

# Evaluation of Eco-environmental Protection and Agricultural Productivity

## -- Based on Panel Data of Anhui Province

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### Abstract

From the perspective of agricultural ecological civilization, this paper will select the agricultural panel data of 10 prefecture-level cities in Anhui province from 2005 to 2019 to analyze the agricultural production efficiency of each decision unit of DEA model through economic statistics theory and data processing analysis method. From the perspective of overall, pure technical efficiency and scale efficiency, scale return, agricultural production efficiency of each city and practice change, conclusions are drawn based on the perspective of ecological environment and relevant countermeasures and suggestions are put forward.

### Keywords

Agriculture; Technical Efficiency; Ecological Civilization; The Production Efficiency.

## 1. Introduction

Since the reform and opening up, with the development of modern intensive agriculture characterized by high resource input and high yield, agricultural environmental problems and ecological crisis are increasing day by day. According to statistics, in 2018, 27 Chinese provinces and 20 Chinese provinces exceeded the international warning line on the intensity of fertilizer use and pesticide use. Based on the research and analysis of agricultural production efficiency, it studies how to invest in agricultural production to improve agricultural production and obtain higher economic and social benefits. For individual farmers, the ultimate goal of agricultural production is to maximize personal economic benefits. In this paper, through the analysis of environmental protection and production efficiency, find out how to improve production efficiency, which is conducive to improving the means of production of each unit of farmers. For government departments, improving agricultural production efficiency means that when managing agriculture, we should not only consider the output index, but also consider the efficiency of resource input, and whether it is suitable for innovative development and green development. From the point of view of economics, improving the efficiency of agricultural production has certain practical significance for every farmer and government departments. Through empirical research and analysis, we can more fully reflect the efficiency of agricultural production in anhui province and parts of the province, and comparing the two dimensions of time and space, more clearly reflect the different situation of space and time, through empirical analysis and the space and time and at the same time put forward a targeted

and operational efficiency of agricultural production solutions to problems, It has certain practical significance.

## 2. Literature Review

In terms of the research results of influencing factors, domestic scholars mainly hold these two kinds of views. One kind of view holds that the input of production factors can improve agricultural production efficiency; The other thinks that the change of environmental factors is the main factor. Du Wenjie (2009), a Domestic scholar, was innovative in his research on agricultural production technical efficiency from the perspective of differences in agricultural policies and studied the relationship between changes in agricultural production efficiency and changes in agricultural policies. Guo Guancheng and Vijole et al. (2015) studied the changes in China's agricultural production efficiency from the perspective of land transfer system and land property rights, and concluded that land system reform should be started to improve agricultural production efficiency. In the study of agricultural production efficiency, some scholars believe that external environmental factors are the main influencing factors. For example, Wang Jie and Li Jiao et al. (2019) analyzed and studied the agricultural production efficiency of Dongting Lake region in Hunan Province and believed that environmental protection and production technology progress have positive effects on agricultural production efficiency. Qian Li and Xiao Renqiao (2013) believed that the low pure technical efficiency of agriculture hindered the development of Agricultural production in China, and the low environmental efficiency resource utilization model brought a lot of waste and land destruction. Strengthening ecological protection and improving the carrying capacity of the environment contributed to the improvement of agricultural output. In the field of agricultural economy, A. Mccunn et al. (2000) and Y. Hayami et al. (1970) respectively demonstrated the importance of agricultural total factor productivity to agricultural output in the United States and Japan. D. Sarker (2004) et al., taking India as the research object, found that there was no significant correlation between the promotion of modern agricultural science and technology and agricultural technical efficiency. In terms of transnational studies, D. Vollrath (2007) and D. Restuccia (2008) et al found that agricultural production efficiency was related to agricultural land distribution and the overall productivity level of a country.

## 3. Research Methods and Index Selection

Traditional DEA model. According to the difference of data envelopment analysis, the hypothesis can be divided into two kinds: one is the CCR model which assumes the constant return of production scale; The other is the BCC model which assumes variable returns on production scale. Due to the complexity of agricultural production efficiency evaluation, the BCC model with variable returns to scale is mostly adopted, which is expressed as follows:

$$\begin{aligned}
 & \text{Max } Y_k = \sum_{r=1}^s \lambda_r y_{rk} - \mu_k; \quad r=1, 2, \dots, s; \quad k=1, 2, \dots, n_o \\
 & \text{s.t. } \begin{cases} \sum_{r=1}^s \theta_i x_{ik} = 1; \quad i=1, 2, \dots, m; \\ \sum_{r=1}^s \lambda_r y_{rk} - \sum_{r=1}^s \theta_i x_{ik} - \mu_k \leq 0; \quad \lambda_r \geq 0, \theta \geq 0. \end{cases} \quad (1)
 \end{aligned}$$

In Formula (1), n is the number of decision making units; M and S are input and output items respectively; Y rk is the output of the RTH term of the KTH decision unit; X IK is the ith input of

the KTH dDU;  $\theta$  I is the weight of input I;  $\lambda$  r is the weight of the output of the r term;  $\mu$  K is the scale return index of the KTH dSU.  $Y_k$  is the comprehensive technical efficiency of the KTH dSU.

#### 4. Agricultural Production Technical Efficiency Analysis

Maxdea Ultra 7.6 software was used to estimate the BCC model shown in Equation (1), and the comprehensive agricultural technical efficiency (Et), pure technical efficiency (Ept), scale efficiency (Es) and return to scale (Rts) of each policy decision unit were derived in turn. The results were calculated without excluding the influence of environmental factors and random error:

##### 4.1. Technical Efficiency of Agricultural Production

Under the condition that market price and production technology remain unchanged, the proportion of the minimum cost required to produce a certain amount of agricultural products to the actual agricultural production cost is agricultural production technical efficiency. Social conditions, natural conditions and policies are important factors affecting the technical efficiency of agricultural production, such as the amount of fertilizer used per labor, irrigation rate, area planted per labor and other factors, as well as the total power, per capita GDP and various indexes of agricultural machinery per labor. That's the amount of government interference in agriculture. Five years is a sign of change.

##### 4.2. The Quality and Safety Awareness of Agricultural Products Needs to be Improved

With the continuous development of agriculture in China, the economic income level and living standard of farmers have been improved. However, China's agricultural development is still inadequate. The agricultural development system in some areas of Our country is still unbalanced. As producers of agricultural products, farmers' awareness of agricultural product quality and safety is not high.

#### 5. Agricultural Production Technology Efficiency Change Countermeasure

Including the formulation of reasonable investment strategy reasonable investment can effectively promote the development of agricultural production technology.

Therefore, formulate reasonable investment strategies, according to the agricultural development of different regions to develop different investment strategies. For example, in areas with low technical efficiency in agricultural production, emphasis should be placed on increasing investment in infrastructure. Advanced agricultural production equipment is an effective measure to improve the technical efficiency of agricultural production. The level of agricultural production technology directly affects the comparison of advantages among industries. We can increase investment according to the actual situation of the region. Provide adequate funding for the area. In addition, the financial subsidies issued by the government can be used reasonably. The financial subsidies can improve the labor enthusiasm of farmers, effectively adjust the direction of agricultural production, and ultimately help realize the efficiency of agricultural production technology.

Cultivate high-quality agricultural science and technology team. High-quality agricultural science and technology team is the most basic condition to improve the technical efficiency of agricultural production in Our country. The economy trains high-quality agricultural talents, and regularly trains farmers in agricultural production and development knowledge and skills.

Improve the land transfer system and increase the level of agricultural intensification. Since the forced implementation of land transfer system harms farmers' interests, each region should proceed from its own situation and formulate land transfer policies to protect farmers' interests

and protect contractors' rights and interests, and prevent social capital from destroying the agricultural foundation after land. Continue to optimize the input structure of agricultural production license. With agricultural fiscal input as the baton, we will focus on guiding the development of green, circular, high-quality, and highly efficient agriculture with special features. At the same time, we will step up efforts to improve the environment for agricultural production, and establish a fiscal supply mechanism conducive to the protection and optimization of the natural ecological environment for agricultural production.

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