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Measure Efficiency of Allocation of Agricultural Production Factors from the Perspective of Comprehensive Rural Revitalization

-- From the Perspective of Literature Review

Tongyu Wu*

School of Economics, Anhui University of Finance and Economics, Bengbu, China

2696517566@qq.com

Abstract

The improvement of the allocation efficiency of agricultural production factors is conducive to the all-round revitalization and development of rural areas in China. Therefore, from the perspective of literature review, this paper first studies the categories of agricultural production factors and the connotation of allocative efficiency under the perspective of rural revitalization. Then, the existing measurement studies using data enveloping analysis, translogarithm production function method and mismatch coefficient method are introduced, and their expansibility is compared. Finally, the paper discusses the difficulties in the allocation of agricultural production factors, such as land decentralization, lack of technical experience, shortage of funds, reduction of labor supply and obstruction of information flow, and puts forward some countermeasures and suggestions, such as strengthening land circulation, promoting modern agricultural technology, promoting financial innovation, cultivating imported talents and strengthening farmer training.

Keywords

Rural revitalization; Allocation efficiency of agricultural production factors; Literature review.

1. Introduction

In 2024, Central Document No. 1 requires that "to promote rural revitalization and China-style modernization, we must consistently strengthen the foundation of agriculture and promote comprehensive rural revitalization." It is particularly important to continuously promote the improvement of agricultural production factor allocation efficiency in order to better promote comprehensive rural revitalization. Thanks to the support of national policies and the adjustment of industrial structure, China's agricultural production efficiency has been increasing year by year. However, compared with non-agricultural industries, there is still considerable room for improvement in China's agricultural production efficiency. Therefore, how to accurately measure China's agricultural production factor allocation efficiency? What problems exist in the field of agricultural production factor allocation in China? And how to solve these problems? Therefore, this paper reviews the existing literature on agricultural production factor allocation efficiency, current status, measurement methods, and improvement pathways from the perspective of literature review. It summarizes the connotation, measurement methods, indicators, and pathway suggestions, aiming to provide experience for better promoting the improvement of agricultural production factor allocation efficiency in the context of rural comprehensive revitalization.

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2. Agricultural Production Factors and Their Allocation Efficiency in the Context of Rural Comprehensive Revitalization

2.1. Classification of Agricultural Production Factors in the Context of Rural Comprehensive Revitalization

Agricultural production factors, that is, the sum of agricultural resources, refers to all kinds of resources used in agricultural activities to produce target agricultural products. Different economic schools have different views on the classification of production factors. For example, Marx summarized the factors of production into three core components: labor, production tools and scientific and technological knowledge, in which the production tools cover the processing objects and operating tools. In western economic theory, factors of production are usually classified as natural resources, capital, labor and scientific and technological information. For our country, agricultural production factors can be divided into: land, labor, capital, technology.

However, from the perspective of comprehensive rural revitalization, agricultural production factors should include all social resources that human beings need to engage in agricultural production, including material inputs such as land, labor, agricultural infrastructure [1] and capital, as well as non-material elements such as agricultural management [2], technology and information.

2.2. Allocation efficiency of agricultural production factors from the perspective of comprehensive rural revitalization

In recent years, with the support of the national rural revitalization strategy and the guidance of science and technology, the allocation efficiency of agricultural production factors in China has been significantly improved, but compared with the developed countries in the world, the development level of agricultural production factor allocation efficiency is still in a low state. Agricultural production efficiency is the fundamental driving force to promote agricultural economic progress, and it is very important to improve the allocative efficiency of its production factors. Under the background of rural revitalization, a large number of studies have analyzed the connotation of agricultural production resources allocation from different perspectives. The allocation of agricultural production factors includes the structure of agricultural production allocation and the efficiency of agricultural production allocation. The allocation structure of agricultural production refers to the proportional relationship between factors, which can be the allocation ratio between different factors, such as the allocation ratio of capital and labor in the agricultural industry, or the allocation ratio of the same factor according to nature [3]. If the allocation efficiency of agricultural production factors is understood from the micro-level, the micro-allocation efficiency of agricultural production factors refers to the process of combining and matching agricultural production factors according to a certain proportion to achieve the production possibility boundary. The fundamental reason for the change of allocative efficiency of agricultural production factors lies in the change of allocation proportion among agricultural production factors with different marginal returns.

Therefore, the allocative efficiency of agricultural production factors can be summarized as the possibility of minimizing the cost at the same yield or achieving the maximum yield at the same cost by optimizing the allocation of resources.

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3. Allocation Efficiency of Agricultural Production Factors from the Perspective of Comprehensive Rural Revitalization

At present, the research methods for measuring the allocative efficiency of agricultural production factors in China mainly focus on three kinds: DEA model, translog production function and mismatch index, which can be summarized as follows:

3.1. DEA model analysis

Data Enveloping analysis (DEA) is a kind of multi-input and multi-output analysis tool based on relative efficiency introduced by the famous operations research scientist A. harnes in 1978. This method takes relative efficiency as the core and uses non-parametric technology to evaluate the production efficiency of similar entities under multi-input and multi-output conditions, so it is widely used. Domestic scholars applied DEA method to analyze agricultural production efficiency in China, and revealed the research progress and practical achievements in this field. Domestic scholars have conducted empirical research on the data of different provinces in China through DEA model. Although these studies are different in time and place, the results show consistency. For example, scholars applied DEA model to conduct a comprehensive assessment of agricultural production efficiency in various regions of China [4], or applied model to conduct in-depth analysis of resource allocation efficiency in specific provinces [5]. It is found that production efficiency is low, regional development is unbalanced and factor input is redundant in some large agricultural provinces. These findings are of great significance for understanding regional differences in agricultural production efficiency in China and improving the efficiency of agricultural resource allocation.

3.2. Translogarithmic production function method

The translogarithmic production function is a flexible function form that makes no prior assumptions about production technology and can be used to approximate any form of production function. It is able to capture the interaction effect between elements, that is, the combination of different elements may produce a synergistic or synergistic effect. The translogarithmic production function can help to analyze the elasticity of output and substitution under different factor endowments, so as to provide a basis for improving agricultural production efficiency. For example, time series data and ridge regression estimation methods are used to analyze the output elasticity, substitution elasticity and relative technological change of agricultural production factors [6]. Some scholars decompose the total factor productivity into several parts and use the stochastic frontier model to measure the change rate of factor allocative efficiency of each province based on the translog production function [7]. Some scholars used the translogarithmic cost function to analyze the impact of changes in agricultural factor endowment on factor input adjustment and technology selection [8]. In general, the translogarithmic production function is both practical and versatile in the analysis of agricultural production factors, especially in assessing the interaction and efficiency of production factors. By citing specific data and applying it to improve agricultural production efficiency and dynamic change of production factors, this shows the important value of translogarithmic production function in economics and agricultural economics.

3.3. Mismatch coefficient method

Mismatch coefficient is a method to measure the optimal allocation of resources, and it is also a method to measure the efficiency difference of resources under different use modes. In agricultural production, factor mismatch function can help researchers analyze whether the allocation of production factors such as land, labor and capital is optimized, and the impact of the degree of mismatch on production efficiency and economic growth. Some scholars have pointed out that the spatial and temporal differences in the misallocation of agricultural

resources are comprehensively affected by a variety of factors, including the endowment level of agricultural resources, the development degree of urbanization, the prosperity of regional economy and the development status of rural finance [9]. Some scholars have proposed that accumulation of human capital, improvement of the "separation of three rights" of agricultural land, construction of digital industry, and improvement and optimization of rural capital investment environment are of great significance to the reduction of the mismatch rate of agricultural production factors [10]. In recent years, some domestic scholars have selected the economic data of Chinese provinces since 2000, calculated the agricultural capital misallocation index, labor misallocation index and land misallocation index, and used spatial econometric models to analyze these indicators to explore their impact on agricultural resource misallocation [11]. Some scholars have established a framework to analyze agricultural resource mismatch and output loss, and have studied the mismatch of agricultural resources in various regions of China and the output loss caused by it [12]. In the context of the implementation of the rural revitalization strategy, it is particularly important to understand and improve the allocation efficiency of agricultural production factors. The research on factor mismatch coefficient can provide scientific decision support for the comprehensive rural revitalization. The impact of factor mismatch on the change of agricultural output is quite different. So it can provide reference for the formulation of economic policy.

3.4. Brief comments

In summary, the existing literature uses a variety of methods to evaluate the allocative efficiency of agricultural production factors, and explores various factors affecting the efficiency of resource allocation in this field from multiple perspectives. However, in terms of research methodology, research object, research content and research results, the following problems need to be further analyzed: On the one hand, the existing research methods are difficult to quantify the output effect of agricultural technology, and the assessment of agricultural production efficiency is not comprehensive enough. On the other hand, the evaluation index system of factor allocation efficiency of agricultural production is not perfect, which can not reflect the various characteristics of agricultural production truly and accurately. Finally, the existing evaluation methods often ignore the impact of policy, environment and other factors on agricultural production efficiency, so it is necessary to incorporate the concept of sustainable development into the evaluation system

To sum up, future research needs to further improve and innovate from the aspects of research methods, systematic analysis, index system, etc., and incorporate the realistic impact of the national rural revitalization strategy into the evaluation system to better reflect the actual situation of agricultural production.

4. The Main Difficulties and Countermeasures of the Allocation of Agricultural Production Factors in the Perspective of Comprehensive Rural Revitalization

4.1. The main difficulties in the allocation of agricultural production factors from the perspective of comprehensive rural revitalization

Rural revitalization strategy provides new opportunities for rural economic development, but in the face of complex development situation, agricultural production factors still have the following difficulties:

First, the dispersion and fragmentation of land resources limit the development of modern agricultural production scale, standardization and industrial agglomeration, resulting in low production efficiency and waste of other resources. Among them, the misallocation of land resources has caused a very large efficiency loss [13]. If the land is not used optimally, it leads to

poor crop growth, which in turn affects the yield and quality of the produce. Land can not play its due value, which affects the efficiency of land resource allocation.

Second, in terms of technology, rural areas lack modern agricultural technology and management experience, resulting in lagging production methods and affecting output efficiency. Insufficient research and development support for the upgrading of traditional agricultural industries [14] directly leads to the slow adjustment and optimization of agricultural industrial structure, the reduction of resource utilization efficiency in the production process, and the difficulty in improving the quality and added value of agricultural products, thus affecting the efficiency of agricultural resource allocation and reducing agricultural production efficiency.

Third, the problem of fund shortage is still serious [15]. Rural funds mainly rely on traditional agricultural income and lack diversified investment and financing channels, resulting in relatively tight funds for agricultural production. Financial constraints may lead to insufficient investment in agricultural technology research and development and application, making it difficult to adopt advanced technology and equipment in agricultural production. In addition, the infrastructure construction in rural areas is lagging behind, which will restrict the development of agricultural production and reduce the efficiency of agricultural allocation.

Fourthly, as the rural revitalization strategy continues to support the development of rural economy, problems such as the transfer of rural labor force to cities, aging and population decline become increasingly prominent, and the supply of labor force in agricultural production will gradually decrease [16]. This will lead to some labor-intensive crops or production links can not get enough manpower support, thus affecting agricultural allocative efficiency. The overall quality of the labor force remaining in the countryside may decline, which will affect farmers' acceptance and application of new technologies and methods, further affecting agricultural allocative efficiency.

Fifth, the flow and use of information is hindered, such as incomplete supply chain information and other factors, farmers to manage inventory, transportation and storage costs increase. Because of the deviation of market information, farmers can not accurately understand the needs and preferences of consumers, so they can not adjust the production plan, resulting in the decline of production efficiency and resulting in the decline of income.

4.2. Countermeasures and suggestions for improving the allocation efficiency of agricultural production factors in China from the perspective of comprehensive rural revitalization

In order to effectively improve the distribution efficiency of agricultural production factors in the process of rural revitalization in China, in view of the unique nature of agricultural activities and the current research progress, we should start from the five key factors of land, technology, capital, labor and information, and carry out a more in-depth and comprehensive analysis and expansion of the allocation efficiency of agricultural resources. Here are some of the recommendations from the study:

First of all, promote land circulation, promote land scale management, and improve land use efficiency and productivity [17]. Promote the integration and transfer of land, encourage farmers to transfer and integrate land through transfer, cooperatives and other ways to improve the utilization rate of land resources. Land transfer should also consider the characteristics of farmers themselves, such as focusing on helping those farmers who cannot optimize the allocation of production factors due to scale constraints, so that they can actively transfer to land and get rid of the dilemma of low efficiency. For those farmers who are more profitable, they should be supported to operate under the original mode, rather than blindly transferring land.

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Secondly, modern agricultural technology should be promoted, agricultural information platform should be established, and agricultural scientific research and technology promotion should be strengthened [18]. Technological change and scientific and technological progress are solid forces to promote the development of agricultural and rural economy, and we must rely on scientific and technological innovation to lead and support the construction of modern agriculture at this stage. Promote the use of advanced agricultural technologies, such as biotechnology, information technology and agricultural mechanization, to improve agricultural production efficiency and output. Using big data, Internet of Things, mobile Internet and other technologies to collect, analyze and publish agricultural information, to provide farmers with scientific planting and breeding guidance. Strengthen the construction of agricultural research institutions, promote the transformation and application of scientific research results, and improve the level of agricultural technology. Popularize modern agricultural technology, improve agricultural production efficiency, and promote sustainable agricultural development.

Third, strengthen the support of financial services for agricultural development, promote financial innovation, and broaden farmers' financing channels. The government and the financial sector should expand financial assistance to rural areas and provide diversified financial services for agricultural production, such as setting up specialized agricultural development banks and rural cooperative banks to provide low-interest loans and other services to farmers. At the same time, farmers are encouraged to raise funds through various channels, such as developing rural cooperative finance, rural Internet finance, and introducing foreign investment.

Fourth, strengthen the development of rural human resources, train and introduce talents, and improve the rural social security system [19]. Strengthen the cultivation of agricultural professionals and improve their practical ability and innovation ability. This involves strengthening personnel training, upgrading the skill level of the rural labor force, and encouraging talents to return home to innovate and start businesses, and promoting the quality of agricultural production labor. Through preferential policies to attract highly educated and highly skilled people to work in rural areas, and then bring new ideas and technologies. Talent is the power source of agricultural economic development, pay attention to training high-quality agricultural talents, and actively train and build a professional and comprehensive revitalizing rural talent lineup can greatly improve agricultural production efficiency.

Finally, we should strengthen the training and education of farmers, improve their management ability and market awareness, and help them make better use of production factors. Farmers are encouraged to develop multi-mode management, such as agricultural product processing, leisure agriculture and characteristic industries, etc. Differentiated agricultural development surveys can also be formulated according to the natural conditions, regional characteristics and economic development level of different regions, so as to give full play to the comparative advantages of different regions, improve the comprehensive benefits of agriculture and promote the upgrading of agricultural industry [20].

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References

[1] Mei Fuchun. The flow of agricultural production factors and sustainable development of agricultural economy in the process of urbanization [J]. Henan Agricultural Sciences, 2005(05): 5-7.

[2] Liu Yansui, Liu Yu, Guo Liying. Impacts of climate change on agricultural production in China and countermeasures [J]. Chinese Journal of Eco-Agriculture, 2010(04): 905-910.

[3] [Liu H. Research on the impact of agricultural production factor allocation on the development of digital agriculture in China [D]: Northeast Agricultural University, 2023.]

[4] Zhang Le, Sun Liangyuan, Zheng Jing. Efficiency of agricultural comprehensive resources allocation in China [J]. Journal of South China Agricultural University (Social Sciences Edition), 2013(04): 19-26.

[5] Yao Fengmin, et al. Evaluation and Policy research on Efficiency of fiscal support to Agriculture in Guangdong Province based on three-stage DEA model [J]. Guangdong Agricultural Sciences, 2021(02): 161-172.

[6] Lu Dongning, Si Xu. Study on agricultural production elasticity based on translogarithmic production function [J]. Hubei Agricultural Sciences, 2023(04): 211-217. (in Chinese)

[7] Xi Jianguo, Hong Qi. Measurement of the change rate of factor allocation efficiency in different provinces in China: Based on stochastic frontier model [J]. Jiangxi Social Sciences, 2011(04): 79-82.

[8] WU Lili, Lian Mengjiao, Deng Lingcan. Effect of factor endowment change on agricultural production factor input and technology selection [J]. Chinese Journal of Agricultural Mechanization, 2021(06): 223-230.

[9] GaI Qing-en, Zhu Xi, Shi Qing-hua. The impact of labor transfer on agricultural production in China [J]. Economics (Quarterly), 2014(03): 1147-1170.

[10] Zhang Xueyan. Research on the Mechanism and Path of Digital Rural Construction to alleviate the mismatch of agricultural Production factors [D]: Zhengzhou Institute of Aviation Industry Management, 2023.

[11] Lei Shaohai, Wang Chengjun. Research progress and Frontier of agricultural Total Factor Productivity in China: a visual analysis of literature metrology based on CiteSpace [J]. Journal of Yunnan Agricultural University (Social Sciences), 2022(03): 124-133.

[12] Zheng Hongyun, Li Gucheng, Zhou Xiaoshi. Factor mismatch and agricultural output loss in China [J]. Journal of Nanjing Agricultural University (Social Sciences Edition), 2019(05): 143-153.

[13] Gai Qingen, et al. Misallocation of land resources and labor productivity [J]. Economic Research, 2017(05): 117-130. (in Chinese)

[14] Ding Yufan, Jia Xingmei. Regional Difference analysis of the impact of factor allocative efficiency on agricultural productivity: Based on the empirical study of 82 agriculture-related enterprises in different regions from 2011 to 2020. Journal of Yangtze Normal University, 2024(01): 54-62.

[15] Wang Xiaohua, Yang Yuqi, Cheng Lu. Rural financial services Rural revitalization Strategy in the new development stage: Problems and solutions [J]. Journal of Southwest University (Social Science Edition), 2021(06): 41-50.

[16] Lin Bao. The trend, influence and countermeasures of rural population aging in China [J]. Western Forum, 2015(02): 73-81.

[17] Chen Hao, Chen Zhongwei. Analysis on the influencing factors of the inconsistency between rural labor transfer and land transfer: Based on the data of fixed observation points in rural China from 1986 to 2010 [J]. Research of Finance and Trade, 2013(05): 32-38.

[18] Chen Weijing, Li Weisheng. Accelerate the construction of diversified agricultural technology extension system [J]. Journal of Northwest A & F University (Social Science Edition), 2007(03): 8-12.

[19] Huang Jian-jie, Luo Xinglu. Discussion on the cultivation of new agricultural talents under the background of rural revitalization [J]. Acta Agricultura Sinica, 2020(05): 97-100.

[20] Chen Yangfen, Liu Yu, Li Yului. The state of agricultural development and ways of industrial prosperity in the context of rural revitalization in China [J]. Geographical Research, 2019(03): 632-642. (in Chinese)