Research on Regional Logistics Capacity of Agricultural Products in Henan Province

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Abstract. There are many kinds and large scale of agricultural products in Henan Province of China. To research on regional logistics capacity of agricultural products is helpful for us to understand the advantages and disadvantages of agricultural products logistics capacity. However, there are many influencing factors and large complexity in the evaluation of agricultural product logistics ability, so it is necessary to establish a scientific variable system. In this paper, 10 variables are selected from three dimensions which are regional economic variables, regional basic variable, and regional development variable, therefore the variable system is constructed. The regional agricultural product logistics capability of 18 cities in Henan Province is evaluated by factor analysis and Cluster Analysis. It is found that logistics development is different among these cities with the low efficiency and high loss of agricultural product logistics. In addition, on the basis of conclusion of the analysis, some suggestions are putting forward to promote the development of agricultural products logistics.

1. Introduction

Henan Province is a major agricultural province in China. The development of agricultural products logistics plays an important role in the development of economic lifeline in Henan Province. Nowadays, under the influence of the new normal of China economy, the logistics of agricultural products in Henan Province has reached a new period. How to ensure the safety of processing and production, innovate to promote the upgrading of the industry, improve the efficiency of production and operation, and so on, have become the inevitable requirement of the development of agricultural products logistics in the new era. The production and circulation of agricultural products in Henan Province are huge, but the logistics cost of agricultural products in Henan Province is high, so the price of agricultural products in Henan Province is constantly rising. In addition, the circulation of agricultural products among various regions of Henan Province has increased, and the regional logistics capacity of agricultural products is facing great challenges.

The domestic and foreign scholars make a great deal of research on the ability of the agricultural product logistics. The whole process of logistics management is fully studied by the authors of Ma...
Shihua and Meng Qingxin by the three categories of physical, intangible and integrated elements, and the 23 capability elements of supply chain logistics are define[1]. The three principles representativeness, comparability and stability of Wei Jing and Wang Jiang selected nine variables to study the logistics ability of 12 different cities to study the urban logistics ability [2]. Gimnez [3] and others think that information and communication play a very important role in the development of the supply chain of agricultural products. The rapid development of the network tool system and the emerging e-commerce will help to promote the overall competitiveness of the agricultural product supply chain and the overall competitiveness of the agricultural products supply chain, and Terry Marsden, et al. [4] think of the "firstly, the characteristics of different agricultural products and the requirements of the adaptation characteristics are determined, different agricultural product supply chains are selected, and then the logistics activities under different agricultural products are organized". In the aspect of regional agricultural product logistics research, some scholars in the country have started to make effective attempts to establish the variable system of regional agricultural product logistics evaluation from different angles, and the quantitative methods such as artificial neural network, AHP and fuzzy evaluation method are used for the analysis.

2. Establish the Variable System

The regional logistics capability reflects the regional logistics ability from the regional economic factors in a certain area, in combination with the research of the relevant literature and the development of the regional agricultural product logistics in the province, Three aspects, such as regional economic factors, regional basic factors and regional support factors, are selected to influence the logistics capacity of the regional agricultural products in Henan Province, and the evaluation system of the regional agricultural product logistics capability in Henan Province is constructed, as shown in Table 1.

| Table 1. The Evaluation Variable System |
|----------------------------------------|
| **Detailed Variable**                 |
| X1GDP                                 |
| X2 Agriculture, forestry and animal husbandry and fishery output value |
| X3 total retail sales of consumer goods |
| X4 Fixed assets Investment in Transportation, warehousing and Post Industry |
| X5 Road mileage                        |
| X6 Freight turnover                    |
| X7 total production of agricultural products |
| X8 Logistics personnel employment     |
| X9 International number of Internet users |
| X10 The total amount of business in the postal industry. |

3. Analysis and results

3.1. Factor Analysis

Sample variable and data suitability test using SPSS 25.0 software, this paper establishes the original data table based on the 10 variable values of Table 1 in 18 cities of Henan Province. The data are derived from the 2018 Henan Official Statistical Yearbook to test the suitability of factor analysis of the standardized sample data. For example, Table 2 can get a KMO value of 0.709, which indicates that the sample data is suitable for factor analysis.

| Table 2. KMO and Bartlett’s test |
|----------------------------------|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy | 0.709 |
| Bartlett’s Test of Sphericity | | |
| Approx. Chi-Square | 311.587 |
| Df. | 45 |
| Sig. | 0.000 |
Table 3. Total variance explained

| Initial eigenvalues | Extraction sums squared loadings |
|---------------------|----------------------------------|
| Total               | Variances contribution rate % | Variance contribution rate % | Cumulative variance rate % | Total | Variance contribution rate % | Cumulative variance rate % |
| 1                   | 6.292                          | 62.915                        | 62.915                      | 6.030  | 60.299                        | 60.299                      |
| 2                   | 2.811                          | 28.113                        | 91.028                      | 3.073  | 30.729                        | 91.028                      |

Table 4. Rotated component matrix

| Variable                                      | F1     | F2     |
|-----------------------------------------------|--------|--------|
| X1GDP                                         | 0.992  | 0.082  |
| X2 Agriculture, forestry and animal husbandry and fishery output value | 0.027  | 0.969  |
| X3 total retail sales of consumer goods        | 0.967  | 0.217  |
| X4 Fixed assets Investment in Transportation, warehousing and Post Industry | 0.944  | 0.048  |
| X5 Road mileage                                | 0.207  | 0.930  |
| X6 Freight turnover                            | 0.635  | 0.524  |
| X7 total production of agricultural products  | -0.065 | 0.942  |
| X8 Logistics personnel employment             | 0.951  | -0.079 |
| X9 International number of Internet users      | 0.959  | 0.206  |
| X10 The total amount of business in the postal industry | 0.973  | -0.033 |

The characteristic value and the eigenvector of the sample data are calculated, and the sum of the square load and the square load after the rotation is obtained. Two principal factors are extracted for this analysis, and the cumulative variance of the two main factors is 91.028%. The results are shown in Table 3. This indicates that the two extracted factors have been able to account for 91% of all 10 indicator features, which is a more satisfactory result.

The factor load of common factor is calculated. In order to better explain all the other factors, the representativeness of the extracted principal factors, then the initial eigenvalues are rotated, the results are as follows: the composition matrix after the rotation of Table 4. As shown in Table 4, X1, X3,X4 X6, X10, X8 X9 are mainly associated with the first component analysis; X7, X5, X2 is mainly analyzed by the second component.

Table 5. Component score matrix

| Variable                                      | F1     | F2     |
|-----------------------------------------------|--------|--------|
| X1GDP                                         | 0.168  | -0.023 |
| X2 Agriculture, forestry and animal husbandry and fishery output value | -0.046 | 0.329  |
| X3 total retail sales of consumer goods        | 0.157  | 0.024  |
| X4 Fixed assets Investment in Transportation, warehousing and Post Industry | 0.161  | -0.033 |
| X5 Road mileage                                | -0.012 | 0.306  |
| X6 Freight turnover                            | 0.083  | 0.146  |
| X7 total production of agricultural products  | -0.060 | 0.324  |
| X8 Logistics personnel employment             | 0.169  | -0.076 |
| X9 International number of Internet users      | 0.156  | 0.021  |
| X10 The total amount of business in the postal industry | 0.171  | -0.062 |

After determining the extracted factor, the evaluation model calculates the factor score, that is, the specific value of each factor on the sample data, and calculates the score matrix of the factor component as shown in Table 5.
On this basis, formulas (1) and (2) are used to calculate the scores of common factors F1 and F2, respectively. In order to make a better comparative analysis and further calculate the comprehensive score, the cumulative variance contribution rate of the two main factors calculated in the table is taken as the weight, and the comprehensive score of logistics capacity in each region of Henan Province is calculated according to the formula (3) as shown in Table 6.

\[
F1 = 0.038X1 - 0.024X2 + 0.188X3 + 0.186X4 + 0.014X5 + 0.117X6 - 0.039X7 + 0.194X8 + 0.188X9 + 0.198X10 \quad (1)
\]

\[
F2 = -0.159X1 + 0.316X2 + 0.01X3 - 0.036X4 + 0.292X5 + 0.116X6 + 0.303X7 - 0.084X8 + 0.003X9 - 0.074X10 \quad (2)
\]

\[
F = 0.60F1 + 0.31F2 \quad (3)
\]

**Table 6. The ability score and ranking**

| The Number | City       | F1   | F2   | Comprehensive score | Rank |
|-----------|------------|------|------|---------------------|------|
| 1         | Zhengzhou  | 3.709| -0.867| 1.957               | 1    |
| 13        | Nan yang   | 0.375| 2.010| 0.848               | 2    |
| 3         | Luoyang    | 0.848| 0.256| 0.588               | 3    |
| 16        | Zhoukou    | -0.144| 1.686| 0.436               | 4    |
| 14        | Shangqiu   | -0.102| 1.179| 0.304               | 5    |
| 15        | Xinyang    | -0.249| 0.966| 0.150               | 6    |
| 17        | Zhundian   | -0.331| 1.114| 0.147               | 7    |
| 7         | Xinxiang   | -0.157| 0.140| -0.051              | 8    |
| 5         | Anyang     | -0.128| -0.080| -0.102              | 9    |
| 10        | Xuchang    | -0.115| -0.499| -0.224              | 10   |
| 8         | Jiaozuo    | -0.035| -0.682| -0.232              | 11   |
| 4         | Pingdingshan| -0.245| -0.324| -0.247              | 12   |
| 2         | Kaifeng    | -0.468| -0.187| -0.339              | 13   |
| 9         | Puyang     | -0.427| -0.536| -0.422              | 14   |
| 12        | Sammenxia  | -0.491| -0.832| -0.553              | 15   |
| 11        | Luohe      | -0.530| -0.879| -0.591              | 16   |
| 6         | Hebi       | -0.722| -1.041| -0.756              | 17   |
| 18        | Jiyuan     | -0.788| -1.422| -0.914              | 18   |

### 3.2. Cluster analysis

The results of cluster analysis by SPSS 25 software are shown in Figure 1.
Author uses Squared Euclidean distance measures the degree of similarity among samples and the method of Between—groups linkage to analyze the ability of regional agricultural products in various regions of Henan province. Finally, the paper obtains cluster chart (Fig.1): the 18 cities are divided into four categories: first-class logistics ability including Zhengzhou, second-class logistics ability including Nanyang, Jiaozuo, Pingdingshan and Luoyang, third-class logistics ability including Zhoukou, Zhumadian, Shangqiu, Xinyang, Luohe, Kaifeng, Xuchang, Hebi, Qiyuan, fourth-class logistics ability including Anyang, Xinxiang, Sanmenxia, Puyang.

4. Suggestions

4.1. Based on regional advantages to balanced regional development
Zhengzhou, a region with strong logistics capability, continues to change the market demand, strengthen the regional advantages, drive the development of the surrounding regions, and develop the industrial structure suitable for the region in the most suitable region

4.2. Actively guiding the development of agricultural products and carrying out standardized management policies
In order to optimize the environment of agricultural products and to pay more attention to the production of agricultural products, the government should pay more attention to the circulation of agricultural products, and should also set up a standard policy and regulations for agricultural products. establishing and perfecting the unified agricultural product quality standard, developing the rural market supervision and management system, improving the quality detection standard of the agricultural products, establishing and perfecting the preferential policies such as the crop disaster subsidies and the insurance system, and regulating the behavior between the various logistics bodies and the agricultural producers of the agricultural products, Effective protection of the legal interests of the main body and the farmers of the agricultural products

4.3. Perfecting the agricultural product logistics information network
Improve the professional agricultural product logistics information network, increase the information construction of the agricultural product market, and give full play to the information function of the logistics market. In the supply chain, the information platform is used to release and update the information in time, and the information can be quickly and quickly acquired, the information is searched, the market information is used to guide the production of the agricultural products, and the benefit is maximized. In addition, improve that cultural quality of the farmer, accept the market information through the Internet, analyze the data, make a reasonable plan, and prevent the stagnation of the agricultural product

4.4. Improving the construction of logistics infrastructure
The existing agricultural product logistics transportation system is modified, the technical innovation is increased, vigorously develop the cold chain logistics network of the low-temperature storage and cold storage of the agricultural products, and ensure the freshness of the agricultural products, so as to meet the differential demand of the consumers and improve the market equilibrium supply capacity. Improve the investment of fixed assets of transport infrastructure, widen the country road, and improve the quality and benefit of transportation.

5. Conclusion
In this paper, the ability of regional agricultural product logistics in 18 cities of Henan province is ranked and analyzed by a factor clustering method. According to the results of the analysis, it is found that there is a significant difference in the level of agricultural product logistics ability in various regions. On the basis of Zhengzhou radiation to the surrounding cities, the logistics of agricultural products is weakened. In general, the higher the regional economic level, the stronger the ability will be. Therefore, different
measures are taken to realize the structural reform of the agricultural supply side. In the high-capacity region, the advantage of the region and the talent keep playing, the innovation of the agricultural science and technology will be accelerated, the green life will be promoted, and the environmental pollution must be reduced. For the second-class logistics ability, in order to further accelerate the market-oriented pace, to effectively protect the legal interests of the main body of the agricultural products and the farmers. For the other places, improving the logistics information network of the agricultural products and making the common information transparency to maintain the balance of production and marketing, and improving the logistics infrastructures for weak areas with increased capital investment.

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