The Study on Services Ability Evaluation and Cultivation of The Logistics Company Based on Agricultural E-Commerce

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Abstract. Recently, the logistics service companies which has complete service system based on agricultural E-commerce are very few. From the perspective of the agricultural E-commerce,the paper put forward evaluation index system and the evaluation method of logistics companies' service ability,which is based on the characteristics of the agricultural products circulation and the diversity of the customer demand in the agricultural consumer market. So they can serve as a guide in cultivating logistics companies for agricultural E-commerce.

1 Introduction

Agricultural e-commerce refers to the introduction of modern information technology and business means, such as e-commerce, into the current production and operation of agricultural products, in order to ensure the effective and smooth flow of agricultural information collection and processing, through the dynamic strategic alliance of agricultural logistics and e-commerce systems, and the establishment of a high-performance agricultural marketing system suitable for the network economy.In October 2015, the General Office of the State Council issued the "Guidance on Promoting Rural Guiding Opinions on Accelerating the Development of E-Commerce", pointing out that rural e-commerce is an important means to transform the agricultural development mode and an important carrier for precise poverty alleviation. According to the opinion, in order to promote the rapid development of rural e-commerce, a very important task is to cultivate diversified rural e-commerce market players, encourage e-commerce, logistics, commerce, finance, supply and marketing, postal services, express and other types of social resources to strengthen cooperation, build rural shopping network platforms, realize the docking and integration of advantageous resources, and participate in the development of rural e-commerce. At present, there are more and more enterprises involved in the field of agricultural products e-commerce. However, because it is a new thing, the construction of related services and supporting facilities for agricultural e-commerce is still weak, and there are few enterprises that really have a complete logistics and distribution system for agricultural e-commerce. This study attempts to propose a logistics enterprise evaluation method based on agricultural products e-commerce service from the perspective of agricultural products e-commerce, which can play a guiding role in the cultivation and development of agricultural products e-commerce logistics service enterprises.

2 Literature review

The study on the distribution operation of agricultural products has been conducted from the perspectives of supply chain and application of information technology, etc. Victoria salin (1998) and others have studied the application of information technology in the agro-food supply chain,[1] in addition, Nicholas Kalaizandinkes (1998) and others have extended the study on agricultural supply chain to transnational In addition, Nicholas Kalaizandinkes (1998) and other studies on agricultural supply chains have been extended to transnational trade and other areas, and have combined existing techniques and theories such as ISO 9000, transparency and traceability. [2]Yang Lei (2012) argues that in agricultural supply chains, their unique competitiveness comes from their core enterprises, which are important subjects for the optimization of the supply chain, and describes the characteristics of the resources that the core enterprises have [3]. Wang Ke, Li Zhen et al. (2014) analyzed the current situation of urban-rural commodity market segmentation and spatial price differences in China, constructed a research framework on how to apply the theory of spatial price equilibrium to the design and analysis of urban-rural supply chain integration, and finally gave a specific research example of urban-rural agricultural product supply chain network analysis with a typical cluster structure [4]. Liu Weihua (2010) and others proposed a closed supply chain operation model for agricultural products based on core sellers [5].

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In the study of agricultural products e-commerce, Zhang Xuehai (2012) analyzed the differences between urban and rural commodity circulation in China and the reasons for their formation, and put forward corresponding policy recommendations [6]. Tao Jianchuan (2010) discussed the classification and development status of e-commerce logistics models in reality, and finally compared and summarized the advantages and disadvantages of several major logistics models such as self-operated model, third-party logistics model, and logistics alliance [7]. Zhu Yongjian (2006) analyzed the current situation of e-commerce development and the current development of agricultural products, pointed out the necessity of carrying out e-commerce trade of agricultural products, and argued the feasibility of carrying out this business. And the intermediary model and transaction chain model for agricultural products trading under e-commerce were proposed [8]. Zhong Cong'er and Li Lin proposed that the most important place to implement e-commerce is logistics and distribution flow distribution facilities and equipment. It is believed that the key to the success of the enterprise lies in the logistics and distribution system of the enterprise under e-commerce and the management of the system by the enterprise. Therefore, the key aspects of the distribution process are optimized [9][10].

In terms of the research on the evaluation index system of agricultural logistics, Wang Jing ((2012) proposed the evaluation index system of agricultural logistics from the perspective of sustainable development, which aims to assess the operational efficiency of agricultural distribution and make a prediction on the related problems in development [11]. Li, Fei, and Liu, Mingwei (2005) based on the selection of evaluation indexes for the modernization of commodity circulation in China, determined the weights of each index by Delphi method and principal component analysis, gave specific values for the modernization level of each index, and established an index system for the evaluation of commodity circulation modernization that can be applied [12]. Sun (2012) argued that the standardization of information system is an important tool in the efficient operation of agricultural logistics, and proposed a specific construction method [13].

For agricultural products e-commerce, the above literature has researched from different perspectives such as agricultural products supply chain operation, industry chain core enterprise cultivation, transaction intermediary model, network layout analysis, and distribution enterprise evaluation index system, and has proposed corresponding solutions. However, with the general increase of income level of consumer groups in the whole society, the consumption demand for agricultural products also shows the trend of diversification. The classification of customer groups based on consumption characteristics and the development of personalized services for different customer groups are the concepts that must be followed by future agricultural products distribution enterprises. Based on such a realistic background, it is necessary to give logistics service enterprises more modern elements and propose evaluation indexes and evaluation methods that are more in line with modern requirements. This is exactly what the existing related research is less involved in.

3 Source and Formation of Evaluation Indexes

According to the National Standard of the People's Republic of China "Classification and Evaluation Indicators of Logistics Enterprises" (GB/T19680-2005), logistics enterprises are divided into 5 levels from A to AAAAA, and the evaluation indicators used include 5 aspects such as enterprise operation status, assets and equipment, management and service, personnel quality, internationalization level, etc. The corresponding evaluation criteria are also According to the current situation of China's logistics enterprises in 2005 or so, the overall weighing is derived. The evaluation index system is mostly quantitative, which is more convenient and operable in evaluation. According to the realistic background in which modern agricultural products e-commerce service enterprises are located, following the principles of modernity, comprehensiveness, scientifically and feasibility, on the basis of the original national standard index system, the hierarchical indexes of industry evaluation, profitability, technological leadership, supply chain operation and team building are added (or modified) to build the logistics service evaluation index system as shown in Table 1.

Table 1. Agricultural products e-commerce logistics enterprise service capacity evaluation index system.

Level A Indicators a_i	Level B Indicators b_{ij}	Level A Indicators a_i	Level B Indicators b_{ij}
Operating condition a_1	Operating income b_{11}	Assets and equipment a_2	Total amount of tangible assets b_{21}
	Profitability b_{12}		Technological leadership b_{22}
	Gearing ratio b_{13}		Owned freight vehicles b_{23}
	Business hours b_{14}		Owned storage area b_{24}
	Industry evaluation b_{15}		Operating network b_{25}
Management and services a_3	Management system b_{31}	Team building a_4	Technical staff situation b_{41}
	Quality management b_{32}		Business personnel b_{42}
	Business coverage b_{33}		Core members b_{43}
	Customer satisfaction b_{34}		Talent training expenses b_{44}
Business information a_5	Network system b_{51}	Supply chain management	Strategic partners b_{61}

t a_6	
Electronic document management b_{52}	Management technology tools b_{62}
Cargo tracking b_{53}	Supplier management mechanism b_{63}
Customer inquiry b_{54}	Industry chain traceability management b_{64}

4 AHP Evaluation Process and Method

According to the complexity of the regional logistics service system and the second-level hierarchical characteristics of the evaluation index system, AHP (hierarchical analysis method) is used to evaluate the regional logistics service system, which is a combination of qualitative and quantitative decision analysis method to solve complex problems with multiple objectives. The principle of the hierarchical analysis method is to decompose the problem into different constituent factors according to the nature of the problem and the total objective to be achieved, and to gather and combine the factors at different levels according to the interrelated influence and affiliation between the factors to form a multi-level analysis structure model.

Based on the hierarchical analysis method to analyze the structural model, the problem can be reduced to the determination of the relative importance weights or ranking of the relative advantages and disadvantages of the lower levels with respect to the higher levels [14] [15]. The main steps are as follows.

(1) Construct the judgment matrix. All elements of the judgment matrix aij are given by Stanty's 1-9 scaling method. The data for this evaluation were obtained based on the importance of the elements of the same level relative to the elements of the previous level by the expert panel, as shown in Tables 3 - 7.

(2) Hierarchical single ranking and consistency test. The feature vector corresponding to the maximum feature root λmax of the judgment matrix is normalized (so that the sum of the elements in the vector is equal to 1) and then recorded as W. The elements of W are the ranking weights of the relative importance of the factors of the same level to the factors of the previous level, and this process is called hierarchical single ranking.

(3) Consistency test. The magnitude of the value $\lambda_{\max} - n$ can be used to measure the degree of inconsistency of the judgment matrix. Let the consistency index of hierarchical single ranking be CI, RI be random consistency index (as in Table 2), and the consistency ratio of hierarchical total ranking be CR.

Table 2. Average random consistency index

n	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.6	0.9	1.1	1.2	1.3	1.4	1.4	1.4

$$CI = \frac{\lambda_{\max} - n}{n-1}, \quad CR = \frac{CI}{RI}$$

(4) Total target hierarchy integrated weight ranking. Through the consistency test, its normalized feature vector can be used as the weight vector, and the total hierarchical ranking is performed by calculating the weight vector obtained from the calculation of each judgment matrix, and the calculation results are shown in Table 3-9.

Table 3. Judgment Matrix A

A	a_1	a_2	a_3	a_4	a_5	a_6	Layer A power vector
a_1	1	3	2	4	6	4	0.3857
a_2	1/3	1	3	2	4	2	0.2193
a_3	1/2	1/3	1	1	2	4	0.1430
a_4	1/4	1/2	1	1	3	3	0.1323
a_5	1/6	1/4	1/2	1/3	1	1	0.0558
a_6	1/4	1/2	1/4	1/3	1	1	0.0639
λ=6.35, *CI*=0.0701, *CR*=0.0566<0.1							

Table 4. Judgment Matrix a_1

a_1	b_{11}	b_{12}	b_{13}	b_{14}	b_{15}	Layer B power vector	Combined weight vector
b_{11}	1	2	4	2	4	0.3911	0.1508
b_{12}	1/2	1	2	3	3	0.2485	0.0958
b_{13}	1/4	1/2	1	4	2	0.1803	0.0695
b_{14}	1/2	1/3	1/4	1	2	0.1066	0.0411
b_{15}	1/4	1/3	1/2	1/2	1	0.0735	0.0283
λ=5.43, *CI*=0.1029, *CR*=0.0919<0.1							

Table 5. Judgment Matrix a_2

a_2	b_{21}	b_{22}	b_{23}	b_{24}	b_{25}	Layer B power vector	Combined weight vector
b_{21}	1	2	5	3	5	0.4321	0. 0948
b_{22}	1/2	1	3	2	3	0.2463	0. 0540
b_{23}	1/5	1/3	1	2	4	0.1465	0. 0321
b_{24}	1/3	1/2	1/2	1	3	0.1184	0. 0260
b_{25}	1/5	1/3	1/4	1/3	1	0.0567	0. 0124
λ=5.31, *CI*=0.0784, *CR*=0.0700<0.1							

Table 6. Judgment Matrix a_3

a_3	b_{31}	b_{32}	b_{33}	b_{34}	Layer B power vector	Combined weight vector
b_{31}	1	2	2	4	0.4079	0. 0583
b_{32}	1/2	1	3	6	0.3494	0. 0500
b_{33}	1/2	1/3	1	4	0.1790	0. 0256
b_{34}	1/4	1/6	1/4	1	0.0637	0. 0091
λ=4.22, *CI*=0.0718, *CR*=0.0797<0.1						

Table 7. Judgment Matrix a_4

a_4	b_{41}	b_{42}	b_{43}	b_{44}	Layer B power vector	Combined weight vector
b_{41}	1	2	2	6	0.4291	0.0568
b_{42}	1/2	1	3	4	0.3198	0.0423
b_{43}	1/2	1/3	1	5	0.1920	0.0254
b_{44}	1/6	1/4	1/5	1	0.0591	0.0078
λ=4.21, *CI*=0.0706, *CR*=0.0785<0.1						

Table 8. Judgment Matrix a_5

a_5	b_{51}	b_{52}	b_{53}	b_{54}	Layer B power vector	Combined weight vector
b_{51}	1	1/3	1/3	1/5	0.0769	0.0043
b_{52}	3	1	1/4	1/3	0.1444	0.0081
b_{53}	3	4	1	1/2	0.3228	0.0180
b_{54}	5	3	2	1	0.4559	0.0254
λ=4.21, *CI*=0.0700, *CR*=0.0777<0.1						

Table 9. Judgment Matrix a_6

a_6	b_{61}	b_{62}	b_{63}	b_{64}	Layer B power vector	Combined weight vector
b_{61}	1	6	2	6	0.5713	0.0365
b_{62}	1/6	1	1	3	0.1623	0.0104
b_{63}	1/2	1	1	2	0.1895	0.0121
b_{64}	1/6	1/3	1/2	1	0.0769	0.0049
λ=4.18, *CI*=0.0584, *CR*=0.0649<0.1						

5. CONCLUSION

(1) According to the high comprehensive weight value, it is divided into high value group and low value group . In the ranking of comprehensive weight value, operating income, profitability and total amount of tangible assets rank high, which indicates that at present, in agricultural products e-commerce, the selection of logistics service providers tends to be based on their explicit performance, that is to say, enterprises with larger scale and better operation condition are more likely to enter the list of logistics service providers. This is basically in line with the basic characteristics of logistics services, that is, through the scale effect to produce efficient and low-consumption services. In particular, agricultural products e-commerce, due to agricultural products from planting, processing, to the distribution chain, the entire industry chain there is a large uncertainty, the resulting risk is much greater than the manufacturing supply chain. For the fresh products with high added value, whether it is agricultural super docking, or agricultural batch docking, on the one hand, it needs relatively high-end cold chain logistics to ensure, on the other hand, on the combination of logistics links, there should be precise planning arrangements and sufficient resources to ensure a seamless docking. Enterprises with certain scale and good operation condition have more advantages in operation ability, scheduling control and resource guarantee.

(2) Indicators such as network system and industry chain traceability management are ranked low. These indicators are relatively hidden indicators, and they are easily ignored when making logistics service provider selection. It also indicates that in the operation of agricultural products circulation, the concept basically still stays in the traditional operation mode. On the other hand, it also shows that in the agricultural products supply chain, there is still more room for improvement in the information means of logistics and the supply chain model based on collaboration. Now, the understanding of agricultural products logistics should not only be regarded as a simple service link, but also as an important value-added link. With the general increase of income level of the whole society, the consumption demand for agricultural products also shows the trend of face diversification and personalization. Customer classification based on consumption characteristics and personalized services for different customer groups are the concepts that must be followed by future agricultural products distribution enterprises. To achieve this requirement, a strong information system and supply chain must be supported, which is also an important direction for agricultural logistics enterprises to achieve core competitiveness.

(3) At present, the vast majority of logistics services based on the circulation of agricultural products are still small and medium-sized enterprises, with insufficient resources and capacity to provide simple, single process-based transportation or warehousing activities. Due to the low entry threshold of logistics industry, more enterprises will penetrate in the future, resulting in disorderly competition in the industry, but it is difficult to form the core competitiveness based on the industrial chain. For small and medium-sized logistics enterprises, the future development direction is to take the road of specialization and cooperation. Compared with large logistics enterprises, small and medium-sized logistics enterprises cannot be compared with them in terms of resource capacity, but this does not affect these enterprises to take the road of specialization. With the diversification of customer needs, in the future development, the agricultural products industry chain extends more value-added links, and the division of labor based on the industry chain will become more and more detailed, and it is impossible for any one enterprise, no matter how big it is, to complete the whole industry chain. As a small and medium-sized enterprise, it needs to fully explore the value-added space based on the agricultural products industry chain, seek the work links suitable for its comparative advantage, so as to carry out the deep development of specialization, which can also create core competitiveness and thus effectively embed itself into the specialized division of labor in the agricultural products supply chain.

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