

The Research on Chinese Agricultural Product Logistics Based on the Supply Chain^①

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Abstract: The level of the agricultural product logistics development has become one of the key aspects which decide the level of the whole development of one country agricultural economy. There are such problems as high cost, low efficiency, low socialization and marketability degree, old logistics facility and technology, lacking talented persons, impeded information and so on. From the angle of the agricultural product supply chain, the agricultural product logistics development patterns based on the supply chain have been discussed. Aiming at these questions, this article has proposed the countermeasures including exploring new agricultural production circulation pattern, cultivating and developing agricultural product logistics organizations, strengthening education and training, enlarging the government's support, speeding up the informationization construction and standardization construction of the agricultural product logistics.

Key words: Agricultural product logistics; Agricultural product logistics organization; Agricultural product logistics standardization

1 Introduction

China is a large agricultural nation, the agricultural population occupies the majority of the national population, and the agricultural product varieties are rich and the circulation is big. The level of the agricultural product logistics development has become one of the key aspects which decide the level of the whole development of one country agricultural economy. Speeding up the development of the agricultural product logistics is important to solve the “agriculture, countryside, peasantry” question, advance the agriculture industrial structure adjustment and promote the rural economy development.

In China's agricultural development process, the influence of the ideology “valuing production, despising circulation” is widespread, but the understanding of coordinate developing function of agricultural production materials, agricultural product circulation and distribution industry is insufficiencies, and the system frame of the agricultural product logistics has not been formed. The agricultural product logistics has become an important constituent of the agricultural industry development, but at present theory discussion about agricultural product logistics in China is serious deficient. Reducing the production and circulation cost of the agricultural product, guiding the production and disposition of agricultural production material, and enhancing the Chinese agriculture industrial benefit needs the modern agricultural product logistics theory instruction. Based on the connotation and characteristic of agricultural product logistics, this article has analyzed the significance of quick development of the Chinese agricultural product logistics, and has proposed countermeasures aiming at the existing questions of the Chinese agricultural product logistics development.

2 The connotation and characteristic of agricultural product logistics

2.1 The connotation of agricultural product logistics

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According to the concept of logistics in the People's Republic of China national standards logistics terms and combining the agricultural economy theory, this article has considered that the connotation of the agricultural product logistics is the process of physical distribution of the agricultural product from the supply place to the receiving place. According to actual need, basic functions including agricultural product transporting, storing, loading and unloading, packing, allocation, circulation processing, information processing are integrated in order to realize the agricultural product to keep and increase its value in the process.

The agricultural production is different from the industry and service, and in production process it is easily influenced by natural condition and crops individual life. At the same time, the fresh agricultural product also is people's daily necessity, the demand elasticity is small, has the characteristic of the expense universality and dispersive. As a result of the agricultural product characteristics, this has caused the agricultural product logistics to be different from the industrial product logistics. The agricultural product logistics characteristics display in the following aspects.

2.2 The characteristic of agricultural product logistics

2.2.1 The strong seasonal characteristic of agricultural product logistics

Because there are different natural conditions such as climate, water and soil, different agricultural and subsidiary products varieties are suitable to plant in different regions. The agricultural production has the strong seasonal characteristic. On the one hand the production and material purchase of the farmers have the seasonal characteristic; on the other hand the output season of the different agricultural and subsidiary products is also different. This has caused the agricultural supply logistics and production logistics to have the strong seasonal characteristic.

2.2.2 The great difficulty and the strict request of agricultural product logistics

Most agricultural and subsidiary products have the characteristic of the easy putrescence and the high request to fresh degree, and need taking certain technical measures to implement management including preventing insects, moisture-proofing, antisepticising and drying in order to guarantee quality. This needs necessary logistics equipment facility, including special warehouses, special-purpose carrier vehicles, and special-purpose loading, unloading and processing equipment and so on. The agricultural logistics emphasizes safety and no pollution and requests realizing "the green logistics".

2.2.3 Many varieties and big scale of agricultural product logistics

Agricultural product variety is rich, including the grain crop, the cash crop, the livestock product, the aquatic product and so on, and the circulation is extremely big. In 2005 the grain yielded 484,010,000 tons, increased 14,540,000 tons compared to the last year, increased 3.1% production; The output of cotton was 5,700,000 tons, reduced 9.8% production; The output of oil plants was 30,780,000 tons, increased 0.4% production; The output of sugar was 95,510,000 tons, reduced 0.2% production. The vegetables and fruit steadily developed in the foundation of the optimized variety. Moreover, the purchasing quantity of agricultural production material is also extremely big, including the seed, the fertilizer, the agricultural chemicals, the mulching plastic, the agricultural tools and machinery, other raw materials and fuel that the agricultural production needs.

3 Existing questions about Chinese agricultural product logistics development

3.1 The "small peasant household" dispersed production and management way brings about low efficiency

Chinese agriculture employed population occupies the overwhelming majority, but most peasant households' production and management have still adopted the single household management way, and it is very difficult to obtain certain economical scale and this way lacks the scale benefit. At present, the purchase of China agricultural production materials such as the seeds, the fertilizer, the pesticide and the farm equipment and the sale of the agricultural product mostly adopt the dispersible way. This way has blindness, and causes the equipment utilization rate to be low and supply time of the production materials to be long and unstable. It is very difficult to meet the economy development need and the enhancement of the people consuming demand quality.

According to the Chinese logistics information center statistics, the basic situation of national society logistics total value (computed according to present value) in 2004 is as follows.

It is showed that from the table the proportion of the agricultural product logistics (barring agricultural production material logistics) total value which occupied in the social logistics total value was very small, only accounted for 3.13%, and the growth per rate was only 6.3%, it was by far lower than the 29.9% growth per rate of the national society logistics total value. This reflected that the agricultural product logistics development scale is small, the overall efficiency is low, and it has not met the economical development request.

Table 1 national society logistics total value In 2004 (computed according to present value)

item	Unit: Hundred million Yuan		
	Logistics total value	the growth per rate	the proportion
whole society logistics total value	383, 515	29.9%	
Among: Industrial product logistics total value	325, 000	30.2%	84.74%
Import cargo logistics total value	46, 000	35.9%	11.99%
Agricultural product logistics total value	12, 000	6.3%	3.13%
Regeneration resources logistics total value	325	16.8	0.09%
unit and inhabitant goods logistics total value	190	2.1%	0.05%

3.2 The low socialization and marketability degree of the agricultural product logistics

China agricultural production way is based on the household small-scale production, and its organization degree is low. The farmers enter the market by the unorganized and dispersed way, and lack the market competitive power and self-protection ability; the dispersed production and management way is incompatible with the modern logistics system requesting specialization division. The intermediary organizations development of the agricultural product logistics market is immature, their service function is not strong, and the unified work service types are limited. The pre-production information instruction and the post-production circulation processing, storing, transporting, packing, picking and distributing have not developed commendably. The entire rural market system is not perfect, and element markets including labor force, science and technology, finance, information have not come into being.

3.3 The high cost of agricultural product logistics

According to the statistics, China logistics cost generally accounts for the total cost of the product 30%-40%, but the fresh product accounts for above 60%. But in the developed country logistics cost generally accounts for the total cost of the product about 10%. The agricultural product C.I.F price in some developed agricultural country such as US, Canadian and the European Union is lower than China production price, its primary cause lies in excessively high logistics costs of China agricultural product in the process of storage, transportation, processing and sale. Most agricultural products through long-distance traffics are primary shape, and there are many low added-value products in agricultural product logistics structure.

3.4 The agricultural product intensive processing degree is low, and the added value is not high

China agricultural products sold are mostly primary products, and the proportion of processing products is small. China processed value-added ratio is 1:1.8, but US's is 1:3.8. China agriculture and food industry output value ratio is 1:0.31, but US's is 1:2.7 and Japan's is 1:1.22. Because the agricultural product intensive processing degree is low and the added value is not high, this causes that China agricultural raw products are surplus, structural contradictory is prominent, and agricultural products lack the competitive power.

3.5 The backwardness of logistics facilities and logistics technology

Agricultural product mostly needs technical processing including settling, sorting, drying, maintaining freshness, refrigerating, antisepticising and so on in the circulation process, but in China the logistics facility and logistics technology are quite backward. Take the fruits and vegetables as the example, according to the related data statistics, China has 80,000,000 tons fruits and vegetables to be rotten every year, loss is nearly 80,000,000,000 Yuan, the loss proportion is approximately 25%~30%. But in the developed country, the vegetables logistics is always in the low temperature condition, and forms one "cold chain", namely the field-picking precooling → cold storage → refrigeration truck transportation → wholesale house cold storage → supermarket cold cabinet → consumer refrigerator.

Dutch uses modernized refrigeration technical equipments to store and transport agricultural product and food. Because the process is prompt and appropriate, the loss proportion of vegetables in circulating processing is only 1%-2%. Because the logistics foundation investment of China is insufficiency, at present agricultural product logistics loss is serious and it is difficulty to enhance benefit.

3.6 Information is blocked and it is difficult to deal with market change

The agricultural product logistics efficiency and benefit have close relationship with informationization degree. The information runs through the whole course of agricultural product logistics, and from pre-production, producing to post-production, logistics information in each stage and each tache should be dealt with. At present, China agriculture information network is not perfect, the peasant households live dispersedly, their communication channel is impeded, the market supply and demand information cannot be transmit fast, and the cost of the peasant household obtaining the market information is high. Because of lacking the effective information guidance, blindness lies in the agricultural materials and products production and circulation, and it is difficulty to deal with the market demand change.

3.7 Short of persons with specialized technical knowledge

Logistics professionals have become one of 12 kind of scarce talented persons in China. According to the authoritative organization's investigation, in the recent 2 to 3 years, China logistics professionals' gap will reach more than 600 thousand. Therefore, speeding up the modern logistics talented persons' training is very important to the modern logistics and the agricultural product logistics development. At present, although China already had several dozens universities setting up logistics specialty, most universities emphasize particularly on the industry logistics talented persons' training, and the agricultural product logistics talented persons are deficient. The logistics is not the simple transportation and needs certain specialized knowledge. The agricultural product logistics is so, such as flowers and plants logistics, fast-frozen fish logistics, meat logistics and other preliminary, intensive processing food logistics and so on. For example, Holland's logistics operators all must pass through the inspection and have the correlation profession employment certificate, and this guarantees the high standard of Dutch agricultural product supply chain management from stem to stern.

4 Chinese agricultural product logistics patterns based on the supply chain and the regulative measures

4.1 Chinese agricultural product logistics patterns based on the supply chain

The development of the agricultural product supply chain is a systems engineering, and needs all aspects' participation and coordinated operation. The entire agricultural product supply chain is under government's overall plan and impetus, under the market mechanism function, a Chain network structure which is formed by the agricultural product supplier, the intermediary organization, the processing and sale enterprise, and the consumer. There is a key enterprise or a key product on each agricultural product supply chain, according to different main body which displays the leading role in the logistics activity of the agricultural product chain, the agricultural product logistics patterns based on the supply chain are mainly as follows.

4.1.1 The agricultural product logistics pattern which takes the agricultural cooperation organizations as the center

Chinese region is board, the level of economy development in each place is different, and the city and countryside inhabitants' consuming demand is different. Therefore, it is not possible that agricultural product circulation organization is only one kind of pattern. According to the countryside situation, developing agricultural product circulation organization taking the cooperation as predominance plays an important role in forming the agricultural product circulation network covering the city and countryside and increasing the farmers' income. The main purpose of building up agricultural cooperation organizations is to enhance the organization degree of the agricultural production, to cultivate the farmers to enter the market by the higher organization form and the main body, and to overcome the contradiction between the small-scale production and the big market.

The agriculture of the European Union including Holland and France is quite developed, besides

the advanced agricultural production technology, the science operation and the high industrialization system, the effective and reasonable agricultural product circulation is also one of important factors which promote its agricultural development. European Union's agricultural cooperation organization is extremely developed, the countries provide with the various service and the economic cooperation such as the necessary warehousing, the transportation and the sale relating with pre-production, production, post-production for the general peasant households through organizational structures including agricultural cooperation, agricultural trade unions, agricultural companies as well as agricultural product special associations. The competitive main bodies with certain capital, business capacity and management scale have formed in order to realize the agricultural product logistics integration and scale effect.

4.1.2 The agricultural product logistics pattern which takes the wholesale markets as the center

From 1995, Ministry of Agriculture had started the construction of the agricultural product wholesale markets. So far, 11 batches, 503 fixed-point markets have been determined and have covered the national main big or media-sized cities and the host production area of the agricultural products, and play the vital role in the agricultural product circulation of the place of production and sale. Because China adopts the independent production pattern taking the family as a main body, it has formed the “dispersing - gathering - dispersing” triadic logistics pattern. Gathering logistics reaches the habitat market, then reaches the selling market through the main channel logistics, and lastly reaches the consumer through the retailing logistics and this also may be called “the double market pattern”. The logistics links of the logistics pattern are many, and each logistics transformation goes along with the transport tools' transformation, the packing transformation, the logistics organization's transformation, products' loading and unloading, storing and so on. If the transformations are not based on the logistics technical standard, transformation efficiency and cost will be higher. This kind of pattern may realize the formalization collection, distribution and logistics through the non-formalization organization way (public market platform), solves the uneconomical scale problem brought by the dispersed production through the non-organization's way to a certain extent.

4.1.3 The agricultural product logistics pattern which takes the key enterprises as the center

A batch of the strong agricultural production and circulation enterprises must be cultivated in order that the agricultural product circulation meets the demand change. Only the big enterprise can form the high technical industry chain, lead and promote the ability of the entire profession quality, and enter the international market and compete with others.

Before China began the market economy, the agricultural product circulation and logistics were realized through the organizations. For example, the state-owned grain warehousing enterprises and the state-owned grain processing enterprises all are shouldering this kind of intermediary function. After entering the market economy, in China the successful cases of logistics development pattern are many, most agricultural product processing enterprises belongs to this kind of pattern such as MasterKong, many large chain supermarkets in other countries also uses this kind of pattern. They concentrate the processing of products, and then use the retails channel to deliver products to the terminal market for the sale, carry on the backward resources conformity through the contract way, and make the production organizations into the integrated category. Yili and Mengniu are the successful cases.

4.2.4 The agricultural product logistics pattern which takes the logistics parks as the center

The development pattern of the agricultural product logistics park is based on the agricultural product logistics activity intensification and integration. Commodities circulation not only includes four basic links namely the information flow, the commercial interchange, the fund flows and the logistics, but also includes the logistics processing, packing, warehousing, transportation, retailing, and the logistics technology and the logistics management improving the logistics level. Therefore, one of effective ways realizing agricultural product logistics development is to broaden the collection and distribution function of the agricultural product wholesale markets and the agricultural product intermediary organizations' intensive function, to establish the agricultural product logistics park, and to realize agricultural product logistics intensification, integration, and formalization. The agricultural product logistics park is the synthesis logistics function point and the space which forms in the agricultural product logistics joint place. The agricultural product logistics park is the place where

different types of agricultural product logistics enterprises with the logistics facility provide many kinds of logistics service. The enterprises in the agricultural product logistics park organize agricultural product logistics activities according to the specialized principle, depend upon the overall superiority and the supplementary superiority, form certain combined effect and scale effect, and promote the integration and intensification of the agricultural product logistics development. The park not only realizes the agricultural product logistics integration, realizes the management intensification in the synthesis management realizes the formalization on the industrial colony in the logistics flow, moreover carries on the organic combination and integration, transporting, loading and unloading, the processing, information management and so on in order to form a socialized highly effective agricultural product logistics system in the park.

4.1.5 The agricultural product logistics pattern which takes the chain supermarkets as the center

In 2003 Ministry of Agriculture had issued “Opinion about Developing Agricultural Product and Agricultural Material Chain Management”, started to guide and to impel the development of China agricultural product and agricultural material chain management. In 2005 Ministry of Commerce started to implement “ten thousand villages thousand countries market project”, planed to set up 250,000 new farmer supermarkets from 2005 to 2008 in the countryside, covered 70% villages and towns of China, 50% natural villages, and gradually improved the consumption environment of the countryside in the next three years. In 2005 1150 circulation enterprises of China carried on the experiments “ten thousand village thousand countries market project” in 777 counties and cities, approximately built and transformed 70,000 standardized farmer shops. China's agricultural products were produced primarily by the individual, and the scale is small. Although many agricultural products are good, but because the channel is hindered, finally it is possible that the good products can't enter the big markets and the supermarkets. Therefore many provinces and cities are developing the “changing the agricultural exchange markets into supermarkets” or “the agricultural exchange markets + supermarkets” management pattern.

The chain supermarkets belong to the third party logistics enterprises. The third party logistics has the huge social benefit, can integrate the multitudinous logistics resources of the society effectively, and enhances the overall logistics efficiency. Its effect is extremely obvious. At present, Suoguo Limited company of Jiangsu Province which develops the countryside logistics is a typical model.

4.2 The regulative measures of Chinese agricultural product logistics based on the supply chain

4.2.1 Enhance fundamental research, and explore the new agricultural production circulation pattern

In order to enhance the market response speed of the agricultural logistics, guarantee the agricultural product reliability and quality, we should explore some new agricultural logistics development patterns, such as “company + production base + peasant household”, “distribution center + peasant household”, “processing enterprise + peasant household” and so on. Fruits and vegetables distribution in Tianyang county of Guangxi province is a successful example. This area adopts the “the company + production base + peasant household” pattern, the vegetable farmers in Tianzhou town are engaged in producing according to “the order”, the fruits and vegetables are sold by the fruits and vegetables distribution company, and this makes Tianzhou vegetables successfully enter the modern logistics market. The logistics company makes peasant household join the markets (agricultural product market and agricultural production material market), and provides logistics services including the agriculture material supply, agricultural byproducts storing, packing, processing, distributing and selling according to the market demand.

4.2.2 Cultivate and develop agricultural product logistics organizations

Through the system innovation, reconstruct, cultivate and develop agricultural product logistics organizations, make them play the vital role in the agricultural product logistics development. The agricultural product logistics organizations may be the following kinds of enterprises: One is the state-owned circulation enterprise, for example state-owned grain company, supply and marketing cooperation; secondly, develop all kinds of specialized cooperative organizations. Depend on the specialized cooperative organization, widely unite enterprise organizations of the agricultural product producing, transporting, warehousing, processing, selling, perfect agricultural product logistics channel, and make the agricultural product logistics low cost and high benefit; thirdly, cultivate the key enterprise,

make it relate with the peasant household and the production base, and enhance the agricultural product circulation efficiency. Depend on this local superiority industry, positively cultivate agricultural key enterprises which have the proprietary intellectual property rights, big industrial interrelatedness, strong impetus ability, and international competitive power, establish many kinds of union and cooperation with the peasant household; lastly, develop the agricultural product logistics enterprise. Positively support and develop many kinds of agricultural product logistics enterprises including the individual, private, Chinese-foreign joint venture. The third party logistics specialized operation can reduce many nonessential middle links in the agricultural product circulation, reduce its circulation cost, directly put the agricultural products produced by the peasant household or the production enterprise on retail merchants' shelves and even in consumers' vegetable basket. In addition, the third party logistics enterprises directly order products from the peasant household or the agricultural production enterprise according to retail merchants' feedback information, and this may reduce the agricultural production blindness, realize "order form agriculture".

4.2.3 Enhance education and training, and improve the agriculture workers' specialized technical level

In order to develop the countryside modern logistics, the logistics talented persons' training is very important. The agricultural logistics development needs a great lot of professionals in storing, processing, distribution, communication equipment, computer maintenance, and management. Therefore, increase the investment of the personnel training, associate with higher academy and the research institutions, and strengthen talented persons' training. In other countries, for example Holland, the agricultural logistics education and training was extremely developed, and the reasonable logistics talented persons' education and training system has been formed. Compared with these countries, China agricultural logistics training and education is extremely backward. Therefore, increase talented persons' training, and shorten the gap with the world. Talented persons' training may adopt the regular education, work training, pre-work training. On the one hand, expand the recruitment scale of higher academy logistics undergraduates and graduates, and train the intermediate and senior logistics talented persons; On the other hand, make the plans and steps to carry out the multi-level, various education and training to the agricultural logistics in-service staff, and raise the agriculture jobholders' specialized technical level. In the practical work, train the farmers by running the classes and teaching dispersedly, and popularize the modern logistics knowledge to the general countryside populace.

4.2.4 Enlarge government's support, and create the good external environment

China should enact the corresponding laws, regulations and policy to encourage agriculture logistics development, standardize agricultural logistics organization behavior, establish and perfect agricultural logistics system, in order to create good external environment for agricultural logistics development and promote agriculture logistics healthy and fast development. At the same time, the government should exert service functions including information guidance and technical support.

Enlarge the investment of infrastructure. The enhancement of countryside logistics level needs the good infrastructure construction support. The infrastructure level directly decides the logistics speed and efficiency. From 2006, China will implement "five years 500,000,000,000 Yuan plan", and in every year of the next 5 year will invest 1 100,000,000 Yuan to construct the countryside road. To 2010, the total mileage of the countryside road will reach 1,850,000 kilometers, and the conditional villages, towns and administrative villages will pass the roads. The government should carry on financing through many kinds of channels and ways and enlarge the investment of transportation construction. Speed up the railway bed transformation, remodel the highway, and enhance the freight ship and airplane delivery ability, and perfect infrastructure constructions including harbors, wharfs, airports, and stations. As a based industry the logistics industry needs the massive fund investment, so the government may enlarge the national debt to the investment of countryside infrastructure construction, also may consider adopting a series of preferential policies to attract foreign capital and encourage private capital to invest.

4.2.5 Advance agricultural product logistics informationization construction

Informationization construction is an important factor impelling the agricultural logistics development. The agricultural logistics informationization construction may strengthen communication network constructions based on the original rural economy information system, realize resources sharing and information used in common in order to realize the real-time track, the active control and the entire

process management of agricultural product logistics. The peasant household may promptly gain agriculture materials and agricultural product market information and complete the transaction by the network, enhance the response speed of the market and expand agricultural product transaction scope. For example Holland, through the informationization method and electronic way, it has enhanced the information transparency, accuracy and timeliness, and has made the supplier, the retail merchant, the producer and the planter of the agricultural logistics supply chain connect with each other by the Internet.

4.2.6 Speed up the agricultural product logistics standardization advancement

Because the agricultural logistics types are excessive and their difference is big, the agricultural logistics standardization construction work is extremely important. After Joining WTO, the standardized level has become a key aspect deciding China agricultural exports product quality and competitive ability. Up to 2000, China had organized to formulate more than 300 items of the agriculture national standards, more than 900 items of agricultural profession standard, and more than 1500 items of agricultural local standard, but this has still not been able to satisfy the industrial structure adjustment, the quality promotion and the domestic and foreign trade request.

5 Conclusions

In 2006 strengthening the countryside modern circulation system construction was brought forward in "Certain Opinions of Central Committee of the CCP and the State Department about Advancing Socialism New Rural reconstruction", and this brings the significant turning point for speeding up the countryside logistics development. At present speeding up the development of the agricultural product logistics is a vital and urgent duty. Developing agricultural product logistics is a complex systems engineering because the involved scope is broad and the influencing factors are many. As a result of the particularity of the agricultural product logistics and the complexity of the research, both its theory research and practice research are quite deficient. From the angle of the agricultural product supply chain, this article has discussed the development patterns of the agricultural product logistics which takes the agricultural cooperation organizations, the wholesale markets, the key enterprises, the logistics parks, the chain supermarkets as the centers. Aim at existing problems of China agricultural product logistics development including high cost, low efficiency, low socialization and marketability degree, backward logistics facility and technology, lacking talented persons, and impeded information, this article has proposed such countermeasures as exploring new agricultural production circulation pattern, cultivating and developing agricultural product logistics organization, enhancing education and training, enlarging government's support, speeding up agricultural product logistics informationization construction and standardization construction in order to provide certain theory instruction and policy-making reference for speeding up China agricultural product logistics development.

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