An Analysis of the Cold Chain Logistics concerning Agricultural Products in Chongqing City

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Abstract Agriculture is the foundation of the national economy. On the one hand, there is increasing demand for fresh and safe refrigerated agricultural products; on the other hand, the current cold chain logistics is relatively underdeveloped and has many problems. This paper does a research on the major large-scale agricultural cold-chain logistics companies in Chongqing, and finds that cold-chain logistics in Chongqing has some problems such as incomplete industrial chain, relatively backward infrastructure, lack of talents, and high logistics costs. Some solutions to these problems are put forward: improving chain logistics infrastructure; strengthening personnel training; building information platform to create a new model of the cold-chain logistics in the Internet era; seeking government's policy and financial support.

Key words Agricultural products, Cold-chain logistics, System

1 Introduction

After the agricultural products are produced, they must be bound to flow to the hands of market and consumers, and agricultural logistics is an important component of agriculture and agricultural economy. *Agricultural Cold Chain Logistics Plan*, released by National Development and Reform Commission in June 2010, pointed out that we will build a number of large-scale efficient inter-regional cold chain logistics distribution centers with new technology, and widely promote core cold chain logistics technology, to form a number of cold chain logistics enterprises with strong ability to integrate resources and international competitiveness. In November 2011, Chongqing municipal government promulgated *Implementation Opinions of Chongqing Municipal People's Government on Accelerating the Development of Agricultural Cold Chain Logistics in Chongqing*, and required that we should build cold chain logistics system, foster third-party cold chain distribution companies, and build Chon-gqing into the most influential agricultural logistics center in the upper reaches of the Yangtze River. In 2014, China's cold chain logistics demand reached 104.88 million t, an increase of 18%, involving 3.74 trillion yuan. In European and American countries, the coverage of the cold chain logistics concerning agricultural products reaches as high as 90%; however, the data in China is only 20% to 30%, due to technical constraints, the whole cold chain logistics is not achieved, and there are many outstanding problems in cold chain logistics system, restricting the development of cold chain logistics concerning agricultural products.

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2 Problems in the cold chain logistics concerning agricultural products

Chongqing Wandun Cold Storage Logistics Co., Ltd., Chongqing Nongtouhengtian Cold Chain Logistics Co., Ltd., and several other major large-scale cold chain logistics companies in Chongqing City, are influential cold chain logistics companies in Southwest China, occupying more than 90% of business volume in Chongqing City. There are still problems concerning institutions, infrastructure, technology, human resources, cost control and other aspects in the cold chain logistics system of these companies, having seriously restricted the development of companies.

2.1 The cold chain logistics concerning agricultural products has not yet formed a complete industrial chain A complete cold chain consists of four parts: processing; refrigeration storage; cold chain transport and distribution; cold chain sale. In order to reduce transport object loss, the cold chain logistics requires the entire distribution process of products from supply places to demand places to be in particular low-temperature environment. In terms of customer product source and distribution, the cold chain logistics enterprises in Chongqing City have not yet formed a complete controllable cold chain industrial chain, and incomplete cold chain of product affects the operational efficiency of cold chain, and increases product loss as well as cold chain logistics costs, thereby having adverse effects on the company's future operation.

2.2 The cold chain logistics infrastructure and equipments are relatively backward The cold chain logistics companies pay attention to the daily maintenance of cold chain equipment in operation, but the storage and cooling system is very old, resulting in unsatisfactory preservation and cold storage effect of refrigerator. The ancillary facilities of refrigerator such as elevators and hallways have far exceeded the load carried by refrigerator, so that the loading and unloading are slow and the aisle is jammed, not conducive to the rapid circulation of goods. Meanwhile, the information and intelligence level of the cold chain industry is very low,

and the warehouse management system and intelligent management platform have not yet been introduced and applied by storage logistics companies, so it is impossible to adapt to the market development needs.

2.3 There is a shortage of agricultural cold chain logistics talents According to the survey, the vast majority of staff in Chongqing's cold chain logistics companies are not logistics-related majors, and their education level is generally low. Many universities at home set up the major of logistics, but few of them set up the majors related to cold chain logistics. Compared with the traditional logistics industry workers, there is an urgent need for interdisciplinary talents proficient in logistics and cold chain technology, which is obviously contradictory with the soaring demand for cold chain logistics talents at present. Cold chain companies are mostly born out of the old state-owned companies, and many older employees have low education level, and poor ability to receive and understand management philosophy, emerging technologies and services, making the cold chain industry still stuck in the traditional mode. At the same time, the cold chain industry will face unprecedented competition, and it needs more professional talents to lead the industry development and innovation.

2.4 The influx of a large number of companies in cold chain logistics leads to fierce competition In recent years, as governments at all levels lay great emphasis on cold chain logistics, various sources of capital flow into Chongqing's cold chain logistics market. Chongqing plans to build cold storage warehouse with capacity of nearly 900000 tons. Chongqing Wandun Company moves to Baishiyi and the cold storage scale is expanded to 300000 tons; Fujian Dashijie Group plans to build cold storage warehouse with capacity of nearly 400000 tons in Baishiyi Agricultural Science and Technology Park; Yuhui Food Group is building Jiangjin Shuangfu Logistics Park and cold storage warehouse with capacity of nearly 150000 tons; Tianlifangxing Food Company, only three kilometers away from Cuntan Port, is building new cold storage warehouse with capacity of 12000 tons; CARE International is carrying out the construction of advanced cold storage warehouse using 100000 tons of carbon dioxide for refrigeration. It is foreseeable that Chongqing's cold storage market will rapidly flourish in the coming years, and the market will face unprecedented competition.

2.5 The cold chain logistics services need improvement Relying on the advantages of fixed assets and supporting market facilities over the years, these cold chain logistics companies occupy absolute dominance in Chongqing's market. However, this has also led to weak sense of service of most cold chain industry service personnel, and there are even abuses of power, resulting in customer dissatisfaction. The reason is mainly due to the lack of cold chain industry supervision system, complaint handling and performance appraisal system.

2.6 The cold chain logistics costs are yet to be reduced The cold chain of cold chain logistics companies is not complete, so the chain breakage is inevitable. At the same time, the cold chain equipment is outdated, so that the temperature control is not particularly desirable, and there is a huge loss of agricultural products in the cold chain logistics process. The loss of agricultural products is naturally grafted onto intact products, thereby resulting in high logistics costs.

3 Opportunities for the development of cold chain logistics in Chongqing City

3.1 The state government and Chongqing municipal government pay high attention to cold chain logistics market and develop support policies The State Council issued Logistics Industry Restructuring and Revitalization Plan in 2009, which clearly pointed out the cold chain logistics concerning agricultural products was the key development area of logistics. Agricultural Cold Chain Logistics Development Plan issued by NDRC states that during the 12th Five-Year Plan period, the cold chain circulation rate of fruits and vegetables, meat and aquatic products in China will be increased from the current 5%, 15%, 23% to 20%, 30%, 36% or more, respectively; the refrigerated transport rate will be increased from the current 15%, 30%, 40% to 30%, 50%, 65%, respectively. MIIT and MOA jointly issued The 12th Five-Year Plan for Meat Industry, and put forward positive policies to promote the development of cold storage and cold chain logistics distribution system. Chongqing municipal government issued *Opinions on Comprehensively Promoting the Linking between Farmers and Supermarkets*, and emphasized the financial subsidies for cold chain logistics construction. It fully demonstrates that the central and local governments attach great importance to cold chain logistics market, and the cold chain logistics industry is facing good opportunities for development.

3.2 The cold chain logistics industry has huge space for development Firstly, with the process of urbanization and living standard improvement in China and Chongqing, there is an increasing demand for meat and other frozen foods, but China's current cold storage capacity can not meet the growing demand for refrigerated food storage. Chongqing now has a population of 32 million, but the cold storage capacity is only 200000 tons, far lower than China's average level. Secondly, the continuous enhancement of food safety and quality requires the many links in cold chain industrial chain (production, processing, storage, transport, distribution and marketing) to have safe operation so as to ensure food quality and safety. Thirdly, the hardware and software cold chain infrastructure is constantly improving. Thus, the cold chain industry has huge space for development.

3.3 The continuous growth of agricultural production places new demands on cold chain logistics According to the data of Chongqing Statistical Yearbook, the yield of meat, vegetables, fruits and aquatic products continuously increased from 2003 to 2013, and the growth rate of fruits was more than 50% during the decade. Most of the agricultural products locally produced, such as meat and aquatic products, are consumed by people in the downtown, districts and counties of Chongqing by the cold chain logistics, and a small quantity of products are transported to other

provinces or exported. With the improvement of people's living standards and population growth, there is a growing demand for meat, fruit and other agricultural products. After being produced, the agricultural products are bound to enter the market for circulation, and consumers place a higher demand on the freshness and quality of agricultural products. In recent years, the proportion of agricultural products circulated through cold chain logistics is growing, and the sustained agricultural production poses a new demand on cold chain logistic in Chongqing City, which also gives a new opportunity for the development of cold chain logistics in Chongqing City.

4 Recommendations

4.1 Accelerating the improvement of agricultural cold chain logistics system In order to achieve rapid development of cold chain logistics in Chongqing City, there is a need to establish a complete agricultural cold chain system covering processing, storage, transportation and sale. It is necessary to strengthen the planning, organization, coordination and control of the entire logistics and related activities, to improve the overall efficiency of cold chain. For the logistics companies, participating in cold chain system can bring stable profits and achieve broad development market. The chain breakage in Chongqing's cold chain logistics companies must draw our attention, and it is necessary to improve the integrated agricultural cold chain logistics system, develop new profit space, and find new service items, to extend the value chain and get a good profit.

4.2 Promoting cold storage logistics facility construction and technology innovation and focusing on the frozen product quality The cold chain logistics companies should always put food safety first, and pay attention to the quality of agricultural cold chain logistics. It is necessary to transform and upgrade the existing obsolete facilities and equipments in cold storage base, in order to meet temperature control requirement of frozen products, ensure quality of frozen products and improve service efficiency. In accordance with the physical and chemical characteristics of meat, vegetables, fruits and aquatic products, as well as different storage and transport conditions, it is necessary to conduct targeted technological innovation, strengthen the research, development and application of agricultural preservation technology, packaging technology, energy-saving technology, automation technology, and cold chain logistics technology. It is also necessary to ensure frozen product quality, improve service efficiency, reduce storage and transport waste due to extensive operation, and lower the operation losses and operating costs.

4.3 Striving to cultivate the cold chain logistics professionals and improve the professional quality of employees The lack of modern logistics personnel and poor logistics education have become a bottleneck on the development of China's logistics industry, and the logistics industry competition has shifted from the low-end price competition to high-end logistics and capacity competition. The cold chain logistics companies should speed up the start of modern logistics industry talent education project, and implement multi-level, diversified logistics education. Firstly, it is necessary to strengthen the high-level academic education of universities and higher vocational and technical colleges to train senior logistics management professionals; cooperate with universities which set up majors related to logistics, take the order-based training mode, and establish cold chain logistics teaching and practice base in companies. Secondly, it is necessary to focus on continuing education and regularly invite experts and scholars to train older employees within the enterprise in order to improve their theoretical level, and take reward incentives to improve work efficiency and quality.

4.4 Strengthening the construction of agricultural cold chain logistics information platform It is necessary to introduce information technology and intelligent systems to enhance the cold chain industry and customer management capabilities. The introduction of agricultural cold chain logistics information system can help us to timely grasp market trends and customer needs, minimize costs, and achieve the level accepted by consumers. Advanced GPS technology, EDI, POS machines, GIS systems and other technologies can help to achieve the integration of cold chain logistics information, synchronization and sharing of information. There is a need to introduce and use warehouse management system, and establish intelligent management platform in order to improve intelligence level of cold chain industry, and make cold storage base customers keep abreast of type, quantity and other information of frozen products; enhance management capabilities of cold chain industry and cold storage base customers, and use automated equipment and intelligent management system to improve the level of automation, reduce operating costs, and improve service efficiency.

4.5 Conforming to the trend of "Internet +" era and building a new form of cold chain logistics system "Internet +" is a business form using Internet thinking to develop traditional logistics. The core of "Internet +" logistics is logistics, and Internet provides marketing channels, trading platform and information exchange paths to logistics. The fusion of logistics and Internet has brought about the following innovative modes. (i) Logistics + E-commerce. Based on the logistics network advantages, it uses supply chain to solve product channels, and builds electronic business platform to provide commodity trading services. (ii) Wise logistics + intelligent logistics. It uses three-dimensional shelf, electronic tags, smart sorting, automatic transmission, intelligent stacking, hand-held terminals and other equipments, and uses the Internet for transmission, to achieve full automation of logistics. (iii) Big data + logistics. It uses the Internet function to collect vehicle information, cargo information, route information and other mass data by large platform or mobile terminal, and realize matching to generate logistics transaction.

4.6 Striving for the supporting policies and financial support of the government By virtue of the opportunities of the state revitalizing logistics industry and Chongqing focusing on

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to make scientific and renewable management rules and regulations on types, fishing sea areas, fishing time, fishing quantity, fishing tools and methods, access system, and supervision methods, and make revision and improvement of prohibition boundary and season of fishing. On this basis, it is recommended to further detail provisions of fishing prohibition areas and moratorium according to population characteristics of various types of living resources, fishing objects and methods, allow fishermen and related fishing ships use fishing tools and methods with specific functions in certain period and sea areas, and implement specialized fishing permit system, so as to comprehensively increase utilization efficiency of marine living resource population, provide higher quality and more foods with animal protein, increase fishery efficiency, and income of fishermen.

4.3 Actively encouraging and supporting enterprises to carry out autonomous innovation and management Relying on modern market system, through voluntary combination, autonomous management, and cooperative multi-win of fishery economic organizations, aquatic product enterprises in offshore and coastal areas of Zhejiang and Fujian provinces lead development direction of small fishery resources in coastal and offshore areas of China. Therefore, China should provide energetic support in policies and management systems, to make such new management mode bring into play wider model effect, increase added value of small fishery resource products, promote increase of fishermen's income, and provide safe and healthy aquatic products for both domestic and foreign consumers with higher quality protein.

References

[1] ZHANG QH. On fishery resources in East China Sea and its sustainable utilization[M]. Shanghai: Fudan University Press, 2007. (in Chinese).
[2] XU HX. Investigation report on fishing gear in "Hua Sheng Yu Jia 1"[R]. 2007. (in Chinese).
[3] ZENGJIN HN, PAN YJ, LE JH. Introduction to the Japanese Fishing Industry[M]. Shaanxi: Northwest A & F University Press, 2010: 6. (in Chinese).
[4] LE JH, ZHANG XG, ZHOU YQ. The management practice and enlightenment of silver anchovy resource utilization in Japan[N]. Chinese Fishery Development Strategy Research Center,2012. (in Chinese).

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building commercial circulation industry and modern logistics industry (especially agricultural cold chain logistics industry), it is necessary to understand and make full use of government support policies for agriculture, and strive for the policy and financial support of government at all levels. Firstly, it is necessary to urge municipal and district governments to strengthen the regulation and guidance on cold chain logistics industry, make regional plan and support key chain logistics companies based on characteristics of cold chain industry. Secondly, it is necessary to strive for tax support from all levels of government, promote the construction of agricultural product distribution service system, accelerate the circulation of agricultural products, ensure the safety of agricultural products in circulation, reduce losses during circulation of agricultural products, lower the early investment pressure of companies, and decrease the circulation costs of agricultural products.

References

[1] ZHAO YG. Popularizing cool storage transportation and developing Chinese cold-chain logistics[J]. Contemporary Economics,2008(18): 67. (in Chinese).
[2] SONG H. Modern logistics and supply chain management[M]. Beijing: Economy & Management Publishing House, 2000:20-36. (in Chinese).
[3] ZHANG P, CHEN SH. Prospects and development situation in low temperature storage for fruit and vegetable in China[J]. Refrigeration and Air-conditioning,2008,8(1): 5-10. (in Chinese).
[4] WU YL. Present situation and optimal measures of vegetable logistics chain in China[J]. Resource Development & Market,2007,23(4): 326-328. (in Chinese).
[5] WEN XW, DA QL. Joint distribution: The optimization selection of cold-chain logistics distribution mode in China[J]. Modern Management Science,2008(3): 13-14. (in Chinese).
[6] LIU Y, CUI BM, WANG XD. Model and improved hybrid algorithm on optimization of distribution routing problem[J]. Logistics Management,2008, 31(4): 26-30. (in Chinese).