

Study on the Choice of Rural Logistics Operation Mode in China

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Abstract

The distribution of rural logistics resources in China is decentralized and unbalanced, which severely restricts the development of the rural economy. How to choose the operation mode of rural logistics has far-reaching influence on the development of the rural economy. Therefore, based on the analysis of the existing operation modes of rural logistics, this paper makes a comprehensive evaluation of the operation modes of rural logistics by using AHP, compares their relative effectiveness, and puts forward some suggestions on selecting different operation modes.

Keywords

Rural logistics, Operating mode, Analytic hierarchy process.

1. Introduction

At present, rural logistics has very large market demand; a large number of material circulation needs a scientific and perfect logistics system. However, the poor foundation of rural road network construction, fewer powerful logistics enterprises and the lack of logistics information platform all seriously restrict the development of rural logistics, resulting in the serious decoupling of rural logistics from market demand and hindering the development of the rural economy. Developing rural logistics plays an important role in promoting rural economic development.

At present, there are four mainstream rural logistics operation modes in China: large enterprise operation mode, supply chain operation mode, professional operation mode and cooperative operation mode. How to choose an appropriate operation mode according to one's situation will play a key role in the development of rural logistics, which will be elaborated in this paper.

2. The Development Trend of Rural Logistics

2.1. Starting to Pay Attention to the Planning and Construction of Rural Logistics Network Nodes

The development of rural logistics depends on a sound logistics network system, which consists of nodes and lines. The planning and construction of logistics nodes is particularly important. It is a rural logistics service station with the functions of goods collection, sorting and distribution, information management, etc. With the strengthening of rural reform and urbanization in our country, the rural areas in our country are gradually taking small towns as the centre, and the economic core position of each township is gradually strengthening. Therefore, it is in line with the development trend and necessary to set up logistics nodes in villages and towns.

2.2. Market Access Management Gradually Standardized

In the rural logistics network system, logistics participants are numerous but also very chaotic. Many farmers run their logistics, storage facilities and transportation are simple, and the logistics services provided are scattered and unsystematic. Its logistics cost is high, and its benefit is low, so it is difficult to undertake the important task of standardized development of rural logistics market. Therefore, the strengthening of market access management has been paid attention to. The government began to use relevant laws, regulations and policies to improve them, to ensure the dominant market position of powerful and qualified logistics enterprises, and to provide better and more effective logistics services for the countryside through professional and social means. Market access management is not only conducive to the promotion of small and medium-sized logistics enterprises to become bigger and stronger, but also should be conducive to the cultivation and support of large-scale logistics enterprises to become the leader of rural logistics.

2.3. Gradually Strengthen the Construction of County Logistics Network

The construction of county-level logistics network group needs to consider the value of the original logistics network system in the process of systematic research and planning, including the market for means of production and the market for agricultural products. A detailed survey of the market situation with county-level economic characteristics will be carried out to give full play to the existing resources and advantages of the original rural logistics enterprises, to consolidate their characteristics, and to encourage enterprises to unite and develop together. We will encourage the transformation of trade markets, trading markets and agricultural material stations that rely on cities and towns to build major gathering points for rural logistics and supplement the rural logistics network system with their influence and radiation. Increase logistics infrastructure statistics and construction work, and the logistics network system will be gradually improved.

2.4. Gradually Improve the Management System of Rural Logistics Market

The construction of rural logistics network system cannot be separated from the perfection of logistics market management system. At the national level, a rural logistics management committee has been set up, which will coordinate and formulate laws and regulations on the development of rural logistics and standardize the development of rural logistics.

3. Rural Logistics Operation Mode

3.1. Leading Operation Mode of Large Enterprises

3.1.1. Rural Logistics Operation Mode Dominated by Large Logistics Enterprises

Compared with the general enterprises, large-scale logistics enterprises have the advantages of abundant network resources and funds. Therefore, if large-scale logistics enterprises are the leaders, such brand resources, network resources and logistics resources will greatly promote the construction of rural logistics network system and the improvement of logistics service level. For example, China Post has the country's largest rural financial network and network transmission system. Its rapid development is an important material foundation formed by the country's high investment. This has greatly saved the cost of developing the rural logistics market. Moreover, China's postal service has formed a comprehensive logistics platform integrating information flow, capital flow and logistics based on the integration of postal transportation resources and financial savings and credit functions using a wide range of transportation platforms. However, due to the lack of awareness of rural logistics and limited ability to obtain market demand information, the government needs to increase its policy support to achieve real development.

3.1.2. Rural Logistics Operation Mode Dominated by Large Chain Commerce Enterprises

Large chain commercial enterprises have advantages in sales network and capital and control a certain market. However, this kind of enterprise has a low level of specialization in logistics operation, and its operation is not standardized, resulting in an increase in the cost of the entire logistics system and low efficiency of operation. If we cooperate with third-party logistics enterprises, we will solve many problems. Therefore, it is necessary for large chain enterprises to cooperate with third-party logistics enterprises to jointly realize the development of rural logistics.

3.2. Supply Chain Operation Mode

From the perspective of supply chain, rural logistics can be rationally organized, market demand-oriented, and existing resources can be integrated. And the use of advanced information technology, so that agricultural products from production, circulation, and sales to achieve the whole process of controllability.

3.2.1. Rural Logistics Operation Mode with Circulation Enterprises as the Core

According to the characteristics of the rural logistics supply chain, the production, processing and consumption of agricultural products are integrated around the agricultural products circulation enterprises, and the third party logistics company provides them with professional and systematic supporting services such as logistics, information, sales and customer data. And then fundamentally solve the problems of high cost and serious waste caused by the miscellaneous circulation links in rural logistics, and improve logistics efficiency.

Its characteristics and applicable conditions:

First, circulation enterprises provide specialized transportation and sales for agricultural products and are the main force of rural logistics.

Second, a specialized agricultural product distribution centre integrating warehousing, distribution processing and distribution is equipped.

Third, breaking through regional restrictions and effectively connecting business flow, logistics and information flow can achieve a balance between production and marketing.

This model is applicable to the vast rural areas where the supply of logistics services such as agricultural products transportation and distribution, processing and sales is insufficient.

3.2.2. Rural Logistics Operation Mode with Wholesale Market as Core

In this mode, the government plans and builds the wholesale market, and relevant departments are responsible for market operation and supervision. Around the wholesale market of agricultural products, farmers, wholesalers and retailers will form a cooperative alliance and participate together.

The model centres on the wholesale market and organizes and coordinates farmers, wholesalers, retailers, agricultural products distribution processing enterprises and other participating entities. To effectively integrate the dominant resources of various subjects, realize their functions efficiently and create more economic value. However, in this mode, the business process, logistics and information flow are separated and independent.

It can be applied to those rural areas with large-scale and well-established agricultural product wholesale market systems, and develop advanced and intensive agricultural product wholesale markets with the help of mature market and resource advantages.

3.3. Operational Mode of Professional Express Logistics Enterprises

Specialized express delivery logistics enterprises can break the situation that farmers are not good at marketing and logistics. Using professional technical equipment to realize the effective

connection between farmers and distributors will greatly save the circulation cost and improve the operation efficiency of rural logistics.

Features:

First, make the rural logistics activities more specialized and specific, making the use of resources more fully. The circulation of rural materials in transportation, storage, distribution, processing and other links is more efficient, reducing logistics costs.

Second, express logistics enterprises should give full play to their professional advantages, make full use of the existing logistics base, and make forward-looking planning and development coordination for rural logistics.

Third, China's rural logistics started late and the government did not pay enough attention to it. Fewer express delivery companies are involved in rural logistics, and the logistics network system is not perfect, which all restrict the development of this mode.

This model conforms to the development trend of urbanization and can meet the demand of modern agriculture for logistics brought by large-scale and mechanized production. Moreover, the implementation process of this model is also a process to speed up the construction of rural logistics infrastructure and improve the rural logistics network.

3.4. Cooperative Rural Logistics Operation Mode

With the development and perfection of a series of network projects in rural areas, the mode of modern direct marketing logistics network has been formed in the rural areas of our country at present, thus taking an important step for the development of rural logistics to seek win-win cooperation.

3.4.1. Cooperative Operation Mode

Relying on the emerging specialized farmers' cooperatives, integrating agricultural production and sales of agricultural products, and using transportation, storage, distribution and other related technologies, the new development of rural logistics will be realized.

First, storage facilities and transportation facilities are shared by members of specialized agricultural cooperatives. Breaking the previous self-sufficiency model is conducive to improving competitiveness and forming its advantages.

Second, for a long time, China's self-sufficient agricultural production mode has led the vast number of farmers to know only production but not logistics management, market and sales. The latter three determine the price of agricultural products and market demand to a large extent. Farmers' professional cooperatives organize scattered farmers to make efficient and reasonable use of resources.

3.4.2. Postal Rural Logistics Operation Mode

At present, China Post has incomparable network advantages in rural areas. Building a rural logistics operation mode based on the postal network can effectively reduce costs.

First, postal outlets are spread all over urban and rural areas, making them have formed sufficient unique advantages and rich experience in logistics, information flow and capital flow in rural areas.

Second, through the advanced network management platform, the exchange of information between farmers and enterprises' needs can be realized, and the effective allocation of network resources can be realized by using the network with more efficient operation.

Third, timely transmission of information through postal distribution networks will effectively improve the production and sales efficiency of rural agricultural products.

4. Evaluation of Rural Logistics Operation Mode Based on AHP

4.1. Analytic Hierarchy Process

Analytic Hierarchy Process (AHP) is a multi-criteria decision analysis method put forward by famous American strategists. By constructing a hierarchical structure model, it quantitatively analyzes a small amount of acquired information and uses mathematical methods for decision-making. The research object is divided into target layer, criterion layer and sub-criterion layer as a whole, and detailed analysis is carried out layer by layer to provide a basis for people to make decisions, forecasts, judgments and controls. In the application of the analytic hierarchy process, we must first determine the research objectives and form the initial model. Secondly, the weight values of influencing factors at all levels are calculated in turn. Finally, the ranking is made according to the overall weight of the influencing factors at various levels. The greater the weight value, the greater the impact. Therefore, in practice, it is often possible to simplify the comparison of a series of factors and facilitate decision-making.

4.2. Construction of Index System

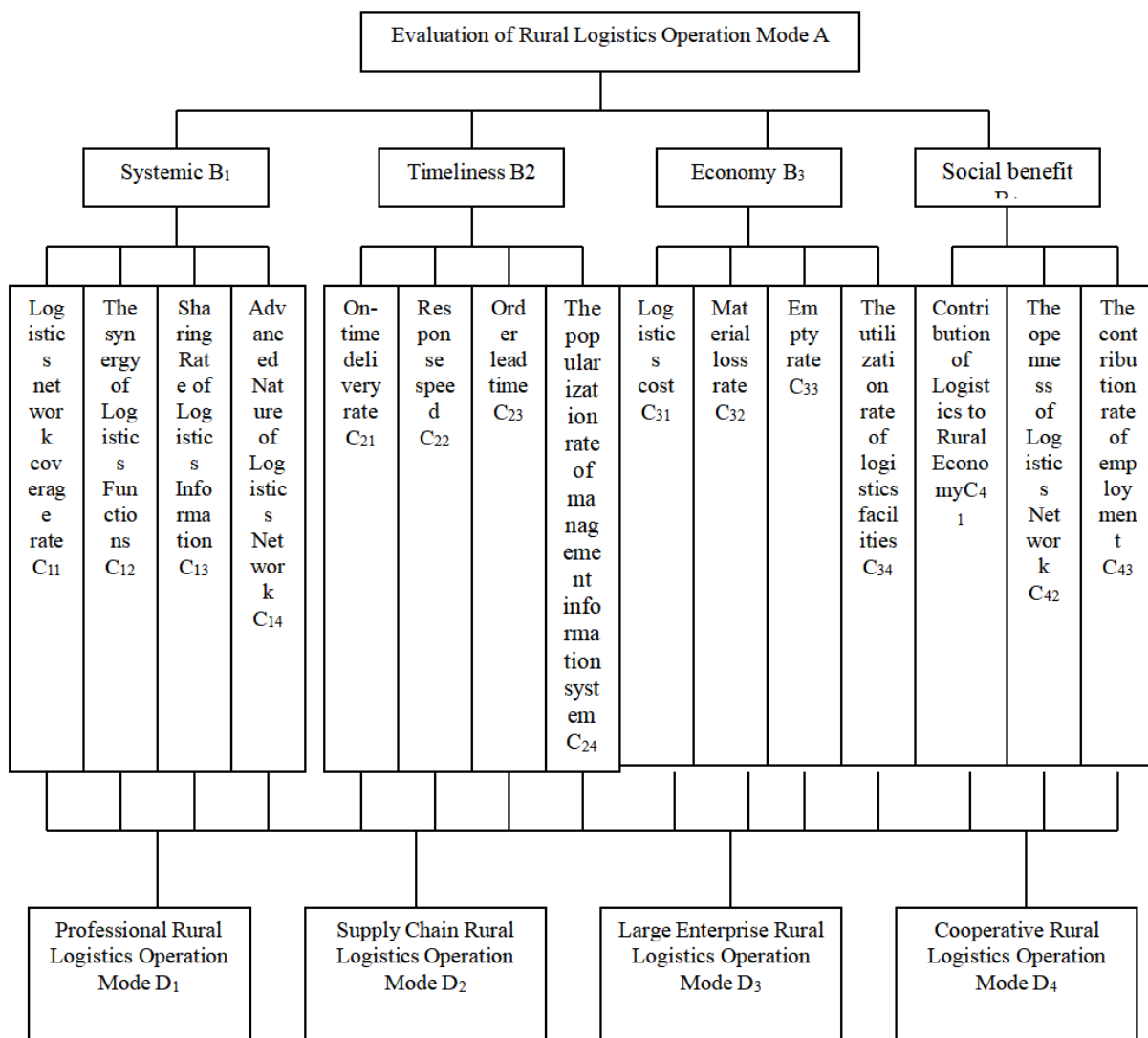


Fig 1. Evaluation Index System of Rural Logistics Development Mode

(The above indicators are obtained from the investigation and collation of expert opinions)

The rural logistics network itself is not perfect, the government lacks the corresponding organization and coordination, the commodity circulation channel is jumbled, the infrastructure network is not perfect, and the information technology is difficult to carry out. Based on these characteristics of the rural logistics network, this paper has established four-dimensional indicators of systematicness, timeliness, economy and social benefits through data access and interviews to complete the evaluation research on the rural logistics operation mode.

4.2.1. Systematic Index

The objective of the operation of the rural logistics network is to coordinate the relationships among the sub-networks and give full play to their respective functions so that the entire rural logistics network system can achieve long-term development and operation.

Systematic indicators are mainly considered from the coverage rate of the rural logistics network, coordination of logistics functions, sharing rate of the logistics information and advancement of the rural logistics network.

4.2.2. Timeliness Index

Reasonable allocation of logistics resources is the key to improve the operation efficiency of logistics network. Usually, four indexes can be considered: on-time delivery rate, response speed, order delivery period and popularization rate of management information system.

4.2.3. Economic Index

The key to restricting the rapid development of rural economy is the high circulation cost of agricultural products. Therefore, to reduce the total cost of the entire logistics network on the basis of the continuous improvement of the functions of the logistics network, the following indicators must be taken into account: first, logistics cost; Second, the material loss rate; Third, transportation costs; Fourth, the utilization rate of logistics infrastructure.

4.2.4. Social Indicator

The operation of the whole rural logistics network plays an important role in the operation of the rural economy. The contribution rate of logistics to the rural economy is related to the overall economic development level of the country, and a perfect logistics network is an important symbol of national economic development. Breaking through industrial and regional restrictions, strengthening urban-rural cooperation and promoting interaction between production and city are another important goal of the rural logistics network. This will expand the openness of the logistics network. Employment rate, that is, in the process of rural logistics operation, farmers in rural areas arrange employment, alleviate the contribution of the employment situation, and reflect the ability of rural logistics operation community to provide employment.

4.3. Evaluation Process and Results

4.3.1. Data Processing and Random Consistency Test of Judgment Matrices at Different Levels

The model data is collected using a specific scoring method. To ensure the effectiveness of data collection, it is carried out in the form of a questionnaire survey, which covers a wide range of subjects. Including logistics experts, rural logistics practitioners, business enterprises, rural logistics professional researchers.

The judgment matrix and the uniform random index value of the processed data are combined with the weight coefficient of the hierarchical structure model to obtain the judgment matrix and random consistency of the relative importance of each factor in the B criterion layer, as shown in the following table:

Table 1. Layer B weight calculation

A	B1	B2	B3	B4	Weight coefficient
B1	1	1/3	1	4	0.234
B2	3	1	2	3	0.449
B3	1	1/2	1	2	0.218
B4	1/4	1/3	1/2	1	0.099

$\lambda_{\max} = 4.169$ CR=CI/RI=0.062<0.10 Consistency check passed

The corresponding judgment matrix and random consistency of each index in sub-criterion layer C under each criterion in criterion layer B are shown in the following table:

Table 2. C1 layer weight calculation

B1	C11	C12	C13	C14	Weight coefficient
C11	1	1/5	1/4	1/2	0.085
C12	5	1	3	1	0.420
C13	4	1/3	1	1/2	0.193
C14	2	1	2	1	0.302

$\lambda_{\max} = 4.236$ CR=CI/RI=0.088<0.10 Consistency check passed

Table 3. C2 layer weight calculation

B2	C21	C22	C23	C24	Weight coefficient
C21	1	2	3	1/3	0.269
C22	1/2	1	2	1/2	0.190
C23	1/3	1/2	1	1/2	0.121
C24	3	3	2	1	0.420

$\lambda_{\max} = 4.258$ CR=CI/RI=0.096<0.10 Consistency check passed

Table 4. C3 layer weight calculation

B3	C31	C32	C33	C34	Weight coefficient
C31	1	5	4	3	0.548
C32	1/5	1	1/3	1/2	0.084
C33	1/4	3	1	2	0.218
C34	1/3	2	1/2	1	0.150

$\lambda_{\max} = 4.117$ CR=CI/RI=0.043<0.10 Consistency check passed

Table 5. C4 layer weight calculation

B4	C41	C42	C43	Weight coefficient
C41	1	1/6	1/5	0.082
C42	6	1	1/2	0.368
C43	5	2	1	0.550

$\lambda_{\max} = 3.086$ CR=CI/RI=0.074<0.10 Consistency check passed

4.3.2. Hierarchical Total Sort

It can be seen from the upper part that the comprehensive weight of the criterion layer C can be obtained by multiplying the B layer weight by the C layer weight. Then, according to the survey results of scoring the four operation modes, multiply by the weight and finally add up to obtain the comprehensive score of each operation mode. As shown in table 6.

Table 6. Programme Evaluation

Indicators	Comprehensive weight	Scheme scoring			
		D1	D2	D3	D4
C11	0.0199	3	2	8	5
C12	0.0983	4	2	5	8
C13	0.0452	2	3	9	5
C14	0.0707	2	6	7	4
C21	0.1208	3	2	7	6
C22	0.0853	2	6	6	4
C23	0.0543	5	3	8	3
C24	0.1886	2	3	8	5
C31	0.1195	4	2	7	6
C32	0.0183	2	5	8	4
C33	0.0475	3	2	9	5
C34	0.0327	2	3	7	5
C41	0.0081	3	1	8	6
C42	0.0364	2	4	6	8
C43	0.0545	3	3	7	6
total		2.8492	3.1188	7.1563	5.4240

Data source: according to the survey results

4.3.3. Result Analysis

From the results, we can see that the large enterprise mode of operation is the best in terms of systematicness, low cost, high efficiency and comprehensive social benefits, with a weight of 7.1563. The cooperative operation mode led by the government, due to the government's unclear market expectations, too much intervention and the problems of local government's face-saving project, leads to many resources being difficult to achieve the expected results. Moreover, the utilization rate of infrastructure is not high, the phenomenon of social resource waste is serious, and the overall effect is slightly lower than that of large enterprise operation mode, with a weight value of 5.4240. It is worth mentioning that if the government coordinates properly, this mode may become the mainstream mode of the rural logistics operation. The supply chain operation mode, due to the low level of enterprise logistics operation and excessive specialization, is prone to instability of logistics, high logistics cost and problems in operation links, resulting in lower response speed. It is slightly superior to the professional rural logistics operation mode with a weight of 3.1188. Due to the lack of integration of upstream and downstream enterprises, lack of control and low utilization rate of logistics resources, the professional rural logistics operation mode is not high. Also, enterprises and farmers have a weak sense of cooperation, which is the worst of the four models.

5. Suggestions on Selection of Rural Logistics Operation Mode

Each county and city should consider the operation mode of rural logistics from the perspectives of economic development level, urbanization construction, organizational development mode and characteristics of industrial agglomeration areas. On this basis, it will promote the rapid development of rural logistics and promote the prosperity and development of the rural economy. Its main recommendations are as follows:

5.1. Choose the Operation Mode of Rural Logistics to Adapt to the Level of Economic Development

Each county and city should analyze the economic structure, objectively evaluate the current economic development situation and future development trend, fully combine the existing rural logistics resources, and select the appropriate rural logistics operation mode. Therefore, all counties and cities should work together to plan the logistics infrastructure as a whole and consider the docking of existing resources such as passenger stations, rural bus stops, logistics stations and other logistics node facilities with the rural logistics network system to effectively integrate the existing logistics centres and promote the development of rural logistics. Areas with good economic development should take the logistics demand of industrial enterprises as the pillar, improve the rural logistics infrastructure, and give logistics enterprises a good space for development. To attract or cultivate professional rural logistics enterprises to settle down and promote the sustainable development of rural logistics in the region with their rich experience and management level.

5.2. Choose the Rural Logistics Operation Mode Suitable for the Urbanization Construction

Urbanization has brought about the merger of a large number of villages and towns, forming a centralized village gathering area. With some villagers moving to cities, counties and towns, economic exchanges with rural areas and the flow and exchange of products are more frequent, and the demand for rural logistics is increasing day by day. The development of urbanization has promoted the improvement of consumption level and the possibility of logistics outsourcing and has driven the growth of rural logistics. The convenience of rural logistics has also changed the consumption and living habits in rural areas, prompting more young people to pursue comfort and convenience and gather in towns and cities to complement each other and promote each other's development. The combination of rural logistics and urbanization construction, centring on large population gathering areas, and the selection of appropriate rural logistics operation mode can not only promote the development of rural logistics but also accelerate the urbanization process to a certain extent.

5.3. Choose the Operation Mode of Rural Logistics Consistent with the Main Body of Rural Logistics

Rural logistics is decentralized, complex and unbalanced. This determines that there can be no unified organization and management of a logistics enterprise, responsible for the management of the entire logistics process. According to the characteristics, scale and flow mode of rural materials, classified management and specialized operation are required. Specialized trade organizations and groups such as rural wholesale markets, specialized cooperatives and supermarket chains can transform into specialized logistics enterprises according to their strength and the characteristics of the materials involved. Therefore, the provinces, counties and cities should combine the characteristics of local logistics, under the existing business operation mode, according to the construction idea of "aggregation, integration and modernization", select the appropriate rural logistics operation mode, encourage enterprises to gather and develop, and realize the prosperity and progress of rural logistics.

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