Forest Chemicals Review
www.forestchemicalsreview.com
ISSN: 1520-0191
July-August 2022 Page No. 1662-1668
Article History: Received: 02 April 2022, Revised: 15 April 2022, Accepted: 24 April 2022, Publication: 04 May 2022

Innovative Model of Agricultural Product Logistics Under the Background of Rural Revitalization

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Abstract:

The Rural Revitalization Strategy plays a leading role in innovating the logistics operation mode of agricultural products. This paper expounds the significance of the innovation of agricultural product logistics operation mode under the background of Rural Revitalization Strategy. This paper analyzes the problems faced by the development of agricultural products logistics industry from the aspects of the integration of urban and rural agricultural logistics system, the integration of rural agricultural products logistics resources and the improvement of logistics technology. At the same time, this paper designs the space-time layout of urban and rural logistics system. This paper designs and implements a cross industry agricultural products logistics resource sharing platform. The experimental results show that the method proposed in this paper can improve the application level of advanced agricultural product logistics technology.

Keywords*: Rural Revitalization, Agricultural Products Logistics, Operation Mode, Space-time Layout.*

I. INTRODUCTION

Taking fresh agricultural products as the research object is because fresh agricultural products, as indispensable food and perishable products, have high requirements for retail circulation [1-2]. The transformation from e-commerce to new retail also starts with fresh agricultural products [3-4]. Fresh e-commerce platforms continue to build bridges between consumers and agricultural product providers, promoting the circulation of fresh agricultural products. After the proposal of new retail, the new retail model of HEMA fresh and the new e-commerce model of daily excellent fresh also provide ideas for new retail and greatly improve the experience of consumers [5]. In the retail circulation of fresh agricultural products, logistics distribution is particularly important. The distribution of fresh agricultural products is difficult. Because it has the characteristics of fresh activity and perishability, it has strict requirements on the temperature, humidity and time in the distribution process. In addition, fresh agricultural products such as vegetables and aquatic products are necessities of daily life, and the demand elasticity is small [6-8]. Therefore, the distribution of fresh agricultural products has the characteristics of high requirements for transportation technology, high requirements for logistics timeliness, high requirements for sorting and

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packaging, and high requirements for quality and safety. With the continuous improvement of living standards, consumers are eager to pursue a higher consumption experience, and fresh agricultural products distribution needs a higher pursuit, which promotes the development of fresh agricultural products distribution industry.

III. ANALYSIS ON THE DEVELOPMENT STATUS AND TREND OF LOGISTICS DISTRIBUTION MODE OF FRESH AGRICULTURAL PRODUCTS

2.1 Current situation and problem analysis of logistics distribution mode of fresh agricultural products

Self operated distribution mode generally refers to that e-commerce enterprises establish their own logistics business, enterprises independently operate the logistics system, various management businesses are also undertaken by the enterprise itself, and the activities of the logistics system are managed by the functional departments within the enterprise. E-commerce enterprises can invest in logistics transportation equipment and build logistics warehousing according to their own strategic plan, and shoulder the functions of logistics, warehousing, distribution and so on. The biggest advantage of the self operated distribution mode is that it has strong business pertinence and fast speed, which can improve consumers' shopping experience and meet consumers' needs, so as to improve consumers' loyalty to the e-commerce platform [9]. Moreover, the self operated distribution mode makes the logistics distribution business more flexible and has more accurate control over the information of logistics distribution. The disadvantages of self operated distribution mode are also obvious, that is, the construction and operation costs are large, and a large amount of investment is required in the early stage. It is difficult for small-scale e-commerce enterprises to build a complete self operated distribution system. Moreover, only when the logistics distribution business of e-commerce enterprises reaches a certain scale, the advantages of self operated logistics distribution mode will appear. Then, the flexibility of self operated logistics has certain limitations, and it may not be able to adapt to the rapidly changing logistics distribution requirements [10].

The third-party logistics mode is that e-commerce enterprises outsource all or part of logistics operation tasks to professional companies, that is, third-party logistics suppliers. The advantage of the third-party logistics distribution mode is that it reflects the specialization of logistics distribution. The third-party logistics distribution enterprises are relatively experienced, highly professional and have a wide range of distribution services. The business of e-commerce enterprises can be quickly arranged and completed. The disadvantages of the third-party logistics distribution mode are poor pertinence and relatively low timeliness. It is impossible for the third-party logistics distribution enterprise to customize the distribution scheme for an e-commerce enterprise. E-commerce enterprises lose the initiative of commodity distribution because they hand over the distribution business to third-party logistics suppliers. In particular, e-commerce enterprises do not control the logistics distribution data, which is unfavorable to the adjustment and development of e-commerce enterprises.

The joint distribution mode is to share third-party logistics services, which means that multiple e-commerce enterprises jointly choose the same third-party logistics distribution enterprise to provide distribution services. The advantages of joint distribution mode are that it can make full use of the

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advantages of multiple e-commerce enterprises and meet the distribution needs of each e-commerce enterprise at the same time. This reduces the logistics cost of e-commerce enterprises, and also gives play to the coordination of logistics distribution of various e-commerce enterprises, which has greatly improved the efficiency of logistics distribution. The disadvantage of the joint distribution mode is that the whole logistics distribution process is completed by multiple enterprises. If one enterprise fails to cooperate or withdraws, it will make the distribution business difficult to carry out and affect consumers' trust in the enterprise.

2.2 Trend analysis of logistics distribution mode of fresh agricultural products under the background of new retail

In order to improve the distribution efficiency, the distribution mode trend under the new retail background gradually forms a multi-level warehouse distribution network system. To build a multi-level warehouse system, it is difficult for a small number of warehouses to achieve effective distribution, so it is bound to form a multi-level warehouse system. Each warehouse distribution center achieves network collaboration and sharing, so as to maximize the speed of goods responding to orders. Many warehouses focus on terminal storage, which can also be understood as front-end warehouse. Only the warehouse layout closer to consumers is scientific and reasonable, can logistics be more safe and efficient. Creating front-end warehouse layout has become one of the development directions of new retail. Build graded distribution, take the needs of customers as the goal, classify the goods according to the information system, and plan the transportation route to improve the distribution efficiency.

The deep integration of online and offline logistics is reflected in the integration of commodities and logistics channels. Offline physical stores continue to develop online channels, and online e-commerce is also developing to offline channels. They cooperate with each other to achieve complementary advantages and win-win results. In terms of logistics distribution, they have realized online ordering, offline picking up, offline ordering and online delivery, achieving unified and coordinated development. Different from the O2O model, the new retail is not a simple addition of the two, but breaks the original boundary and constructs a virtuous circle of omni-channel commodity and logistics distribution network, which will greatly improve the experience of consumers. The new retail introduces the offline traffic to the online through intelligent network equipment. The corresponding mature online order processing and logistics distribution system also brings convenience to the offline and reduces the offline inventory cost. At the same time, give full play to online and offline advantages to build a new retail era.

III. CONSTRUCTION OF INNOVATIVE LOGISTICS DISTRIBUTION MODEL OF FRESH AGRICULTURAL PRODUCTS UNDER THE NEW RETAIL BACKGROUND

3.1 Overall architecture design of innovation mode

The overall structure of the innovative logistics distribution model is mainly based on the previous warehouse distribution module, combined with the third-party logistics distribution of traditional e-commerce, and the design and construction of data support module based on new technologies such as big data artificial intelligence. The characteristics are as follows: (1) supporting the whole logistics

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distribution mode is a big data platform. Its main functions include coordinating the distribution scheme, vehicle scheduling, formulating the corresponding vehicle use plan, and then taking and sending goods to the best cost driving path through the reasonable arrangement of intelligent path decision-making to realize the complete logistics distribution. (2) In the context of new retail, in addition to the support of big data platform, there are new generation emerging technologies such as artificial intelligence and Internet. Automatic replenishment, intelligent transportation, automatic sorting, and the combination of online and offline logistics can constitute the innovative mode of logistics distribution. (3) The front warehouse is the core of the whole logistics distribution mode. This distribution mode is mainly used for the distribution of the previous warehouse. The front warehouse is not just a warehouse. At the same time, it also undertakes the distribution function. The most important thing in the construction of front-end warehouse is to select the location of front-end warehouse. A scientific and reasonable location scheme can not only reduce the cost, but also better serve consumers. (4) The location of the front-end warehouse is mainly concentrated in the areas with large customer demand, and the front-end warehouse has a certain distribution range. The additional construction of the front-end warehouse in the areas with less customer demand will cause a waste of resources. Therefore, the third-party logistics is used to assist the distribution, and the third-party logistics is used for distribution in areas beyond the distribution scope of the front warehouse. The third party has special distribution services and cold chain buses, which can better ensure the distribution quality of fresh agricultural products.

3.2 Design of front bin module

The design of front warehouse module is the key to the innovative mode of logistics distribution. Its functions are as follows: (1) storage. Although the front warehouse occupies a smaller area than the logistics distribution center built by region, the warehousing and storage service of fresh agricultural products is indispensable. It must be ensured that it can meet the demand of the distribution scope before replenishment. (2) Sorting and packaging. The front warehouse replenishes a wide range of goods from the central warehouse of a node on the logistics distribution network. Therefore, the front warehouse needs to further sort and package the goods, so that the staff can deliver the goods in time according to the orders of consumers. (3) Transportation and distribution. Providing distribution service for customers is the core function of the front warehouse. The staff shall timely allocate the types and quantities of goods required by customers according to the customer's order requirements, and formulate a reasonable distribution route according to the delivery time and place of goods. At the same time, we should pay real-time attention to the urban traffic conditions, so as to adjust the distribution route in time and deliver the goods to consumers on time. (4) Information processing. While providing customers with distribution services, the front warehouse also needs to deal with the information in the process of logistics distribution. Timely upload orders from customers to the information system of the logistics center to monitor the real-time traffic situation in the distribution area, so as to plan a reasonable distribution route for distribution vehicles. The vehicles in the distribution process should also be monitored in real time to avoid emergencies. At the same time, the delivery of goods and other information should be registered, processed and analyzed in time.

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In this paper, two stages are used to study the location of front warehouse: in the first stage, the improved DBSCAN clustering algorithm and K-means algorithm are used to determine the number of front warehouse construction. In order to save the cost, the clustering algorithm will no longer set the front warehouse for the isolated point, and the third-party logistics distribution can be adopted. The isolated point is distributed by the third-party logistics, which can save the cost of cold chain distribution; In the second stage, the multi center of gravity method aiming at the minimum cost is established to realize the location of the front bin of fresh agricultural products, and the center of gravity method is used to solve each cluster area to obtain the coordinate position and minimum cost of the front bin; Finally, an example is given to verify the effectiveness of the algorithm.

When using the multi center of gravity method for location, the demand point needs to be divided into multiple sub areas, and the center of gravity method is used for location in each area. Due to the limited distribution range of the front warehouse, some areas divided by DBSCAN clustering algorithm will be too large and exceed the distribution range. It is necessary to re divide the areas with large range by secondary clustering of K-means algorithm. When constructing the center of gravity location model, because the construction cost of the front warehouse is a fixed cost, it is no longer added to the objective function, and the construction cost difference of different sections in practice is not considered. The specific steps are as follows: (1) Data collection and processing. Determine the abscissa and ordinate of demand points, and forecast and estimate the demand of demand points. (2) improved DBSCAN clustering partition. Run JAVA program based on My Eclipse, substitute data for processing, and output the result. (3) Draw the clustering effect diagram with MATLAB. Classify and number each point. (4) Remove isolated points, use SPSS to do secondary clustering of K-means algorithm for the areas where the clustering area exceeds the distribution range of the pre-warehouse, and draw the clustering effect diagram of all areas where the pre-warehouse needs to be set with MATLAB. (5) The center of gravity method program calculates the location coordinates of each cluster area and calculates the minimum cost. (6) Drawing the results of site selection in each area by 6)MATLAB. Get the final site selection scheme.

IV. OPERATION OF INNOVATIVE LOGISTICS DISTRIBUTION MODE OF FRESH AGRICULTURAL PRODUCTS UNDER THE NEW RETAIL BACKGROUND

The operation of the innovative mode needs to realize the data support module and the front bin module. An example is given to verify the effectiveness of the proposed algorithm and model. The example source is the annual demand historical data of fresh agricultural products in a region. The selected demand points are the main demand points of fresh agricultural products in the region, and the coordinate values are obtained from the coordinates of Baidu map. The demand of each location is predicted and calculated by the historical data with the grey prediction model, which is the demand within a certain range of the demand point. In the application of the model, it is assumed that the demand of the demand point remains unchanged for a certain period of time. Finally, the center of gravity method model is written in MATLAB to solve the location coordinates and minimum cost.

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In this paper, it is necessary to predict the demand for fresh food of customers. A major demand point in the region is selected as an example to predict the demand. The interval of each time series is 1 year. The demand of demand points according to the time series is shown in Table 1 below:

TABLE I. Demand at demand point

Time series	Demand at demand point (10000 tons)
1	0.09
2	0.12
3	0.17
4	0.16
5	0.21
6	0.22
7	0.25
8	0.27

According to the area span and front bin coverage of cluster 5, the secondary cluster is divided into six areas, so k = 6. The initial point selects six scattered demand points with large demand, which are location 4, location 6, location 14, location 26, location 32 and location 44. SPSS is used for secondary cluster analysis, and the clustering results are shown in Table 2.

TABLE II. K-means clustering results

Category	Clustering region
Cluster 1	Location 2, location 3, location 4, location 7, location 10
Cluster 2	Location 6, location 8, location 9, location 13, location 16, location 17
Cluster 3	Place 19, place 22
Cluster 4	Location 24, location 26, location 27, location 28, location 31
Cluster 5	Location 25, location 32, location 33, location 34, location 36, location 38, location 40
Cluster 6	Location 39, location 44, location 47, location 48, location 49, location 50

The calculation results of the example meet the expectations of the experiment of the algorithm and model. The demand prediction of each demand point is realized through the grey prediction model. The improved DBSCAN clustering and K-means algorithm secondary clustering effectively realize the clustering of demand points, determine the number of front warehouses and find isolated points. The isolated points implement the way of third-party logistics distribution. The location model of multi center of gravity method also finds the location of front bin for each cluster area. Therefore, the innovative logistics distribution model of fresh agricultural products under the new retail background constructed in this paper can realize effective operation.

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V. CONCLUSION

Under the background of new retail, this paper studies the innovation of logistics distribution mode of fresh agricultural products. Firstly, it analyzes the background of new retail and the current situation of logistics distribution mode of fresh agricultural products, and explains the relevant concepts. Then it analyzes the impact of new retail on the logistics distribution mode of fresh agricultural products and the development trend of fresh agricultural products distribution mode under the background of new retail. Finally, an innovative logistics distribution mode of fresh agricultural products under the new retail background is constructed, which is dominated by front warehouse distribution and supplemented by third-party logistics distribution.

ACKNOWLEDGEMENTS

This research was supported by soft science research project of Henan science and technology development plan in 2022, Project Name: Research on improving the logistics efficiency of agricultural products in Henan Province under the background of Rural Revitalization (Grant No.222400410453).

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