

# China's food production and Cold Chain Logistics

W.Wang, F.Jaeger, X.Li, X.H.Wang,J.M.Zhang

**Abstract:** In the world China takes a leading position in the supply of agricultural and animal products. But due to a short of chill facilities and a lack of cold-chain systems, there is serious loss of quality and quantity before the products reach the consumers. This situation has become one of the main reasons for serious food incidents that often happen, and the demand for Cold-Chain is improving. This has provided technology, equipment and a market; not just for China itself, but also for the whole world.

**Key words:** food production, Cold-Chain logistics; Development of China

## 1 Introduction

China is a major contributor in terms of agricultural and animal products with an annual value over \$300 billions a year. But due to the inadequate chill facilities and the unsound cold-chains system, Fruits and vegetables suffer losses of 20% to 30%,meat 12% and aquatic products 15%, in their transportation processes and other steps. 90% meat products, 80% aquatic products, and the majority of dairy and bean products are transported and sold without cold-chain assurance. Although frozen food is in a better condition, it faces the problem of disconnecting from cold-chain. This phenomenon has become one of the major reasons for food incidents that occasionally happen in China(Jia Weili, et,al., 2004).

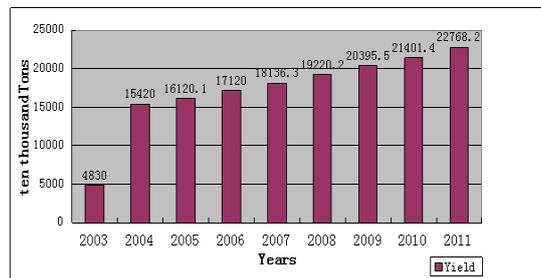
With the development of economy and people's living standard, the demand for cold chain food is rapidly growing. Future development includes: accelerating the building of the cold chain logistics security system, security monitoring of the cold chain logistics information network platform, as well as the cold-chain infrastructure and supporting technology(Victoria de-la-Fuente M,et,al.,2010).

## 2 The development of cold-chain food products

### 2.1 Fruits

Since 2003, the production of fruit has increased by 6% steadily every year, from 48.3 million tons in 2003 to 241.34 million tons in 2012. There has also been development in terms of variety, quality and Planting area. There are 20 kinds of fruits with apples, oranges, pears, bananas and grapes having the highest output.They account for over 70% of the total production.(Cui Zhongfu, 2012).

**Table 1** fruits products in the past 10 years (unit: 10,000 tons)

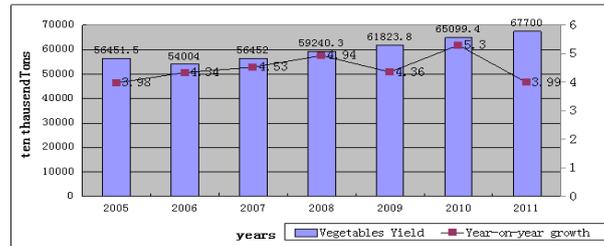


(Source: A Report on China's Cold-chain Development)

### 2.2 Vegetables

In recent years there has been a steady annual increase of 4%, from 564.515 million tons in 2005 to 677 million tons in 2011. The origin areas are usually close to the consumer area, which reduces the cold chain needs, and causes the rot loss rate which is as high as 25% of China's current supply of vegetables(Wu Yun Liang, 2007, Zhang Jian,2009, Cui Zhongfu, 2012) .

**Table 2 China's vegetables production and increase rate (unit: 10,000 tons)**

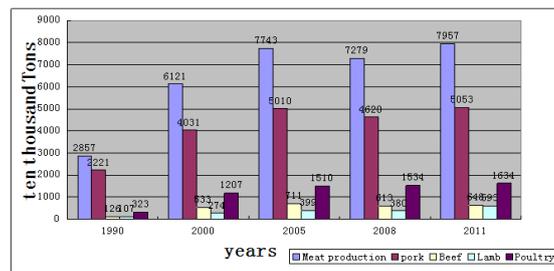


(Source: A Report on China's Cold-chain Development)

### 2.3 Meat products

The meat production and sales volume of China rank first in the world, accounting for 25% of the world's total. In the past 20 years, the meat industry has maintained a momentum of rapid development with a continuous 5.4% increase. In 1990, the total production of meat reached 28.57 million tons, and in 2011 it increased to 79.57 million tons. The cold-chain adoption rates of nation's meat is only 15%, and the post-production loss rate is as high as 25%-30%. The coverage of chilled meat and low-temperature maintenance meat products in China is 10%, there are about 8 million tons meat transported and sold via cold-chain. These kinds of products take 10% of the total meat production, and this may become a major tendency in the meat industry (Cui Zhongfu, 2012).

**Table 3 Meat Production in China from 1990 to 2011 (unit: 10,000 tons)**

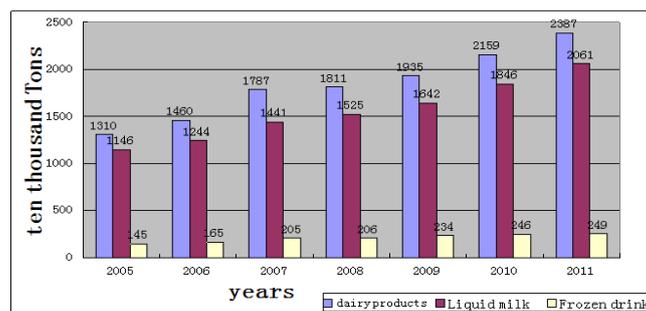


(Source: A Report on China's Cold-chain Development)

### 2.4 Dairy

In the past 20 years, in China there has been a rapid development in dairy products. The melamine incident's had a negative effect on people's lives, the dairy product still increase by 20% annually. The related cold-chain dairy products (frozen and chilled products) have developed very quickly, and the annual increase rate is around 10%. In 2005, the dairy products reached 13.1 million tons, and in 2011 it reached 23.88 million tons, among which the liquid dairy products reached 20.61 million tons, The people's average consumption of dairy products is 14 kg per year, among which the consumption of liquid milk is 13.3L (Cui Zhongfu, 2012).

**Table 4 liquid mild and dairy products annual production (unit: 10,000 tons)**

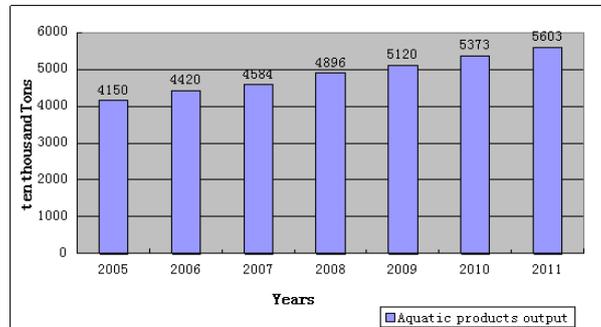


(Source: A Report on China's Cold-chain Development)

## 2.5 Aquatic products

In 2005 the aquatic production reached 41.5 million tons, and in 2011 amounted to 56 million tons, among which the raised products are 40.26 million tons and fished products total are 15.74 million tons. In 1978 the people's average consumption volume was less than 5 kg, In 2011 it reached 41 kg (Cui Zhongfu, 2012).

**Table 5 annual aquatic production (unit: 10,000 tons)**

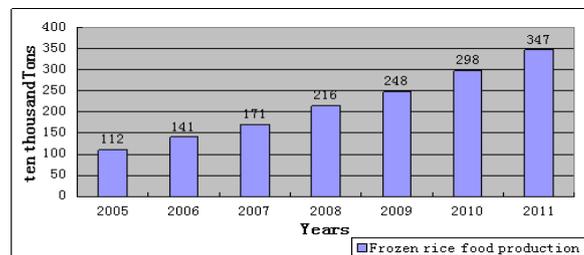


(Source: *A Report on China's Cold-chain Development*)

## 2.6 Instant Frozen Products of Rice and Flour

Instant frozen products of rice and flour take a major portion in Chinese people's family life, including Tang Yuan (rice balls with varied stuffings), Jiaozi (dumplings), Man Tou (bread in Chinese style), and Zong Zi (sticky rice with varied stuffings). In 2005 the annual production was 1.12 million tons, and in 2011 it reached 3.465 million tons, and the sales volume was over ¥50 billion (Cui Zhongfu, 2012).

**Table 6 Quick-frozen Rice and Flour Food Production (unit: 10,000 tons)**



(Source: *A Report on China's Cold-chain Development*)

## 3 The Development of Cold-chain Logistic

### 3.1 Cold-chain Transportation

Road transport is the main force of the refrigerated trunk transport currently. The average price is ¥10.00 / ton kilometer, followed by rail and waterways, and the air-transportation accounts for a smaller proportion. The adjustment of national industrial policy and the increase of the demand for market development, in recent years the annual growth rate of refrigerated trucks is 10 %, and the increment is 10,000 units in 2011 (Wen Xiaowei, et al., 2008). In accordance with the transportation scale, the refrigerated trucks of cold chain logistics enterprises in China are divided into different types of 2 to 30 tons. Under normal circumstances, the average replacement time of the refrigerated trucks is about 8-10 years. At present, the number of refrigerated vehicles of Cold chain road transport are about 35,000, which accounts for 0.3% of the proportion freight cars. In rail transport the total running vehicles are about 500,000. The refrigerated vehicles are only about 7500, accounting for 2%. (Shabani A, et al., 2011)

### 3.2 Cold-chain needs and refrigeratory construction

### **3.2.1 Cold-chain needs**

Since 2010 to 2012, The cold chain demands of the products such as beverage products, frozen rice food, frozen aquatic products, fruits, vegetables and meats. were 65.418 million tons in 2010, 69.224 million tons in 2011, and 82.112 million tons in 2012. The most popular for cold chain are fruits, vegetables and meat which will be also the main force in the future development.(Cui Zhongfu, 2012).

### **3.2.1 Refrigeratory construction**

In 2008 the China's cold storage capacity for meat was 7 million tons, with an annual capacity of 0.5 million tons. The growth rate amounts to 10%. Currently there are more than 10,000 cold storage units in China, The units with a capacity over 10,000 tons are more than 80, accounting for more than 50% of the total national cold storage. From 2008 to 2012, the cold storage construction in China doubled each year. The total cold storage capacity was 71.11 million m<sup>3</sup> in 2011, and the storage volume is 17.43 million tons. As for the regional distribution of cold storage, the eastern part amounts for 60%. As for the storage items, the comprehensive storage accounts for 46%. Specific products, such as fruits, account for 27% market share. For the cold storage types, freezing cold storage accounts for more than 50%, but the ultra-low temperature cold storage proportion is very small. Cold storage rental across the country varies little. In 2012 the average rent is 3.5-5¥ / m<sup>2</sup> in Shanghai, and 4.5¥ / m<sup>2</sup> in Beijing.(Shen Shaoji, 2012).

### **3.3 Energy Consumption on Cold-chain Logistics**

The industry in China mainly consumes petroleum products. Statistics on China's logistics energy consumption from 1990 to 2010 shows that energy consumed in logistics has been increasing. There exist problems, such as backward facilities and technology, unsound management, high empty-load rate and low full-load rate, repeat operations, etc. These all caused a serious energy waste. Take Cold-Storage as an example, the chill system consumes the 80% of the total energy. Statistics shows that the chill system consumes 15% of the nation's electric power use, and the Cold-Storages from the cold-chain industry also takes a large portion. In the cold storage cost, the chill power cost takes over 25%, so the reduction of cost mainly depends on the efficient use of energy (Montanari R.2008, Shen Shaoji, 2012).

### **4 Conclusion**

China Cold Chain Logistics is in the early stages of development. The continuous growth of China's economic and the people's increasing awareness of improvement on food safety, We should attach importance to more activities related to food production, transit, and sales. Also, with the increase of trade volume and market expanding, China's cold-chain construction business is motivated for booming. At the same time, cold-chain procedures will be more regulated, cold-chain logistics enterprises will keep growing, and the related information technology of cold-chain will quickly improve(zhao Li'e, 2011).

In the coming years, the Chinese government will invest tremendously on food safety and health care programs while stimulating the economy as a national reform program. These future events will surely promote the cold-chain industry. With the strengthening of social insurance and security, the need for safe agricultural and pharmaceutical products increases (Liu Lixin, et,al.,2008). It provides technology, facilities, and market for China as well as the rest of the world. Importance should be attached to chill and freezing storage, vehicles, and related technology market. (Shabani A, 2011).

## References:

- Sarkis J. 2003. A strategic decision framework for green supply chain management. *Journal of Cleaner Production*,11(4):397-409
- Jia Weili, Wang Chengyan, Zhao Ruiying, 2004. An analysis and solution on agricultural products logistics supply and need status .*Journal of Anhui Agricultural University (Chinese): Social Science*, (5):52-56
- Victoria de-la-Fuente M, Ros L,2010. Cold supply chain processes in a fruit-and-vegetable collaborative network . *Advances in Information and Communication Technology*,322:3-10
- Cui Zhongfu, 2012. A report on China's cold-chain logistics development, China Fortune Press (Chinese), Beijing, ISBN: 9787504745569
- Wu Yun Liang, 2007.The national vegetable logistics chain status and perfection. *Resource exploration and market (Chinese)*. (4),326-341
- Zhang Jian, Liu Lixin, Li Jianrong,2009. A research on adaptability of China's vegetable cold-chain logistics mode, *Food science (Chinese)*, 30(5):287-290
- Liu Weihua,2008. Three tendencies leading the way of the national cold-chain logistics development[N], *International Business Daily (Chinese)*, 19(7),5
- Huang Chengzhou, Xie Ruhe, 2007.The national food cold-chain logistics development and solutions[J]. *Commodity storage, transportation and maintenance (Chinese)*, (04):37-39
- Wen Xiaowei, Da Qingli, 2008.Distribution together: the perfection of cold-chain logistics distribution mode[J], *Modern Management Science (Chinese)*, (3):13-14.
- Shabani A, Saen R F, Torabipour S M R. 2011. A New Benchmarking Approach in Cold Chain [J]. *Applied Mathematical Modeling*, 36(1):212-224
- Shen Shaoji, 2012. China Warehousing Industry Development Report, China Business Press, ISBN: 9787504469045
- Montanari R. 2008. Cold chain tracking: a managerial perspective[J]. *Trends in Food Science &Technology*,19(8):425-43
- Zhao Li'e, 2011. A research on the perfection of fresh agricultural products cold-chain system cost[J], *Reform and strategy (Chinese)*, (3):61-67
- Liu Lixin, Li Jianrong, 2008. A brief on agricultural cold-chain logistic development mode and government involvement[J], *Food science (Chinese)*, 29(9):680-683

Author Contact: Wang Wei, Professor & Director of Meet Proceeding Key Lab. of Sichuan Province and Faculty of Bio-industry of Chengdu University, Tel & Fax:+86-28-84616062, [wangwei8619@163.com](mailto:wangwei8619@163.com)