

# A Review of Literature for Research on Urban Demand Oriented Agri-Food Cold Chain Logistics Management System

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## Abstract

Agri-food cold chain is at the very beginning in China, however, it has been the focus of academic study abroad. Most studies mainly lay emphasis on the awareness of agricultural security issues, agri-food traceability and making researches from the perspective of supply chain; the orientation of researches includes some parts or links, etc. At present, in China, there are a lot of factors impacting on agri-food quality safety, researchers conduct studies on agri-food cold chain mainly from four aspects: legal system, production and distribution standards, regulatory system, and market access standards. This paper presents an overview of agri-food chain study from the perspectives of supply chain, quality safety, traceability, standardization, technology and urban management.

## Keywords

Urban Demand Oriented, Agri-Food, Cold Chain Logistics Management System, Review of Literature

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## 1. Introduction

Recently, the research on agri-food cold chain logistics management system is heating up in China, however, researches mainly focus on the awareness of agricultural security issues, and making preliminary researches from the perspective of some part or links of supply chain. This paper tries to comb through the development process and system changes of the domestic and foreign agri-food logistics, to sum up the experience of agri-food logistics development in developed countries, and to make analysis of the researches' progress of the organization mode, system arrangement, system elements and development environment of the domestic and

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foreign agri-food logistics. The literature reviews of the quality and safety, traceability, standardization, technology application, and urban management are combined from the perspective of all elements of agri-food supply chain, in order to seek a new direction of research and good ideas.

## 2. From the Perspective of Supply Chain

The agri-food cold chain logistics management system involves the whole supply chain: the production, processing, storage and marketing of agricultural food. In each link of the supply chain, the subject will have influences on the safety of cold chain service to some degree. The study of products supply chain started early abroad. Agri-food supply chain has been the hot topics among consumers, enterprises and governors worldwide. Young and Hobbs (2002) [1] had probed the vertical linkages among producers, produces associations and governments in agri-Food supply chains. Vorst (2002) [2] investigated into the contamination of agri-food, and pointed out that governments should play an important role in the trace of agri-food supply chains. Vetter(2002) [3]. contended that vertical integration was an effective method to handle moral hazard in the market where consumers cannot verify the safety and characteristics of products. And he also pointed out that saving the cost of supervision was the motivation of vertical integration, but multi-government supervision was not good for vertical integration of agri-food supply chains. Ahumada and Villalobos (2009) [4] presented that, for agri-food supply chains is related to public health, it caused great concerns and its design and operation would be closely monitored in the future, especially in human consumed agri-food. With the public's increasing quality safety requirements of agri-food, the attention to agri-food cold chains was improving. Mohan *et al.* (2012) [5] regarded cold chains as a temperature controlled supply chains, which can guarantee and extending products, such as extending the expiration time of agri-food. Mohan also pointed out that cold chains can be managed by quality management systems, and it should be analyzed, measured, controlled, recorded and verified.

As the public's awareness of the quality and safety of agricultural products has increased, Chinese academics gradually further their studies on agri-food supply chains. Based on the organization of the agri-food supply chains, Tan Tao (2004) [6] presented two main supply chains organization models currently in China that were integrated with processing center and logistic center as the cores. Tan tried to establish an effective organization form according to the current transition economy and open economy environment in China. Qian Yin and Wang Huimin (2007) [7] built an agri-food supply chains management system by the idea of procedure quality management, considering the features of quality building of agri-food supply chains. Li Jifang (2007) [8] analyzed the obstacles of agri-food supply chains in China, and contended that at the limitation of the contradiction between small production and big market, the circulation system of agri-food in China, which was with wholesale at the core, was not good for the appreciation of agri-food in the circulation stage. Li proposed breeding core enterprises (including big commercial and trade enterprises, third party logistics providers and agri-food processing plants) instead of wholesale markets, and contented that agri-food supply chains management based on the core enterprises has obvious advantages in digital markets integration. Yang Weiming (2009) [9] held that as the developments of logistic technologies, especially the changes of agri-food organization forms, agri-food supply chains should improve its efficiency and safety. Based on transaction cost theory, Yang proposed that the integration of agri-food supply chains is the object requirement now and future. Zhang Xuezhi and Chen Gongyu (2009) [10] thought that the operational efficiency of agri-food supply chains had great influences on the competence of agri-food in a country or region. The deficiency of core enterprise who organizes and manage the whole supply chains was the main factor of the low efficiency of agri-food supply chains in China. Core enterprise played a very important role in the supply chain, since it was responsible for handling many problems in agri-food chain, such as inner benefit distribution, cooperative partner choices, supply chain performance evaluation, and problems of incentive and constraint. According to different core enterprises, there were three models for agri-food supply chains in China: enterprising wholesale market as the core model, integration of supply-production-sale agricultural group as the core model, and agricultural products delivery center as core model. These models had their own advantages and different region should chose specific model according to local regional characteristics. Han Yan (2009) [11] believed that information asymmetry was the root cause for the problem of quality and safety in the process of agri-food production and circulation, and she pointed out that the "chain retail network + production base + farmers" mode was the most secure mode for quality and safety. It can improve the production and sales for the degree of organization, made vertical integration for supply chain, built the system of pursuing and tracking, fully played the role of brand "signal" to optimize

the agri-food cold chain logistics. Zhang Min (2010) [12] analyzed the existing model of agri-food supply chain logistics from the perspective of supply chain management, and pointed out the mode of supply chain organization is closely related to agri-food safety, used the principal-agent theory to analyze the problem of the system of “farmer + enterprise” model, put forward the formation of the supplying organization model of “agricultural co-operatives + enterprise”, in order to realize the dual goals of protecting the agricultural products quality safety and farmers’ benefits at last. Xu Jinli, Zhang Mingyu (2011) [13] analyzed agri-food supply chain logistics from the perspective of each node of agri-food supply chain logistics’ collaborative operation in deeply, and pointed out collaborative motivation was the driving force for collaboration, trusting mechanism was the base of the agri-food supply chain logistics’ collaboration, cooperative pattern matching was the core of agri-food supply chain logistics collaboration, information sharing was the main technology of agri-food supply chain logistics collaboration. Based on the definition of agri-food social responsibility, Ouyang Xiaoxun (2011) [14] from market incentives and state intervention two aspects to analyze the causes of the lack of social responsibility for agri-food supply chain logistics. Studies indicated that in the process of the reconstruction of the social responsibility for the agri-food supply chain logistics, and it was not advisable to solely rely on market incentives or state intervention. Used the market-oriented means to incentive product enterprise to bear the social responsibility, also needed state intervention to regulate the behavior of the main economic entities in the agri-food supply chain logistics, in order to promote their performance of social responsibility, however, this intervention is limited. Market incentives and state limited intervention played an important role in the construction of social responsibility system of agri-food supply chain logistics in China. Li Huiliang, Wen Xiaowei (2011) [15] thought that, along with the problem of food quality and safety becoming increasingly prominent, to construct and improve the traceability system of agri-food supply chain logistics became special important. Zhou Jie (2011) [16] studies showed that the quality control in the supply chain members of the internal quality control of the agri-food control mechanism, professional knowledge as the main; the quality control between the members stressed the trust mechanism, knowledge complementary as the main.

### 3. From the Perspective of Quality and Safety Control

Starbird (2005) [17] believed that the distribution of food quality information in the supply chain is not uniform, and the fine design of the food supply chain contract can detach the quality safe producer and the quality unsafe producer; the validity of this contract depended on the quality cost, the failure probability and the penalty cost of the producer. Adrie *et al.* (2005) [18] discussed the relation and contradiction between agri-food cold chain middle peasants products quality and safety and the transparency of information, in order to eat the assured agri-food, consumers always appealed to the improve the quality of agri-food, guarantee of agri-food quality and safety, and improve transparency of information. They also discussed the challenges in the cold chain network to meet the agri-food cold chain quality and safety as well. Gaynor (2007) [19] discussed the European Union (EU) policy and legislation on food safety, which covered the safety of food production with the distribution, food inspection, import food safety and official control system, in order to ensure compliant with food policy. Rohit Joshi *et al.* (2009) [20], the latest research showed that the developing countries needed a strong and reliable cold chain system. The cold chain became a part of perishable goods supply chain. They used game theory to demonstrate the wide application prospect of cold chain in developing countries, in addition, took India as an example. Liu Min *et al.* (2007) [21] through the analysis of the problems of the cold chain logistics, the mechanism of the quality and safety of the vegetable supply chain was discussed in detail, the shortcomings of the HACCP management system was pointed out, and a series of optimization methods for the HACCP management system of the cold chain logistics system was put forward. Feng Zhongze *et al.* (2007) [22] comprehensively analyzed on the market access of agri-food in the United States, Canada, France and Japan, and put forward the suggestion of the establishment of the market access system for agricultural products in China. Feng Zhongze *et al.* (2008) [23] used the general principle of government economics, through the normative analysis, put forward the goal and principle of establishing the market access system for the agri-food quality and safety, defined the main body, object and scope of the regulation of agri-food quality safety market access, put forward the framework of agri-food market access mechanism, to provide a theoretical reference for the establishment of agri-food market access mechanism for the Chinese government. Feng Zhongze, Chen Si (2008) [24] summarized and defined the market access and related concepts of agri-food quality and safety, analyzed the generation and development of agri-food market access regulations, Chinese agri-food quality and safety management was

divided into four stages, and they are stage of quantity management, stage of product structure adjustment, stage of safety level improving and stage of quality safety supervision according to law. Made a comparative analysis on the system of agri-food market access system and processed food market access, summarized the early development of agricultural products quality safety market access, to put forward suggestion for the establishment of Chinese agri-food quality and safety market access mechanism. Tian Yuan (2008) [25] constructed the food safety assurance system that bases on supply chain logistic, this food safety assurance system was made of food safety purchasing system, food safety cold logistics system, food safety tracing system and food safety credit system, in addition, made an analysis on food safety credit management system. Zhao Yanyan, Zhang Yuxian (2009) [26] made an analysis and research on the application of HACCP system in the food safety management of cold chain logistics, disintegrated the process of cold chain logistics, made an analysis from the perspective of biological property, chemical property and physical property for the potential risk that in every link, to identify the critical control points and develop the HACCP implementation plan. Chen Yanyan (2011) [27] analyzed the market access system of Chinese agri-food quality and safety, problems and reasons in the course of the convergence and implementation of *The Law of Quality and Safety of Agricultural Products of People's Republic of China*, to provide a unified, continuous and scientific policy basis for the market management of the agri-food quality and safety. Liu Chunxia *et al.* (2011) [28] studied Chinese agri-food status, analyzed the characteristics and present status of agri-food market access technology of United States, Japan, the European Union and South Korea, etc. Put forward the countermeasures to deal with the international market access measures. Guo Qunzhou *et al.* (2012) [29] analyzed the current situation and the key factors of the supply chain management of food supply chain management, put forward a suggestion that based on the innovation of agri-food quality and safety supply chain management, created organization model of supply chain management, built a chain organization model of “farmer + cooperative + production and the origin of the wholesale market” and supply chain vertical integration model of “enterprise + cooperative + base”; created a operation management of agri-food supply chain, built the process management and supply chain coordination mechanism based on information platform, established traceability system, innovated food supply chain logistics management, played the advantages of the third party logistics, made a promotion of cold chain logistics, took the use of supply chain logistics management of new technology to meet the demands of the differential. Pang Shumei, Li Xuegong *et al.* (2012) [30] analyzed the successful practice of Chinese agri-food filing system, summarized the existing problems, and discussed the establishment of agricultural products market access for the record information system construction, included information collection, process design and system design of the functional module, put forward a number of measures to complete the whole process of agri-food information system at last.

#### 4. From the Perspective of Traceability

Agri-food cold chain logistics traceable system is a quality guarantee system that record and store the various information of agricultural products in the process of agricultural products supply. Study of agri-food cold chain logistics traceable system has more than 20 years history. For a relatively new research questions, domestic and foreign scholars do a lot of basic research on the cause, connotation of traceability of agricultural products.

Montanari (2008) [31] believed that time/temperature control was a key issue in fresh food logistics, and efficient and effective tracking under cold chain conditions was the key to solve the problem of the cold chain. Shackell *et al.* (2008) [32] thought food safety/risk management and certification were two driving forces of meat and meat product's traceability; as global competition intensifies, traceable technology was an important means of defensive and deterrence identification of fraud and shoddy products. Engelseth (2009) [33] studies showed that agri-food traceability as a complex of work depends on the connection of information, included supply chain integration technology, as well as different forms of knowledge, and organizational aspects of the integration of the supply chain. Hurley *et al.* (2012) [34] study indicated that based on the Government Regulation, such as mandatory traceability may not necessarily result in safer food, but increased the cost of food processing.

Based on the condition that small-scale and scattered of agricultural production led by current small-scale production of single family, Yang Qiuhong, Wu Xiumin (2009) presented the driving request of the leading enterprises, the core agri-food processing enterprises had profit motive in establishing traceability systems.

Ren Guangchao *et al.* (2010) [35] thought it was a worthwhile approach to promote corporate social responsibility by agri-food quality and safety traceability system, which was in the condition of food safety traceable

system has not been mandatory in China.

Wang Ruixia *et al.* (2011) [36] focused on technologies required in construction of quality traceable system in the cold chain logistics management system, and discussed how to ensure product quality and safety through quality traceable system in each link of the cold chain logistics.

Zhao Rong *et al.* (2012) [37] summarized experience and enlightenment of traceable supervision system in developed countries, which was based on the analysis of food quality and safety traceable system, regulators and regulatory content in United States, European Union, and Japan.

Wen Xiaowei, Li Huiliang (2012) [38] survived consumers' perception of gains and risk, trust attitude, willingness to purchase and wishes to supervise traceable system in Guangzhou, took broiler for cases, and discussed relationship between perception of gains and risk, trust attitude, willingness to purchase and wishes to supervise traceable system; results showed that: consumers' more perception of gains from traceable product and they had more tendencies to purchase traceable product and supervise traceable system; consumers' perception of risk was more big, and wishes of purchase was more low ; consumers' trust on traceable product was stronger, and more willing to buy; consumers' more willingness to purchase, the willingness of traceable system's supervision was also higher.

## 5. From the Perspective of Standardization

Agri-food cold chain logistics' standard is the basis of Government to fulfill its regulatory functions to the agri-food quality and safety, and also is the yardstick of enterprises' self-control in each link of the supply chain management. Therefore, researches on standardization of agricultural products gradually get more attention at home and abroad. Hammoudi *et al.* (2009) [39] thought public and private standard not only affected eventually commodity of security, but also affected internal organization of enterprises, enterprises' strategy behavior and organization of supply chain through research on effect of European food security legislation and standard on food supply chain; food security legislation and standard will affect distribution of market's influence and profit in supply chain and all interests related to parties, pointed out that the people who develop public policy must consider all these aspects at last. Ensured that food to be sold to consumers must meet the food safety requirements, and do not distort the market because of government intervention.

Xiang Li (2009) [40] pointed out that society should improve awareness on agri-food cold chain logistics standardization due to big gap of agricultural cold chain logistics compared between China and developed countries and regarded the construction of agricultural cold chain logistics' standardization as the most powerful of measures to promote the agricultural economic development in China. Regarded markets' guide as main direction to perfect the construction of agricultural cold chain logistics' standardization in China, and introduced international standards actively, strengthen international cooperation, clear supervision subject and integrate the enterprises into the process of legal construction of logistics standardization. To ultimately improve the competitiveness of agri-food cold chain logistics industry and enhance the international competitiveness of Chinese agricultural products.

Weng Xingang *et al.* (2010) [41] analyzed the motivation of cold chain logistics system's construction, elaborated the mechanism of cold chain logistics system's construction, initially built framework structure of the cold chain system, and put forward constructive ideas on the cold chain system's implementation.

Based on the characteristics of cold chain logistics and analysis of the current situation of cold chain logistics standardization, An Jiuyi (2010) [42] analyzed the issues of cold chain logistics standardization, and put forward ideas for future construction of standardization.

Zhu Chaocai (2011) [43] thought companies of agri-food cold chain logistics had no access standard, which made many business's opportunities, and the government was lack of theoretical and institutional basis in monitor link of food logistics.

Cai Nanshan, An Jiuyi (2011) [44] put forward characters of special products, high special of equipment, high process coordination, and high running costs of cold chain logistics for agricultural products, which required us to fully consider the complexity of the cold chain logistics system in the cold chain logistics' standardization system. Mobilized government departments, industry associations, enterprises and all sectors of society, and made efforts to improve the continuity of standards, enhanced usability and operability of standards, increased supervision of standards' implementation, focused on forward-looking of standards, introduced international advanced standards properly, gradually built the scientific cold chain logistics system.



## 6. From the Perspective of Technology

Along with the continuous development of technology, the application of various new technologies used in every link of agri-food supply chain have been innovated, scholars of domestic and foreign have more and more study on the application of new technology in agri-food supply chain.

Sheng Yan, Zhou Ailian, Li Jinxia (2003) [45] explored the possible applicative way that the Internet of things technology was used in agri-food cold chain logistics. In addition, they set up the agri-food supply logistic public information platform that based on the Internet of things technology, and did research on the functional structure and technical framework of the cold chain logistics information platform based on Internet of things in detail.

Ma Dongyan (2010) [46] did research on the existing question of the current domestic fresh agricultural products logistics and the multi-warehouse distribution technology, and analyzed the applicative necessity that multi-warehouse distribution technology using in the zone of agri-food distribution.

According to that different agri-food have different temperature sensitivity, Kuo (2010) [47] proposed innovation of logistics service mode, it is based on Multi-Temperature Joint Distribution technology.

According to the agri-food logistics demand of the characteristics of low temperature, fast speed, easy regulatory, traceability and low cost, Liu Guomei, Sun Xinde (2011) [48] combined the advantages of WSN and RFID technology and proposed a monitoring and tracking system for cold chain logistics of agri-food. Research results showed that, the system not only can achieve real-time monitoring of agri-food environment and agri-food quality, but also can significantly improve the efficiency and accuracy of cold storage management and distribution. It had wide application prospects.

According to that agri-food cold chain distribution has the requirements of multi measurement point, multi factor and convenience of environmental monitor, and basing on the core of information processing of the wireless sensor network of the JN5139 of Tigbee technology, Guo Bin (2011) [49] combined the module of temperature and humidity sensor, designed the acquisition node and built the wireless sensor network in the car environment, he combined embedded model and NET technology to develop the upper computer software of cold chain distribution of fruit and vegetable, solved the problem of data acquisition and real-time monitor. Research results showed that the system was stable, data collection and transmission met the design requirements, it can be easily applied to the cold chain during transporting for environmental information collection and monitor.

Zhang R (2012) [50] reviewed the advantages of hyper-spectral imagination and fluorescence spectra and summarized on he latest progress of application of product evaluation of food and agriculture, such as the detection of pollutants, ingredient analysis and quality evaluation.

According to the characteristics of temperature controlling logistics of agri-food with multidisciplinary, trans-regional, more links and Multi-agent, basing on considering the needs of temperature-controlled logistics current technology of agri-food and social development and the analysis of multiple restriction elements of agri-food logistics, Wang Guoli (2012) [51] presented temperature-controlled technology logistics integrates theory system of agri-food.

## 7. Review of Research

In recent years, along with the rapid increase in the level of consumption of urban residents, the consumption of fresh agri-food has significantly increased in the city, while city residents have paid more and more attention to “freshness” and “safety” of fresh agricultural products. When the consumption characteristics of people transits from subsistence to nutrition, then after entering the health, the pursuit of the nutrition structure and freshness, and the importance of security translate into a higher level of market demand, which promotes the reform and development of modern agri-food circulation pattern. The construction of logistics system of agri-food cold chain is an important aspect of transformation and development of modern agri-food circulation style, especially in recent years, basing on the background of the demand of domestic market and international market, people have attached great importance to agricultural cold chain logistics from central to local Government. In recent years, central has stressed the requirements to accelerate the construction of cold-chain logistics system of agricultural products in the first and promote the circulation of agricultural products. In June 2010, the national development and Reform Commission issued *Development planning cold chain logistics of agricultural products*, proposed the clear objectives and requirements to accelerate the development of cold chain logistic of agri-food. Corresponding with the above background, in the study of agri-food logistics and cold chain logistics of agri-food

in China, it has been dynamic recent years. From the literature, research is focused on the following aspects:

1) Basing on that analysis of development course and system changes of developed countries' agricultural products logistics, they sum up experience of agricultural products logistics development of developed countries. Among them, study of Japan, the United States, the Netherlands and other countries is concentrated, contents of the study are mainly their agricultural products logistics organizational mode, institutional arrangement, system elements and the development environment.

2) They combine Chinese actual of agricultural production, circulation and consumption, expand research from agricultural logistics system construction angle. Among them, more representative research direction can be inducted as: firstly, they study cooperation relationship and resources configuration of upstream and downstream of agricultural products logistics chain from supply chain perspective, stress that agricultural logistics is a series of processes of organization innovation of activities of raw materials production, processes, storage, transport and sales. Secondly, around the natural properties of agri-food, they improve the efficiency of agri-food circulation, reduce circulation costs, coordinate the relationship between production and consumption, focus on changes of flow integration and the development of third party logistics for agri-food circulation, focus on analyzing the important role of modern logistics technology application for the increase of circulation efficiency and cost reduction. Thirdly, they combine the status of China's small-scale decentralized management and industrialization development, analyzing choice and design of agri-food logistics in china. Some scholars emphasize the rationality of the adaptability of agricultural products logistics organizational structure and the rationality of the system, some scholars believe that it is more effective to establish cooperation and competition mechanism and promote the Union form the market-oriented. Fourthly, in recent years, Chinese regional agricultural logistics has developed rapidly, it has been effected by economic development and guided policy, many scholars also have large research in the field, as on agricultural logistics research of Shanghai and Hebei, and on fresh agricultural proprietary logistics mode research of Anhui, and on quality security agricultural logistics distribution system research of Sichuan, and on flower logistics system research of Yunnan, and on freshwater products logistics mode research of Nanjing.

3) Referring to the foreign agri-food logistics research theories, methods and experience of research issues, they study the domestic agricultural practice. They focus on the introduction of foreign theories, methods and experience and learning, deepening their understanding of agri-food cold chain logistics and agri-food logistics concept, connotation and characteristics, discussing descriptive analyses and policy recommendations.

In General, the study on the agri-food logistics in China has been increased. Research on cold chain logistics for agri-food has also begun to receive attention. Although research has focused on agri-food cold chain and food safety issues, but mainly focused on the macro-level issues and equipment technology research, especially we have not found the system research of cold chain logistics management of fresh agri-food in central cities, they need to be closely combined with China's practice in this regard, and carry out empirical and intensive studies from the perspective of theoretical analysis.

Foreign countries carry out earlier the study of agri-food logistics and cold chain logistics of agri-food, in the 1960 of the 20th century to the 70's, research and discussion in this area were quite active, and research of agri-food logistics management theories, methods, cost control and development trend of rationalization, optimization was in-depth. After proposing the concept of supply chain management in the 1980 of the 20th century, it promoted research and practice of supply chain process integration of agri-food logistics, along with the emergence of institutional arrangement study of vertical integration coordination, strategic alliances, long-term win-win cooperation. At present, study of foreign agri-food logistics and cold chain logistics of agricultural products has been continuously deepened and refined in strategic management, cooperation and coordination, performance evaluation, simulation, security monitor and so on. It has directly improved foreign agricultural products logistics efficiency and management level. Thus, it can be said that foreign theory research of agricultural products logistics and cold chain logistics of agricultural products are matured, more informative research development, research results and rich experience can provide a useful reference for the study of this subject.

Through the analysis of cities' and especially Center Cities' problems research of cold chain logistics management system, for developing Chinese cold chain logistics, there is a need for in-depth research of important subject. Past related research and advanced national experience provide some support and do further research, combining Chinese development actual and real need. Through theoretical analysis and empirical research, this article has important theoretical and practical significance for the construction of a new type of cold chain logistics management system for fresh agricultural product logistics management system.

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