Research on Input-Output Efficiency and Structure Optimization Strategy of Agricultural Disaster Prevention and Mitigation under the Strategy of Rural Revitalization

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Abstract: the Countryside is the Foundation of China's National Economy and Has an Important Strategic Position. the Implementation of the Rural Revitalization Strategy, for the Current Domestic Rural Economic Development Situation for the Accurate Study and Judgment, for the Solution of the “Three Rural” Problem Can Provide a Sustained Driving Force. Therefore, Based on the Dea Model, This Paper Selects the Input-Output Efficiency of Agricultural Disaster Prevention and Mitigation of 25 Agricultural Provinces in 2017 for Scientific Calculation, and on This Basis Puts Forward Targeted Structural Optimization Measures to Further Improve the System of Agricultural Disaster Prevention and Mitigation, So as to Promote the Implementation of Rural Revitalization Strategy and Achieve the Goal of Agricultural Modernization.

1. Introduction

Since the 19th National Congress of the Communist Party of China (CPC) put forward the strategy of rural revitalization, it has always been the top priority of the work to solve the “three rural” problems, so as to actively invest in human resources, material resources, science and technology and other resources, comprehensively promote agricultural modernization production, and deepen rural economic reform. The disaster prevention and relief work is related to the safety of people's lives and property. The agricultural disaster prevention and relief work is not only a matter of national economy and people's livelihood, but also the top priority of the local government. There are village cadres in rural areas, disaster informants in civil affairs departments, agricultural technical service personnel in agricultural departments, water conservancy and geological disaster prevention personnel at the grass-roots level, and some university student village officials are also responsible for agricultural disaster prevention and mitigation. Therefore, this paper starts with the calculation of input-output efficiency of agricultural disaster prevention and mitigation, explores the optimization measures of agricultural disaster prevention and mitigation structure under the strategy of rural revitalization, and speeds up the modernization process of agricultural production.

2. Input-Output Efficiency Evaluation of Agricultural Disaster Prevention and Mitigation

2.1 Dea Evaluation Model

DEA model, also known as data envelopment model analysis, is a common data analysis method in the current academic field. Compared with other data analysis methods, data envelopment analysis method can effectively reduce the calculation of service cost. When each indicator unit is not used, it can comprehensively calculate multiple input indicators and multiple output indicators with higher accuracy. DEA model evaluation method is a common efficiency evaluation method used by scholars at present. Compared with other evaluation methods, DEA model evaluation method has the following advantages. First, data analysis is simple in real time. In the process of DEA model evaluation, it is not necessary to build production function model before efficiency evaluation, which greatly reduces the impact of human factors in the process of efficiency evaluation and improves agricultural defense The accuracy of the evaluation results of input-output

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efficiency of disaster reduction. The calculation formula is as follows:

$$\max \theta_0 = \mu^t Y_0$$

$$S.T \begin{cases} \mu^T Y_j - \omega^T X_j \le 0 \\ \omega^T X_0 = 1 \\ \omega \ge 0, \mu \ge 0 \end{cases}$$

In the above formula, it represents the main input and Y represents the main output. When θ = 1, DEA is effective, and the ratio of input to output of the research subject is the optimal value. At that time, it shows that the input of research subjects is greater than the output.

2.2 Selection of Evaluation Indexes and Data Processing

According to the characteristics of domestic agricultural production and disaster prevention and mitigation, the input-output efficiency index is analyzed. The input of disaster prevention and mitigation is mainly the specific resources and measures that the local relevant departments put into agriculture to prevent and control drought and flood disasters, including various human resources, material resources, science and technology, etc. Combined with the reality of agricultural development, it is found that the drought and flood disaster measures that are often adopted in China are mainly to focus on organizing human, material and scientific and technological resources of all parties, strengthen the construction of agricultural disaster prevention and mitigation, so as to carry out effective flood drainage and irrigation, and thus improve agricultural production. Therefore, these indicators are also used in this study, such as agricultural drainage and irrigation diesel engine, reservoir capacity, etc., which reflect the local agricultural water conservancy construction status and agricultural machinery technology input. The output indexes of agricultural disaster prevention and mitigation selected in this paper are irrigation area and waterlogging area indexes, which can reflect the output results of agricultural disaster prevention and mitigation to a large extent. The specific index system is shown in Table 1.

Table 1 Input-Output Efficiency Index of Agricultural Disaster Prevention and Mitigation

evaluating indicator	evaluating indicator	variable
Investment in agricultural disaster prevention and mitigation	Agricultural drainage and irrigation diesel engine (set)	X_1
	Reservoir capacity (100 million cubic meters)	X_2
Output of agricultural disaster prevention and reduction	Irrigation area (1000 HA)	Y_1
	Flood removal area (1000 HA)	Y_2

Note: obtained by sorting out relevant data

Combined with the above index system of input-output efficiency of agricultural disaster prevention and mitigation, this paper uses DEA model to carry out empirical research. From 23 provinces and 5 autonomous regions, due to the lack of data, Tibet Autonomous Region, Hainan Province, Taiwan Province, etc. are excluded, and 25 domestic agricultural provinces in 2017 are selected as the research objects. It can be seen that the number of DMUs in this model is 25. With the help of maxdea software for data processing. On the basis of the corresponding input-output efficiency data of agricultural disaster prevention and mitigation, spss23.0 measurement software is used to process the research data.

As for the measurement of the input-output efficiency of agricultural disaster prevention and mitigation in 24 agricultural provinces in 2017, we should fully realize that the emergence of the input-output efficiency of agricultural disaster prevention and mitigation needs a certain reflection time, which is obviously lagging behind. In the above, the output index of year t should be selected as the minimum level of improvement, and the input index should be selected as the statistical data of year T-1. In order to further ensure the scientificity and effectiveness of the research, a certain length of measurement time is set aside, i.e. 2016 innovation input and 2017 innovation output data. In order to determine that the relevant data can meet the research needs, the processing data is shown in Table 2.

Table 2 Pearson Correlation Test

variable	X_1	X_2	Y_1	Y_2
X_1	1	0.522	0.812**	0.712**
X_2	0.537*	1	0.649*	0.965**
Y_1	0.932**	0.623*	1	0.725**
Y_2	0.776**	0.881**	0.732**	1

Note: the author arranges by himself, where * means significant correlation at the level of 0.05; * * means significant correlation at the level of 0.01

From the above results, it shows that there is a significant correlation between the input-output efficiency of agricultural disaster prevention and mitigation, which can be used to evaluate the input-output efficiency of agricultural disaster prevention and mitigation.

3. Calculation Results of Input-Output Efficiency of Agricultural Disaster Prevention and Mitigation

Combined with the input data of agricultural disaster prevention and mitigation and the output efficiency calculation results of 25 agricultural provinces in 2017, it is found that the current driving situation of input-output efficiency of agricultural disaster prevention and mitigation in China is shown in Table 3.

Table 3 Calculation Results of Input-Output Efficiency of Agricultural Disaster Prevention and Mitigation in Domestic Agricultural Provinces in 2017

Province	technical efficiency	pure technical efficiency	Scale technical efficiency	Trend of income change
Zhejiang Province	0.078	0.197	0.393	Rise
Yunnan Province	0.154	0.411	0.374	Rise
Xinjiang Autonomous Region	1.511	1.609	0.939	Rise
Sichuan Province	0.167	0.298	0.559	Rise
Shaanxi Province	0.252	0.781	0.322	Rise
Shandong Province	0.281	0.386	0.728	decline
Inner Mongolia Autonomous Region	0.749	1.226	0.611	Rise
Liaoning Province	0.194	0.438	0.442	Rise
Jiangxi Province	0.157	0.351	0.448	Rise
Jiangsu Province	2.659	2.764	0.962	Rise
Jilin Province	0.223	0.521	0.428	Rise
Hunan Province	0.115	0.147	0.779	Rise
Hubei province	0.095	0.149	0.639	Rise
Heilongjiang Province	2.102	5.432	0.387	decline
Henan Province	0.325	0.327	0.993	decline
Hebei Province	0.510	0.527	0.968	decline
Guangxi Province	0.084	0.235	0.358	Rise
Guangdong Province	0.104	0.251	0.412	Rise
Fujian Province	0.198	1.034	0.191	Rise
Anhui Province	0.241	0.254	0.948	decline
Guizhou Province	0.121	0.342	0.354	Rise
Ningxia Autonomous Region	1.081	1.234	0.876	Rise
Gansu province	0.926	1.032	0.897	Rise
Qinghai Province	0.886	1.123	0.789	Rise
Shanxi Province	0.252	0.785	0.321	Rise

Note: the author arranges by himself

It can be seen from the above table that only Xinjiang, Jiangsu, Heilongjiang, Ningxia and other provinces have the current technical efficiency of more than 1. Although their scale technical efficiency is not more than 1, their pure technical efficiency is higher than 1, making their comprehensive technical efficiency higher than 1. It can be seen that the main driving factor of input and output of agricultural disaster reduction and prevention in China is pure technical efficiency, which reflects the current utilization of agricultural disaster reduction and prevention resources. In addition, in 25 provinces of agricultural production, 20 provinces have an increasing trend of income change, which shows the benefit of the current domestic agricultural disaster reduction and prevention work.

4. Optimization Strategy of Agricultural Disaster Prevention and Mitigation Structure under the Strategy of Rural Revitalization

Based on the DEA model above, the input-output efficiency of agricultural disaster prevention and mitigation in 25 agricultural provinces in 2017 is calculated scientifically. The results show that although the current domestic achievements in agricultural disaster reduction and prevention are outstanding, there are still great deficiencies. The utilization degree of current agricultural disaster reduction and prevention resources is the main factor affecting its efficiency. Therefore, the Rural Revitalization war Some optimization strategies are put forward for the structure of agricultural disaster prevention and reduction.

4.1 Optimization of Strategic Structure

Under the strategy of rural revitalization, its agricultural production and development presents new development characteristics. Therefore, the structure of agricultural disaster prevention and mitigation should also be adjusted to adapt to the new strategy of Rural Revitalization and development, change the previous extensive way of resource investment, and scientifically layout its strategic development structure with the efficiency of agricultural disaster prevention and mitigation as the guide.

4.2 Dynamic Structure Optimization

Combined with the above, we can see that the input-output efficiency of agricultural disaster prevention and mitigation should focus on the improvement of pure technical efficiency, but also can not ignore the scale efficiency drive. Therefore, under the revitalization of rural areas, the work of agricultural disaster prevention and mitigation should integrate the existing resources to optimize the dynamic structure of agricultural disaster prevention and mitigation and improve the utilization rate of agricultural disaster prevention and mitigation resources. At the same time, we will further expand the investment scale of agricultural disaster prevention and reduction resources, and further improve the management capacity of agricultural disaster prevention and reduction driven by scale efficiency.

4.3 Optimization of Regional Structure

Under the revitalization of rural areas, the optimization of agricultural disaster prevention and reduction structure should also pay attention to the optimization of regional structure, explore the differences of each agricultural production area, and invest the resources of agricultural disaster prevention and reduction to promote the improvement of the management capacity of agricultural disaster prevention and reduction, and further tap the potential of agricultural production in each area.

5. Conclusion

Under the strategy of rural revitalization, the local government is required to adhere to the strategy of agricultural production optimization, invest the corresponding human, material and scientific and technological resources, strengthen the agricultural production capacity, promote the modernization of agricultural production, and lay the foundation stone for the overall revitalization of rural areas. Therefore, we should optimize the structure of agricultural disaster prevention and reduction from the aspects of strategic structure, dynamic structure and regional structure, so as to improve the efficiency of agricultural disaster prevention and reduction, and lay a solid foundation for the implementation of the strategy of Rural Revitalization and promote the development of rural economy.

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