh agricultural products, which not only increases the cost of logistics and distribution but also affects the speed of logistics and distribution. First, the cold chain logistics distribution network is relatively scattered. China is a big agricultural country. Many fresh agricultural products come from rural areas. Most fresh agricultural products must be transported to cities and towns for sale (Parashar et al., 2019). In production and sales, many fresh agricultural products are distributed to various regions through intermediaries. Fresh agricultural products have seasonal characteristics, from production to sales, which requires the logistics network's support. Secondly, the cost of logistics and distribution is high (Nai et al. 2021). In the process of circulation of fresh agricultural products, a lot of manpower, material resources, and financial resources need to be invested. The cold chain transportation cost of fresh agricultural products is much higher than that of normal temperature transportation, which seriously hinders the development of the cold chain logistics industry. Again, there are certain risks in logistics and distribution. The most important thing about fresh agricultural products is their freshness, and the timeliness of distribution is very demanding (Miao et al., 2009). In the cold chain logistics system, distribution is an important link to ensure the safety and freshness of fresh agricultural products. However, problems such as vehicle failures often occur during the transportation process. Therefore, fresh agricultural products' cold chain transportation routes should be planned. To ensure that agricultural products can be delivered to the destination on time.

Optimization Strategy of Cold Chain Logistics Distribution Path of Fresh Agricultural Products

In order to effectively solve the current problems in the cold chain logistics and distribution of fresh agricultural products, it is necessary to learn from the logistics and distribution experience of developed countries, actively optimize the distribution path, and ensure the smooth development of cold chain logistics and distribution.

Make Full Use Of Information Technology To Build A Network Information Platform For Cold Chain Distribution

The particularity of fresh agricultural products determines the importance of their distribution link. The optimization of the distribution path of the cold chain logistics of fresh agricultural products is to effectively avoid the deterioration and decay of agricultural products and reduce economic losses (Jiaqi, Lun, and Transportation 2019). Logistics distribution is an essential part of the cold chain system, which has higher requirements for the timeliness of distribution and preservation. In the information age, in order to optimize the cold chain logistics transportation

system, it is necessary to make full use of advanced information technology, effectively connect all aspects of logistics distribution, monitor the status of logistics distribution time by time, and realize intelligent management of logistics distribution (Li et al., 2019). Through the construction of a corresponding network information platform, the collection, sorting, and feedback of logistics information can be integrated and managed, the transportation status of fresh agricultural products can be grasped time by time, and the safety and preservation of fresh agricultural products can be improved. In implementing distribution management, using big data and other technologies to automate logistics and transportation management improves the distribution management level. One-stop cold chain logistics distribution includes the whole process from production to sales of agricultural products. By applying information technology to manage the entire service process intelligently, it can avoid the disadvantages of traditional logistics and distribution and is in line with the optimization of cold chain logistics distribution paths for fresh agricultural products (CHEN and KANG 2018).

Increase The Implementation Of Relevant Policies To Improve The Development Of Cold Chain Logistics

Currently, China's cold chain logistics network is not perfect, and the government needs to increase financial investment, play a role in policy guidance, and provide a good environment for the development of cold chain logistics (Chen, Liao, and Yu 2021). First, the government should give full play to the macro-guidance role, attach importance to the construction of the cold chain logistics system, and make scientific plans according to the actual situation to make logistics and transportation management more standardized (Yi et al. 2016). Secondly, it is necessary to increase the implementation of policies related to cold chain logistics, which can formulate and improve relevant regulations. When optimizing the cold chain logistics distribution path of fresh agricultural products, it is necessary to improve the operation and distribution efficiency to make the circulation of fresh agricultural products smoother and effectively reduce transportation costs (Xie and Huang 2020). Again, increase the research and development of related technologies. The government should encourage relevant institutions to research and develop cold chain logistics technology and, at the same time, increase financial investment according to the local development situation and attach importance to infrastructure construction. Actively introduce and cultivate technical talents, cultivate their sense of innovation, and reserve high-quality technical talents for the development of the cold chain logistics industry (Zhao et al., 2019).

Optimize The Supply Chain Of Fresh Agricultural Products And Establish Large Distribution Centers

In order to optimize the distribution path of cold chain logistics of fresh agricultural products, it is necessary to establish a large-scale cold chain logistics distribution center to further improve the efficiency of logistics distribution by optimizing the supply chain of agricultural products. The large-scale distribution center needs strong organizational capabilities to provide storage and distribution services of agricultural products, etc. It can strengthen the connection between suppliers and customers and improve distribution efficiency by controlling logistics and costs. When building a distribution center, it is first necessary to clarify the supply and demand of agricultural products (Liu and Li 2023). Fresh agricultural products are unique and seasonal, and the demand for fresh products is constantly changing. In response to this situation, the cold chain logistics distribution center should adopt the correct sales strategy according to the market demand. It can improve the fresh-keeping ability and storage ability and facilitate the agricultural products to maintain a certain balance in different seasons (Wu 2011). Therefore, the prices of agricultural products in the market tend to be stable and effective

in protecting the rights and interests of farmers. Secondly, it is necessary to effectively connect production and circulation to reduce the loss of agricultural products. Fresh agricultural products' production and circulation process has very high technical requirements and is prone to lose, resulting in certain losses. In order to solve this problem, the distribution center should optimize the refrigerated supply chain, carry out refrigerated processing in each link, minimize the loss of agricultural products, and ensure the safety and preservation of fresh agricultural products (Matskul, Kovalyov, and Saiensus 2021). Again, to strengthen the unity of logistics and distribution. Traditional supermarkets have problems such as small batches and incomplete varieties of agricultural products. The cold chain logistics distribution center can effectively make up for this defect. Purchasing fresh agricultural products in large quantities will be uniformly inspected and stored, distributed, and optimized according to the specific needs of the supermarket to optimize the fresh agricultural products logistics distribution path (Chen, Liao, and Yu, 2021).

Strengthen The Union Of Organizations Related To Fresh Agricultural Products And Establish A Joint Distribution Alliance

With expanding the wholesale market of agricultural products, the wholesale market and distributors should be united to form a joint distribution alliance and build a comprehensive cold chain logistics system when optimizing the distribution path. The agricultural product wholesale market should give full play to its advantages, integrate the surrounding logistics resources, and carry out unified distribution of agricultural products (Weng et al., 2019). Establishing a joint distribution alliance can optimize the supply chain, improve the service level of cold chain logistics, alleviate transportation problems and improve logistics distribution efficiency.

Conclusions

With the continuous increase in income, people's quality requirements for fresh agricultural products have continued to improve. In order to better meet people's needs, effective strategies must be adopted to optimize the cold chain logistics distribution path of fresh agricultural products. First of all, when optimizing the delivery path, it can make full use of information technology to build the network information platform of the cold chain distribution. Secondly, it is necessary to increase the implementation of relevant policies to provide a suitable environment for developing cold chain logistics. In addition, to optimize the supply chain of fresh agricultural products and build a large distribution center. Finally, strengthen the union of fresh agricultural products-related organizations to form common distribution Alliances, etc., and promote the long-term and stable development of China's cold chain logistics industry.

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References

- Chen, J., W. Liao, and C. Yu., 2021, Route optimization for cold chain logistics of front warehouses based on traffic congestion and carbon emission. *Computers & Industrial Engineering*, 161: 107663.
- CHEN, and KANG. 2018. "Optimization of Cold Chain Path of Cooling Storage Multi-Temperature Fresh Produce under the Uncertain Demand and Time Window." In.
- Dong, Y., M. Xu, and S. A. Miller., 2020, Overview of cold chain development in China and methods of studying its environmental impacts. *Environmental Research Communications*, 2: 122002 (15).
- Gao, E., Q. Cui, H. Jing, Z. Zhang, and X. Zhang., 2021, A review of application status and replacement progress of refrigerants in the Chinese cold chain industry. *International Journal of Refrigeration*, 128, pp.104-117.
- Guo, Z., L. Bai, and S. Gong., 2019, Government regulations and voluntary certifications in food safety in China: A review. *Trends in Food Science & Technology*, 90, pp.160-165.
- Jiaqi, Yang, Cao Lun, and School Of Transportation. 2019. 'Optimization of Urban Cold Chain Logistics Route Involving Multiple Logistics Centers', *Logistics Technology*.
- Jin, W., 2017, Food Safety Management Strategy from the Perspective of Food Cold Chain Logistics. *Modern Food*. China Pharmaceutical University.
- Liu, Shouchen, and Ms. Elaine Li. 2023. 'Multimodal Transportation Route Optimization of Cold Chain Container in Time-Varying Network Considering Carbon Emissions'.
- Li, S., Z. Hao, L. Ding, and X. Xu., 2019, Research on the application of information technology of Big Data in Chinese digital library. *Library Management*, 40: 518-31.
- Liu, H., L. Pretorius, and D. Jiang., 2018, Optimization of cold chain logistics distribution network terminal. *EURASIP Journal on Wireless Communications and Networking*, 2018(1), pp.1-9.
- Matskul, V., A. Kovalyov, and M. Saiensus. 2021. 'Optimization of the cold supply chain logistics network with an environmental dimension', *IOP Conference Series Earth and Environmental Science*, 628: 012018.
- Miao, X. H., X. N. Zhou, and W. U. Zhi-Long., 2009, Research on Cold Chain Logistics of Fresh Food. *Logistics Technology*.
- Minard, J.J., Poolman, C., Chopko, R.A. and Eddy, R.A., Carrier Corp, 2019, Data warehouse for a cold chain system. U.S. Patent Application 16/069,541.
- Nai, Rathana, Buntong Borarin, Tong Socheath, Jessie Lvipham, Glenn Myoung, and Karen Legrand. 2021. 'Development of Cold-Chain for Postharvest Loss Reduction of Chinese Cabbage(*Brassica campestris L.ssp.Pekinensis*)', 11: 14.
- Parashar, V, A. Haleem, and J. A. Usmani., 2019, Performance Analysis of Free Air Cooling Conditioning Chamber (FACCC) to Develop Improved Cold Chain During Transportation of Agricultural Crops in India. In *Advances in Interdisciplinary Engineering* (pp. 451-458). Springer, Singapore.
- Weng, Chuanfang, Huang, and Haibin., 2019, Cold-chain Logistics Optimization of Fresh Agricultural Products Enterprises Based on Internet of Things. In *International Conference on Economics, Business, Finance, and Management*.
- Zhao, C. D., 2019, Research on the construction of cold chain logistics ecosystem of internet+fresh agricultural products. *Hubei Agricultural Sciences*. 58(16), p.175.
- Wu, Q. 2011. 'The Current Situation and the Countermeasures of China's Cold Chain Logistics Development', *China Business and Market*.
- Xie, Dongdi, and Rongling Huang. 2020. 'Optimization of Preservation on Fresh-cut Yam under Simulated Cold-chain Process'.

- Nai, Rathana, Buntong Borarin, Tong Socheath, Jessie Lvipham, Glenn Myoung, and Karen Legrand. 2021. 'Development of Cold-Chain for Postharvest Loss Reduction of Chinese Cabbage (*Brassica campestris* L.ssp.Pekinensis)', 11: 14.
- Yi, L., W. Han, Z. Yin, L. Li, and L. Zheng. 2016. 'An Internet-of-Things Solution for Food Safety and Quality Control: A Pilot Project in China', *Journal of Industrial Information Integration*, 3: 1-7.