Social Science Asia, Vol.6 No.3, July-Sept.,2020, p: 46-57
DOI : 10.14456/ssa.2020.21

RESEARCH ON INFLUENCING FACTORS OF COLD CHAIN LOGISTICS DEVELOPMENT OF AGRICULTURAL PRODUCTS IN SOUTHWEST CHINA

Yuanguo Yao[1,*]

Abstract

In order to research the factors influencing the development of cold chain logistics in relation to agricultural products, a survey of employees and stakeholders in the cold chain logistics industry for agricultural products in western China's Sichuan and Guangxi Provinces was conducted. This consisted of the distribution of 270 questionnaires to 144 enterprises and 126 consumers via a combination of systematic sampling and random sampling. Analysis of the survey data shows that the major influencing factors include industrial technology, economy, macro policy, infrastructure, logistics management level, social environment and logistics participants, ranked from high to low in importance. The article puts forward some suggestions to strengthen popularization and application of advanced technology in agricultural product cold chain logistics; to improve development policy and industry standards; to enhance infrastructure development for agricultural products, and personnel training for logistics management; and to improve the awareness of modern logistics among participants.

Keywords**:** Cold Chain Logistics; Influencing Factors; Factor Analysis

1. INTRODUCTION

The term fresh agricultural products generally refers to primary agricultural products that have not been deeply processed, including vegetables, fruits, meat and aquatic products (Yang, 2012). As people's material conditions have increased gradually, their demand for diverse, green, nutritious and fresh agricultural products, including fruits, vegetables, fresh meat, eggs and milk, continues to increase. In order to keep these natural agricultural products as fresh as possible when delivered to consumers, they must be pre-cooled, transported, stored and delivered at a suitable low temperature. According to the "Development Plan for Cold Chain Logistics of Agricultural Products" released by China's National Development and Reform Commission in 2010, the cold chain logistics of agricultural products is defined as a special supply chain system, where fresh agricultural products such as meat, poultry, aquatic products, vegetables, fruits, and eggs will be processed, stored, transported, delivered and retailed always in a suitable low-temperature environment after harvesting (including slaughtering, or fishing) in production areas, so as to maximally ensure product quality and product safety, reduce loss, and prevent pollution. In recent years, the output and circulation of fresh, agricultural, products in China has increased year by year, and society has put forward higher requirements for the safety and quality of fresh produce. Accelerating the development of the cold chain logistics of agricultural products is of great significance to promote the continuous increase of farmers' income and ensure consumer safety.

[1,*] Assoc Prof Dr. Yuanguo Yao obtains a Ph.D. from Panyapiwat Institute of Management, Thailand. Currently he is working as a Lecturer in the School of Mathematics and Statistics of Baise University, China. Email: yao-yuanguo@qq.com

Industry practitioners and consumers of agricultural products which utilise cold chain logistics, possess a micro-level and deeper understanding of the real situation of market development, such that their judgments can more realistically reflect the industry's objectives, reality and needs. In the event that we only analyze from a macro perspective or base judgment on a few experts, we cannot fully grasp the real condition of the logistics industry regarding fresh agricultural products, resulting in a difficulty in formulating policies and measures to advance the industry with respect to the actual demands at a micro level. Therefore, analyzing the influence of China's fresh agricultural product logistics from the micro-perspective of industry professionals does not only make up for deficiencies in existing research, but also provides a reference for the formulation of relevant policies, which will have important theoretical value and positive practical significance. Based on micro-data obtained from surveys of some industry practitioners and stakeholders in the cold chain logistics of agricultural products in Sichuan and Guangxi Province in southwest China, this paper conducts confirmatory factor analysis on the influencing factors of the development of cold chain logistics for agricultural products in southwest China.

2. LITERATURE REVIEW

Research on the influencing factors for the development of the cold chain logistics of agricultural products has mostly focused on the technical aspects. That is, emphasis has been placed on exploring the impacts from the implementation of various refrigeration and cold storage technologies on the development of cold chain logistics. At the same time, a considerable part of literature relates to applied research based on case studies combining practice with theory. Brown & James (2006) believed that cold chain logistics were not designed for refrigeration, but rather to keep foods at a certain temperature so as to maximize the food quality for sale and to maintain their shelf life. Salin, V. & Jr R. M. N. (2003) studied a cold chain network of food exports in some developing countries. In this process, the authors discussed the main influencing factors of the cold chain logistics network during construction, while elaborating on the main factors of the economic entity making decisions for the cold chain logistics business. In addition, Yang et al. (2009) and Yao et al. (2012) analyzed the current status of logistic development regarding fresh agricultural products in China in recent years. They concluded that there were problems existing in China's logistics of fresh agricultural products, including a backward logistics infrastructure, incomplete standardization systems, an imperfect cold chain system, low level of logistics technology, low involvement of third-party logistics, and low logistics efficiency. Wang et al. (2014) analyzed the factors influencing the logistics of fresh agricultural products in China through quantitative analysis. They found that these factors included the organization status of agricultural product logistics, logistics infrastructure and application of technology, the logistics management system for agricultural products, cold chain costs and the marketization of circulation forms for agricultural products. Xu & Ren (2015) took the cold chain logistics system as their research object, studying the main factors affecting the cold chain logistics system by expert investigation, interpretive structural modeling, and an analytic hierarchy process. Through Delphi's expert investigation method, 12 key influencing factors, such as "the degree of marketization of cold chain logistics" and "awareness of the cold chain logistics of fresh agricultural products", were selected from many factors influencing the development of cold chain logistics (Lu & He, 2015).

In general, the existing research focuses on the current problems existing in the logistics of fresh agricultural products and discusses various logistics models. It suggests that the industry focus on strengthening infrastructure, optimizing organizational structure, coordinating interest relationships

among relevant participants, and improving the efficiency of logistics regarding fresh agricultural products. Analyzing issues mainly from a macro perspective, these studies obtained raw data using statistical methods such as an analytic hierarchy process, with a few expert scholars as the research object. From a micro perspective, there have been a few empirical studies conducted by surveying numerous industry professionals.

3. RESEARCH OBJECTIVES

This research aims to study the factors influencing the development of the cold chain logistics of agricultural products in western China, and to analyze and classify these influencing factors, to determine the main influencing factors, from which policy recommendations for the government and industry associations can be made.

4. RESEARCH METHOD AND DATA SOURCES

In order to reflect the objective evaluation of industry practitioners and stakeholders of the cold chain logistics of agricultural products regarding the factors influencing its development, this research has not adopted the conventional methods of directly obtaining scores or weights through investigating experts and scholars. Instead, a questionnaire survey was conducted, obtaining data from a large number of industry practitioners and stakeholders who are involved in and familiar with the cold chain logistics of agricultural products. To process results of the survey data, a factor analysis method was used to analyze and study the influencing factors for the development of the cold chain logistics of agricultural products.

In order to objectively reflect the understanding and assessment of the industry practitioners and stakeholders in southwest China regarding the development of the cold chain logistics of agricultural products, this paper used a combination of systematic sampling and random sampling to collect a sample of 144 questionnaire responses from agricultural product processing and logistics enterprises as well as 126 consumers in western China's Sichuan and Guangxi provinces. 120 questionnaires were distributed to consumers and management of enterprises in 15 cities of China’s Sichuan province, while 150 questionnaires were distributed to cold chain logistics companies, agricultural producers, processing and sales companies, chain supermarkets selling fresh foods, and consumers in Guangxi’s Nanning City and Baise City, the main base of “Southern Food Supply to Northern regions”. Questionnaires were distributed face-to-face and by post. A total of 270 questionnaires were distributed, 227 of which were determined to meet validity requirements. The distribution of samples among different industry segments is shown in Table 1**.**

Table 1. Industry Distribution of Survey Samples

Industry	Sample	
	Sample Size	Proportion (%)
Logistics enterprises	86	37.89
Agricultural production and processing enterprises	77	33.92
Fresh food retail and catering enterprises	51	22.47
Others	13	5.73
Total	**227**	**100**

Analysis of the Influencing Factors for the Development of Cold Chain Logistics Agricultural Products

Factor Analysis on Survey Data

Data from the 227 valid questionnaires recovered from the survey were analyzed, with each of the 30 questions concerning the development factors of agricultural product cold chain logistics taken as a variable, and each questionnaire as a sample. Each variable was examined one by one until the correlation coefficient matrix of all variables in the factor analysis was a positive definite matrix. 23 questions (variables) were subsequently used as analysis indicators, as shown in Table 2.

Table 2. Analysis Indicators for Factors Affecting the Development of Agricultural Product Cold Chain Logistics

No.	Question No.	Indicators
1	Q01	Application of advanced cold chain technology has promoted the development of cold chain logistics.
2	Q02	Application of information technology plays a vital role in cold chain logistics and delivery.
3	Q03	Common delivery in cold chain logistics is conducive to saving delivery cost.
4	Q05	Cold chain logistics develops better in areas where supermarkets are larger in scale.
5	Q06	Current cold chain logistics of agricultural products is low in marketization and specialization.
6	Q07	Urban traffic jams have a negative impact on cold chain logistics and delivery.
7	Q08	Application of the internet and big data has lowered the cost of cold chain logistics.
8	Q09	It is satisfied with the current national policies in promoting development of cold chain logistics.
9	Q10	Application of agricultural product preservation technology has reduced the cost of cold chain logistics.
10	Q11	More complete standards of the cold chain logistics industry should be formulated.
11	Q12	The "Last 1 Kilometer" of cold chain logistics delivery in cities constrains the development of cold chain logistics.
12	Q13	Consumers are more willing to buy "raw" agricultural products that have not been "processed" by refrigeration.
13	Q14	The integrity of regional logistics systems affects the development of cold chain logistics.
14	Q15	Logistic management and technical personnel are in short supply.
15	Q16	The level of logistics management has a greater impact on cold chain delivery of agricultural products.
16	Q18	Consumers' increasing demand for fresh, nutritious and diverse agricultural products has promoted the development of cold chain logistics.
17	Q19	The government should establish a unified logistics information platform.

Table 2 (continued)

No.	Question No.	Indicators
18	Q20	Inadequate refrigeration storage and unreasonable layout affect cold chain logistics and delivery.
19	Q21	It is very important to obtain information of upstream and downstream enterprises of cold chain logistics.
20	Q22	The government should formulate mandatory standards for the circulation of agricultural products cold chain.
21	Q24	Development potential of cold chain logistics in China is huge.
22	Q25	There is a lack of unified coordination and integration between upstream and downstream enterprises in the supply chain of cold chain agricultural products.
23	Q26	Laws and regulations related to cold chain logistics need to be improved.

Validity Test

Factor analysis was performed on the variables, by means of KMO of sampling adequacy and Bartlett's test generating results as shown in Table 3. It can be seen from Table 4 that when KMO = 0.728, the factor analysis value for the Bartlett's test is 3377.538, with a significance of $0.000 < \alpha = 0.001$, indicating that there is a correlation between the original variables, and that the data is therefore suitable for factor analysis.

Factor Analysis

The eigenvalues of the correlation coefficient matrix for each variable, the total variance explained, were calculated as shown in Table 4.

Table 3. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.728
Bartlett's Test of Sphericity	Approx. Chi-Square	3377.538
	df	253
	Sig.	.000

Table 4. Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.721	24.874	24.874	5.721	24.874	24.874	5.067	22.031	22.031
2	3.840	16.693	41.568	3.840	16.693	41.568	2.479	10.780	32.811
3	2.486	10.807	52.375	2.486	10.807	52.375	2.149	9.346	42.157
4	1.587	6.901	59.276	1.587	6.901	59.276	2.103	9.144	51.301
5	1.275	5.546	64.821	1.275	5.546	64.821	1.914	8.321	59.622
6	1.097	4.771	69.593	1.097	4.771	69.593	1.678	7.297	66.919
7	1.060	4.609	74.202	1.060	4.609	74.202	1.675	7.283	74.202
8	.840	3.652	77.853						
9	.729	3.170	81.024						
10	.663	2.884	83.907						
11	.556	2.418	86.325						
12	.534	2.320	88.645						
13	.462	2.011	90.655						
14	.425	1.848	92.503						
15	.389	1.690	94.193						
16	.314	1.365	95.558						
17	.249	1.082	96.639						
18	.233	1.015	97.654						
19	.160	.694	98.348						
20	.148	.642	98.990						
21	.098	.424	99.415						
22	.097	.423	99.838						
23	.037	.162	100.000						

--Extraction Method：Principal Component Analysis

According to the principle of selecting common factors with eigenvalues greater than 1, seven principal component factors were selected from the 23 indicators (variables). These seven principal component factors were found to explain 74.202% of the total variance. This indicates that the first 7 principal components already contain 74.202% of all indicator information. Therefore, the first 7 eigenvalues were taken to calculate the corresponding eigenvector.

The eigenvectors of the correlation matrices were calculated, and factor axes were then rotated by the maximum variance method, thus obtaining component matrices of the 7 rotated principal components, as shown in Table 5.

Table 5. Component Score Coefficient Matrix

	Component						
	1	2	3	4	5	6	7
Q01	.893	.015	.116	-.147	.057	-.028	-.197
Q02	.569	.017	-.060	.151	.046	-.584	-.247
Q03	.074	.859	.193	-.004	.256	.040	.008
Q05	.027	.894	-.046	.041	.173	-.106	.126
Q06	.041	.604	.550	.148	-.028	-.017	-.259
Q07	-.067	.163	.003	.723	.105	.128	.220
Q08	.839	.085	.155	-.060	.043	.064	-.005
Q09	.082	.438	.531	.038	.079	.247	-.350
Q10	.905	.092	-.019	-.085	.023	-.028	-.041
Q11	.077	.125	.669	-.089	.148	.137	.236
Q12	-.074	-.022	.067	.598	.124	.562	-.178
Q13	-.211	-.113	-.040	.393	.047	.120	.658
Q14	.904	.015	.068	-.093	.022	-.027	-.158
Q15	.044	.164	.086	.169	.883	.008	.076
Q16	.150	.246	.164	.018	.877	.069	.154
Q18	.054	-.134	-.001	.370	.125	.706	.165
Q19	.841	.010	.118	.048	-.005	.059	.033
Q20	.013	.002	.133	.764	.018	.065	.044
Q21	.673	-.051	.055	.241	.190	-.053	.241
Q22	.208	-.176	.689	.332	.239	.020	-.007
Q24	.490	.232	.188	.203	-.181	.547	.202
Q25	-.033	.110	.235	.010	.232	.155	.707
Q26	.242	.331	.625	.106	-.091	-.232	.340

--Extraction Method: Principal Component Analysis
Rotation Method: Varimax with Kaiser Normalization

When the rotation method was changed, similar results were obtained as shown in table 5, above. Shaded figures correspond to high load indicators with an absolute value of factor loading greater than 0.5. Based on this, the results of the principal component analysis of the influencing factors for the development of the cold chain logistics of agricultural products are shown in Table 6.

Table 6. Principal Component Analysis Results of Influencing Factors of Cold Chain Logistics Development of Agricultural Products

Factor	Factor Name	Question No.	High-load Variable	Factor Load	Eigen-value	Interpre-tative Variance (%)
Factor 1	Industry technology	Q01	Application of advanced cold chain technology has promoted the development of cold chain logistics.	.893	5.721	24.874
		Q02	Application of information technology plays a vital role in cold chain logistics and delivery.	.569		
		Q08	Application of the internet and big data has lowered the cost of cold chain logistics.	.839		
		Q10	Application of agricultural product preservation technology reduces the cost of cold chain logistics.	.905		
		Q14	The integrity of regional logistics systems affects the development of cold chain logistics.	.904		
		Q19	The government should establish a unified logistics information platform.	.841		
		Q21	It is very important to obtain information of upstream and downstream enterprises of cold chain logistics.	.673		
Factor 2	Economy	Q03	Common delivery in cold chain logistics is conducive to saving delivery cost.	.859	3.840	16.693
		Q05	Cold chain logistics develops better in areas where supermarkets are larger in scale.	.894		
		Q06	Current cold chain logistics of agricultural products is low in marketization and specialization.	.604		
Factor 3	Macro policies	Q06	Current cold chain logistics of agricultural products is low in marketization and specialization.	.550	2.486	10.807
		Q09	It is satisfied with the current national policies of promoting development of cold chain logistics.	.531		
		Q11	More complete standards of the cold chain logistics industry should be formulated.	.669		
		Q22	The government should formulate mandatory standards for the circulation of agricultural products cold chain.	.689		
		Q26	Laws and regulations related to cold chain logistics need to be improved.	.625		
Factor 4	Infrastruc-ture	Q07	Urban traffic jams have a negative impact on cold chain logistics and delivery.	.723	1.587	6.901

Table 6 (continued)

		Q12	The "Last 1 Kilometer" of cold chain logistics delivery in cities constrains the development of cold chain logistics.	.598		
		Q20	Inadequate refrigeration storage and unreasonable layout affect cold chain logistics and delivery.	.764		
Factor 5	Logistics manage-ment level	Q15	Logistic management and technical personnel are in short supply.	.883	1.275	5.546
		Q16	The level of logistics management has a greater impact on cold chain delivery of agricultural products.	.877		
Factor 6	Social context	Q12	The "Last 1 Kilometer" of cold chain logistics delivery in cities constrains the development of cold chain logistics.	.562	1.097	4.771
		Q18	Consumers' increasing demand for fresh, nutritious and diverse agricultural products has promoted the development of cold chain logistics.	.706		
		Q24	Development potential of cold chain logistics in China is huge.	.547		
Factor 7	Logistics participants	Q13	Consumers are more willing to buy "raw" agricultural products that have not been "processed" by refrigeration.	.658	1.060	4.609
		Q25	There is a lack of unified coordination and integration between upstream and downstream enterprises of supply chain of cold chain agricultural products.	.707		

Name and Explanation of Influencing Factors of Cold Chain Logistics Development of Agricultural Products

(1) Factor 1 (F_1), termed "industry technology" consists of seven highly correlated indicators including "application of advanced cold chain technology", "application of agricultural product preservation technology", "application of the internet and big data", "establishing a unified logistics information platform", "application of information technology", "information acquisition of upstream and downstream enterprises in chain logistics" and "integrity of regional logistics system". The factor loadings were found to be between 0.53 and 0.69, with an eigenvalue of 5.721, while the interpretative variance was 24.87%.

$$F_1 = 0.893Q_1 + 0.569Q_2 + 0.839Q_8 + 0.905Q_{10} + 0.904Q_{14} + 0.841Q_{19} + 0.673Q_{21} + \varepsilon_1 \quad (2\text{-}1)$$

ε_1 is a special factor, which indicates that Fi cannot be included in Q_1, Q_2, Q_8, Q_{10}, Q_{14}, Q_{19} and Q_{21}.

(2) Factor 2 (F_2), identified as "economy" consists of three highly correlated indicators including "common delivery in cold chain logistics", "regional supermarket scale", and "marketization & specialization degree of agricultural product cold chain logistics". The factor loadings were found to be between 0.60 and 0.89, with an eigenvalue of 3.840, and an interpretative variance of 16.69%.

$$F_2 = 0.859Q_3 + 0.894Q_5 + 0.604Q_6 + \varepsilon_2 \quad (2\text{-}2)$$

ε_2 is a special factor, which indicates that Fi cannot be included in Q_3, Q_5 and Q_6.

(3) Factor 3 (F_3), "macro politics" consists of five highly correlated indicators including "marketization & specialization degree of agricultural product cold chain logistics", "policies of cold chain logistics development", "industry standard of cold

chain logistics", "mandatory standards of agricultural product cold chain circulation" and "laws and regulations related to cold chain logistics". The factor loadings were found to be between 0.60 and 0.89, with an eigenvalue of 2.486, and interpretative variance of 10.81%.

$$F_3 = 0.550Q_6 + 0.531Q_9 + 0.669Q_{11} + 0.689Q_{22} + 0.625Q_{26} + \varepsilon_3 \quad (2\text{-}3)$$

ε_3 is a special factor, which indicates that Fi cannot be included in Q_6, Q_9, Q_{11}, Q_{22} and Q_{26}.

(4) Factor 4 (F_4), named "infrastructure" consists of three highly correlated indicators including "urban traffic jam problem", "the last 1km of cold chain logistics delivery in cities", and "refrigeration storage construction and layout". The factor loadings were found to be between 0.60 and 0.76, with an eigenvalue of 1.587, and interpretative variance of 6.90%.

$$F_4 = 0.732Q_7 + 0.598Q_{12} + 0.764Q_{20} + \varepsilon_4 \quad (2\text{-}4)$$

ε_4 is a special factor, which indicates that Fi cannot be included in Q_7, Q_{12} and Q_{20}.

(5) Factor 5 (F_5), named "logistics management level" consists of two highly correlated indicators including "logistic management and technical personnel in short supply" and "logistics management level has a greater impact on cold chain delivery of agricultural products". The factor loadings were found to be between 0.66 and 0.71, with an eigenvalue of 1.275, and the interpretative variance is 5.55%.

$$F_5 = 0.883Q_{15} + 0.877Q_{16} + \varepsilon_5 \quad (2\text{-}5)$$

ε_5 is a special factor, which indicates that Fi cannot be included in Q_{15} and Q_{16}.

(6) Factor 6 (F_6), identified as "social context" consists of three highly correlated indicators including "the last 1 kilometer of cold chain logistics delivery in cities", "consumers' increasing demand for quality agricultural products" and "development potential of cold chain logistics". The factor loadings were found to be between 0.55 and 0.71, with an eigenvalue of 1.097, and interpretative variance of 4.77%.

$$F_6 = 0.562Q_{12} + 0.706Q_{18} + 0.547Q_{24} + \varepsilon_6 \quad (2\text{-}6)$$

ε_6 is a special factor, which indicates that Fi cannot be included in Q_{12}, Q_{18} and Q_{24}.

(7) Factor 7 (F_7), "logistics participants" consists of two highly correlated indicators including "consumers' purchasing choice for agricultural products" and "coordination and integration of upstream and downstream enterprises of the supply chain of cold chain agricultural products". Both factor loadings were found to be approximately 0.88, with an eigenvalue of 1.060, and interpretative variance of 4.61%.

$$F_7 = 0.658Q_{13} + 0.707Q_{25} + \varepsilon_7 \quad (2\text{-}7)$$

ε_7 is a special factor, which indicates that Fi cannot be included in Q_{13} and Q_{25}.

Model of Influencing Factors of the Development of Cold Chain Logistics for Agricultural Products

According to the analysis of the principal components of the influencing factors of the development of the cold chain logistics of agricultural products, the interpretative variance of the seven influencing factors was 24.874, 16.693, 10.807, 6.901, 5.546, 4.771, and 4.609, respectively. The factors of "industry technology", "economy", "macro policies", "infrastructure", "logistics management level", "social context", and "logistics participants" can be used to express the structural relationship of the influencing factors:

$$Inf = 24.874F_1 + 16.693F_2 + 10.807F_3 + 6.901F_4 + 5.546F_5 + 4.771F_6 + 4.609F_7 + \varepsilon \quad (3\text{-}1)$$

In the above formula, *Inf* = influencing factors of the development of cold chain logistics for agricultural products; F_1 = industry technology; F_2 = economy; F_3 =

macro policies; F_4 = infrastructure; F_5 = logistics management level; F_6 = social context; F_7 = logistics participants; ε = error term.

5. CONCLUSION AND POLICY SUGGESTION

This research was conducted through means of a questionnaire survey for industry practitioners who were familiar with the status of cold chain logistics for agricultural products, and various stakeholders in the industry who possess a micro perspective. A factor analysis method was used to analyze the influencing factors of the development of cold chain logistics for agricultural products in southwest China. The results show that the main factors of industry technology, economy, macro policies, infrastructure, logistics management level, social context, and logistics participants, do affect the development of cold chain logistics for agricultural products.

As the influencing factors are complex, it is certain that development cannot be entirely determined by these seven factors. The factor model obtained through factor analysis in this study is only a possible description of the structure of the influencing factors for cold chain logistics development regarding agricultural products.

Policy suggestions:

Firstly, the application of advanced cold chain technology and information technology should be strengthened in all links of the cold chain logistics for agricultural products. The analysis shows that applying advanced cold chain technology, agricultural product preservation technology, and information technologies such as the internet and big data, can effectively reduce the logistics costs for agricultural products. As these factors are important in influencing the development of the cold chain logistics for agricultural products, and improving the development level of the cold chain logistics of agricultural products in southwest China, focus should be placed on strengthening the popularization and application of advanced technologies for the cold chain logistics of agricultural products, such as setting up a unified logistics information platform, and establishing a complete regional logistics system.

Second, the development policy for the cold chain logistics of agricultural products, and the formulation of industry standards for cold chain logistics should be improved. According to the analysis, the marketization and the degree of specialization of the cold chain logistics of agricultural products in a specific area, the laws and regulations related to cold chain logistics and the completeness of mandatory standards for the cold chain circulation of agricultural products are other important factors influencing the development of the cold chain logistics of agricultural products.

Third, the physical infrastructure for the cold chain logistics of agricultural products, and personnel training for logistics management should both be strengthened. Through the analysis, it can be seen that the construction of transportation infrastructure, cold storage, and storage and transportation facilities are important factors affecting the cold chain logistics of agricultural products. A well-developed network of transportation infrastructure and cold chain logistics nodes are conducive to the rapid development of regional cold chain logistics. It is certain that human resources talented in logistics technology are also essential in managing these facilities effectively.

Fourth, it is necessary to improve the awareness of modern logistics among participants in the cold chain logistics of agricultural products. The analysis shows that, for the factor of logistics participants, modern logistics awareness among the producers of fresh agricultural products, and consumer choice of agricultural products delivered via cold chain logistics, both significantly affect the level of logistics development. A good sense of modern logistics will help participants to change the traditional concept of logistics and lead to the application of advanced logistics technologies, thereby enhancing the

development level of the local cold chain logistics of agricultural products. As a result, it is necessary to strengthen education and training for various participants, including farmers, agricultural product operators, cold chain service providers and primary logistics managers, and to enhance their awareness of modern logistics.

REFERENCES

Yang, A. N. (2012). The analysis of the development of fresh agricultural products logistics in China. *Logistics Sci-Tech*, 36(5):61-63.

Brown, T., & James, S. J. (2006). The effect of air temperature, velocity and visual lean (vl) composition on the tempering times of frozen boneless beef blocks. *Meat Science*, 73(4), 545-552.

Salin, V., & Jr, R. M. N. (2003). A cold chain network for food exports to developing countries. *International Journal of Physical Distribution & Logistics Management*, 33(10), 918-933.

Yang, G. H. et al. (2009). Study on cold chain logistics mode and countermeasures of fresh agricultural products. *Guangdong Agricultural Sciences*, 45(6):200-203.

Yao, Y. Q. et al. (2012). Analysis of influencing factors of fresh agricultural products cold chain logistics based on fuzzy AHP. *Logistics Sci-Tech*, 36 (1):92-95.

Wang, T. et al. (2014). The logistics level evaluation and development mode selection of fresh agricultural products in Western Areas of China. *Soft Science*, 28(2):136-139.

Xu, L. R. & Ren, J. J. (2015). Study on the influencing factors of cold chain logistics based on ISM and AHP. *Information Technology*, 7, 131-136

Lu, Z. & He, Q. (2015). Influencing factors and assessment on fresh agricultural products logistics development--Based on the analysis of survey data of industrial professionals in five regions. *West Forum*, 25(2):25-32.