The Construction of Cold-Chain Logistics Park of Agricultural Products in Sanshui from Two-stage Perspective

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Abstract This paper firstly analyzed the operation model, market positioning, market demand forecast as well as market competition and challenges, park site selection, and transportation conditions for construction of the Cold-Chain Logistics Park of Agricultural Products in Sanshui. Then, it presented the overall planning scheme for construction of the Cold-Chain Logistics Park of Agricultural Products from a progressive two-stage perspective of overall planning and stage-by-stage implementation. The first stage mainly performs the function as a transaction platform of agricultural products and meanwhile provides customers with agricultural products storage and inspection services. The second stage adds value-added services such as distribution processing, modified atmosphere storage, freezing and refrigeration, market price information distribution, E-commerce of agricultural products and personalized services. It is expected to provide references and suggestions for the construction of the Cold-Chain Logistics Park of Agricultural Products.

Key words Cold-chain logistics, Logistics park, Agricultural products

Currently, Guangdong Bureau of Reclamation (hereinafter referred to as GBOR) is implementing a strategy of industry layout adjustment and transformation. A part of the strategy is how to revitalize existing lands so that they are used for services with a higher value added. Sanshui Warehouse of GBOR locates in Leping Township, Sanshui District, Guangdong Province. This warehouse is engaged in common storage services with a low value added all the time. In addition, it has large area of unused land. With the rapid development of economy and society in China, the development of cold-chain logistics of agricultural products is accelerated throughout the country to meet the need for an integrated cold-chain logistics system “from farm to dining-table”. Based on such market need, in order to make good use of this warehouse land, GBOR proposes to make the warehouse a cold-chain logistics park of agricultural products in Sanshui for agricultural reclamation in Guangdong which can create high value added (hereinafter referred to as the Cold-Chain Logistics Park).

Construction of the Cold-Chain Logistics Park would be a systematic and huge project. In order to ensure the feasibility of the construction of this park, objective and accurate market positioning, market analysis, park site selection and transportation condition analysis are carried out so as to make a more reasonable and practicable overall planning for the construction of the Cold-Chain Logistics Park.

1 Market positioning of the Cold-Chain Logistics Park

1.1 Meaning of Cold-Chain Logistics of Agricultural Products Cold-chain logistics is derived from the food cold chain. Agricultural products including vegetables, fruits, meat and aquatic products require low-temperature distribution so that they can preserve to the maximal extent their intrinsic freshness, color, flavor and nutrition as natural foods, so cold-chain logistics emerges at the right moment[1]. The Cold-Chain Logistics Park of Agricultural Products is a large comprehensive logistics park which brings various cold-chain logistics enterprises together to implement specialized, large-scale and intensive operation and integrates services such as processing, freezing, refrigeration storage, import and export of agricultural products. Agricultural products are characterized in highly seasonal production, easy deterioration and demanding transportation conditions, which directly results in large circulation loss, high logistics cost and low logistics efficiency[2].

1.2 Market positioning of the Cold-Chain Logistics Park The Cold-Chain Logistics Park depends on the advantage of abundant agricultural resources in Sanshui and its surrounding areas, follows a development path of "large leading enterprises drive the development of a large base and a prosperous industry", forms an operation model of "cooperative/household + logistics base + agricultural products market", and prepares to build a large comprehensive, multi-functional and modern cold-chain logistics park that delivers integrated services including freezing and refrigeration, modified atmosphere storage, distribution processing, agricultural products transaction, information service, agricultural products quality inspection, personalized demand service and logistics. A logistics center for distribution of agricultural products in Foshan area that is basically "based on Sanshui, radiating to Foshan, and serving the Pearl River Delta Region" is formed by cultivating market players, standardizing market order, accelerating circulation and development of agricultural products, and facilitating farm’s incoming growth and all-around development of ru-
2 Market analysis of the Cold-Chain Logistics Park

2.1 Abundant high-quality resources of agricultural products

The fruits, vegetables and aquatic products here are delivered to markets throughout China. The agriculture in Sanshui District, Foshan City is divided into three parts, namely livestock, aquatic products and vegetables. The fruits, vegetables and aquatic products of Sanshui are gradually entering large cities like Guangzhou and Foshan as well as domestic markets including Northeast China and Shanghai. For example, enterprises including Sanshui Lidalong Subsidiary Agricultural Products Plantation have been supplying vegetables for provincial government, Provincial Department of Finance, Chinese Armed Police Force of the province and hospitals and colleges and universities of Guangzhou\(^3\). Furthermore, the agricultural products of Sanshui are quite popular in Hong Kong and Macao, with its "clean vegetables" directly supplied to Hong Kong and Macao. "Sanshui flowering cabbage" has extended to public dining-table and become a special "street brand" in the agricultural products market in Hong Kong. "Sanshui flowering cabbage" is also very popular in various supermarkets in Hong Kong and Macao. For example, enterprises like Aonong Vegetable Plantation Co., Ltd. in Sanshui Datang Agricultural Park supply vegetables for Hong Kong and Macao everyday, and have established a long-term cooperation relationship with PARKnSHOP Supermarket HK\(^3\).

In addition, Sanshui District positively promotes new agricultural technologies and varieties to keep increasing the grade and level of agricultural development. The site selection for construction of the logistics park has one requirement, among others, that is to analyze supply and demand distribution\(^4\). Continuous supply of the above mentioned agricultural products resources is a key link for the balance of market supply and demand. The supply of abundant local agricultural products is bound to cause logistics cost to reduce and facilitate sound and long-term development of the Cold-chain Logistics Park.

2.2 Market demand Forecast of the Cold-Chain Logistics Park

There is still a large gap between the cold-chain logistics of agricultural products and the market demand. The development of cold-chain logistics of agricultural products in China is still in a fledging period, where a systematic and large-scale system of cold-chain logistics is not formed yet and there is still a large gap compared with the need for development of modern agriculture, expansion of agricultural products export and consumer demand. At present, in China the proportion of cold-chain circulation of fresh agricultural products is far lower than that of the developed countries in Europe and America (the rate of cold-chain circulation of vegetables and fruits in the developed countries has reached above 95% , and their rate of cold-chain circulation of meat and poultry has reached 100% ), and most fresh agricultural products are still circulated at normal atmospheric temperature. Our supply chain of the cold-chain logistics is not systematic, standardized and coherent. Many agricultural products adopt low-temperature treatment during the storage process, but this chain is "broken" in processes like transportation, sales and so on. Therefore, the rate of all-around cold-chain is low\(^5\).

The market has present higher requirements for the cold-chain logistics of agricultural products. In view of the experience of development of international agricultural products circulation industry, western countries have established a supply chain system of integrated cold-chain logistics "from farm to dinning-table", which not only ensures the quality of agricultural products, but also increases agricultural output. With the rapid development of economy and society in China, in order to adapt to the large-scale circulation of agricultural products, meet consumer needs and facilitate farmers to increase their incomes, the society has present a stricter demand for accelerating the development of the cold-chain logistics of agricultural products.

The cold-chain logistics in Guangdong Province has seen a new development period. Guangdong Province has considered the cold-chain logistics of agricultural products as a key area for development of modern logistics industry. With the development of modern logistics industry and more detailed segmentation of market, people are attaching more and more importance to the management of cold-chain logistics of fresh agricultural products and food. Each level of governments in Guangdong Province is working hard on planning and policy research of the cold-chain logistics industry and is positively carrying out good planning and arrangement of key projects and parks. In recent years, the construction scale of cold storages has been increasing by about 20% each year, and the revenue of cold-chain logistics is increased year by year.

The potential of market demand for cold-chain logistics of agricultural products in Sanshui and its surrounding areas is huge. As the yield of famous local agricultural products is increased year by year and the sales market is gradually increasing, the fresh storage need and quality requirement of agricultural products are increased accordingly. Currently, many specialized farmers' cooperatives perform logistics transportation of agricultural products through their own logistics. However, such way of "fighting alone" of farmers can not withstand external market risks, and the
market is in urgent need of a group of core cold-chain logistics enterprises with strong competitive power and resources integration ability.

In addition, various large industrial enterprises and upscale hotels is pulling up the demand for the cold-chain logistics of agricultural products. Industrial enterprises in various local industrial parks and upscale hotels in Sanshui Township is the main sales channel of agricultural products and one of the main consumer groups. This will greatly pull up the market demand for cold-chain logistics of agricultural products. This phenomenon is proven in Guijiang Comprehensive Wholesales Market of Agricultural Products in Dali, Foshan, the main consumer group of which at present is various nearby private enterprises and hotels.

2.3 Market competition and challenges of the Cold-Chain Logistics Park

The first competitor to face for the Cold-Chain Logistics Park of Agricultural Products is enterprises related to the cold-chain logistics of agricultural products in Sanshui District and its surrounding areas, such as Foshan Cross-Strait Creative Agriculture Center in Sanshui, Guangdong Guotong Logistics Center Co., Ltd. which is a "National Key Leading Enterprise in Agriculture Industrialization" in Shunde District, Zhongnang Agricultural Products Exchange Center in Nanhai District, Foshan, and Guijiang Comprehensive Wholesales Market of Agricultural Products in Dali. These developed strong enterprises of cold-chain logistics of agricultural products have the first-mover advantage, and the market of cold-chain logistics of agricultural products already taken by them would pose a direct challenge for the development of late comers.

The cold-chain logistics of specialized farmers’ cooperative would cut down the market space. Currently, many local specialized farmers’ cooperatives depend on their own logistics to perform transportation of agricultural products. This traditional self-sufficient approach would prevent them from entering the Logistics Park or outsourcing the transportation of agricultural products to third-party cold-chain logistics enterprises of agricultural products, so their existence would hamper the benign development of the local cold-chain logistics market. The logistics bases in Sanshui and its surrounding areas would bring indirect influence on the Cold-chain Logistics Park. The logistics bases in Sanshui and its surrounding areas are mostly comprehensive logistics parks. Though they are not specialized cold-chain logistics bases of agricultural products, they can absorb part of the market need for cold-chain logistics of agricultural products, which will cause a certain negative influence on the market development of the cold-chain logistics of agricultural products.

3 Advantageous location of the Park site

The site of the Cold-chain Logistics Park locates in Leping Township, Sanshui District, Foshan City. Sanshui District is in the northwest part of the Pearl River Delta Region, with Huadu District of Guangzhou City to its east, Nanhai District of Foshan adjacent to its southeast, Sihui City of Zhaoping bounding to its north-west, Qingyuan City to its North, and Gaoyao City of Zhaoping and Gaoming District of Foshan just on the other side of the river on its southwest. The entire district is in the heart of the Economic Development Area of Pearl River Delta, and Xi’nan Street where the Sanshui government resides is 24 kilometers from Foshan City, 35 kilometers from Guangzhou City, 230 kilometers from Hong Kong and 195 kilometers from Macao. It is only 20 minutes’ driving to the new Baiyun Airport in Huadu, Guangzhou. It has the location advantage of the economic circle of the airport in Huadu and it is within the "1-hour economic and life circle of Guangzhou", so its location condition is quite advantageous.

4 Transportation conditions richly endowed by nature

Sanshui District is a key junction in "Guangzhou-Foshan-Zhaoping Economic Circle", and it is also the cut-throat place and an important transportation hub of the southwest part of China, northern Guangdong and western Guangdong. Currently, the whole region has formed a three-dimensional transportation network system of expressway, national highway and railway combined with waterways with Xijiang River and Beijing River as the framework.

There is an extensive and convenient highway system. 324 National Highway, 321 National Highway, Sanshui-Zhaoping Expressway and Guangzhou-Sanshui Expressway, among others, run across Sanshui. The Class I road of Sanshui Highway runs from south to north and connects together various townships of the district. The "Village-Village Cement Road Project" has made village-level cement road coverage in the whole district exceed 340 kilometers, which extends highway transportation into every natural village.

Sanshui District is an important hub for railway transportation throughout China. In addition, Sanshui is also the terminal and starting stations of railway transportation arteries like Guangzhou-Sanshui Railway and Sanshui-Maoming Railway. Guangzhou-Zhuhai Railway with an overall length of 187 kilometers has setup Beijiang Station in Sanshui. Furthermore, Sanshui is also the intermediate station of both Nanning-Guangzhou and Guiyang-Guangzhou Railways. Therefore, railway passenger and goods transportation here is fast and convenient.

Sanshui District also has great advantages in terms of water transportation. Xijiang River, Beijiang River and Suijiang River converge here, and the trunk and branch streams of Xijiang River is the main water transportation channel in Sanshui District. The entire district has planned twelve 15-kilometers port shorelines and three tourism terminals. There are over 20 large or small terminals including container terminals located on Xijiang River and Beijiang River. Among them, the Sanshui Port built and put into service in 2000 is the public terminal with the largest scale and strongest stevedoring capacity within the district. It can berth 3000-ton ships, with an annual throughput up to 2 500 000 tons and a container yard area of 150 000 square meters, and it is one of the largest ports with a large scale in Xijiang water area.
5 Overall planning of the Cold-Chain Logistics Park

Based on the aforementioned market positioning of the Cold-chain Logistics Park as a distribution center of agricultural products, the market analysis about the large potential of market demand for cold-chain logistics of agricultural products in the surrounding areas as well as the corresponding advantageous park site location and excellent transportation conditions richly endowed by nature, a two-stage overall plan for the construction of the Cold-Chain Logistics Park of Agricultural Products in Sanshui, Guangdong can be made.

5.1 Two-stage overall plan

The general layout of the Cold-Chain Logistics Park mainly consists of agricultural products wholesale transaction area, specialized freezing/refrigeration storage and distribution processing areas, with general office area, supporting service area and so on. It shall have clear area separation, reasonable layout, smooth process and high security and reliability. The construction of the Cold-Chain Logistics Park adopts a systematic approach that combines buildings, logistics channels and wholesale transaction squares.

For better development of the Logistics Park and based on a progressive development principle, the construction of the park is divided into two stages (see Figure 1 for the overall plan for the construction of the Cold-Chain Logistics Park made according to the trapezoid-shaped construction land and its actual area). The first stage mainly performs the function as a transaction platform of agricultural products as well as provides customers with agricultural products storage and agricultural products inspection services. The second stage is to expand the function of the first stage and to add functions of value added services such as distribution processing, modified atmosphere storage, freezing and refrigeration storage, market price information distribution, e-commerce of agricultural products, and personalized services. Based on the actual business operation after construction of the first stage, the subsequent construction content and plan can be adjusted according to the economy benefits of the park to better exert the due function of the logistics park and reduce the market risks. In addition, finishing the overall construction by dividing it into two stages can also reduce the pressure of construction funds.

The first stage construction of the park should be consistent with the construction layout of the overall plan. In terms of the park land planning, for functions to deliver in the first stage, the construction scale shall be reduced while expansion land for subsequent construction of the park shall be reserved. Meanwhile, the land demand for premises for new logistics functions added in the planning of the second stage shall be met.

![Fig. 1 Overall planning for the construction of the Cold-Chain Logistics Park of Agricultural Products in Sanshui, Guangdong](image)
In addition, the construction of the Cold-chain Logistics Park shall fully take advantages of ICT (information communication technology) to improve its operation efficiency. For construction of the comprehensive logistics information platform of the park, better use of storage information system, RFID, bar code technology, GPS and GIS, mobile communication technology and even information technology like Internet of Things shall be made. The construction of the comprehensive logistics information platform can also be divided into two stages - "Internal information stage" and "Supply chain information stage". The first stage is to integrate and share internal information of the logistics park and perform online processing work of various businesses of the park; the second stage is to integrate various logistics information resources in the supply chain of the cold chain of agricultural products, analyze and interpret functional demands of residing enterprises in the logistics park, related governmental function departments, industrial associations and other related parties, and incorporate processes and functions including logistics finance, insurance, customs declaration, taxes, inspection and market prices into the modular architecture design of the comprehensive logistics information platform[6].

5.2 Planning of construction of the first stage Refer to Figure 1 for the planning layout for construction of the first stage of the Cold-chain Logistics Park of Agricultural Products.

Construction of the first stage is divided into A, B and C three areas; Area A is the comprehensive service area; Area B is the agricultural products wholesale transaction area; Area C is the specialized storage area. During the planning, the characteristics of convenient transportation and clear flow line are utilized to avoid losses of commercial values due to location difference.

For the layout, Area A set in the northwest side of the park is the comprehensive service area, which includes Area A1 Comprehensive service building and Area A2 Ancillary building. Area A is near the main entrance of the park, Kele Avenue, so it is convenient to manage and facilitates to provide services for Areas B and C.

Area B agricultural products wholesale transaction area is set on the southwest and middle location of the land. In view of the main passageway in the park, Area B is divided into both southern and northern parts; the southern part includes B1 Vegetable and fruits transaction area, B2 Meat, poultry and egg transaction area and B3 Aquatic products transaction area; the northern part includes B4 frozen and refrigerated products transaction area and B5 Escort goods transaction area.

Flattened surface mainly adopts a large space design and regular arrangement of column grid to facilitate flexible division, and the entrance arrangement meets the requirement of fire evacuation.

On the east side of the land is Area C, which is the specialized storage area with a reinforced concrete structure. In combination with the main passageway in the middle, this area is divided into 5 areas; at the first stage, only Area C3 Common warehouse is constructed, while the rest four areas (C1 Parking lot area, C2 Distribution processing warehouse, C4 Modified atmosphere storage warehouse, C5 Freezing and refrigeration warehouse) shall be considered as subsequent construction content of the park.

6 Conclusions

In order to coordinate with the industry transformation and upgrading strategy of GBOR to construct Sanshui Warehouse as a Cold-Chain Logistics Park of Agricultural Products with high value added and provide the future development strategy for the Cold-Chain Logistics Park of Agricultural Products, this paper analyzes the operation model, market positioning, agricultural product resources, market demand forecast, market competition and challenges, park site selection, transportation conditions and so on of the Cold-Chain Logistics Park in Sanshui of GBOR. It presents a two-stage park development strategy. The first stage mainly performs the function of an agricultural products transaction platform and provides services such as agricultural products storage and agricultural products inspection. The second stage adds value added services and functions such as distribution processing, modified atmosphere storage, freezing and refrigeration, market price information distribution, e-commerce of agricultural products, and personalized services. This paper aims to provide clearer and more reasonable reference for the planning of construction of the Cold-Chain Logistics Park of Agricultural Products.

References


