

# Process Reengineering of Cold Chain Logistics of Agricultural Products Based on Low-carbon Economy

GUO Hong-xia<sup>1\*</sup>, SHAO Ming<sup>2</sup>

1. Mechanical Engineering Department, Guangxi University of Technology, Liuzhou 545006; 2. Guizhonghaixun Logistics Co., Ltd., Liuzhou 545000, China

**Abstract** Through the process analysis of cold chain logistics of agricultural products, we find that cold chain logistics of agricultural products contradict the development model of low-carbon economy to some extent. We apply the development idea of low-carbon economy, introduce the third-party logistics companies, establish distribution center of cold chain logistics of agricultural products, and strengthen information sharing, to reengineer the process of cold chain logistics of agricultural products in China. The results show that applying low-carbon economy to process reengineering of cold chain logistics of agricultural products, has advantages of increasing added value of products, promoting scale merit and abating lag, plays a role in promoting emission reduction, high efficiency and environmental protection in the process of cold chain logistics of agricultural products in China.

**Key words** Low carbon economy, Business process reengineering, Agricultural products, Cold chain logistics

The cold chain logistics of agricultural products is one sub-system of logistics system on the basis of refrigeration technology, and one systematic project that vegetables, fruits, meat and so on are always under low temperature stipulated in production, transportation, storage, sale and other links, in order to ensure the quality and performance of agricultural products. The cold chain of agricultural products has high requirement on temperature and timeliness, with perishability and other features. The key of its management is to emphasize more on seamless connection in whole logistics process in terms of the control over cold environment of the entire chain<sup>[1-4]</sup>.

With people's growing demand for a variety of fresh agricultural products, the cold chain of agricultural products in China develops by leaps and bounds, and in the mean time, also brings tremendous pressure and challenges to logistics distribution, therefore, the cold chain logistics further draws much attention. Compared with developed countries, the cold chain logistics of agricultural products in China is still in its infancy. As the process of cold chain logistics in China is not smooth, the loss rate of agricultural products in plucking, transportation, storage and other logistics links is 25% to 30%. "Low-carbon economy" refers to the economy with the lowest carbon emissions, environmental costs and socio-economic costs in the process of economic development. It is a kind of economy that can improve self-regulation ability of earth ecosystems with strong sustainability. How to make the logistics transform from "big energy consumer" to "low-carbon industry" has captured much attention of enterprises. The cold chain is regarded as one of services with the highest energy consumption and carbon emission in logistics industry, thereby how to make the cold chain adapt to low-carbon requirement of economic development is a

question worthy of serious exploration.

The cold chain logistics of agricultural products is an important part of China's agricultural development, the rationality of whose process will be an important factor in the process of agricultural development in China. In order to reduce the cost of cold chain logistics of agricultural products and rapidly promote the competitiveness of China's agricultural products in the international market, we analyze the process of the cold chain logistics of agricultural products in China and reengineer such process using the idea of development of low-carbon economy, to achieve seamless connection between various logistics links.

## 1 The status quo and problems of the cold chain logistics process of agricultural products in China

**1.1 The status quo of logistics process** The cold chain facilities of cold chain logistics and equipments of cold chain logistics in China are short, and it has not formed complete cold-chain logistics system. The third-party cold chain logistics develops slowly<sup>[5-6]</sup>. China's agricultural products have not yet formed the cold chain logistics chain from farm to fork, still at the low level of long time, considerable losses, low efficiency, and poor efficiency, and the phenomenon of "broken chain" in logistics process is serious, which are the major factors influencing the development of the cold chain logistics of agricultural products in China (Fig. 1).

**1.2 The problems in service process** First, we use ABC analysis method to analyze the existing process. ABC (Activity Based Costing) is a method of calculating costs with activity as unit. In the business activities, not all activities can create value, and this method is used to identify whether the operation is value-added operation or non value-added operation. Table 1 is the analysis of cold chain logistics process of agricultural prod-

ucts in China using ABC analysis method.

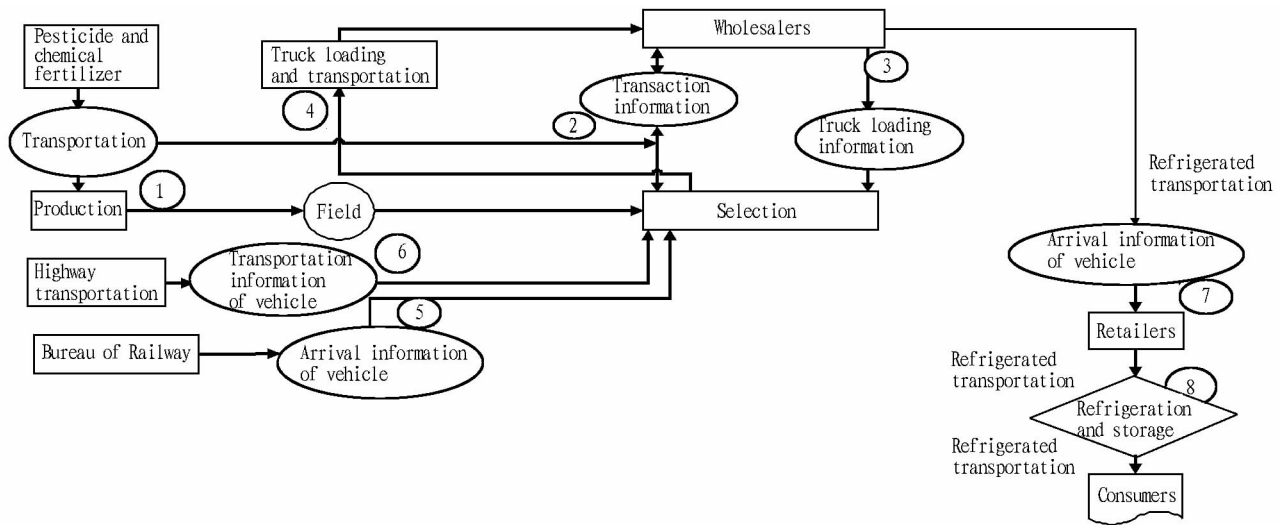


Fig. 1 The cold chain logistics process of agricultural products

Table 1 Analysis of cold chain logistics process of agricultural products

Sequence number	Business process description	Operation classification	Whether it is the necessary activity or not
1	Production of agricultural products	Non-value-added operation	The necessary activity
2	The wholesalers order agricultural products	Non-value-added operation	The necessary activity
3	The wholesalers inform the farmers of truck loading information	Non-value-added operation	The unnecessary activity
4	Agricultural products are loaded on truck for transportation	Non-value-added operation	The necessary activity
5	Bureau of Railway informs the farmers of vehicle arrival information	Non-value-added operation	The unnecessary activity
6	The enterprises responsible for highway transportation inform the farmers of vehicle arrival information	Non-value-added operation	The unnecessary activity
7	The wholesalers inform the retailers of vehicle arrival information	Non-value-added operation	The unnecessary activity
8	Marketing of retailers	Non-value-added operation	The necessary activity

Through analysis, we can know that the process of cold chain logistics of agricultural products in China is still traditional logistics model, and under this model, there are many circulation links of agricultural products, with serious waste. Based on the idea of low-carbon economy, we analyze the problems in the process of cold chain logistics of agricultural products as follows.

First, there is phenomenon of diseconomy in the link of refrigerated transport. The enterprises are responsible for distribution of almost all agricultural products. The cold chain logistics system is still in the phase of "warehousing" and "transport", which will definitely lead to the situation of high cold chain logistics costs and low level of service. Consequently, the cold chain logistics of agricultural products in China is in urgent need of the third-party logistics companies that can provide "one-stop" cold chain logistics services of agricultural products throughout the country, and outsource the original distribution services.

Second, the cold chain logistics of agricultural products lacks the overall planning and integration of upstream and downstream. China's farmers are engaged in decentralized production, lacking consciousness of cooperation, and the cooperation capability of supply chain is poor. Meanwhile, the degree of organization of the cold chain logistics of agricultural products

in China is not high. In operation, most of the cold chain logistics of agricultural products passively wait for the market's response, failing to play the role in piloting production, even more difficult to form a cooperative alliance. All these show that the cold chain logistics market of agricultural products in China is not developed well and soundly, for want of overall planning and coordination of upstream and downstream of supply chain. In addition to farmers' extensive and small-scale production pattern, the cold chain logistics in rural areas is basically in a spontaneous and disorderly state, resulting in unbalanced development of cold chain logistics, waste of resources and so on.

Third, the process of cold chain logistics of agricultural products is unreasonable. At present, the cold chain logistics of agricultural products in China mainly uses the pattern of "wholesaler-retailer-consumer", with many distribution nodes, increasing frequency of transfer and car backing in the process of transportation, resulting in a considerable part of losses in cold chain of agricultural products. In the mean time, as the circulation links and logistics costs increase, the energy consumption and emission of carbon dioxide increase, inconsistent with the low-carbon economy.

Fourth, the transmission of information in all links of cold chain logistics of agricultural products is poor. The information

of inventory, loading and unloading, and transportation is opaque, making the cold-chain agricultural products unnecessarily delay in distribution and transportation, resulting in complexity in distribution links and increase in logistics costs.

## 2 Apply the idea of low-carbon economy to design new process

**2.1 Design of new process** In the process of cold chain logistics of agricultural products, how to reduce carbon emission in the field of cold chain logistics is very important. We should

optimize the process of cold chain logistics of agricultural products in China, conduct system innovation and development pattern innovation, reduce the consumption of cold-chain agricultural products and other high-carbon energy resources, and reduce greenhouse gas emission, to achieve win-win situation of socio-economic development and ecological environmental protection. Through the above analysis, the reengineered process of cold chain logistics of agricultural products in China by applying the idea of low-carbon economy can be seen in Fig.2.

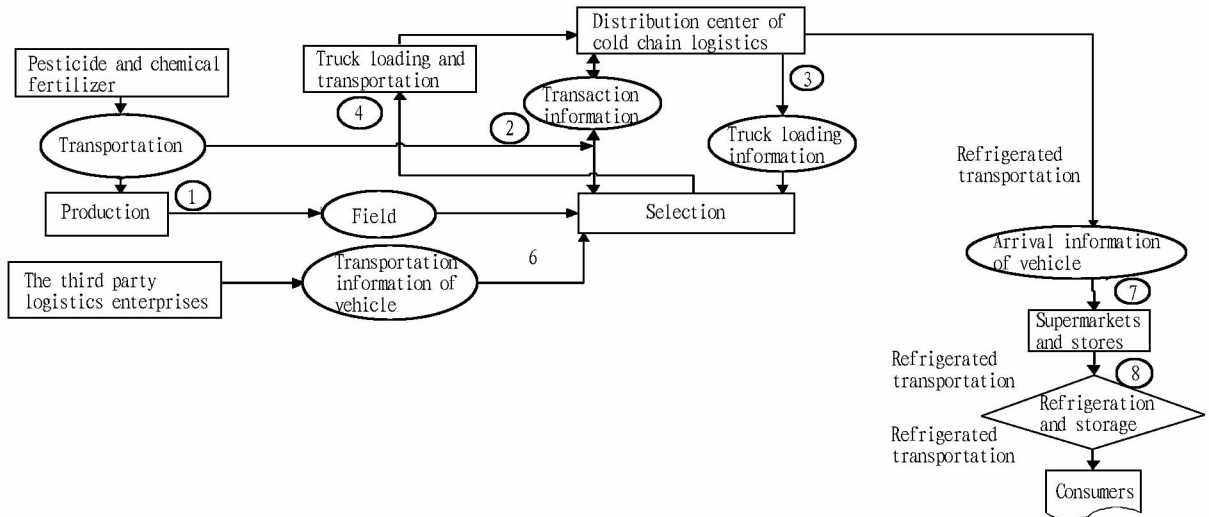


Fig.2 The reengineered process of cold chain logistics of agricultural products

**2.2 The advantage of new process** The process of cold chain logistics of agricultural products after being optimized will nurture and introduce a number of large third-party cold chain logistics enterprises with great economic strength, advanced management idea, and sustainable development capacity.

Professional cold chain logistics companies should have the cold chain logistics management capability of agricultural products from farm to supermarket, including the ability to carry out temperature-controlled transportation, storage, door to door services. Due to the low-temperature characteristics of the cold chain logistics, the logistics companies singly establish the cold chain logistics distribution center, with high investment costs and long payback period, and the third-party cold chain logistics industries can work together to build cold chain logistics distribution center, to achieve common distribution of cold chain logistics industries. At the same time, by virtue of information system, we can greatly promote the information sharing degree of agricultural products from production to sale. The new process of cold chain logistics of agricultural products will achieve better economic efficiency in the following aspects.

First, in process reengineering of cold chain logistics of agricultural products, introducing the third-party logistics companies to integrate the cold chain process, and fully using the social resources by virtue of the scale merit of the third-party logistics to reduce logistics costs, can connect the cold chain with big modern market and great circulation, provide integrated cold chain logistics services from farmers to sale. The logistics

enterprises, as the main body of circulation, can provide processing, packaging and other value-added services, improve the added value of products, and achieve integration of "production, supply and marketing" of cold chain food, so that the farmers, the third-party logistics companies, and supermarkets, stores benefit, and the cold chain process of agricultural products is effectively integrated.

Second, constructing the distribution center of cold chain logistics, and implementing joint distribution can improve the efficiency of vehicle loading transportation, improve the business logistics environment of cold chain, and promote the formation of scale effect.

Third, through the establishment of cold chain logistics information system of agricultural products, we can achieve integration of supply chain information, and information sharing between upstream and downstream enterprises. Meanwhile, the cold chain logistics information system of agricultural products can also provide accurate market information for the related aspects of cold chain, and play the market-oriented role, so that the process of logistics becomes more transparent and reasonable.

## 3 Conclusion

Researches show that applying the idea of low-carbon economy to reengineering of the process of cold chain logistics of agricultural products is feasible. As there are many problems

in the cold chain logistics process of agricultural products in China, whether the cold chain logistics process of agricultural products is reasonable or not will directly affect the cost of agricultural products. Reengineering the cold chain logistics process of agricultural products based on the idea of low-carbon economy, is of great significance to emission reduction, high efficiency, and environmental protection in the process of cold chain logistics of agricultural products.

## References

[1] SHANG Y. Research on RFID-based low carbon logistics of tropical characteristic agricultural products[J]. Journal of Anhui Agricultural Sciences, 2010, 38(29): 16660–16661, 16664. (in Chinese).

- [2] JIAO R, YU XQ. The problems and path thinking of China's rural logistics development [J]. Journal of Anhui Agricultural Sciences, 2011(7): 37–40. (in Chinese).
- [3] LIU HW. Cold chain logistics of food industry [J]. China Materials Distribution, 2004, 17(8): 48–49. (in Chinese).
- [4] BOER JM. Environmental impact assessment of conventional and organic milk production [J]. Livestock Production Science, 2002, 80(2): 69–77.
- [5] LIU QC. Research on cold chain considering carbon emission [D]. Beijing: Tsinghua University, 2010; 60–65. (in Chinese).
- [6] SUN NY. Research on food cold chain logistics based on lean thinking [D]. Shanghai: Tongji University, 2008; 67–71. (in Chinese).

(From page 58)

on political views, carrying out multi-level communication, enhancing monitoring in order to establish the government's credibility, scientifically guiding villagers to improve national consciousness. Through long-term effective communication, we should improve the villagers' participation in the work of merger, which can fundamentally resolve villagers' resisting behaviors due to lack of understanding. In addition, the cultural protection and migration is particularly important. There must be profound organizational culture within the organizations with long history, and the organizational culture is the root of long-term existence of this organization. Promoting the fusion of it using commonness of culture in all regions, can greatly enhance the cohesion of community newly merged. The neglect of cultural preservation will make farmers have serious psychological rejection to the new homes, affecting the maintenance of merger achievement.

## 4 Conclusion

The village merging in Zhucheng City creates a new road, and the ideas and some constructive schemes proposed by it are of guiding value to the construction and development in many rural areas of China. But in terms of the development of Zhucheng City in recent years, the development

potential of rural communities has not been fully exploited, and this merger has not yet been able to completely change the living mode of farmers in Zhucheng City. However, under the joint effort of Zhucheng government and people with the revolutionary spirit, the development of rural communities is worthy to be expected.

## References

- [1] SHANGGUAN JM. Cancellation of administrative village in Zhucheng, Shandong [EB/OL]. <http://news.sina.com.cn/c/sd/2010-08-26/192120982388.shtml>. (in Chinese).
- [2] National Development and Reform Commission (NDRC). Civil administration department experts investigation on rural community construction in Zhucheng, Shandong [EB/OL]. [http://shs.ndrc.gov.cn/gzdt/t20090602\\_283664.htm](http://shs.ndrc.gov.cn/gzdt/t20090602_283664.htm). (in Chinese).
- [3] WU BS. Specialist research the experience of Zhucheng—rural community become the important platform of integrated development of urban and rural areas [EB/OL]. <http://news.xinmin.cn/domestic/gnkb/2011/05/09/10622521.html>. (in Chinese).
- [4] The general situation of Dragon City—Zhucheng, China [EB/OL]. <http://www.zhucheng.gov.cn/zc/logk/index.html>. (in Chinese).
- [5] Countryside governance research center task group of Huazhong University of Science and Technology. Fuzzy city and village under enclosure constructing city [EB/OL]. <http://www.shekebao.com.cn/shekebao/node197/node207/userobject1ai3295.html>. (in Chinese).

## EBSCO

EBSCO Publishing, headquartered in Ipswich, Massachusetts, is an aggregator of premium full-text content. EBSCO Publishing's core business is providing online databases via EBSCOhost to libraries worldwide. EBSCOhost is used by libraries, schools, academic institutions, medical institutions, and corporations. The company is a subsidiary of Birmingham, Alabama-based EBSCO Industries. EBSCO Industries is located at number 196 of the top 200 privately held companies in the United States by Forbes Magazine. The company's core business is providing online databases via its proprietary software, EBSCOhost, to libraries. EBSCO provides over 350 full-text and secondary databases. Content for these databases include full-text journals, magazines, books, monographs, reports, ebooks, business book summaries and various other publication types. It also provides databases for reference to the health and business sectors, such as DynaMed.