ISSN:2790-5160 Vol 1, No.4, 2023

Comparative Analysis of Agricultural Competitiveness of Prefecture-level Cities in Shandong Provinc

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Abstract

Agricultural competitiveness is an important indicator for measuring the level of local agricultural development, and high-quality agricultural development is the future development trend of agriculture. This paper analyzes the changes and factors of agricultural competitiveness in Shandong Province, and makes a comprehensive evaluation, and puts forward measures and suggestions to promote the development of high-quality agriculture in Shandong Province. In this paper, relevant agricultural data of 16 prefecture-level cities in Shandong Province are selected, and factor analysis is used to assess the level of agricultural competitiveness of prefecture-level cities in Shandong Province. The results show that the overall distribution of agricultural competitiveness in Shandong Province is uneven, with large gaps and low values. The geographical distribution shows the trend of "high in the middle and low around", and the input-output and economic factors, planting output, fruit and vegetable output, fishery output all affect the competitiveness of Shandong's agriculture. Therefore, the future development direction of Shandong Province's agriculture should be based on the actual development situation, and the competitiveness of agriculture in each prefecture-level city should be improved according to local conditions.

Keywords

Quality development; Agricultural competitiveness; Factor analysis; Regional differences.

1. Introduction

1.1. Background

With the implementation of China's new development concept, the new development pattern of agriculture is also gradually constructed, agricultural development requirements to high-quality development, green and efficient development mode has become the current new mode of agricultural development. Therefore, how to improve the competitiveness of the region's agricultural cities in Shandong Province has become an urgent problem and focus of work. Part of the region to carry out agricultural brand building and geographical indications to create products, with the help of intelligent agriculture, ecological agriculture and other

new agricultural development methods, to take advantage of the opportunity of the development of the digital economy, to open up a new path of agricultural development.

Improving the quality of agricultural development and developing a high-quality, high-standard agricultural economy is a sure way for agriculture to achieve sustainable development. As a traditional agricultural province in China, Shandong Province is committed to the innovation of high-quality agricultural development model, and actively develops eco-agriculture, organic agriculture, urban agriculture and other types of agricultural economy, and the level of agricultural development is located in the forefront of China. However, due to the vast area of Shandong Province, the agricultural production conditions and development status of each prefecture-level city vary greatly, and the condition of natural resources and the level of regional economic development together affect the level of agricultural development in each city, so there are differences in the competitiveness of agriculture in each region. The study of agricultural competitiveness and its influencing factors in each prefecture-level city in Shandong Province, and the reasonable prediction based on the research results, will help to find the development path to improve the agricultural competitiveness of each prefecture-level city in Shandong Province in the new era, and create a new system of high-quality development of agriculture in Shandong Province, which is of guiding significance for the planning of future development of Shandong Province's agricultural economy.The concept of the bathroom facilities for the elderly.

1.2. Literature review

Overseas scholars such as Sallis[1] have pointed out that the stability of agricultural production structure is an important indicator and measure of whether the level of agricultural competitiveness of a country can effectively improve the competitiveness of farmers and the ability of sustainable rural development. Coronado F[2] has included the rural population and other factors affecting the agricultural activities in the indicators, which are used to calculate the competitiveness of agriculture in each region and compare it with other commonly used socio-economic indicators. Domestic scholars, such as Chen Weiping[3] and others, believe that the comparison of agricultural competitiveness should include comprehensive indicators of effect, foundation, structure, modernization, growth and characteristics; Cao Zhiling[4] through his research and suggestions to take the competitiveness of policies as an important indicator to improve agricultural competitiveness; regarding the researches of Liu Xiuqin[5] , Cao Yang[6] and others, the important factors that apply to the improvement of agricultural competitiveness include the ability to compete in the agricultural market and technology; Yao Aiping[7] , Zheng Jun[8] , and Wan Qing etc. will be used to calculate agricultural competitiveness by using the factor analysis method, the hierarchical analysis method, and the factor analysis method, and gray correlation analysis as research methods to discover the problems of agricultural competitiveness.

Currently, international and domestic scholars are focusing on China's agricultural development at the macro level, ignoring the micro research on Chinese agriculture, especially the research on a single province in China is more insufficient. Besides, the current research mainly focuses on the theoretical research and future outlook of high-quality development of agriculture, and the empirical research on the competitiveness of Shandong Province's agriculture is lacking. Therefore, based on the actual situation of Shandong Province, this paper establishes and uses the agricultural competitiveness index system, uses

factor analysis to comprehensively evaluate the competitiveness of Shandong agriculture, explores the hindering factors affecting the development of agriculture in Shandong Province, and puts forward countermeasures and suggestions in a targeted manner.

2. Empirical analysis

2.1. Research methodolog

Factor analysis is a statistical technique for extracting common factors from groups of variables by eliminating overlapping information between them and avoiding the effects of high correlation between indicators on data analysis. Extracting common factors of groups of variables from a large number of variables. Factor analysis can find the variable factors that have been hidden from many representatives in a large number of variables. If the same variables become a factor, it can reduce the number of variables and also test the hypothesis of the relationship between variables, which is a better research method to study the measurement of agricultural competitiveness in Shandong Province in this paper. Agricultural competitiveness is a comprehensive, systematic and dynamic concept. The agricultural sector of a country or region that is competing with its rivals shows a competitive advantage over its rivals. Combining the academic fruits and survey results of scholars at home and abroad, the measurement system is constructed to objectively carry out the measurement of Shandong Province's agricultural competitiveness. The index system includes 3 levels of agricultural production level, agricultural production consumption, and socio-economic factors, and contains 12 indicators (as shown in Table 1). Among them, the agricultural production level and agricultural production consumption reflect the input and output capacity and business situation of agricultural production, and the socio-economic factors reflect the agricultural production environment, which is the external environmental factors affecting the region to improve agricultural competitiveness. The combined analysis of the two can carry out a comprehensive evaluation of Shandong Province's agricultural competitiveness and get a prediction of its future development.

Taking into the consideration the influence of age, the psychological state of the elderly also presents certain changes, including the following aspects. First is the safety needs. The elderly are longing for adequate security to prevent themselves from danger and injury. Second is the social needs. The elderly always hope to get noticed by others, otherwise they will feel lonely. Third is the needs to be respected. The elderly crave respect from others, while to achieve respect, the premise is to accomplish certain things independently. Fourth is the self-actualization needs. As the highest pursuit of life, self-actualization need also represents the level of self-value, which is of paramount importance for achieving goals in life.

Table 1 Construction of the indicator system

Indicator dimension	Indicator name	Meaning of the indicator
Level of agricultural production	Food output rate X_1	Reflects food unit production
	Fruit output rate X_2	Reflects fruit unit production
	Vegetable output rate X_3	Reflects unit production of vegetables
	Fisheries output rate X_4	Reflecting fisheries unit production
	Number of hogs farrowed X_5	Reflecting the level of animal husbandry

Consumption in agricultural production	Pesticide use X_6	Reflecting the level of chemicalization of agriculture
	Plastic film use X_7	Reflecting the level of chemicalization of agriculture
	Fertilizer use X_8	Reflecting the level of chemicalization of agriculture
	Actual irrigated area X_9	Reflecting the level of agricultural hydration
	mechanical power capacity X_{10}	Reflecting the level of agricultural mechanization
Socio-economic factors	Financial expenditure on agriculture in all municipalities X_{11}	Reflecting the strength of agricultural policy support
	Freight transported by municipalities X_{12}	Reflecting agricultural transportation capacity

2.2. Analytical steps

2.2.1. Extracting the common factor

First of all, the data 12 indicators should be processed for dimensionality reduction, the method utilized in this article is principal component analysis for this step. Through the operation can be obtained in Table 2, as shown in the table, the KMO value of the data is 0.853, sig is 0.000, indicating that there is a strong correlation between the indicators, can be factor analysis.

Table 2 KMO and Bartlett's test table

KMO Number of Sampling Suitability Measure.		0.853
Bartlett's test of sphericity	approximate chi-square	141.139
	degrees of freedom	66
	significance	0.000

According to the requirements of eigenvalue>1 and cumulative variance contribution rate>80%, the first four factors were extracted as the common factors by combining with the gravel plot. According to the output data of SPSS software, the cumulative variance contribution rate of the first four male factors is 83.470%, which leads to the comprehensive evaluation score index weights of agricultural competitiveness of 16 prefecture-level cities in Shandong Province.

2.2.2. Calculate the factor loading matrix

The factor loading matrix was rotated orthogonalized using the maximum variance method, resulting in Table 3.Based on the rotated factor loading matrix, it was determined which covariate to use to illustrate the 12 raw indicators. The first common factor (F1) focuses on input indicators such as the amount of hogs slaughtered, the amount of pesticides used, the amount of plastic film used, the amount of fertilizer used, the amount of mechanical power, etc., and environmental indicators such as the amount of agricultural financial expenditures in each city, and the amount of transportation and freight transported in each city, and can therefore be interpreted as an agricultural input and socio-economic factor. The second common factor (F2) mainly focuses on indicators such as grain output rate and actual irrigated area, which can be interpreted as the grain cultivation output factor. The third common factor (F3) mainly focuses on the indicators of vegetable output rate and fruit output rate, which can be interpreted as the output factor of vegetable and fruit farming. The fourth common factor (F4) mainly focuses on the indicators of fishery output rate, which can be interpreted as the fishery output factor.

Table 3 Component matrix after rotation

Evaluation indicators	ingredient			
	F_1	F_2	F_3	F_4
X_1	0.054	0.879	0.152	0.086
X_2	0.191	0.497	0.687	0.137
X_3	-0.126	-0.080	0.868	-0.085
X_4	-0.032	0.052	-0.042	0.975
X_5	0.870	0.205	-0.052	-0.237
X_6	0.781	0.173	-0.270	0.007
X_7	0.735	0.143	0.475	-0.127
X_8	0.867	0.369	-0.129	-0.168
X_9	0.603	0.616	-0.231	-0.213
X_{10}	0.760	0.595	-0.077	0.004
X_{11}	0.883	0.035	0.080	0.177
X_{12}	0.839	-0.089	0.264	0.107

2.2.3. Factor scores

Next, the agricultural competitiveness of 16 prefecture-level cities in Shandong Province was evaluated and the factors were analyzed, and the evaluation coefficients and evaluation results of each factor were obtained as follows.

$$\begin{cases} F_1 = -0.177X_1 - 0.050X_2 + 0.020X_3 + \ldots + 0.254X_{12} \\ F_2 = 0.586X_1 + 0.263X_2 - 0.068X_3 + \ldots - 0.265X_{12} \\ F_3 = 0.044X_1 - 0.379X_2 + 0.520X_3 + \ldots + 0.156X_{12} \\ F_4 = 0.054X_1 + 0.099X_2 - 0.106X_3 + \ldots + 0.137X_{12} \end{cases} \quad (1)$$

The ratios of variance contribution to cumulative contribution for each of the four metric factors were taken as follows and weighted to obtain the composite score formula:

$$F = 0.513 \times F1 + 0.2 \times F2 + 0.17 \times F3 + 0.117 \times F4 \quad (2)$$

By using the comprehensive score formula, we can calculate the agricultural competitiveness (F) and its ranking for each prefecture-level city in Shandong Province separately (Table 4).

2.3. Results and Analysis

From the previous discussion, the level of agricultural competitiveness in each region of Shandong Province is determined by the score of agricultural competitiveness, and the higher the score, the higher the level of regional agricultural competitiveness.

Table 4 Agricultural Competitiveness Score and Ranking of Regions in Shandong Province, 2021

City name	Score	Rankings
Weifang	3.93	1
Zibo	2.24	2
Linyi	1.87	3
Jinan	1.27	4
Liaocheng	0.94	5
Dezhou	0.88	6
Qingdao	0.8	7
Rizhao	0.04	8
Zaozhuang	-0.78	9
Taian	-0.82	10
Weihai	-1.09	11
Jining	-1.39	12
Yantai	-1.77	13
Dongying	-1.79	14
Heze City	-2.04	15
Binzhou	-2.3	16

Going through the chart to analyze the comprehensive score of agricultural competitiveness of each region in Shandong Province in 2021, it can be seen that: the overall score of agricultural competitiveness in Shandong Province in 2021 is not high, more than half of it is negative, and the score is generally low. Among them, Weifang City has the highest score of 3.93, far ahead of neighboring cities. This is thanks to Weifang's well-developed agricultural infrastructure, advanced agricultural cultivation technology, rich agricultural cultivation experience and the local government's attention and support to the agricultural industry. Weifang has the largest vegetable distribution center in China, Shouguang, and the output value of the primary industry is the first among all cities in Shandong Province, so the competitiveness of the regional agricultural industry is much higher than that of other cities. The lowest agricultural competitiveness is in Binzhou City, with a value of -2.3. Binzhou City was founded late and its overall size is small, so its agricultural infrastructure and agricultural technology lag far behind other cities, and thus its agricultural competitiveness is low.

According to the overall scoring model, F1 agricultural inputs and socio-economic factors occupy a larger proportion. It indicates that the development of regional agricultural competitiveness has a greater relationship with agricultural inputs. Cities such as Weifang and Linyi are important agricultural product production areas in Shandong Province, their agricultural facilities are more complete, they have a more complete agricultural circulation and trading system, and their level of economic development is also at the forefront of the province, and the government's financial input subsidies are higher, so their agricultural products have stronger product competitiveness, so the region has a higher level of agricultural competitiveness. While Binzhou, Dongying and other areas, the overall area is smaller, the financial income is much lower than other cities, its natural conditions are also greater restrictions on crop cultivation. Therefore, the local agricultural competitiveness due to inputs and economic and social environmental factors, the overall low. Therefore, how to utilize the limited natural resources to develop local agriculture and improve the added value of agriculture has become the key to the local government's agricultural development. Jining, Yantai and other prefecture-level cities with medium levels of agricultural competitiveness have a better economic foundation and a longer history of agricultural production. With the continuous expansion of urbanization and industrial clusters in the region, the living space of agriculture has been continuously compressed, which is also an important factor restricting its development. So from the current economic development, therefore, under the current trend of economic development, how to make good use of agricultural resources to realize industrial upgrading and the development of special agriculture has become the top priority for the middle-travel city of agricultural competitiveness to improve the high quality of agriculture.

3. 3 Conclusions and responses

3.1. Conclusion

Through the above empirical analysis, the level of agricultural competitiveness in Shandong Province is most affected by agricultural input factors and least affected by the level of local fishery development. The agricultural competitiveness of the cities in the center of Shandong Province is the highest, much higher than that of the neighboring cities high, while the competitiveness of the neighboring cities is low, such as the low level of agricultural competitiveness of the two cities of Dongying and Binzhou in the northern region, and Zaozhuang in the southwestern region. The distribution of agricultural competitiveness shows a clear regional division, and the overall distribution of competitiveness level shows "high in the middle and low around". This is also more related to the natural endowment conditions of different regions, regional land area and regional development orientation. Overall, the level of agricultural competitiveness in Shandong Province varies greatly among regions, with a low overall level but huge development potential. This requires the government to take a holistic approach, use targeted policies to promote regional agricultural economic development, improve the construction of agricultural infrastructure in each region, improve the overall competitiveness of Shandong Province's agriculture, promote farmers' income, and realize the revitalization of the countryside!

3.2. Recommendations for countermeasures

Accordingly, the following recommendations are made with regard to the above issues, taking into account the local context:

(1) Cities with high agricultural competitiveness should ensure their existing advantages and increase agricultural inputs. The government and universities can organize researchers to go to the countryside to improve local agricultural production technology and develop new models of comprehensive agricultural development, so as to make the strong stronger and continuously improve their competitive advantages.

(2) Cities with average agricultural competitiveness should utilize their resource endowments to develop industries with advantages. The localities should rationalize their layout according to resource endowments, find a balance point for the joint development of agriculture and other industries, and improve the efficiency of the use of agricultural resources, so as to achieve the purpose of promoting the industrial integration of the countryside and the coordinated development of urban and rural economies, and to realize the steady improvement of the level and quality of the competitiveness of agriculture in the context of the new era.

(3) Regions with poor agricultural competitiveness need to break through the shackles of natural resources and increase the degree of modernized agricultural production. It is necessary to improve the level of agricultural management, use advanced production models, increase socialized services, realize large-scale and intensive production, and improve the competitiveness of agricultural production.

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