ISSN 2616-5902 Vol. 5, Issue 14: 9-14, DOI: 10.25236/AJBM.2023.051402

Exploration of Fruits and Vegetable Distribution in Chongqing Based on the Intelligent Logistics Model

Hui Hu[1,a,*]

[1]*Business College, Southwest University, Chongqing, 400715, China*
[a]*hhswu@foxmail.com*
[*]*Corresponding author*

Abstract: *As the consumption pattern of our people gradually develops in the direction of diversification and the concept of green and safety continues to grow, people have also put forward higher requirements for the supply and quality of food. In recent years, China's logistics industry has developed rapidly, but due to the late start, the logistics infrastructure is not perfect, the lack of a unified platform for logistics, and the level of information technology is low, making the transport process loss still serious. China is the world's largest producer of fruits and vegetables, but the annual loss rate in fruit and vegetable logistics transport has been high, much higher than in other developed countries, resulting in huge economic losses. This paper carefully analyses the existing problems of fruit and vegetable logistics and distribution in Chongqing from several aspects and puts forward proposals for building a fruit and vegetable logistics and distribution system from the perspectives of the government, enterprises and society, in the hope that through logistics integration and technological innovation, the loss rate of fruit and vegetables in the transportation process in Chongqing can be reduced.*

Keywords: *fruit and vegetable logistics and distribution; logistics integration; technological innovation; fruit and vegetable loss rate*

1. Introduction

With the rapid rise of the economy and the increasing demand for material living standards, fresh produce logistics are developing rapidly, making the transport and circulation of fruits and vegetables more widespread. China is a large agricultural producer, and according to the 2022 China Statistical Yearbook, the country had 128,080 km^2 of fruit orchards and 219,860 km^2 of vegetables at the end of 2021, showing a good trend of year-on-year growth. Secondly, China's fruit and vegetable exports totalled $25,059 million in 2021, an increase of 1.72% year-on-year, and the market is well supplied and in demand.

However, because of their high moisture content, short shelf life, crash vulnerability and seasonal and regional characteristics, fruits and vegetables are prone to deterioration and spoilage during transport and become inedible. The loss of fruit and vegetables during transport has become a global problem that has received widespread attention. According to the relevant data from the China Federation of Logistics and Purchasing, the current corruption rate of fruit and vegetable logistics in China is more than 20%, while the loss rate of fruit and vegetables in developed countries is generally controlled at less than 5%. It can be seen that China's fruit and vegetable logistics and transportation system compared to the world's advanced level there is still a certain gap.

As a major agricultural province in the southwest of China, the output of fruits and vegetables in the Chongqing region is very large. According to the government statistical yearbook, the total output of fruits and vegetables in the Chongqing region in 2021 was 27,375,200 tons, and every year it faces a large amount of fruit and vegetable logistics transportation problems. At present, most of the logistics of fruits and vegetables in Chongqing are still natural. With the development of technology in recent years, such as packaging, grading, pre-cooling, cold chain transportation, preservation and logistics information systems have gradually started to be used in the transportation of fresh fruits and vegetables. However, due to the late start of China's logistics development, the logistics infrastructure is not perfect, the logistics system is still mostly in the traditional logistics mode, the lack of advanced logistics technology and logistics personnel, so there are still some problems and shortcomings in the process of the specific application of technology. The logistics of fruits and vegetables in Chongqing is facing the problems of the low utilization rate of cold chain equipment, low level of logistics information, high logistics cost

ISSN 2616-5902 Vol. 5, Issue 14: 9-14, DOI: 10.25236/AJBM.2023.051402

and high loss rate. Therefore, it is very important to analyze and research the development of fruit and vegetable logistics under the intelligent logistics mode.

2. Literature Review

After the early stages of competition in various industries, the markets in the 1920s are close to saturation and to improve their competitiveness, many companies are turning their focus to the "Third Source of Profit" - Logistics. As one of the industries that emphasize timeliness, freshness and safety, the logistics requirements are even more demanding. Under the premise of ensuring timeliness, the high loss rate of fruit and vegetable transportation is a long-standing problem, how to reduce the loss of fruit and vegetables in the logistics process has become an important means of reducing logistics costs. Many scholars and experts at home and abroad have conducted in-depth research in this field, analyzing ways to reduce the loss rate of fruit and vegetable transportation from the aspects of cold chain technology, information technology and business model.

Numerous scholars have conducted detailed studies on cold chain logistics technology, and the development of cold chain preservation technology and logistics preservation industry for fruits and vegetables is considered very important [1]. Some studies have proposed a sound cold chain logistics and distribution system from producer to distribution and then to consumer [2]. Some scholars have designed an insulated packaging container for pre-cooling and refrigerated transport of fruits and vegetables at the origin [3].

In terms of the construction of logistics information systems, the construction of a network information platform for the fruit and vegetable logistics market is the main research direction [4]. A real-time detection system for temperature, humidity and geographical information of cold chain logistics based on the Internet of Things has also been proposed [5]. Cold chain transport is often linked to the construction of logistics information systems in existing studies. For example, some scholars have suggested building a cold chain logistics system for the fruit industry to improve standardization and information technology [6]. Some scholars have also suggested accelerating the construction of cold chain infrastructure and information technology [7].

In analyzing the causes of losses of agricultural products in logistics, some studies have used factor analysis and Q-type clustering to quantify the logistics loss problem [8]. Some studies have also proposed a unique fuzzy multi-criteria decision-making method to reduce losses through the evaluation and selection of logistics suppliers [9].

From the perspective of logistics preservation, some studies have analyzed domestic and international research on logistics packaging technology for fruits and vegetables [10]. Some scholars have also studied the application of ozone micro-nano bubble treatment vegetable preservation technology in logistics and transportation [11]. It is also more common to apply the idea of supply chain system management to study fruit and vegetable logistics systems [12,13].

In this paper, based on the existing research, we analyze the logistics and transportation problems of the fruit and vegetable industry in the context of smart logistics mode and give suggestions, taking into account the specific situation of the Chongqing area.

3. Current status of fruit and vegetable logistics in Chongqing

3.1. The smallholder business model

Most fruit and vegetable cultivation and marketing in Chongqing is small and scattered, making fruit production and transportation largely fragmented, and this fragmentation does not improve with the improvement of individual fruit cultivation techniques or the expansion of cultivation areas. The family-based production unit, which is very common in China, is fragmented, small-scale and technologically backward. As a result, the transport of such products is limited to individual logistics or small logistics enterprises, which do not have the necessary transport conditions and transport technology for fruit and vegetable logistics, resulting in high rates of damage to fruit and vegetable transport.

3.2. Insufficient attention from the government

Domestic supervision of logistics is not strong enough, and the laws and regulations for the logistics industry are not perfect enough, which seems to lag compared to the rapidly developing society. No clear

ISSN 2616-5902 Vol. 5, Issue 14: 9-14, DOI: 10.25236/AJBM.2023.051402

standards have been established for the construction within the logistics industry in China, resulting in a mixed logistics industry with a relatively low threshold, directly affecting logistics enterprises' quality. The relatively short development time of Chinese logistics enterprises and the low accumulation of experience have led to a lack of talent, capital and technology in China's logistics industry, and a lack of a safe and stable environment for individual enterprises to carry out reforms and innovations.

3.3. Imperfect logistics infrastructure

Compared with other developed countries, China's logistics started relatively late, and the infrastructure construction is not perfect. The transport infrastructure such as railway, highway and air transport, the operation infrastructure such as information management centre, distribution and consolidation centre, and the hardware facilities such as cold chain vehicles, warehouses and other related logistics infrastructure are relatively backward and cannot adapt to the rapidly developing logistics needs of China. The complex road situation in the Chongqing area, the lack of global planning of regional logistics nodes and the lack of uniformity in the number and standard of warehouses around the region have increased the difficulty of logistics transportation.

3.4. Lack of professional logistics talents

China's logistics education started late, with the first major in logistics management being offered at the Beijing Institute of Materials in 1998. It can almost be said that China did not start to train logistics professionals until the 21st century. Although as of 2018, there are 655 distribution points of undergraduate logistics majors in mainland universities, the overall twenty years of training time also seems very thin compared to the West, making it difficult to form a systematic way of training logistics talents. And many logistics companies are transformed from traditional warehousing enterprises and automobile enterprises, relying solely on the rule of thumb and the principle of profit, and do not have specialized knowledge of logistics management and have limitations in their thinking.

3.5. Logistics information technology is backward

At a time when big data and the Internet of Things are developing at a high speed, the information technology of China's logistics industry appears to be very inadequate, including network computing technology, real-time positioning technology, electronic data exchange, real-time data monitoring technology, radio frequency identification technology and so on.

For the Chongqing area, the factors that limit the development of information technology in the regional logistics industry are manifold. In some areas, due to the backwardness of the economic level, the vast majority of ticket statistics are still in the form of paper, which is manually entered, error-prone and does not facilitate centralized statistics. This makes the collection of data more difficult and does not facilitate the flow of information on logistics. Moreover, the lack of a unified bill of proof in the region and the lack of uniformity in logistics information between logistics enterprises make it difficult to coordinate information between the various enterprises. The backwardness of technology and the lack of standards has led to a large investment in human, material and financial resources, making the logistics costs in the Chongqing region high.

3.6. Backwardness of preservation technology

Fruits and vegetables are prone to collision damage and short life cycles and are prone to spoilage during transport, which places high demands on the environment and timeliness of transport. The main technologies used in the field of fruit and vegetable preservation are physical and chemical preservation, which require different preservation methods for different properties and values of fruit. There are a variety of preservation methods on the market such as coating, high-pressure preservation, critical low-temperature and high-humidity preservation, and low-dose radiation pretreatment preservation [14], but fruit and vegetable logistics companies are not able to use reasonable preservation methods for different fruits and vegetables due to cost saving or lack of professionalism, resulting in high spoilage rates.

Recent research has focused much attention on cold chain transport. Cold chain transport means that the goods transported are always kept at a certain temperature during the whole process of transport, whether it is loading and unloading, changing the mode of transport, changing the packaging equipment, etc. The cost of cold chain transport is high and the technical requirements are high. Compared to developed countries, China's cold chain logistics transport is still in its initial stage. The number of infrastructures such as cold storage and refrigerated vehicles is insufficient, and the relevant data shows that the proportion of refrigerated vehicles in China is only 10%-30% of that in developed countries.

ISSN 2616-5902 Vol. 5, Issue 14: 9-14, DOI: 10.25236/AJBM.2023.051402

Due to the high technical and environmental requirements of cold chain logistics equipment, the existing cold chain logistics equipment and facilities in China are slow to be updated, which does not match the rapidly growing demand for fruit transportation. The lack of logistics information also leads to information lag in the cold chain transportation process, resulting in a higher rate of fruit spoilage in cold chain transportation, which does not reach the effect of developed countries. The cost of cold chain transport is high, and the small fruit and vegetable logistics enterprises common in the Chongqing area do not have the financial ability to provide cold chain transport conditions and adopt other cheap methods of preservation to save costs, and lack the awareness of cold chain transport, making the regional cold chain circulation rate proportionally low.

4. Suggestions for fruit and vegetable logistics

4.1. Strengthen the government's attention and support

Chongqing government departments need to strengthen the importance of the fruit logistics industry, introduce relevant policies to regulate standards within the industry, and introduce relevant laws and regulations to regulate and restrict the industry internally. Given the fact that China's logistics system lags behind that of developed Western countries, the state needs to provide some support to the logistics industry. In particular, the government needs to encourage large-scale joint production and cooperation among individual households to effectively integrate and utilize idle resources to solve the current situation of a small and scattered fruit logistics industry and achieve comprehensive management. The government needs to invest in the construction work of fruit logistics infrastructure, lower the threshold for enterprises to enter the logistics market, encourage more enterprises and individuals to engage in logistics work, and encourage entrepreneurs to develop an innovative logistics industry.

In August 2021, the General Office of the State Council issued the "Proposal of the General Office of the State Council on Accelerating the Construction of Rural Mailing and Logistics System", which reflects the importance that our government attaches to logistics. The Ministry of Commerce of the People's Republic of China has proposed the development of a "farm-to-table" approach to agricultural products, supporting the docking of supermarket chains, agricultural products distribution enterprises and agricultural products professional co-operators. This measure directly links the suppliers and sellers of agricultural products together, eliminating the need for complex third-party logistics companies and effectively reducing costs. Secondly, the time between picking and selling is shortened, and the freshness and safety of the fruit are guaranteed, thus ensuring food safety for consumers. At the same time, this measure can promote the fruit growers to increase their income and solve the problem of the farmers' marketing. For example, the Yong Hui supermarket has established cooperation with local orchards to supply some of the fruit directly, which not only ensures the freshness of the fruit but also offers very favourable prices.

4.2. Speed up the construction of Chongqing's logistics infrastructure

Building transport infrastructure requires the government to continuously plan and improve the construction of China's road and railway network on the one hand, and the transport supervision department to strengthen the maintenance and repair of existing roads on the other. For each transport centre city, the role of urban transport hubs can be constantly improved through reasonable planning, and a complete range of transport systems such as roads, railways, water transport and shipping can be built, giving full play to the advantages of water transport along the Yangtze River in the Chongqing area to meet the regional transport needs. Various fruit and vegetable logistics enterprises need to improve their transport equipment, such as cold chain vehicles, cold storage, large-scale cargo volume transport vehicles and other facilities, according to the actual situation of the enterprises as well as their business scope. Also need to improve the distribution centre, distribution centre cargo throughput capacity and processing capacity, and constantly improve the ability of scientific and technological innovation to provide a superior environment for the transport of fruits and vegetables.

4.3. Cultivating talents in logistics management

First of all, the Ministry of Education of the People's Republic of China should pay more attention to logistics engineering and management and set up more majors in universities across the country. Secondly, universities should pay attention to the mode of training logistics management talents, logistics engineering and management is a discipline with very close contact with reality, pure theoretical knowledge learning is far from enough, must be combined with the reality in society, should pay more attention to the combination of theory and practice. In terms of curriculum education, effective logistics management teaching activities are carried out and relevant personnel training programs are developed

ISSN 2616-5902 Vol. 5, Issue 14: 9-14, DOI: 10.25236/AJBM.2023.051402

in conjunction with specific teaching contents. Cooperation between schools and enterprises is strengthened, and training content on logistics is developed together with logistics enterprises. Enterprises put forward training needs according to the current situation of the social industry, and schools develop theoretical contents of training according to the needs of enterprises. New trends and technologies in logistics are brought into the classroom through lectures, investigations and practice so that students can keep up with the dynamics of the industry [15]. The university researches the actual situation of the logistics industry and analyses the actual situation of different jobs and sectors so that the students can be taught according to the actual needs of the industry [16]. We will train a group of logistics professionals who meet the needs of the new era and contribute to the development of China's logistics industry.

4.4. Implementing the construction of a logistics information technology system

The most intuitive utility of implementing the construction of logistics information technology is to integrate logistics data and improve the operational efficiency of enterprises. Secondly, the efficiency of logistics delivery enhanced by the construction of information technology can largely reduce the loss of logistics. To promote the construction of the logistics system of information technology, it is necessary to build a comprehensive and integrated logistics management platform, to effectively integrate logistics enterprises and individual households in Chongqing, and to solve the problem of high management costs brought about by the traditional management mode of information asymmetry, untimely data and unified standards. At the same time, enterprises need to create an electronic trading platform to process a large amount of data from logistics enterprises and analyze the preferences of customers to develop different solutions. With the help of big data and cloud platform for a large number of various types of data, the actual situation to achieve accurate grasp, reasonable and effective planning and allocation of human and material resources and financial resources enterprise's future development should be towards the development of information technology direction, with value-added services as a new value growth point for the modern service industry.

4.5. Development of preservation technologies

There is a wide range of freshness technologies available on the market and more logistics companies are using a combination of freshness technologies to achieve better results. However, for small and medium-sized third-party logistics companies or individual operators, the high cost of preservation can significantly reduce profits. To gain more profit, they generally opt for inexpensive but poorly insured preservation methods. Therefore the first thing is to promote a joint approach to production and transport and to reduce the randomness of logistics companies. Secondly, there is a need to constantly innovate preservation technology. In addition to traditional chemical and physical preservation technology, research into biological preservation technology has been very hot in recent years. Biological preservation technology uses the competition between microorganisms to kill germs to achieve the purpose of freshness. Although the price of biological preservatives on the market is also high, their green and harmless nature is the trend of the times and companies and universities can increase their research efforts in this area. For companies capable of providing high-end fruit preservation services, the implementation and supervision of preservation technology can be strengthened to ensure that the phenomenon of saving costs for profit does not occur and that attention is paid to the implementation of preservation technology, especially cold chain transport. Develop more efficient preservation techniques based on what is already available and continue to innovate and discover greener and healthier preservatives.

4.6. Improving the packaging of fruit

A large part of the loss of fruit and vegetables during transport is also due to the unreasonable packaging materials for fruit and vegetables, resulting in improper preservation of fruit and vegetables. The importance of packaging materials for fruits and vegetables as the environment in which they have been stored during transportation cannot be overstated. The government should actively encourage and guide enterprises and universities to develop new packaging materials for fruits and vegetables so that the packaging materials have characteristics such as environmentally friendly materials, inflatable shock absorption, air conditioning to preserve freshness, folding and storage, and reasonable size. Make it in the transportation process to a great extent to maintain the freshness of fruits and vegetables, and reduce the logistics loss rate.

ISSN 2616-5902 Vol. 5, Issue 14: 9-14, DOI: 10.25236/AJBM.2023.051402

5. Conclusion

With the development of the economy and people's increasing requirements for material living standards, China's fruit and vegetable market is bound to become more and more prosperous. Reducing the loss rate of fruits and vegetables is not only a means to promote the production of fruits and vegetables but also an important measure to improve farmers' income and promote the development of the fruit and vegetable trade market, as well as an important element of agricultural industrialization and a necessary path for China's agricultural development. Building a sound logistics system for fruits and vegetables in China can reduce the cost of agricultural production and increase the total value of agricultural output, especially for today's growing population and decreasing arable land is of special significance.

In Chongqing, due to its geographical location and economic conditions, fruit and vegetable logistics is lagging, requiring the joint efforts of the government, logistics companies, individual operators, universities and other entities. Construction of information technology, intelligent, green and safe fruit and vegetable logistics and transportation system, reduce logistics losses, to the world's advanced level, to make a greater contribution to China’s economic development.

References

[1] Zhang P, Chen S, Li Z, et al. Developing cold chain technology for fruits and vegetables to ensure food safety[J]. Food Research and Development, 2014, 35(18): 354-358
[2] Cui Y. Problems and countermeasures in logistics distribution of fruit and vegetable products in Jilin region [J]. Chinese Journal of Agricultural Resources and Regional Planning, 2016, 37(07): 220-223.
[3] Quan H, Zhi X, Yang F, et al. Design and performance testing of portable cold storage and insulation packaging for fruit and vegetable logistics[J]. South China Fruit, 2015, 44(4), 30-34.
[4] Cai W. Research on the construction of network information platform of Guangxi fruit and vegetable logistics market system[J]. Social Sciences in Guangxi, 2018, 281(11): 48-51.
[5] Liang K, Xiao H, Du Y, et al. Real-time monitoring system for fruit and vegetable cold chain logistics based on IoT technology[J]. Jiangsu Agricultural Sciences, 2015, 43(11): 519-521.
[6] Tian C. Exploring the Cold Chain Distribution of Fruits in Jiangsu under E-Commerce Mode[J]. Food Research and Development, 2022, 43(02): 227-228.
[7] Tang X, Leng X, Yang L, et al. Analysis of the current situation and countermeasures of cold chain logistics for fresh agricultural products in Yunnan Province[J]. Logistics technology, 2014, 24: 14-19.
[8] Gao J, He P, Chen X, et al. Analysis of the causes of agricultural product logistics losses[J]. Logistics Engineering and Management, 2015, 37(05): 38-41.
[9] Raut R D, Gardas B B, Narwane V S. Narkhede, B. E. Improvement in the food losses in fruits and vegetable supply chain - a perspective of cold third-party logistics approach[J]. Operations Research Perspectives, 2019, 6, 100117.
[10] Gao H, Yang H, Chen H, et al. Research and perspectives on fresh fruit and vegetable logistics and packaging technology[J]. Journal of Food Science and Biotechnology, 2020, 39(08): 1-9.
[11] Yang Y, Chen Q, Zhang H. The Application of Ozone Micro-nano Bubble Treatment Vegetable Fresh-Keeping Technology in Air Logistics Transportation[J]. Advances in Materials Science and Engineering, 2022, 4981444.
[12] Jin L, Zhou X. Exploring the construction of supply chain logistics system for fruits and vegetables in Jiangsu [J]. Jiangsu Agricultural Sciences, 2013, 41(04): 414-417.
[13] Zhao S, Li H. Study on the Export Logistics Model of Xinjiang Fruits and Vegetables Agricultural Products from the Perspective of Supply Chain[J]. Journal of Xinjiang University (Philosophy - Humanities and Social Sciences Edition), 2021, 49(3): 10-18.
[14] Long X, Zhang F, Bai L, et al. Wang, Y. A silver-loaded nano-TiO2 method for preserving the freshness of Nanfeng honey tangerine[Z]. 2013.
[15] Xie J. A study of strategies to develop smart logistics talent in Suzhou[J]. Market Modernization, 2020, 928(19): 46-48.
[16] Han X, Jia D, Yan F. Research on the teaching practice of logistics management professional talents training [J]. ShangXi Youth, 2021, 612(23): 74-75.