

Research on the Development Efficiency of Leisure Agriculture in Hebei Province under the Background of Rural Revitalization

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Abstract: ***Objective:** To explore the static and dynamic characteristics of the development efficiency of leisure agriculture in Hebei Province after the implementation of the rural revitalization strategy. **Methods:** First, the study constructed an efficiency evaluation system including input indicators such as leisure agriculture area, total investment, and number of employees, as well as output indicators such as business income, reception, and number of farmers driven by data envelopment analysis (DEA). Then, the static and dynamic empirical analysis of the development efficiency of leisure agriculture was carried out using relevant data from 11 prefecture-level cities in Hebei Province. **Conclusions:** 1) In 2020, the comprehensive efficiency of leisure agriculture in Hebei Province has not yet reached the optimal level. There are deficiencies in resource allocation, industrial scale, and quality of employees. There is a large room for improvement in pure technical efficiency and scale efficiency. 2) Dynamic analysis shows that the average total factor productivity index of leisure agriculture in Hebei Province from 2018 to 2020 was 1.091, showing an overall upward trend. Technological progress is the key factor to promote development. Therefore, this article believes that in order to further play the role of leisure agriculture in rural revitalization, it is necessary to promote its economies of scale and strengthen scientific and technological empowerment with the help of digital rural construction.*

Keywords: Leisure agriculture, Development efficiency, Data envelopment analysis (DEA), Rural vitalization.

1. Introduction

As a typical business model integrating primary industry, second industry, and tertiary industry, leisure agriculture is of great significance in promoting the transformation of the agricultural development mode, optimizing the agricultural industrial structure, and deeply developing the potential of agricultural characteristics in Hebei Province, and it also plays an important role in increasing agricultural efficiency, farmers' income and rural prosperity, gradually developing into a pillar industry to promote rural revitalization [1]. Its development can generate significant economic benefits (rural economic development, etc.), social benefits (farmer employment, etc.), and environmental benefits (ecological livability, etc.) [2]. At the same time, the in-depth implementation of the rural revitalization strategy also provides a new opportunity for the development of leisure agriculture in Hebei Province.

Data Envelopment Analysis (DEA) has its unique advantages in studying multiple input and multiple output problems. The weights of indicators do not need to be set in advance, and the objective information based on the indicators is generated through linear programming, which excludes the subjectivity of human interference and has strong objectivity and comparability. This non-parametric method is widely applied in the study of leisure agriculture development efficiency, mainly focusing on the study of leisure agriculture development efficiency in different regions and different subjects. For example, Zheng and Lin (2017) evaluated the development efficiency of leisure agriculture in eight prefecture-level cities in Fujian Province based on the DEA method [3]. Zhang and Lv (2018) took the demonstration sites of leisure agriculture and rural tourism in Qingdao as an example and used the DEA method to evaluate the efficiency of leisure agriculture in Qingdao [4]. Wang and Wang (2019)

used 39 national leisure agriculture and rural tourism demonstration counties in the Yangtze River Delta region as samples and used the DEA method to measure the efficiency characteristics, change dynamics, spatial pattern, and evolution of leisure agriculture from 2013 to 2016 [5]. Han and Wang (2020) used a three-stage DEA method to measure the operational efficiency of star-rated demonstration enterprises of leisure agriculture in Jiangsu Province in 2018 [6]. Li et al. (2020) introduced heterogeneous environmental variables into the efficiency measurement and used the three-stage DEA method to measure the efficiency of leisure agriculture development in 30 provinces in China [7]. Li and Sun (2021) took Nanjing City as an example and measured the efficiency of leisure agriculture business entities from the perspective of differences in recognition levels [8]. In summary, the above study shows that improving the efficiency of leisure agriculture is important to the effective implementation of the rural revitalization strategy (Wang and Liu, 2020) [9]. After the 19th National Congress of the Communist Party of China report put forward the rural revitalization strategy in October 2017, leisure agriculture in Hebei Province has developed rapidly, but there is no clear evaluation of how efficient the development is. Therefore, this paper will make a scientific evaluation of the development efficiency of leisure agriculture in Hebei Province based on the data on leisure agriculture development in 11 municipalities in Hebei Province in this paper.

2. Research Methodology and Data Sources

2.1 Research Methodology

Data Envelopment Analysis (DEA) is a quantitative analysis method for comparing the relative effectiveness and efficiency of comparable units or sectors in the case of multiple inputs and multiple outputs, and it has its unique

advantages in studying multiple inputs and multiple outputs [10]. First of all, the Data Envelopment Analysis method does not need to set up the production function model in advance, which improves the efficiency of dealing with the problem. Second, the generation of DEA model weights excludes the subjectivity of human interference and is based entirely on the objective information of index data generated through linear programming, with a certain degree of comparability and objectivity. Moreover, the DEA model allows the researcher to clearly identify the difference between the actual and target values by reaching the corresponding production frontier surface, fully revealing the characteristics of the evaluated object, and thus targeting the specific adjustment. Therefore, the DEA model has been applied in the study of development efficiency, and this paper chooses the DEA model to study the development efficiency of leisure agriculture in Hebei Province has a certain theoretical basis and scientificity.

2.2 Evaluation Index System Construction

This paper constructs the DEA model evaluation index system based on the principles of comprehensiveness, scientificity, orientation, and accessibility and requires that the selected indicators can reflect the overall situation of the research object from different perspectives and at different levels and that the data should be easily accessible to ensure the authenticity of the data, so that changes in input indicators can indeed cause changes in output and guide and regulate the development direction of leisure agriculture.

After reviewing a large amount of relevant literature, it is found that the inputs of leisure agriculture are mainly reflected in the three aspects of capital, labor, and land, and outputs are mainly expressed in terms of economic and social benefits [11]. Among them, Liu (2017) and Zhang (2017) indicated that the development of leisure agriculture requires constant capital injection, and capital investment assumes a huge role in its development process as economic support [12,13], therefore, in this paper, the total investment in leisure agriculture is chosen to reflect the capital investment. Lu et al. (2020) considered that because leisure agriculture is a labor-intensive industry, the number of employees can measure the labor input in leisure agriculture to some extent [14]. Although different types of labor talent have different output benefits, because the data statistics are more complex and not easy to obtain and other reasons, this paper directly regards the number of employees as a measure of labor indicators. Zhang (2016) indicated that the footprint of leisure agriculture, as an industry based on agricultural production and natural scenery, can reflect the level of development of leisure agriculture and affect the efficiency of development

[15].

Regarding output indicators, Zhang and Li (2019) argued that the economic benefits of leisure agriculture can be directly measured by using business income, and in addition, the number of people employed driven by leisure agriculture can adequately measure its social benefits [16]. In addition, the number of visitors received by leisure agriculture business units in a certain period can reflect visitors' preferences and reflect the popularity of leisure agriculture. Therefore, combining with the current situation of leisure agriculture development in Hebei Province and considering the above principles of leisure agriculture evaluation index system construction, the three output indicators of leisure agriculture business income, the number of receptions, and the number of driven farm households, and the three input indicators of leisure agriculture land area, total investment in leisure agriculture and the number of employees were finally selected to establish the DEA evaluation model.

Table1: Leisure agriculture input-output evaluation index system

Indicator Type	Indicator Name
Input Indicators	Leisure agriculture footprint
	Total investment
	Number of employees
Output Indicators	Leisure agriculture operating income
	Number of visitors
	Number of farmers brought up

3. Research Results

Relying on the basic data of 11 prefecture-level cities in Hebei Province from 2018 to 2020 provided by the Hebei Agricultural Environmental Protection Monitoring Station and the Industrialization Office, based on establishing an indicator system based on three input indicators and three output indicators for the development efficiency of leisure agriculture in Hebei Province, this section adopts the DEA method to statically measure the development efficiency of leisure agriculture in Hebei Province in 2020 in terms of comprehensive technical efficiency, scale payoff, and slack variables by establishing the DEA-BCC model and establishes a DEA-MI model to measure and analyze the development efficiency of leisure agriculture in Hebei Province from a dynamic perspective in 2018-2020.

3.1 Static Analysis Based on DEA-BCC Model

This section uses DEAP software to measure the development data of leisure agriculture in Hebei Province in 2020, and by dividing Hebei Province into 11 leisure agriculture decision units and establishing an input-oriented BCC model, the specific results obtained are shown in the following Table 2.

Table 2: Results of DEA evaluation analysis of leisure agriculture by cities in Hebei Province in 2020

Area	Crste	vrste	scale	Rts	S1-	S2+	S3-	S1+	S2+	S3+
Shijiazhuang	1.000	1.000	1.000	—	0.000	0.000	0.000	0.000	0.000	0.000
Langfang	1.000	1.000	1.000	—	0.000	0.000	0.000	0.000	0.000	0.000
Hengshui	0.565	0.676	0.836	irs	0.000	55830.648	0.000	12856.568	119.529	2796.345
Tangshan	0.372	0.381	0.976	drs	0.000	0.000	2.537	50996.567	0.000	0.000
Qinhuangdao	1.000	1.000	1.000	—	0.000	0.000	0.000	0.000	0.000	0.000
Handan	0.566	1.000	0.566	drs	0.000	0.000	0.000	0.000	0.000	0.000
Xingtai	0.716	1.000	0.716	drs	0.000	0.000	0.000	0.000	0.000	0.000
Baoding	0.879	0.907	0.969	drs	0.000	29796.734	0.000	18686.133	0.000	0.000
Zhangjiakou	1.000	1.000	1.000	—	0.000	0.000	0.000	0.000	0.000	0.000
Chengde	0.906	1.000	0.906	drs	0.000	0.000	0.000	0.000	0.000	0.000
Cangzhou	1.000	1.000	1.000	—	0.000	0.000	0.000	0.000	0.000	0.000
Average	0.819	0.906	0.906	—	0.000	7784.307	0.231	7503.570	10.866	254.213

3.1.1 Comprehensive technical efficiency analysis

On the whole, the development level of leisure agriculture in Hebei Province in 2020 was low, and the average value of comprehensive technical efficiency was only 0.819, which was at a low level, and there was a large gap with the production frontier surface, indicating that the development level of leisure agriculture in Hebei Province still has a large room for improvement. Only Shijiazhuang, Langfang, Qinhuangdao, Zhangjiakou, and Cangzhou cities reached DEA effectively, accounting for 45.45% of the total. Moreover, by comparing the comprehensive technical efficiency values of each region, it is found that the comprehensive technical efficiency of each region spanned a wide range, indicating that the level of development of leisure agriculture in Hebei Province is relatively uneven and generates serious geographical differences.

In addition, the average value of pure technical efficiency of leisure agriculture in Hebei Province in 2020 was 0.906, which still has some room for improvement, although 8 decision-making units, such as Shijiazhuang and Langfang, have reached the effective pure technical efficiency, accounting for 72.73% of the total, more than half, the pure technical efficiency of Hengshui, especially Tangshan, was still at a low level of 0.381, which indicates that some areas in Hebei Province the development of leisure agriculture still have serious deficiencies in the level of technology application, and key technologies are not effectively promoted and utilized, and the management system is not sound. However an important feature of leisure agriculture is science and technology, the use of agricultural production technology not only allows consumers to experience the culture of science and technology but also improves the quality of agricultural production, therefore, it is necessary to continuously increase scientific and technological support, improve the content of science and technology and improve the organizational structure, etc. In terms of scale efficiency, the scale efficiency of leisure agriculture in Hebei Province is at an average level, with a mean value of 0.906, and there are 5 decision-making units reach scale effectiveness, accounting for 45.45% of the total, which indicates that the business scale of leisure agriculture in Hebei Province is small, the supporting infrastructure is not well set up, and the scale agglomeration effect of leisure agriculture has not been realized. Although the mean values of pure technical efficiency and scale efficiency are the same, both at 0.906, the distribution of scale efficiency is more concentrated, and no extreme values are present. In a comprehensive analysis, both pure technical efficiency and scale efficiency are at an average level, and the low pure technical efficiency and scale efficiency result in low overall technical efficiency. Therefore, the current resource allocation structure of leisure agriculture in Hebei Province is still unreasonable, the quality level of labor cannot meet the needs of industrial development, and the overall technical level is low, which leads to the lack of coordination between input and output. It is necessary to further improve the level of technology application, strengthen the research and development and innovation of high and new technologies, and carry out technical training for practitioners to improve their comprehensive quality, to ensure the efficient development of special resources and culture and the efficient combination of output and input.

From a regional point of view, only five of the 11 regions in Hebei Province, namely Shijiazhuang, Langfang, Qinhuangdao, Zhangjiakou, and Cangzhou have reached DEA validity, indicating that the resource allocation in these five regions is more reasonable, the technology application level is higher, and a certain scale effect has been formed. The other decision-making units that did not achieve DEA validity were Chengde, Baoding, Xingtai, Handan, Hengshui, and Tangshan in order of overall technical efficiency. Among them, only Handan, Xingtai, and Chengde have achieved pure technical efficiency, but the scale efficiency is ineffective so the overall efficiency is still low, so the scale of operation should be adjusted to promote the overall technical efficiency. Baoding, Hengshui, and Tangshan cities are not only ineffective in terms of pure technical efficiency, but also still not effective in terms of scale efficiency, so they should adjust the scale of input based on improving the level of technology, strengthen the quality education of practitioners, motivate more practitioners to participate in technological innovation and product development, realize the wide application of high and new technology, and promote the maximum improvement of benefits. Among them, the comprehensive technical efficiency of Tangshan City is the smallest, only 0.372, and the pure technical efficiency is only 0.381, which is much lower than the average level of leisure agriculture development in Hebei Province. Therefore, the layout of the leisure agriculture industry in each region should be scientifically planned, and the adjustment of the investment scale in Tangshan City, especially the improvement of the technical level, should be emphasized.

3.1.2 Returns to Scale Analysis

It is found that among the 11 regions in Hebei Province, Shijiazhuang, Langfang, Qinhuangdao, Zhangjiakou, and Chengde are at constant returns to scale, indicating that the scale effect in these regions has reached the best and there is no need to expand the scale of the industry, and the focus should be on the innovative application of technology, improving the business management level and service quality of practitioners, and optimizing the layout structure of the industry, etc. There is only one decision unit in Langfang city with increasing returns to scale, which indicates that the resource allocation and technology level in this region is more reasonable, and smaller inputs can achieve larger output returns, so the proportion of factor inputs in the city can be increased to a certain extent to achieve the best economic and social benefits by increasing output. In addition, 45.45% of the total number of decision-making units for the state of diminishing returns to scale, respectively, Tangshan, Handan, Xingtai, Baoding, and Chengde, indicating that the factor input-output efficiency of these five regions is low, there is a certain loss of efficiency, the proportion of output growth is lower than the proportion of factor input increase, so these regions have a more serious problem of resource waste, resource allocation structure is urgently needed to be improved, need to reduce the scale of operation, appropriate reduction in the proportion of input factors, to achieve the optimal allocation of resources.

3.1.3 Slack variable analysis

Among the 11 decision units of leisure agriculture in Hebei

Province, 3 areas have the problem of redundant inputs or insufficient outputs, which means that some areas of leisure agriculture in Hebei Province still have the problem of uncoordinated resource inputs and outputs. The redundant variable S2 for the total investment in leisure agriculture in Hengshui City equals 55830.648 which exceeds zero, indicating that there is an excess problem in the total investment, which means that the output efficiency of the total investment in Hengshui City is low, and the total investment in leisure agriculture in Hengshui City should be reduced to make it reach the optimal ratio. The effective demonstration models for Hengshui are Langfang and Zhangjiakou. If it adjusts to the production frontier model consisting of Langfang and Zhangjiakou, Hengshui needs to reduce 894,624,240,000 yuan from the original value of total investment of 125,592,000,000 yuan to reach the target value of 378,498,920,000 yuan to achieve the maximum output efficiency. Moreover, Hengshui not only has redundant variables in inputs but also has the problem of insufficient outputs, S1+, S2+, and S3+ are 12856.568, 119.529, and 2796.345 respectively, which shows that Hengshui's leisure agriculture has problem of insufficient outputs in terms of business income, number of receptions and driven farmers, which needs to increase a certain amount based on the original output value respectively to reach the target value.

In addition, Tangshan and Baoding also have different degrees of output shortage. Among them, Tangshan, Xingtai, Shijiazhuang, Qinhuangdao, and Zhangjiakou constitute an effective leverage demonstration point for the production front surface to adjust, based on the inputs remain unchanged, leisure agriculture business income should be increased by another 50,996.57 to reach the target value. However, although Xingtai and Handan do not have input redundancy and output deficiency, they still do not reach DEA validity, and the analysis is due to the low scale efficiency in Xingtai and Chengde, therefore these areas need to adjust the scale of leisure agriculture appropriately.

3.2 Dynamic Analysis Based on DEA-MI Model

To further analyze the development efficiency of leisure agriculture in Hebei Province dynamically, this paper establishes the Malmquist Index model of DEA on the data related to the development of leisure agriculture in Hebei Province from 2018 to 2020. The DEA-MI model can not only show the total factor productivity, which is the development trend of leisure agriculture but also decompose it into technical progress and technical efficiency, thus revealing the reasons behind the generation of the changing trend.

Table 3: Changes in All Factor Production Index of Leisure Agriculture in Hebei Province, 2018-2020

Year	Technical efficiency	Technological advances	Pure technical efficiency	Scale efficiency	Total Factor Productivity
2018-2019	0.963	1.224	0.993	0.970	1.178
2019-2020	0.943	1.071	1.008	0.935	1.009
Average	0.953	1.145	1.001	0.952	1.091

Table 4: Malmquist index of leisure agriculture and its decomposition by regions in Hebei Province

Area	Technical efficiency	Technological advances	Pure technical efficiency	Scale efficiency	Total Factor Productivity
Shijiazhuang	1.229	1.298	1.229	1.000	1.596
Langfang	1.056	1.295	1.056	1.000	1.367
Hengshui	0.991	1.274	0.991	1.000	1.263
Tangshan	0.888	1.711	0.888	1.000	1.520
Qinhuangdao	1.000	1.055	1.000	1.000	1.055
Handan	0.777	1.012	1.000	0.777	0.786
Xingtai	0.903	0.967	1.170	0.772	0.873
Baoding	0.782	1.011	0.755	1.036	0.791
Zhangjiakou	1.000	1.154	1.000	1.000	1.154
Chengde	0.937	0.816	1.000	0.937	0.765
Cangzhou	1.000	1.226	1.000	1.000	1.226
Average	0.953	1.145	1.001	0.952	1.091

From the overall efficiency change, by analyzing Table 3 and Table 4, it can be obtained that the average value of total factor productivity of leisure agriculture in Hebei Province in 2018-2020 was 1.091>1, which indicates that the overall development of leisure agriculture in Hebei Province in the period of 2018-2020 was positive. After decomposing the total factor productivity, where the average value of technical efficiency was 0.953<1 and the average value of technical progress was 1.145>1, indicating that technical progress plays a crucial role in the efficiency improvement of leisure agriculture development in Hebei Province, while the technical efficiency was decreasing instead of rising, which hindered the efficiency improvement of leisure agriculture to some extent. It reflects that the scale of leisure agriculture in Hebei Province has not yet reached the optimal level, but the level of technology used is more reasonable. In addition, during 2018-2019, the technical efficiency of leisure agriculture in Hebei Province was 0.963 and technical progress was 1.224, with a 3.7% decrease in technical

efficiency and a 22.4% increase in technical progress, with the combined effect of both achieving an increase in the efficiency of leisure agriculture development in Hebei Province. During 2019-2020, technical efficiency declined by 5.3%, and technical progress improved by 7.1%, slowing down the rate of progress compared to 2018-2019, indicating that both the scale of leisure agriculture operations and the use of technology in Hebei Province were not at their optimal state during 2019-2020. Moreover, during 2018-2020, the technical efficiency of leisure agriculture in Hebei Province has been less than 1. The reason for this is found to be that the scale efficiency has been less than 1. Therefore, Hebei Province should focus on the adjustment of the industry scale and set a reasonable layout structure to form the best scale effect.

In terms of efficiency comparison by regions, it can be seen from Table 4 that there were 7 regions in Hebei province with total factor productivity of leisure agriculture greater than 1

during 2018-2020, accounting for 63.64% of the total, namely Shijiazhuang, Langfang, Hengshui, Tangshan, Qinhuangdao, Zhangjiakou and Cangzhou, and the productivity index of the remaining 4 regions was less than 1, which indicates that the development efficiency of leisure agriculture has fallen back and the development trend is poor in nearly half of the regions in Hebei province. From the perspective of the magnitude of productivity improvement, Shijiazhuang had the fastest efficiency improvement of 59.6%, followed by Tangshan, Langfang, Hengshui, Cangzhou, Zhangjiakou, and Qinhuangdao, and the important role played by technological progress in the productivity improvement of these regions.

4. Conclusions and Discussion

4.1 Research Conclusions

In this paper, by dividing the development of leisure agriculture in Hebei province into 11 decision units and establishing the DEA model for analysis, the results indicate that the comprehensive efficiency of leisure agriculture in Hebei province in 2020 had not reached effective, resource allocation, industrial scale and comprehensive quality of practitioners were not yet perfect, and there are large gaps between pure technical efficiency and scale efficiency and the best level, and there is a large room for improvement. In addition, different regions have different levels of leisure agriculture efficiency development, and there are large geographical differences. Therefore, efforts should be made to improve the overall quality level of workers, enhance the level of technology and its utilization, improve the management system, and increase the scale of the industry. The results of dynamic analysis show that the average value of the total factor productivity index of leisure agriculture in Hebei Province from 2018 to 2020 was 1.091, indicating that the overall development of leisure agriculture in Hebei Province is on the rise, in which technological progress plays a key role. However, specifically, the growth trend has gradually become slower in recent years and even decayed. Therefore, to continuously improve pure technical efficiency and scale efficiency.

4.2 Suggestions for Countermeasures

4.2.1 Government to strengthen guidance and promote economies of scale in leisure agriculture operations

At present, the development scale of leisure agriculture in Hebei Province is relatively small, and the development types are diverse but low, unable to meet the personalized market demand of consumers and not forming effective scale efficiency. The development of leisure agriculture in various places blindly follow the trend, not fully aware of the local characteristics and resource advantages, a serious lack of innovation, and caused a waste of resources. Therefore, the government departments should strengthen the guidance, make comprehensive planning according to local conditions, strengthen exchanges and cooperation with developed areas of leisure agriculture, and try their best to provide a good environment for the development of leisure agriculture. On the one hand, government departments should increase financial support for leisure agriculture, strengthen the guarantee of credit services, speed up the process of land

system reform, and not only provide financial support such as financial subsidies and tax breaks for producers of agricultural products, but also further increase financial investment in public infrastructure, improve hard and software infrastructure conditions, and provide consumers with a clean, convenient and beautiful leisure service environment. In addition, government departments can formulate relevant legal systems, introduce industry-standard specification documents, regulate the development direction of leisure agriculture, strengthen the regulation, guidance, and supervision of leisure agriculture business entities, and promote the sustainable and high-quality development of leisure agriculture. In addition, leisure agriculture demonstration units can be set up to encourage and guide leisure agriculture to diversify, scale, and market-oriented gathering business model, give full play to the scale effect of industrial clusters, promote the exchange and cooperation of business management, culture, and technology among leisure agriculture business units, reduce the risk of business management and promote the improvement of efficiency.

4.2.2 Keeping up with the development of the times and further relying on the digital village construction to promote the development of leisure agriculture technology empowerment

Technological progress has always been an effective engine to promote the sustainable and healthy development of the leisure agriculture industry. Based on the era of continuous change and development in the technology industry, we should give full play to the convenience brought to us by 5G technology, artificial intelligence, cloud computing, big data, and other technological means, align agriculture with technology, promote the integration and change of the leisure agriculture industry, scientific planning, and design, and drive the improvement of leisure agriculture efficiency. In the face of the distinctive cultural connotation and industrial foundation of each place, each place should fully exploit the characteristic industrial model according to local conditions and realize the effective combination of tradition and innovation. Make full use of the characteristics of the era of big data, relying on the construction of the digital village, based on the consumer's consumption data to dig deep into their needs and preferences, and through the analysis of the summary, the precise positioning of the target customer population, to combine their development status targeted marketing strategies and leisure and entertainment programs. In addition, we should follow the lifeline of the times and constantly explore various forms of industrial development models, not only sticking to the traditional development model of leisure agriculture and additional development models of pension, Internet, etc., but based on the times, constantly innovate and explore, and devote ourselves to realize the efficient combination of elements of leisure agriculture, standardization of production and operation, modernization of brand planning, sustainability of resource utilization, and model of technology integration.

Funding

Funded by Science Research Project of Hebei Education Department (SQ2023085), Hebei Agricultural University introduces talents for scientific research (YJ2021010), and

Research project of social science development in Hebei Province (20230302023).

References

- [1] Ren Kairong, Dong Jigang. Review of research on leisure agriculture[J]. Chinese Journal of Agricultural Resources and Regional Planning, 2016, 37(03): 195-203.
- [2] Zhong Zhen, Yu Zhentao, Bai Di. Leisure agriculture and rural tourism in the context of rural revitalization: Is foreign investment important? [J]. China Rural Economy, 2019(06):76-93.
- [3] Zheng Shi, Lin Guohua. Research on the Evaluation of Leisure Agriculture Development Efficiency in Fujian Province Based on DEA[J]. Fujian Forum (Humanities and Social Sciences Edition), 2017(02):187-193.
- [4] Zhang Qiuyue, Lv Wenjing. Evaluation of leisure agriculture efficiency in Qingdao based on DEA model: A case study of leisure agriculture and rural tourism demonstration sites in Qingdao[J]. Chinese Journal of Agricultural Resources and Regional Planning, 2018, 39(12): 284-288.
- [5] Wang Mingkang, Wang Chengqing. Characteristics and evolution analysis of leisure agriculture efficiency: A case study of the Yangtze River Delta region[J]. Regional Research and Development, 2019, 38(01): 138-143.
- [6] Han Guixin, Wang Kai. Research on the operating efficiency of star-rated demonstration enterprises in leisure agriculture in Jiangsu Province[J]. Journal of Chinese Agricultural Mechanization, 2020, 41(10): 229-236.
- [7] Li Binbin, Mi Zengyu, Zhang Zhenghe. Difference and convergence of provincial leisure agriculture development efficiency[J]. Journal of China Agricultural University, 2020, 25(01): 231-244.
- [8] Li Fanfan, Sun Hongwu. Analysis on the efficiency of leisure agriculture business entities from the perspective of recognition level differences: A case study of leisure agriculture business entities in Nanjing[J]. Chinese Journal of Agricultural Resources and Zoning, 2021, 42(06): 225-232.
- [9] Wang Mingkang, Liu Yanping. Evaluation of leisure agriculture efficiency and analysis of its driving factors: A case study of 81 demonstration counties in East China[J]. Geography and Geographic Information Science, 2020, 36(03): 133-140.
- [10] Ren Dandan. Research on tourism industry efficiency based on DEA model: Taking China's (new) first-tier cities as an example [J]. Commercial Economics Research, 2018(05):179-182.
- [11] Kong Qingshu, Li Hongying, Shi Weili. Research on the evaluation of leisure agriculture in Hebei Province based on DEA: A case study of leisure agriculture and rural tourism demonstration sites in Hebei Province [J]. Chinese Journal of Eco-Agriculture, 2013, 21(04): 511-518.
- [12] Liu Peng. Research on the efficiency evaluation and improvement strategy of China's leisure agriculture based on DEA[D]. Zhengzhou: Henan Agricultural University, 2017.
- [13] Zhang Shuping. Empirical analysis of leisure agriculture evaluation under DEA model: A case study of Henan Province[J]. Chinese Journal of Agricultural Resources and Regional Planning, 2017, 38(02): 226-230.
- [14] Lu Yuxin. Research on the efficiency of urban tourism industry in Jilin Province based on DEA model[D]. Siping: Jilin Normal University, 2020.
- [15] Zhang Jingyun. Research on the efficiency evaluation of leisure and tourism agriculture in Zhongmu County based on DEA[D]. Zhengzhou: Henan Agricultural University, 2016.
- [16] Zhang Yu, Li Weijian. Evaluation and analysis of the development efficiency of leisure agriculture in Xinjiang based on DEA model[J]. Journal of Hebei Agricultural University (Social Science Edition), 2019, 21(05): 57-62.

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