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Supply Chain Management Strategies for Fresh Agricultural Products in China

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Abstract: *With the rapid development of economy and technology, people's demand for high-quality fresh agricultural products (FAP) is rapidly growing in China. However, in comparison to developed countries, China's overall fresh agricultural products supply chain (FAP-SC) is still incomplete, and the cold chain logistics infrastructure is insufficient. This inadequacy not only contributes to increased logistics expenses but also leads to a lower level of customer service and substantial financial losses. The paper examines the factors that impede the growth of the FAP-SC in China and proposes effective strategies.*

Keywords: *Fresh Agricultural Products, Supply Chain Management, Cold Chain Logistics in China*

1. Introduction

Agricultural economic growth has emerged as a key component of China's strategic framework. However, the existing level of agricultural development is insufficient, impeding the nation's total economic prosperity. The implementation of an optimal and effective supply chain system can expedite the flow of agricultural products in the market environment, hence supporting agricultural economic growth [1]. China's two sessions in 2021 stressed the importance of prioritising agricultural and rural development. It emphasised the significance of undertaking structural reforms in the agricultural supply chain and hastening the modernization of agriculture and rural communities. The objective is to establish a robust agricultural industry, a beautiful countryside, and prosperous farmers [2]. Therefore, various policies have been implemented to guide the high-quality development of the supply chain and achieve rural industrialization. These policies include the "14th Five-Year Cold Chain Logistics Development Plan", the "Circular on Supporting the Acceleration of the Construction of Agricultural Supply Chain Systems and Further Promoting the Development of Cold Chain Logistics", and the "Opinions of the CPC Central Committee and the State Council on Comprehensively Promoting the Revitalization of the Countryside and Accelerating the Modernization of Agricultural and Rural Areas." The supply chain has evolved with a focus on excellence, helping to revitalize rural businesses and raise consumer demand for high-quality agricultural products [3]. The government encourages micro, small and medium-sized businesses to engage in the primary processing of agricultural products at the site of origin and instructs major agricultural firms to focus on the advanced processing of agricultural goods. The government also supervises the development of industrial parks in key agricultural regions to facilitate the processing of agricultural products. Furthermore, efforts are being made to enhance the infrastructure network that enables the delivery of fresh agricultural products (FAP). To optimise storage and marketing efficacy, the government plans to construct suburban warehouses and expand the wholesale markets in terms of production, distribution, and sales [4].

Perishable food items like vegetables, fruits, aquatic products, poultry, and meat products, directly linked to our daily lives, are known as FAP [5]. The Fresh Agricultural Product Supply Chain (FAP-SC) is a highly streamlined network that effectively coordinates the interests of all stakeholders engaged in the production, processing, distribution, and sale of FAP. It improves efficiency and cost-effectiveness by controlling the flow of capital, information, and products, and the supply chain mainly includes agricultural producers, processors, distributors, retailers, and consumers [6]. FAP are essential for people's daily lives, and the smooth functioning of the supply chain ensures that people's basic needs are met [7]. Perishable agricultural goods are prone to deterioration and decay, making it challenging to preserve their freshness. Refrigeration is required throughout the manufacturing, transportation, storage, and distribution processes. A variety of factors, including product freshness, price, logistics, and distribution

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service level, may influence the operational effectiveness of the FAP-SC [8].

With the rapid development of Internet technology, FAP consumption in China has shifted from traditional offline channels, such as farmers' markets, supermarkets, and physical retail stores, to online methods, such as various online shopping malls and e-commerce platforms (e.g., Pinduoduo, Community Group Buying, Freshippo, etc.). Multiple channels enable the acquisition of FAP, thereby enhancing the convenience of the purchasing process. FAP's perishable nature and inconvenient transportation and storage characteristics, as well as the issue of information asymmetry in the supply chain, have a significant impact on the overall customer experience and profitability for all parties involved.The traditional supply chain for FAP in China has excessive intermediary links, significant losses, high operational expenses, and fails to satisfy consumer expectations regarding freshness and convenience, as shown in Figure 1. These issues have sparked tremendous interest from both industry experts and academics. This article aims to analyze and evaluate the issues of the FAP-SC in China while providing suggestions for enhancing its performance [8].

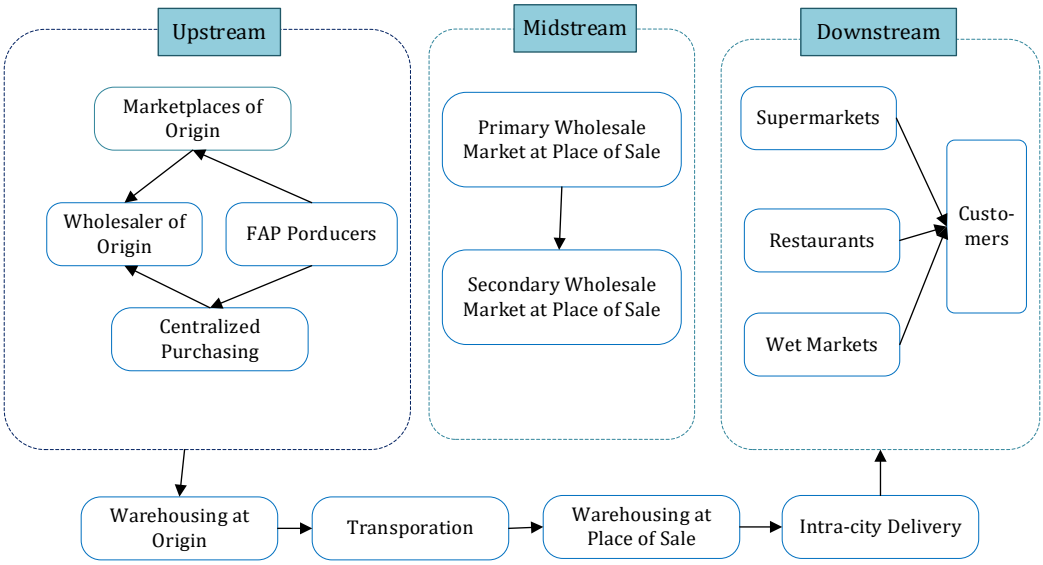

Figure 1: China's Fresh Agricultural Product Supply Chain [9]

2. Current State of Supply Chain Development for Fresh Agricultural Products in China

2.1. Overview of The Fresh Agricultural Product Supply Chain

The substantial population of China generates a robust need for FAP such as vegetables, fruits, aquatic items, and meat, and the FAP-SC is experiencing significant growth. The FAP-SC includes the complete industrial process, beginning with production and ending with the distribution of items to clients to meet their demands and preferences. The principal components of this process are production, distribution, processing, handling, warehousing, and distribution. An efficient supply chain facilitates the smooth functioning of these elements [7]. In recent years, China's fresh food retail business has grown steadily, with a market size exceeding six trillion yuan by 2022 (see Figure 2). FAP has seen a progressive increase in demand, and the market size will reach 6.8 trillion RMB by 2025. The FAP e-commerce industry accounted for 12.5% of total sales in 2023, with an annual growth rate of 21.59%. Currently, there are around 3,000 e-commerce brands operating in various sections of the fresh food market, including fresh food e-commerce, group purchasing, and other related areas. In this business, there are several new concepts, including front warehousing, shop and warehouse integration, O2O platforms, and community group buying [4].

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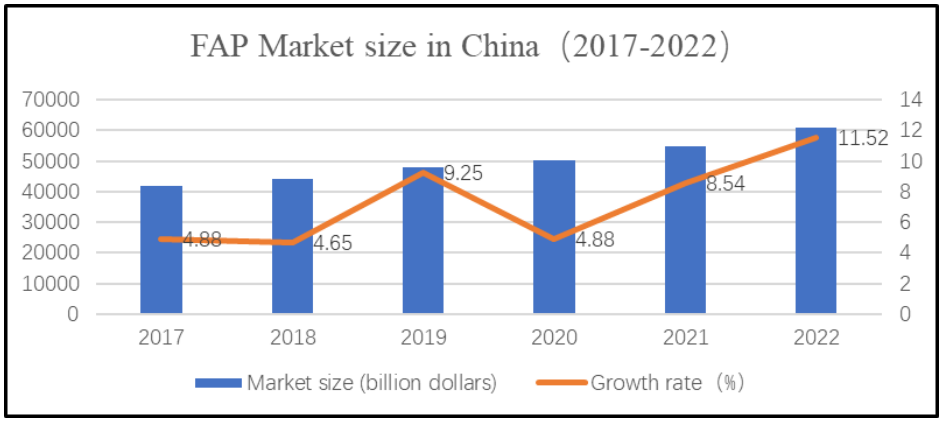

Figure 2: Fresh Agricultural Product Market Size in China (2017-2022) [10]

2.2. Current Fresh Agricultural Product Supply Chain Models

China's agricultural product distribution models involve farmers and the integration of various distribution corporations to facilitate the flow. These flows allow farmers to achieve self-sufficiency while also enabling the exchange and trade of agricultural products in the market, boosting the value of such transactions. There are several approaches for identifying the models of FAP-SC. Duo Xu divided the current distribution patterns of FAP into five categories: farmer + market, farmer + broker, farmer + wholesaler, farmer + leading firm, and farmer-super-docking [1]. Yunzhen Xu divided the distribution models into three categories: wholesale market-centered, farm-supermarket docking, and warehouse-centered (see Figure 3-5) [7]. Each of these distribution models represents an operational form of FAP-SC, and various FAP-SC are competitive and capable of serving the needs of a wide range of customers.

Figure 3: The Wholesale Market-centered Model

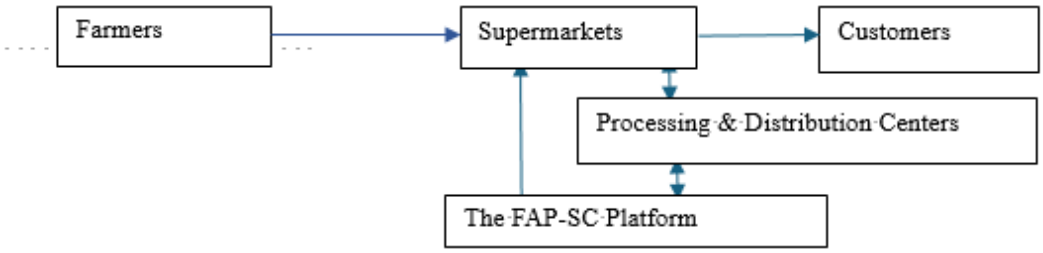

Figure 4: The Farming-Supermarket Docking Model

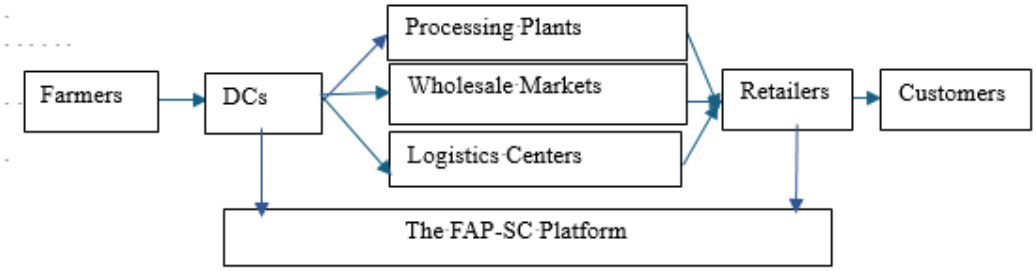

Figure 5: The Warehouse-centered Model

2.3. Trends in the Fresh Agricultural Product Supply Chain

At present, the FAP-SC's development trend primarily includes four aspects, as follows [4, 7]:

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(1) Slowly developing large-scale farmers: Previously dispersed and lacking in organization, small farmers began adopting a more organized approach by forming larger and more professional cooperatives.

(2) The advancement of cold chain technology in China has led to improved cold storage and preservation methods, resulting in enhanced commodity quality and freshness. It has also significantly expanded the sales range.

(3) The sales of FAP e-commerce in China are experiencing significant growth due to the widespread use of the Internet and mobile communication devices. However, traditional retail outlets like supermarkets and farmers' markets still have a dominant position in the fresh food business. The huge online consumer market offers a profitable opportunity for fresh food e-commerce enterprises to attain substantial success. Community group buying, O2O platforms, and other online sales channels are expected to become more popular in the future.

(4) The FAP-SC's digitalization services closely link to the use of information technologies like the Internet and big data. By collecting and aggregating data from various stages of FAP-SC, such as planting, primary processing, and distribution, each stage's operational efficiency can be improved. This will lead to an overall improvement in quality of service across the supply chain.

3. Current issues of Fresh Agricultural Product Supply Chain in China

The implementation of China's various FAP-SC models has encountered numerous challenges, resulting in low efficiency and impeding the sustainable development of the agricultural industry.

3.1. Trends in the Fresh Agricultural Product Supply Chain

The perishable nature and timing sensitivity of FAP impose additional demands on the cold chain system. The majority of agricultural planting and breeding facilities are situated in rural areas, where transportation, communication, and storage infrastructure are inadequate. This presents difficulties in developing a robust supply chain. The logistics for FAP at the point of origin include several steps, such as grading, storage and preservation, packaging, and delivery. Cooling and preservation techniques must be used throughout the manufacturing, transit, storage, and distribution stages [8]. Appropriate storage conditions are essential for preserving the quality of fresh goods. Therefore, the initial stage of the supply chain must have sufficient storage capacity and efficient pre-cooling capabilities. Nonetheless, cold chain facilities in China are inadequate, with a per capita cold storage capacity of only 0.132 cubic metres, significantly below that of developed countries. The lack of cold chain infrastructure and refrigerated vehicles hinders the ability to promptly pre-cool and store freshly harvested agricultural products. Some FAP have a short freshness period and are very prone to spoiling, leading to avoidable losses. The lack of preservation at the source of products reduces efficiency and imposes additional burden on trunk and terminal logistics because of heightened storage requirements. The high cost of construction and operation of cold chain storage facilities at the place of origin is an important factor restricting the utilization of cold chain logistics for agricultural products. A refrigerated warehouse is more than four times the cost of an ordinary warehouse. A medium-sized cold chain warehouse costs at least 15 million RMB to build, which is unaffordable for small e-commerce farms [11].

3.2. Significant product wastage, insufficient transportation effectiveness, and Excessive intermediary links

The transfer of FAP from farmers to consumers involves several stages, resulting in consistent price increases at each stage of the supply chain. This leads to an increase in the cost of FAP and the generation of significant waste. Farmers are at the initial stage of the supply chain and have limited knowledge of market information. When customers transmit demand to farmers through multiple layers of suppliers, they acquire inaccurate information, leading to oversupply in large-scale farming. Furthermore, small-scale farmers who sell their products online are at a greater risk due to their inability to directly select and deliver their products. They convey agricultural products to customers via carriers, or less-than-truckload (LTL) transportation. The process requires a minimum of six to eight loading and unloading operations, each of which leads to deterioration and damage. The significant costs of cold chain shipping decrease farmers' overall profits from online trade [8,11].

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3.3. Limited level of digitalization in the FAP-SC

With the rapid expansion of the 5G network, the development of high-speed information networks has significantly improved. However, due to imbalanced regional economic development, many areas continue to suffer from limited network coverage. Despite the network's popularity in certain regions, the limited number of individuals who possess advanced knowledge of modern information technology means that farmers continue to rely on traditional methods, such as blackboards or electronic screens, to share product price information. There are limitations on the sharing of knowledge about agricultural goods, and farmers lack organized planning and professional guidance for cultivating FAP. They frequently encounter significant volatility in product pricing, with both upward and downward movements, resulting in insecure earnings and diminished enthusiasm for agricultural activities [12].

3.4. Quality and safety issues

Toxic substance residues are the most significant quality and safety issue for agricultural products. As agricultural growth has progressed, the use of artificial fertilizers and pesticides has increased dramatically, while the use of farmyard manure has declined. Economic and technical factors classify the majority of chemical fertilizers and pesticides as hazardous substances. Their long-term usage destroys the environment and poses risks to human health. The emission of waste gas and waste materials from industries, as well as from cities, has allowed many harmful and toxic substances to enter the soil, affecting the quality of food, fodder crops, cash crops, livestock products, and aquatic products in many areas. Agricultural production in some locations continues to be based on the small-scale farming model in China, with outdated agricultural equipment and a rough production process that affects the quality of FAP. Supermarkets mostly source fresh food from suppliers through joint partnerships, which limits their ability to fully verify the quality of the products, allowing some problematic agricultural items into shops [12].

4. Experiences with the Fresh Agricultural Product Supply Chain Management in developed countries

4.1. Distribution model of Fresh Agricultural Products in Japan

In Japan, there was a conflict between small-scale production and high demand in the market regarding the distribution of agricultural products. To address this issue, Japan initiated the implementation of a comprehensive strategic framework known as decentralized production and centralized supply. Currently, Japan has emerged as a highly developed country in terms of agriculture, and it has established two distinct modes of the FAP-SC. The first model relies on the wholesale market to facilitate the transshipment of agricultural products. Japan's various agricultural wholesale markets implemented cold chain logistics and professional equipment transportation, while quality control is also in place. They have established quality control measures for FAP and successfully achieved the efficient distribution of diverse agricultural products throughout different cities across the country. The second model is the direct marketing approach, which relies on supermarkets. This approach efficiently reduces the number of intermediate links involved in distribution, resulting in lower costs and improved efficiency in the supply chain process. This method of distribution has significantly reduced the systemwide cost of agricultural goods, enabling consumers to acquire high-quality FAP at lower prices [1].

Four characteristics summarize the FAP distribution model in Japan. First, wholesale markets play an important part in the FAP-SC. Government departments and social investment organizations collaborate to construct wholesale marketplaces. Each wholesale market undergoes thorough examination to ensure that it effectively manages the production and distribution of agricultural products using its own distinctive methods. Additionally, it has undergone rigorous audits and possesses the ability to control the production and distribution of agricultural products by setting its own prices. Second, Japanese agricultural cooperatives (JAs) have played a critical role in improving the distribution of agricultural products. JAs are nationwide organizations of farm cooperatives and present in all prefectures and have branches in numerous municipalities. Agricultural cooperatives are defined as a community of farmers who voluntarily unite to achieve economic and social goals [13]. JAs provide technical and financial help to individual farmers, allowing them to process and package agricultural items independently. This successfully preserves the rights of individual farmers. Third, Japan has enacted legislation and rules to manage FAP distribution, such as the Wholesale Markets Law. Legislative restrictions ensure the

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standardization and organization of the entire FAP supply chain. Finaly, Japan's agricultural wholesale marketplaces widely utilize auctions, effectively expanding the range of FAP traded and improving the efficiency of distributing finished products [1].

4.2. Distribution model of Fresh Agricultural Products in the United States

The primary factor contributing to the high efficiency of the FAP-SC in the United States is the well-organized and highly functional distribution model. The FAP-SC of the U.S. has evolved over time into two major types. One type is based on the wholesale market for agricultural products and every region has formed a detailed division of FAP production based on the wholesale market for agricultural products. Large-scale agricultural production has increased, and agricultural product marketing capability has greatly improved, with all areas establishing divisions of labour in agricultural product production. The second type is the transaction model formed by farmers and various retailers. The production model of American farmers differs significantly from that of China. Farmers in the United States have larger production scales and can identify the most suitable partners for cooperation. This approach is also a significant aspect of the "Farming-Supermarket" docking [1].

Duo Xu summarized four key characteristics of the US farm product supply chain as follows:

(1) The agricultural production market exhibits a relatively centralized structure, with a successful division of production among regions. Direct marketing models are adopted to significantly reduce distribution costs and lead time.

(2) The United States has established wholesale markets in all regions, utilizing well-developed cold-chain logistics and transportation technologies which allow for rapid movement of agricultural products between cities.

(3) The United States has effectively constructed regional divisions in agricultural product production, as well as an integrated model for connecting farmland and supermarkets via an advanced transportation network. The information system for agricultural product distribution in the United States is highly comprehensive, allowing for the utilization of the Internet to identify the most appropriate trading partners.

(4) The United States has created highly efficient service organizations for FAP distribution. They also have established various trade associations and exhibitions, which have greatly expanded the reach and effectiveness of agricultural product distribution. These measures have successfully ensured the economic benefits of individual farmers [1].

5. Strategies for Fresh Agricultural Product Supply Chain Optimization in China

After conducting investigations on the FAP-SC in the United States and Japan and analysing the existing challenges of the FAP-SC in China, four primary strategies have been proposed.

5.1. Promoting the development of the cold chain system

To reform and adjust the FAP-SC, the government must prioritize the technical advancement of agricultural product logistics, with a particular emphasis on cold chain logistics technology. Each local region must gradually improve cold storage warehouse infrastructure construction while also configuring a certain number of cold chain transportation trucks, which can reduce temperature-related product losses during distribution [1]. It is critical to increase the rate of refrigerated transportation while decreasing the cost of cold chain transportation. Japan and the United States account for more than 80% of refrigerated transportation, whereas China's overall transit rate is only 10% to 20%. Thus, there is still room for improving the coverage and efficiency of cold chain transportation in China. The government must implement appropriate economic, taxing, and regulatory policies to preserve or subsidize the development of cold chain logistics. It should increase investment in cold chain logistics infrastructure, establish cold chain logistics parks with strategic locations and routes, construct warehouses, logistics, and distribution centres in regional hubs, and develop intelligent logistics.

The National Development and Reform Commission (NDRC) in China issued “Notice on the Construction of National Key Cold Chain Logistics Bases in 2024”, releasing a new batch of 20 national key cold chain logistics bases for construction (see table 1). Since 2020, the NDRC has included a total of 86 national key cold chain logistics bases in 4 batches into the list of constructions covering 31

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provinces.

Table 1: List of 2024 National Cold Chain Logistics Bases in China [14]

No.	Province	Location	No.	Province	Location
1	Hebei	Shijiazhuang	11	Guangdong	Shantou
2	Hebei	Tangshan	12	Guangdong	Maoming
3	Shanxi	Yuncheng	13	Guangxi	Nanning
4	Jiangsu	Xuzhou	14	Hainan	Yangpu
5	Zhejiang	Wenzhou	15	Chongqing	Tongnan
6	Anhui	Wuhu	16	Sichuan	Dazhou
7	Fujian	Quanzhou	17	Guizhou	Liupanshui
8	Jiangxi	Shangrao	18	Ningxia	Yinchuan
9	Shandong	Jining	19	Xinjiang	Bayin'guoleng
10	Hubei	Ezhou	20	Dalian	Jinpu New District

5.2. Developing advanced supply chain models

Promoting the adoption of innovative supply chain models, such as the "Farming-Supermarket" docking, is crucial. This model centers around supermarkets and aims to combine agricultural producers, distributors, and consumers to achieve integrated and mutually beneficial development. The supermarket provides producers with a significant volume of orders, as well as relevant technical assistance. It also provides producers with feedback and more precise guidance on their production strategy. The supermarket facilitates direct coordination between agricultural products and sales terminals, allowing for an efficient flow of products, capital, and information within the supply chain. Furthermore, we can employ community group buying, front warehousing, and other methods to reduce the number of intermediaries in the distribution process. This not only results in cost reductions, but also significantly reduces losses during the distribution process [15].

The future development of the FAP-SC in China must prioritize the establishment of cooperatives, fresh food supermarkets, wholesale markets, and other entities as essential nodes in the agricultural product flow. Each local government in China should build wholesale markets at different levels based on their geographical circumstances. While forming specialized wholesale marketplaces, they should also examine the distinctive characteristics of their agricultural products. The development of these wholesale marketplaces can gradually concentrate local agricultural production, leading to regional specialization. At the same time, the local government should accelerate the development of wholesale markets, cooperatives, and other institutions to expand their respective roles, allowing for the swift movement of local FAP across the national territory [1].

5.3. Promoting the digitalization of the FAP-SC, establishing industry standards, and optimizing the intelligent logistics system

There are many reasons why the FAP intelligent logistics system is needed to speed up the standardization of the FAP-SC. These include the product's biological and physical properties, its low economic value, the uncertainty of production and supply, and the rapid changes of consumer demand. For instance, the implementation of "Internet +" and other technologies involves integrating the Internet of Things with big data, cloud computing, and other tools to establish a more comprehensive cold chain logistics service platform. This platform facilitates the efficient allocation of logistics resources, the optimal utilization of logistics equipment, the strategic planning of distribution routes, and the tracking of vehicle locations. The selection of distribution routes is based on algorithms. Real-time monitoring of vehicle position and products in transit should be employed to improve service quality and ensure effective product distribution. Another example is the use of blockchain technology. The blockchain, with its inherent tamper resistance, facilitates anti-counterfeiting and ensures supply chain traceability [2].

5.4. Focus on the training of logistics professionals

With the continuous development of information-based logistics, the demand for experienced logistics personnel grows. Logistics experts must possess the necessary knowledge and logistical skills to ensure the sustainable development of the FAP-SC [16]. It is necessary to establish a talent exchange mechanism with universities, implement a "point-to-point" training model, and foster an optimal mechanism for the synchronized growth of cold chain logistics that aligns with the developmental

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requirements of e-commerce platforms and logistics companies. By allocating a specific proportion of their monthly earnings into coordinated development, logistics firms and e-commerce platforms can enable all stakeholders, including logistics companies, cooperatives, and e-commerce platforms, to attain increased income. On the other hand, it can rapidly and effectively increase consumer purchases, attract new consumers, and promote effective FAP movement [17]. The smooth operation of the entire supply chain is closely associated with the participants at each stage. Enterprises in the supply chain should prioritize improving participants' professional knowledge through training and developing their professional skills to continually boost the overall quality of the participants [15].

6. Conclusions

The fresh agricultural product supply chain in China has experienced significant growth in recent years and has become a crucial factor in driving economic and social development. However, China's cold chain distribution model for fresh farm goods lags behind that of developed countries. China should continue to strengthen its cold chain distribution system and encourage farmers to actively participate in the development and optimization of the fresh agricultural product supply chain. Furthermore, the government should actively promote information technology for fresh agricultural product distribution, establish regional agricultural market information platforms, and cultivate logistical talent.

References

[1] Xu D, Han S P. The experience of developed countries in the agricultural product flow model[J]. Rural Markets, 2020, vol. 10:142-145.
[2] Wang Y. Research on the development of fresh agricultural products intelligent logistics under the rural revitalization strategy [J]. Logistics Engineering and Management, 2022, vol. 1:101-104.
[3] Wang J L, Hu Y M. Research on the development status and optimization strategy of cold chain logistics of fresh agricultural products: take Xuzhou City as an example[J]. Logistics Sci-Tech, 2023, vol. 9: 167-169.
[4] Chen Z X. Research on fresh agricultural product e-commerce to help rural revitalization [J]. Cooperative Economics and Technology, 2024, vol. 3:75-77.
[5] Liu J S, Ke X S. Improvement in logistics of fresh agricultural products[J]. Journal of System and Management Sciences, 2012, vol. 2:36-45.
[6] Wang Y Y, Li Y. Development of fresh agricultural products supply chain in Shandong Province under E-commerce environment[J]. Logistics Sci-Tech, 2023, vol. 19:118-121.
[7] Yu Y Z. Research on optimal design of the fresh agricultural product supply chain[J]. Debate and Discussion, 2024, vol. 1:107-108.
[8] Qu M D, Xu X. Construction and optimization of supply chain system of fresh agricultural products under the background of Internet[J]. Logistics Sci-Tech, 2023, vol. 21:132-134.
[9] Information on: https://www.sohu.com/a/730785912_120928700
[10] Gao K. Research on the Innovation of Business Models in Fresh Food E-commerce Enterprises in the Digital Economy[J]. Management Innovation, 2024, vol. 11: 157-163.
[11] He D J. Research on the development path of fresh agricultural product E-commerce logistics from the perspective of rural revitalization[J]. Logistics Sci-Tech, 2023, vol. 16:72-79.
[12] Xu H. Study on circulation channel and development path of fresh agricultural products, Research and studies[J]. 2023, vol. 10: 9-11.
[13] Harimaya K, Kagitani K. Efficiency, and economies of scale and scope in Japanese agricultural cooperatives [J]. Journal of Economic Structures, 2022, vol. 11: 9-11.
[14] Information on: https://baijiahao.baidu.com/s?id=1802390270471485319&wfr=spider&for=pc
[15] Luo Y W. Research on the development strategy of fresh produce supply chain in China, Logistics Engineering and Management [J]. 2023, vol. 4:76-78.
[16] Liu P P, Tan C F. Thoughts on the development of fresh agricultural products logistics supply chain under the background of 'Internet +' [J]. Logistics Engineering and Management, 2022, vol. 9: 65-67.
[17] Wu J Q, Yang M, Huang W Y, et al. Examination of the correlation between the upstreaming of fresh agricultural products and the synergistic development of cold chain logistics in the context of e-commerce[J]. China Price, 2024, vol. 2: 45-49.