Investigation and Analysis of Agricultural Cold Chain Logistics and Its Development Strategy in Heilongjiang Province

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Abstract Accelerating the development of agricultural cold chain logistics is of great significance to improve the competitiveness of agricultural products, increase rural incomes and ensure food security. The present situation and main problems of agricultural cold chain logistics in Heilongjiang Province were analyzed from five aspects, such as the scale of construction, infrastructure, status quo of cold chain logistics technology, cold chain logistics enterprises and development environment, and proposed that Heilongjiang Province should focus on the development of poultry, fruit and vegetable, aquatic products, and processed food cold chain, then the strategic implementation measures for above areas were put forward.

Key words Agricultural cold chain logistics, Investigation, Development strategy, Heilongjiang Province

Agricultural cold chain logistics is a special supply chain system, which can ensue that after meat, poultry, aquatic products, vegetable, fruit, eggs and other fresh agricultural products are collected, they are processed, stored, transported, distributed and retailed at appropriate low temperatures, aiming to guarantee quality safety, reduce loss and prevent agricultural products from pollution as much as possible[1]. Accelerating the development of agricultural cold chain logistics is of great significance to improve the competitiveness of agricultural products, increase rural incomes and ensure food security. In recent years, China has paid more attention to the construction of agricultural cold chain logistics. For instance, the National Development and Reform Commission issued the *Notice about Printing and Distributing The Development Plans of Agricultural Cold Chain Logistics* on June 18, 2010, showing that the construction of agricultural cold chain logistics has been paid unprecedented attention to.

To investigate the construction state of agricultural cold chain logistics in Heilongjiang Province, the ways to construct a suitable agricultural cold chain logistics system for "modern logistics industry", and establish suitable development plans of agricultural cold chain logistics for the provincial conditions to guide future construction and practice, the group studying "the construction state and countermeasure of agricultural cold chain logistics in Heilongjiang Province" made a deep questionnaire survey on seven prefecture-level cities and eight counties (cities) in Heilongjiang Province for 20 days. Besides the questionnaire survey, the group also adopted other methods to deeply survey the construction state of agricultural cold chain logistics in above regions, such as holding a session, report-back meeting, interview and so forth. Meanwhile, the group entrusted by the Development and Reform Commission of Heilongjiang Province also designed eight pieces of questionnaire for 83 city-level and county-level development and reform commissions, aiming to investigate the production and consumption layout of agricultural products, agricultural cold chain logistics enterprises and construction. In this study, the present situation and main problems of agricultural cold chain logistics in Heilongjiang Province were analyzed from five aspects, such as the scale of construction, infrastructure, status quo of cold chain logistics technology, cold chain logistics enterprises and development environment, and proposed the key fields of agricultural cold chain logistics in Heilongjiang Province, then the strategic implementation measures for above areas were put forward.

1 Status quo of agricultural cold chain logistics in Heilongjiang Province

1.1 Agricultural cold chain logistics has begun to take shape

In China, Heilongjiang Province is an important agricultural base, where the standardized level of cultivation has been improved day by day, and many mandatory local standards, like reasonable application guidelines of pesticides for producing pollution-free agricultural products and vegetable, have been applied. In the province, the sown area of vegetable is up to 187 580 hm^2, and its annual yield reaches 7.01 million tons; orchard area is 35 340 hm^2, and its annual yield is 0.5 million tons; annual yield of meat, eggs, milk and aquatic products reaches 1.879 million, 6.495 million, 1.019 million and 0.380 7 million tons respectively. Presently, the monitoring area of green food (4.84 million hm^2) and the quantity of products authenticated (1 600) in Heilongjiang Province is in the first place in China[2]. In addition, the cold chain circulation rate of vegetable, fruit, meat, eggs, dairy products and aquatic products in Heilongjiang Province is up to 4%, 3%, 10%, 13%, 95% and 1% respectively, and the transport rate of these products refrigerated reaches 1%, 7%, 25%, 30%,

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90% and 1% respectively, showing that cold chain logistics has become greater. .

1.2 Infrastructure of agricultural cold chain logistics has been improved step by step At the end of 2010, there were 400 cold storages in Heilongjiang Province, with total volume of about 0.62 million tons. Among them, the proportion of high-temperature, low-temperature and frozen cold storages was 40%, 45% and 15% respectively. Additionally, there were 415 trucks for refrigeration transport, with total refrigeration capacity of 0.22 million tons[2]. At present, most cold storages were built by civil engineering, while there are few air-conditioned cold stores. Moreover, the volume of most cold storages is below 1 000 tons, while the number of middle cold storages with the volume of 1 000 tons accounts for about 30%.

1.3 Cold chain logistics technology had been popularized gradually Green agricultural bases take the lead in introducing internationally advanced HACCP (Hazard Analysis and Critical Control Point) management thinking, GAP (Good Agricultural Practice), GMP (Good Manufacturing Practice) and other management technology to make great efforts to implement low-temperature control in the whole process. Based on RFID technology, using internationally advanced cold chain logistics technology, large meat slaughtering enterprises begin to develop storage, transport and selling process besides slaughtering, processing and cooling at low temperatures, developing rapidly toward low-temperature control in the whole process. In addition, advanced foaming technique has been applied to cold storage building, and most new cold storages are air-conditioned cold stores.

1.4 Cold chain logistics enterprises have emerged gradually There are 145 enterprises having cold storages in Heilongjiang Province, and most enterprises processing agricultural products process meat, dairy products, vegetable, fruit and eggs. Among them, 21 enterprises have developed large-scale cold chain transport; 1 112 workers engage in cold chain logistics; there are 243 refrigeration trucks used for cold chain transport; the tonnage of refrigeration ships is 3 tons. Besides, there are 62 agricultural trade wholesale markets with large-scale sales of agricultural products, and 80 sales areas of agricultural products in comprehensive supermarkets.

1.5 Development environment of agricultural cold chain logistics has been improved gradually During recent years, to develop agricultural cold chain logistics better, China established the *Development Plans of Agricultural Cold Chain Logistics*, and its surrounding environment has been improved gradually. Heilongjiang Province has paid more attention to the construction of rapid flow channel of fresh agricultural products, and has established the green channel of agricultural products to Beijing and Tianjin, improved facility conditions of vegetable circulation and "green channel" policy, and increased organization level of vegetable production and marketing, which makes long-distance transport of fresh agricultural products more convenient, and promotes rapid development of agricultural cold chain logistics. Moreover, the demand for good agricultural with preferential prices has been improved gradually.

2 Main problems of agricultural cold chain logistics in Heilongjiang Province

2.1 Low development level of fresh agricultural product cold chain In Heilongjiang Province, most agricultural products are circulated at normal temperatures, and links of cold chain logistics do not join together well, resulting in serious loss. Some agricultural products are processed at low temperatures, but clod chain is cut during transport and sales. In addition, cold chain logistics has a low organization degree and lagging management means, and there is no complete cold chain logistics system[3-4].

2.2 Small-scale cold chain facilities Current cold storage facilities are old, and most state-owned cold storages have been used for above 30 years. Perishable goods are loaded onto a lorry in the open air instead of a cold storage and low-temperature field. Besides, all kinds of cold storage have unreasonable structure; there are few cold storages for wholesale and retail; the construction of fruit and vegetable cold storage fall behind; the building of original processing cold storages is slow. In summer and autumn, the supply of vegetable to cold storages is surplus, but most vegetable is from other provinces in spring and winter, and the shortage of facilities in homothermal cold storage is serious. There are fewer large-scale slaughtering enterprises having refrigeration trucks in the province, and most transport trucks can not reach the standards of cold chain transport. High-temperature slaughter and transport has resulted in secondary pollution, which has brought great risks to meat safety.

2.3 Lagging development of third-party cold chain logistics enterprises Third-party cold chain logistics enterprises mainly provide cargo agent, inventory management, good carrying and directional transport, but can not provide complete, comprehensive and integrated solution to cold chain logistics. Large amounts of cold chain logistics service resources distribute in primary processing filed of food and agricultural products, and resource integration and value-added service capacity is weak, so that the loss of agricultural products after production is great, and their added value can not be developed deeply.

2.4 Insufficient application and low information level of cold chain logistics technology Postpartum pre-cooling technology and classifying, packing and processing of fresh agricultural products at low temperatures have not been popularized, as well as automatic temperature control technology in the whole process. Besides, cold chain logistics enterprises have low level of information, and it is difficult to effectively connect and share information resources of each link, but the tracking traceability technology for agricultural products has weak support ability[5].

2.5 Serious shortage of cold chain logistics talents Most workers engaging in agricultural cold chain logistics have low levels of educational qualifications and lack cold chain logistics system and vocational training. There are very few colleges and uni-

versities offering logistics, food and refrigeration major, and there are fewer graduates, so that cold chain logistics talents are seriously insufficient. In addition, there is no multi-level training and education system for cold chain logistics talents.

3 Key fields of agricultural cold chain logistics in Heilongjiang Province and main tasks

3.1 Poultry cold chain Heilongjiang Province is the important home of pork, beef, mutton and birds, so it should make full use of this location advantage to establish the cold chain logistics system with large agricultural products processing enterprises as the leader and seamless connection between product home and sale terminal. First, the province should strengthen the construction of cold chain logistics facilities, transform slaughter production line and temperature control facilities, and improve modernization level of slaughtering and processing meat. Second, it should reinforce the construction of low-temperature preliminary processing facilities. Third, relying on large meat processing enterprises, it ought to build the cold chain logistics base to preliminarily process meat. Fourth, it should to increase the proportion of chilled meat sold, monitor the entire transport process, encourage supermarkets, hypermarkets and other sale terminals to adopt freezer sales.

3.2 Fruit and vegetable cold chain With resource, ecological and location advantages of fruit and vegetable species, Heilongjiang Province should build professional cold chain logistics for fruit and vegetable based on production bases and taking terminal markets as its carrier. First, the province should strengthen infrastructure construction of cold chain in fruit and vegetable production bases, and improve sorting, fresh storage, packing and other links to increase the quality and quantity of fruit and vegetable sold. Second, it should improve cold chain network construction of fruit and vegetable terminal market, and build the fruit and vegetable cold chain logistics center covering transaction, refrigerated storage, quality testing, transport and dispatching relying on professional fruit and vegetable terminal market. Third, the province should upgrade the cold chain system of fruit and vegetable processing enterprises, such as increasing investment, encourage fruit and vegetable processing enterprises to use international logistics, facilities and equipment, strengthening precooling, fresh-keeping, intensive processing and packing of fruit and vegetable, and enlarging the scale of cold chain logistics. Fourth, it should improve seasonal two-way cold chain system. In Heilongjiang Province, fruit and vegetable supply is insufficient in spring and winter, so most fruit and vegetable are from South China. From July to September, fruit and vegetable of Heilongjiang Province have high yield, good quality and taste, so they are transported to South China. Based on the time difference of fruit and vegetable planting, the province should strengthen the sales, precooling, packing, fresh-keeping, refrigerated storage and transport of seasonal fruit and vegetable products, and develop the seasonal two-way cold chain system meeting the demand of seasonal transport of fruit and vegetable products, so as to ensure adequate supply of fruit and vegetable products in the whole year. Fifth, the province should cultivate professional third-party leading enterprises for fruit and vegetable cold chain logistics. It should support third-party logistics enterprises, encourage large fruit and vegetable wholesale markets, super enterprises and fruit and vegetable storage and transport enterprises to integrate cold chain facilities and service resources, build cold chain logistics system from production to sales, and cultivate some influential third-party leading enterprises for fruit and vegetable cold chain logistics at home and abroad.

3.3 Aquatic product cold chain Heilongjiang province should deepen the adjustment of aquatic product structure, increase the proportion of aquatic products stored at low temperatures, and build cold chain logistics system supported by large breeding bases and aquatic product market. Firstly, it should increase the investment in cold chain facilities, encourage key aquatic product breeding bases to build ice fresh, freezing and other cold chain facilities, and guide aquatic product bases to improve rapid freezing, refrigerated storage and other cold chain facilities. Secondly, it should establish rapid transport network, and actively popularize refrigerated storage, freezing and other cold chain transport ways, because aquatic products are perishable. Thirdly, it should strengthen dispatching, speed up the facility construction of freezing stores, cold storages and deeply processing workshops, and actively develop storage, dispatching and processing relying on breeding bases and large aquatic product markets.

3.4 Processed food cold chain During the procurement of raw materials, production and processing, storage, product transport, dispatching and sales of processed food, Heilongjiang Province should establish the cold chain logistics system with postpartum precooling, processing, storing, transporting, dispatching and selling at low temperatures. First is to build circulation and processing bases with functions of sorting, cleaning and refrigeration, and establish the cold chain logistics network with nodes of food processing and circulation bases. Second is to actively promote the distribution of cold chain logistics business of food processing enterprises, integrate cold chain logistics resources, and establish Cold chain products distribution mode with order as its core to improve common distribution level. Third is to upgrade professional markets, supermarkets and hypermarkets, improve cold chain service function, strengthen the control of food procurement and sales process, and establish a retroactive food safety management system.

4 Conclusions

As a big agricultural province, Heilongjiang Province has the resource advantage of developing agricultural cold chain logistics. During the "Twelfth Five-Year Plan" period, the province should guide and encourage the improvement and innovation of agricultural cold chain logistics service mode, impel agricultural cold chain logistics service to develop toward specialization, informatization, networking and large scale, gradually improve agricultural cold

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gardens managed by different ethnics indicates: there is no difference in proportion of endemic species and naturalized species for farm type community gardens, while endemic species and naturalized species managed by native ethnics take up higher proportion (about 67.6%) for garden type community gardens.

4 Conclusions

Based on the framework of Millennium Ecosystem Assessment[21] and focusing on eco-service functions of community gardens, we discussed the connection between structural diversity and function diversity of urban vegetation landscape, and analyzed the influence of ethnic culture on biological diversity. Through the above analysis, it can be concluded that community garden has become important species pool in urban eco-system of Los Angeles, it can maintain rich native plant resources, such landscape mode manifests significant function in protecting traditional plant culture and native knowledge, and its vegetation landscape structure and function are influenced by ethnic background. Therefore, community gardens, as the intersection landscape of ecological diversity and cultural diversity, play important role in safeguarding urban green infrastructure and developing urban agriculture.

In China, there will be more than half of the population living in cities. How to satisfy demands of these people's living habits and establish livable green landscape at rapid urbanization background? It requires considering habits and customs and selection preference of these people when making urban planning and conducting green capital construction. We can learn from construction mode of community gardens in US, encourage people with different cultural background to do cultivating, to make community gardens become gathering point of ecological diversity and cultural diversity, and then carry out urban ecological vegetation construction and develop leisure agriculture at the context of building powerful harmonious social and cultural country. At the same time, it is required to pay attention to invasion of alien species and pollution of heavy metals, to prevent invasion of species and protect food security.

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chain logistics service system, and increase the competitive power of agricultural cold chain service enterprises, so as to change resource advantage into economic, industrial, management and competitive advantage, improve the modernization level of agricultural circulation in Heilongjiang Province, meet the demand of people's lives, and promote our national economy developing rapidly.

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