Research on Joint Distribution of Rural Logistics

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Abstract. With the progress of science and technology and the development of society, the popularity of online shopping has been greatly improved, and it provides a broad space for the circulation and sale of agricultural products, and promotes the development of new countryside in China. Despite the vigorous development of rural e-commerce, it is still in its infancy, and there are many problems such as imperfect logistics distribution system. Among them, the joint distribution mode of terminal logistics is an important factor restricting the development of rural e-commerce. Therefore, we should develop the logistics mode of common warehousing and distribution among logistics enterprises, and promote the integration of rural logistics warehousing and distribution resources through computer simulation of logistics distribution. This paper investigates the situation of rural express delivery, evaluates the performance of rural express terminal distribution by using the method of fuzzy comprehensive evaluation, and constructs a new mode of rural express delivery operation in view of related problems.

1. Introduction
Due to the saturation of the urban electricity market, Taobao, Jingdong, Suning, Gome and other electricity giants have set foot in rural electricity providers. Especially in the context of "Internet +", the development of rural electric business has become a new engine for the development of e-commerce. At present, there are many problems in rural express delivery, such as low distribution efficiency, low information level, high distribution cost and low service level. The distribution of customers in rural areas is not centralized, and single distribution enterprises can not achieve large-scale operations. In order to solve these problems, some enterprises have sought to establish joint distribution alliance of rural express delivery in order to achieve cost reduction and efficiency increase. Rural express joint distribution alliance needs to statistic the location of joint distribution center, transportation capacity optimization, route selection and other issues. The rationality of joint distribution route selection will directly affect the cost and efficiency of distribution. Therefore, it is of great significance to study it.

2. Current Development of Rural E-commerce
Rural e-commerce has received widespread attention since 2014, and rural e-commerce has been written into the No. 1 document of the Central Committee for four consecutive years, which attracts great attention of the government. After Alibaba announced its rural strategy, many e-commerce platforms also competed to enter the rural market. In our country, the scale of rural online retail continues to present rapidly. With the development of information technology, the comprehensive coverage of rural network and the popularization of smart phones, the proportion of rural netizens and online buyers is increasing. Our government also attaches great importance to and supports the development of rural logistics, and promulgates a series of relevant development policies and
strategies. But at present, there are some problems in rural logistics, such as unreasonable distribution network planning, lack of centralized resources, high cost of distribution, inadequate two-way circulation channels of commodities, and no express delivery to the village. This paper focuses on the optimization of rural logistics distribution mode under e-commerce: integrating the resources of distribution demand, implementing joint distribution, and realizing economies of scale.

3. Performance evaluation of current rural logistics distribution enterprises

3.1. Performance evaluation of logistics distribution based on fuzzy comprehensive evaluation method

In order to analyze the current distribution situation of rural logistics, this paper uses the method of fuzzy comprehensive evaluation to investigate the distribution situation of three logistics enterprises with higher distribution quality: Shunfeng, EMS and Yunda.

3.2. Performance evaluation process

| Evaluating indicator | Very bad V1 | Poor V2 | Commonly V3 | Good V4 | Excellent V5 |
|----------------------|-------------|--------|-------------|--------|--------------|
| Accurate distribution rate | 0.0384 | 0.0382 | 0.1936 | 0.4866 | 0.2342 |
| Timely delivery rate | 0 | 0.0385 | 0.0789 | 0.3254 | 0.5572 |
| Safe distribution rate | 0 | 0.0769 | 0.2682 | 0.4561 | 0.1986 |
| Accurate distribution rate | 0.0364 | 0.0795 | 0.3046 | 0.4856 | 0.0939 |
| Timely delivery rate | 0.0769 | 0.0497 | 0.4236 | 0.3465 | 0.1033 |
| Safe distribution rate | 0.0385 | 0.0358 | 0.1538 | 0.5385 | 0.2308 |
| Accurate distribution rate | 0.0769 | 0.1154 | 0.2308 | 0.3846 | 0.1923 |
| Timely delivery rate | 0.0385 | 0.0769 | 0.2308 | 0.5000 | 0.1538 |
| Safe distribution rate | 0.0385 | 0.1154 | 0.2692 | 0.4615 | 0.1154 |

Evaluation Vector of Shunfeng Express Distribution Quality

\[ B_1 = W_1 \times R_1 = \begin{bmatrix} 0.633 \\ 0.260 \\ 0.107 \end{bmatrix} \times \begin{bmatrix} 0.0384 \\ 0.0382 \\ 0.1936 \\ 0.4866 \\ 0.2342 \end{bmatrix} \]

Evaluation Vector of EMS Express Distribution Quality

\[ B_2 = W_2 \times R_2 = \begin{bmatrix} 0.525 \\ 0.334 \\ 0.141 \end{bmatrix} \times \begin{bmatrix} 0.0364 \\ 0.0795 \\ 0.3046 \\ 0.4856 \\ 0.0939 \end{bmatrix} \]

Evaluation Vector of Yunda Express Distribution Quality

\[ B_3 = W_3 \times R_3 = \begin{bmatrix} 0.525 \\ 0.334 \\ 0.141 \end{bmatrix} \times \begin{bmatrix} 0.0364 \\ 0.0795 \\ 0.3046 \\ 0.4856 \\ 0.0939 \end{bmatrix} \]
\[ B_3 = W_3 \times R_3 = \begin{bmatrix} 0.633 \\ 0.186 \\ 0.181 \end{bmatrix} = \begin{bmatrix} 0.1154 \\ 0.2308 \\ 0.2692 \end{bmatrix} = 0.628 0.1082 0.2378 0.4200 0.1712 \]

Integrated Evaluation Vector of Logistics Distribution

\[ B = W \times R = \begin{bmatrix} 0.623 \\ 0.240 \\ 0.137 \end{bmatrix} = \begin{bmatrix} 0.0243 \\ 0.0510 \\ 0.0628 \end{bmatrix} = 0.0360 0.0566 0.2172 0.4397 0.2472 \]

Shunfeng, EMS and Yunda's distribution quality performance evaluation results are respectively: 3.9621, 3.5158, 3.5286

The overall performance evaluation results of logistics distribution are as follows: 3.4956

3.3. Results of performance evaluation.
In the above analysis, only Shunfeng has achieved good results, while the other two enterprises have only achieved general results. This means that there is still much room for improvement in the development of rural logistics. Rural e-commerce is developing rapidly, and rural e-commerce network retail sales have made amazing achievements. However, in the process of rapid development of rural e-commerce, there are some problems, such as imperfect logistics distribution system and imperfect distribution mode, which seriously affect the efficiency and service convenience of terminal logistics.

4. Solutions.

4.1. Co-distribution model.
In terms of integration of distribution resources, rural areas can adopt the mode of joint distribution, design a new distribution system, cooperate with the government and chain enterprises, build a distribution center specially serving the countryside in the county town. All goods transported from other cities to the countryside in the county are put into the distribution center first, and then the distribution center sorts and transports the goods from the countryside to the countryside together. Distribution station, and then by the distribution station to distribute or by consumers directly to pick up parts. This paper designs the rural logistics co-distribution mode of distribution stations in rural areas under e-commerce environment, as shown in Figure 1.

![Figure 1. Common distribution mode of rural logistics](image-url)
4.2. The design of rural logistics distribution network under the mode of joint distribution.
The composition of logistics network is generally point, line and surface. Points represent logistics nodes, which connect logistics lines in logistics network. Logistics nodes have the function of linking up each logistics line into a system. Therefore, for the rural logistics network, we can establish a secondary distribution network, including a single primary distribution center near the county or business district, and multiple distribution stations in rural areas (each distribution station serves one or more administrative villages), relying on the rural road network to realize the distribution of rural logistics network. The layout of rural logistics network under joint distribution mode is shown in Figure 2.

![Diagram of rural logistics network layout](image)

**Figure 2.** Rural logistics Network layout map under common distribution mode

In the planning of rural logistics network, the location of distribution center, distribution station layout and distribution cost should be solved. Rural distribution centers are responsible for collecting and distributing goods. Determine the location of distribution center according to the total demand, and then carry out distribution station layout.

4.3. Terminal Distribution Problem.
Considering the transportation and economic development in rural areas, logistics enterprises can choose towns with convenient transportation to set up integrated logistics service points. This integrated logistics service center can be used as the management station of joint distribution of terminal logistics and provide comprehensive services. Farmers shop through commercial platforms, and then the goods are sent to the township logistics integrated service center by various logistics companies. The Service Center organizes the express packages of the companies according to the rural level, and then reorganizes them. Unified distribution. The Center recruits some delivery personnel who are familiar with the situation in the villages. The delivery staff provides terminal logistics services to deliver packages from the service center to farmers. This joint distribution method solves the problem of terminal transportation and delivers goods directly to farmers. But this mode only solves the problem of one-way freight transportation from city to town, and does not provide a
convenient and fast way for rural products from village to city. Because the logistics integrated service center is located in villages and towns in this way, it is far away from most village-level agricultural products producing areas. It is not easy to provide convenient services for the sale logistics of agricultural products.

5. Conclusion
In recent years, with the gradual expansion of the e-commerce market, rural e-commerce is developing rapidly, and rural e-commerce network retail sales have made amazing achievements. However, in the process of rapid development of rural e-commerce, there are some problems such as imperfect logistics distribution system and imperfect distribution mode, which seriously affect the efficiency and service convenience of terminal logistics. This paper gives a brief overview of the current joint distribution mode of rural e-commerce terminal logistics in China, summarizes the main characteristics and operation modes of the current joint distribution mode of rural e-commerce terminal logistics, and puts forward corresponding ways to improve its development, hoping to better promote the overall development of rural e-commerce.

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