Measurement of China's Agricultural New-Quality Productivity Forces and Analysis of Regional Differences

Abstract

This paper focuses on the connotation and characteristics of China's agricultural new quality productivity forces. By constructing an evaluation index system and applying the entropy method, the dynamic measurement of agricultural new quality productivity forces levels across 31 provinces from 2012 to 2022 is conducted. The kernel density estimation method is then used to analyze its spatiotemporal evolution characteristics.The study finds that China's agricultural new quality productivity forces generally show a trend of annual improvement, manifested in a steady increase in productivity levels and a gradual narrowing of regional disparities.However, there are still significant differences in the development speed and levels between regions, with the eastern region performing the best, the central region improving slowly, and the western region showing the smallest increase, with the lowest productivity levels and notable regional imbalance.Based on the research findings, this paper offers policy recommendations for promoting the development of agricultural new quality productivity forces: First, differentiated development strategies should be tailored to local conditions. The eastern region should continue to leverage its economic and technological advantages to promote agricultural digitization, intelligence, and green sustainable development. The central region should focus on enhancing agricultural infrastructure, optimizing industrial structure, and developing specialized high-value-added agriculture. The western region should strengthen policy support, improve infrastructure, and promote the dissemination of agricultural technologies.

Keywords:New-Quality Productive Forces;Agricultural Green Development;Regional Differences;Kernel density estimation;Dynamic Evolution

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1 Introduction

In the new development stage, China has clearly proposed the strategic goal of building an agricultural powerhouse. However, achieving the historic leap from an "agricultural giant" to an "agricultural powerhouse" cannot be accomplished solely through traditional and conventional methods of productivity enhancement(Lin et al. 2024).At the second session of the 14th National People's Congress held on March 5, 2024, the government work report emphasized: "Vigorously advancing the construction of a modern industrial system and accelerating the development of new quality productive forces."In recent years, technological innovation, factor allocation innovation, and industrial innovation in China's agricultural sector, along with the emerging industries and new business models they have generated, have preliminarily demonstrated the tremendous potential of new agricultural productivity(Shen and Li 2024).The core concept of new quality productive force focuses on the leading role of digital technology innovation in economic development, breaking through traditional economic growth models and development paths. It takes the opportunity of a new round of technological breakthroughs to promote the innovative allocation of production factors by optimizing and integrating labor, labor materials, and labor objects.In the process of agricultural modernization, new quality productive forces are not only a key pathway to significantly improving agricultural production efficiency, promoting seed industry innovation, soil improvement, and agricultural diversification, but also an inevitable choice for advancing the modernization of agriculture with Chinese characteristics and accelerating the construction of an agricultural powerhouse(Huang et al. 2024).

Focusing on the agricultural sector, scholars have reached a general consensus that new quality productive forces in agriculture not only follow the general characteristics of new quality productive forces, but also trace their origins to the transformation from traditional agriculture to modern and even future agriculture.During this transformation, agricultural technological innovation has played a leading role, promoting the deep integration of strategic emerging industries, future industries, and agricultural subfields,

Commented [WU8]: a space is required after the period thereby giving rise to entirely new business models(Feng et al. 2024).These new business models focus on developing and expanding new types of agricultural operators and improving the quality and efficiency of agricultural social services as their core objectives.(Gao 2024) believes that new quality productive forces in agriculture are a high-quality form of productivity characterized by innovation-driven and disruptive technological breakthroughs. It is composed of new types of laborers, labor materials, labor objects, and other factors, while also incorporating new production factors such as data. (Zhang and Wang 2024) point out that by achieving breakthroughs and widespread application of key or disruptive technologies in the agricultural sector, it is possible to effectively break free from the traditional high-input, high-consumption development model of agriculture, thereby achieving a significant leap in production efficiency and showcasing the characteristics of advanced agricultural productivity.Meanwhile, (Zhang et al. 2024) further explain that the emergence of new quality productive forces in agriculture stems from disruptive breakthroughs in agricultural technology, innovative allocation of production factors, and the comprehensive upgrading of the agricultural industry ecosystem.This process not only represents the improvement of the quality of agricultural laborers, but also signifies the enhancement of agricultural labor material efficiency and the increased value of agricultural labor objects. It further reflects the qualitative changes these production factors undergo through optimized combinations, collectively driving the formation and development of advanced agricultural productivity. (Gao and Cheng 2024) argue that new quality productive forces in agriculture are led by technological innovation, supported by factor changes, and driven by industrial upgrading as a competitive advantage. Their formation represents the process through which agricultural productivity transforms from quantitative to qualitative changes, involving the transformation and upgrading of production methods, industrial structure, and business models, which is reflected in the leap in laborer quality, smart iteration of labor materials, expansion of labor object boundaries, and qualitative changes in the optimized combination of factors.

Regarding the measurement of agricultural new quality productivity forces, (Gong

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Commented [WU10]: check grammar comma not needed and Yuan 2024) reviewed the traditional agricultural total factor productivity measurement systems represented by Solow residual, data envelopment analysis, and stochastic frontier analysis. They reconstructed the measurement system by incorporating frontier methods, with a focus on technological innovation, agricultural characteristics, and multidimensional objectives. They demonstrated the application of the new system using agricultural digital intelligence technologies as an example. (Zhu and Ye 2024) constructed a comprehensive evaluation index system for agricultural new quality productivity from three dimensions: agricultural laborers, agricultural labor objects, and agricultural labor materials. They measured and analyzed the development level and dynamic evolution characteristics of China's agricultural new quality productivity. (Song et al. 2024) developed an agricultural new quality productivity forces evaluation index system with three primary dimensions: technological productivity, green productivity, and digital productivity. They employed the ecological niche model to identify the level and dynamic evolution of China's agricultural new quality productivity forces. (Jiang 2024) constructed an agricultural new quality productivity forces level evaluation system for major grain-producing areas from three dimensions: agricultural technological productivity, agricultural green productivity, and agricultural digital productivity. They measured the level of agricultural new quality productivity forces in major grain-producing regions.

In conclusion, this paper first provides an in-depth analysis of the theoretical connotations of agricultural new quality productivity forces, enriching the theoretical research on new quality productivity.Secondly, a comprehensive evaluation index system is constructed, providing a feasible approach for scientifically measuring the development level of agricultural new quality productivity forces in China.Finally, through various empirical analysis methods, this paper explores the regional disparities and dynamic evolution characteristics of agricultural new quality productivity forces in China, aiming to provide robust policy recommendations for accurately guiding the formation of agricultural new quality productivity forces.

2 Research Foundation

2.1Indicator System and Data Sources

Based on the analysis of the theoretical connotations of agricultural new-quality productivity Forces and a review of existing literature, this paper selects relevant indicators from three aspects—agricultural laborers, agricultural labor objects, and agricultural labor means—and constructs a comprehensive evaluation indicator system for agricultural new-quality productivity forces, as shown in Table 1.Specifically, some indicators are based on the method proposed by (Zhu and Ye 2024), while the remaining data are sourced from the National Bureau of Statistics official website, the China Statistical Yearbook, the China Rural Statistical Yearbook, the China Financial Yearbook, the China Environmental Statistical Yearbook, the China Social Statistical Yearbook, and statistical yearbooks from various provinces.For missing data, the moving average interpolation method was used to fill in the gaps.The study period of this paper spans from 2012 to 2022, with the research sample covering 31 provinces in China (excluding Hong Kong, Macau, and Taiwan).

Table 1. Agricultural New-Quality Productivity Forces Comprehensive Evaluation Indicator System

Objective level	Normative level	Level 1 Indicator	Level 2 Indicator	Measurements	Causality
New Quality Productivity Forces	Agricultural workers	Worker skills	Education level	Average years of education of rural labor force per capita	Positive
			Proportion of rural adults receiving technical training	Number of graduates from rural adult education and technical training schools per rural population	Positive
		Labor productivity	Per capita output value of the primary industry	Output value of the primary industry per number of people employed in the primary industry	Positive
			Per capita income of rural	Per capita disposable income of rural residents	Positive

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		residents		
	Employment philosophy of workers	Rural labor force mobility	Outward migrant labor force per rural workforce	Negative
Agricultural labor objects	Ecological environment	Green environmental protection	Forest coverage rate	Positive
			Environmental protection fiscal expenditure as a percentage of government public fiscal expenditure	Positive
		Pollution control	Agricultural COD pollution emission ratio to the output value of the primary industry	Negative
			Agricultural ammonia nitrogen emissions ratio to the output value of the primary industry	Negative
	New-quality industries	Innovation in the agricultural industry	Number of farmer cooperatives per number of people employed in the primary industry	Positive
		Agriculture, forestry, animal husbandry, and fishery services status	Growth index of the total output value of agriculture, forestry, animal husbandry, and fisheries	Positive
Agricultural means Of labor	Material production means	Traditional infrastructure	Rural road mileage per rural population	Positive
		Digital infrastructure	Number of rural broadband users per rural household	Positive
			Length of optical fiber cable per square meter	Positive
		Energy consumption	Energy consumption in agriculture, forestry, animal husbandry, and fisheries per total output value	Negative
			Per capita electricity consumption in rural areas	Positive
	Intangible production means	Technological innovation	Number of agricultural science and technology professionals	Positive
			Stock of agricultural R&D investment	Positive
		Level of digitalization	Rural digital inclusive finance investment index	Positive
			Rural digital inclusive finance mobile payment index	Positive

2.2 Measurement Methods

2.2.1 Entropy Method

This paper uses the entropy method to measure the development level of agricultural new-quality productivity forces.The entropy method is a multi-indicator comprehensive evaluation approach that can objectively reflect the relative importance of each indicator, avoiding the subjective bias introduced by manual weighting. The basic steps of the calculation are as follows:

First, the indicator data is standardized.

For positive indicators, the standardization formula is as follows:

$$X'_{ij} = \frac{X_{ij} - \min(X_j)}{\max(X_j) - \min(X_j)} \tag{1}$$

For negative indicators, the standardization formula is as follows:

$$X'_{ij} = \frac{\max(X_j) - X_{ij}}{\max(X_j) - \min(X_j)} \tag{2}$$

Here, X_{ij} represents the original data, i denotes the region, j denotes the indicator, X'_{ij} is the standardized result, $min(X_j)$ and $max(X_j)$ represent the minimum and maximum values of the indicator, respectively.

Next, calculate the proportional value of each sample i for indicator j:

$$P_{ij} = \frac{X'_{ij}}{\sum_{i=1}^{n} X'_{ij}} \tag{3}$$

Here, n represents the total number of samples.

Then, calculate the information entropy of indicator j:

$$e_j = -k \sum_{i=1}^{n} \left(P_{ij} \cdot \ln P_{ij}\right) \tag{4}$$

Based on redundancy, determine the weight of each indicator:

$$W_j = \frac{d_j}{\sum_{j=1}^{m} d_j} \tag{5}$$

Here, m represents the total number of indicators.

Finally, using the weighted calculation formula, the comprehensive score for each region is obtained:

$$S_i = \sum^{m} W_j \cdot X'_{ij} \tag{6}$$

2.2.2 Kernel Density Estimation Method

The kernel density function is a non-parametric estimation method that estimates the unknown probability density function by smoothing known data points, and is widely used in statistics.It works by applying a kernel function to each data point and summing them with weights to generate a smooth probability density curve, which can flexibly adapt to different data distributions.This paper applies the kernel density estimation method to study the distribution, location, extensibility, and polarization trends of agricultural new-quality productivity forces and its three dimensions.It is used to describe the distribution and evolution patterns of regional absolute differences.Suppose $f(x)$ be the density function of China's agricultural new productive forces x:

$$f(x) = \frac{1}{Nh} \sum_{i=1}^{N} K\left(\frac{X_i - x}{h}\right) \tag{7}$$

Here,$N$is the number of observations,x represents the mean of the observations,X_i denotes the independently and identically distributed observations ,$K(\cdot)$ is the kernel density function, and h is the bandwidth. The larger the bandwidth, the higher the estimation accuracy.This paper uses the Gaussian kernel density function to estimate the distribution dynamics of agricultural new-quality productivity forces nationwide and across the three major regions.The Gaussian kernel density function is:

$$K(x) = \frac{1}{\sqrt{2\pi}} \exp\left(-\frac{x^2}{2}\right) \tag{8}$$

3 Empirical Analysis

3.1 Analysis of Measurement Results

From Fig. 1, it can be observed that the trends in agricultural new-quality productivity forces in different regions of China from 2012 to 2022 show significant regional differences.Overall, the southeastern coastal regions, such as Guangdong, Fujian, Zhejiang, and Jiangsu, have demonstrated excellent levels of agricultural new-quality productivity forces, with most of these regions showing annual growth in productivity over time.In contrast, the agricultural new-quality productivity forces levels in the western and some inland provinces, such as Tibet and Gansu, are relatively low, and their growth rate is slower.The agricultural new-quality productivity forces in the southeastern coastal regions shows a trend of annual growth, while the western and inland areas generally face lower productivity levels. This disparity is closely related to the economic development level, agricultural infrastructure, technological innovation capability, and natural conditions of each region.High-productivity regions typically have better policy environments, technological innovation, support for agricultural industrialization, and digital agriculture, while low-productivity regions are constrained by lagging infrastructure, traditional agricultural production methods, and insufficient technological innovation capacity.Therefore, to promote the balanced regional development of agricultural new-quality productivity forces, differentiated policy measures should be implemented, and localized efforts should be made to drive technological innovation and agricultural modernization, in order to raise agricultural productivity forces levels and reduce regional disparities.

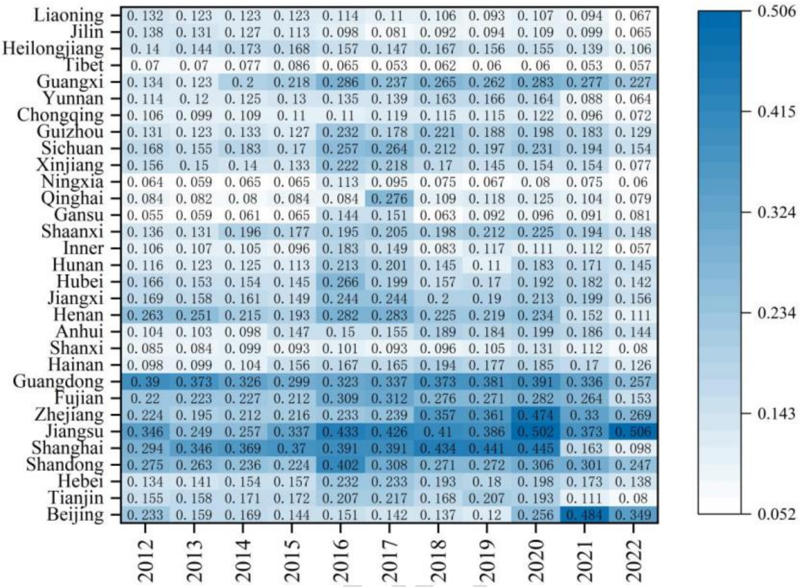

Fig.1. Level of Agricultural New-Quality Productivity Forces

As shown in Fig.2, there are significant differences in the level of agricultural new-quality productivity forces across different provinces in China, displaying distinct regional characteristics.The agricultural new-quality productivity forces in southeastern coastal provinces such as Jiangsu, Zhejiang, and Guangdong are relatively high,The agricultural new-quality productivity forces in these regions stand out, reflecting their leading positions in agricultural modernization, technological innovation, industrialization, and digital agriculture.The agricultural development in these provinces not only relies on advanced agricultural technologies and innovation-driven production models, but also benefits from strong economic foundations and well-established industrial chains,Particularly, significant progress has been made in the digitalization, intelligence, and green development of agriculture.Moreover, government policy support and resource investment in these regions have played an important role in enhancing agricultural new-quality productivity forces.For example,

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Jiangsu and Zhejiang have promoted agricultural industrialization, deepened rural economic reforms, strengthened agricultural technology research, and introduced talent, thereby promoting efficient agricultural development and sustainable transformation, which has contributed to the continuous growth of agricultural new-quality productivity forces.

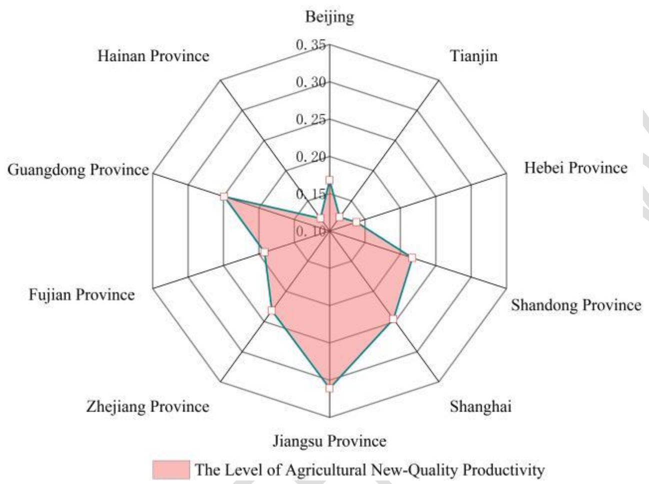

Fig.2. The Level of Agricultural New-Quality Productivity Force in Eastern region

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Relatively speaking, the agricultural new-quality productivity forces in provinces such as Shandong, Shanghai, and Hebei are at a moderate level, while the agricultural new-quality productivity forces in provinces such as Hainan, Tianjin, and Beijing are relatively low, with values significantly lower than those in other regions.The low level of agricultural new-quality productivity forces in provinces such as Hainan, Tianjin, and Beijing is mainly related to the agricultural production characteristics, scale, and development models in these regions.For example, Hainan's agriculture primarily focuses on tropical crops. Although it has unique agricultural resources and climatic conditions, its relatively traditional production methods, low application of technology, and lack of agricultural digitalization result in poor performance in agricultural new-quality productivity forces.In Tianjin and Beijing, due to limited land resources, smaller agricultural production scales, slower agricultural modernization processes, and lower levels of industrialization and technological innovation in agriculture, agricultural new-quality productivity forces are relatively lagging behind in these regions.Especially in Beijing, due to rapid urbanization, the reduction of agricultural land, and the gradual shift of agricultural production toward urban agriculture and modern services, the improvement of agricultural new-quality productivity forces faces significant challenges.

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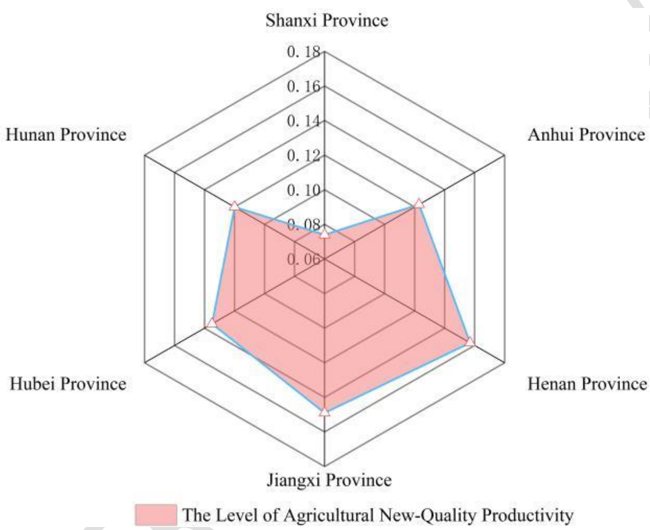

Fig.3. The Level of Agricultural New-Quality Productivity Forces in Central region

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As shown in the Fig.3 , the level of agricultural new-quality productivity forces in these provinces is relatively low and generally lower compared to coastal regions.Among these provinces, Jiangxi's agricultural new-quality productivity forces stands out slightly and performs the best, followed by Henan and Hunan, which also perform better than Shanxi and Anhui.These provinces, located in central China, have relatively similar agricultural productivity levels, with agriculture still dominated by traditional methods.The low level of agricultural new-quality productivity forces can be attributed to several factors: insufficient technological investment, slower adoption of digital agriculture, and a generally slower industrialization process compared to coastal regions.Additionally, during the transformation to modern agriculture, these provinces often face limitations in the comprehensive application of advanced agricultural technologies.However, Jiangxi’s performance is relatively better, thanks to improvements in agricultural infrastructure in recent years and more active promotion of agricultural industrialization measures, which have contributed to an increase in productivity levels.The overall pattern of these provinces suggests that targeted policy interventions are needed, with a focus on promoting technological innovation, digitalization, and agricultural modernization, in order to improve agricultural new-quality productivity forces and narrow the gap with more developed regions.

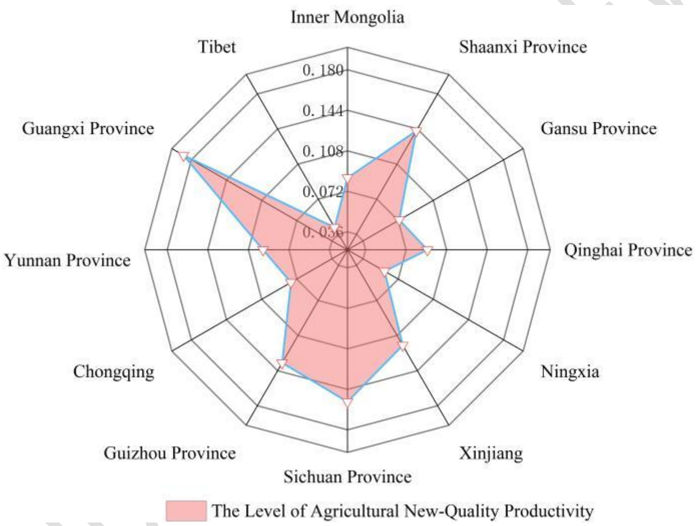

Fig.4. The Level of Agricultural New-Quality Productivity Forces in Western region

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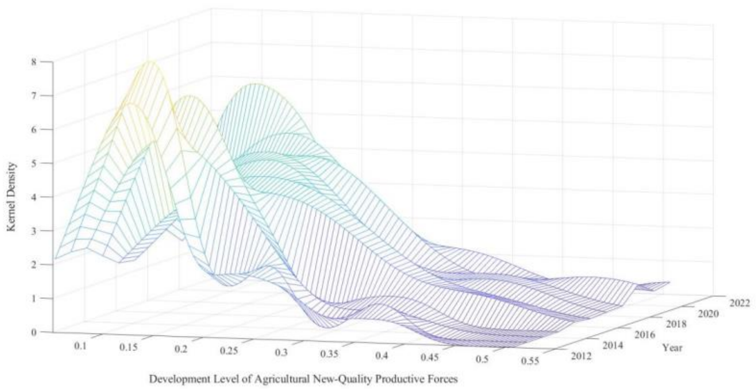
As shown in Fig. 4, there are significant differences in the level of new agricultural productivity forces across various regions in the western part of China.Regions such as Shaanxi, Guangxi, and Yunnan have performed relatively well, benefiting from favorable natural conditions, agricultural technological innovation, and government support, which have contributed to the development of modern agriculture.In contrast, regions such as Qinghai, Tibet, and Ningxia have lower levels of development, constrained by harsh natural environments, weak economic foundations, and technological lag.Sichuan, Chongqing, and Guizhou are in the middle range, facing challenges related to terrain and the promotion of mechanization; however, they are gradually improving agricultural productivity through industrial structural adjustments.Although Inner Mongolia and Xinjiang are rich in resources, their performance is hindered by vast land areas, sparse populations, and low production concentration.Overall, each region should leverage its own advantages, adopt local strategies, increase investments in technology, and promote agricultural modernization and high-quality development.



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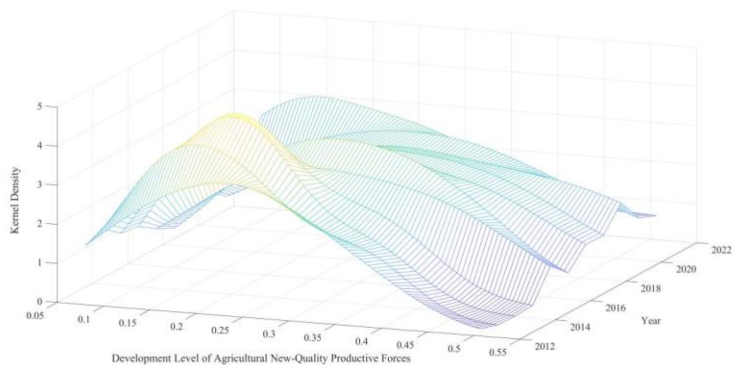
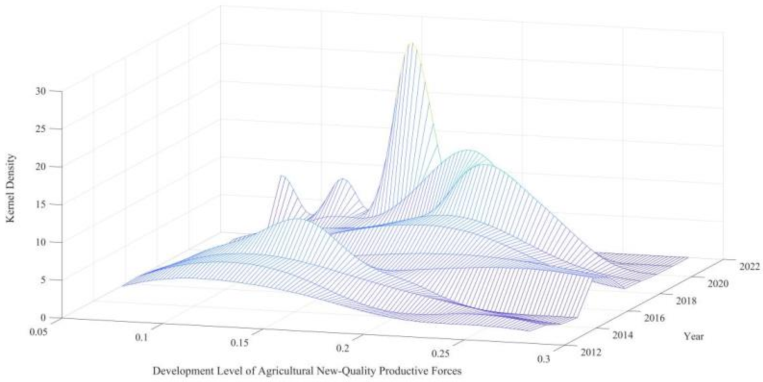
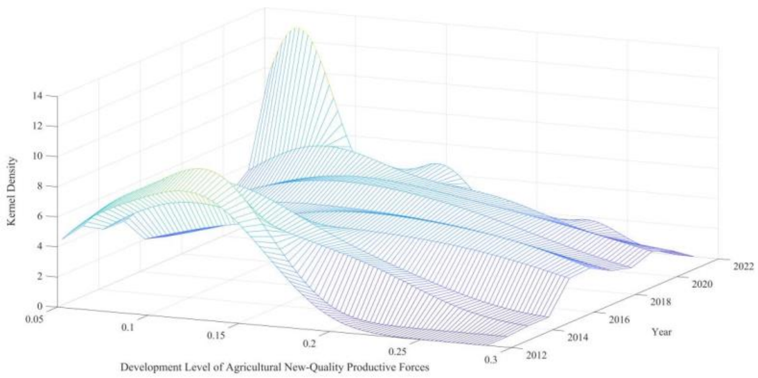


(b)Eastern Region



(c)Central Region



(d)Western Region

Fig. 5. The Kernel Density Curve Distribution Map of Agricultural New-Quality Productive Forces

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As shown in Fig. 5(a), from 2012 to 2022, the level of new agricultural productivity forces in China exhibited a gradual upward trend.In the early stages, new agricultural productivity forces were primarily concentrated at lower levels, with high peaks and narrow distributions, reflecting the underdevelopment of most regions.Over time, particularly from 2016 to 2020, the distribution curve shifted to the right, the peak of the kernel density decreased, and the distribution range expanded, indicating that the productivity level improved and regional disparities gradually narrowed.This change can be attributed to policy support, technological advancements, infrastructure improvements, and the optimization of agricultural industrial structure, which have driven new agricultural productivity forces towards high-quality and balanced development.

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From Fig. 5(b),In the eastern regions, the new agricultural productivity forces exhibited a significant upward trend from 2010 to 2022. The distribution gradually shifted from lower levels (0.15-0.25) to medium-high levels (0.35-0.5), with an expanded distribution range, indicating balanced development and quality improvement in regional productivity.This change can be attributed to the strong economic foundation in the eastern regions, the driving force of technological innovation, the improvement of modern agricultural infrastructure, as well as policy support and market demand.Some regions have taken the lead in achieving high-level development, reflecting the pioneering role of the eastern regions in agricultural modernization and the development of new agricultural productivity forces.

According to Fig. 5(c),First, the initial development of new agricultural productivity forces was concentrated and at a low level.Between 2012 and 2014, the kernel density distribution of new agricultural productivity forces in the central region was mainly concentrated in the lower range, between 0.15 and 0.25.During this period, the peak kernel density was high, exceeding 30, indicating that the majority of regions' new agricultural productivity forces were still in the early stages of development and lacked significant improvement.This distribution pattern reflects the overall low level of agricultural modernization in the central region, with delayed technological applications and constrained by weak economic foundations and a monolithic industrial structure.Therefore, although some areas received policy support, the overall development level remained at a low level.Secondly, new agricultural productivity forces gradually improved, but the progress was relatively slow.From 2014 to 2022, although new agricultural productivity forces improved in some areas, the kernel density distribution curve gradually shifted to the right, but the overall rate of improvement remained slow.In particular, the proportion of high-level regions remained small. Although the distribution curve broadened in 2020, showing significant progress in some areas, most regions still stayed below the 0.25 level, and the proportion of high-level regions (above 0.3-0.35) remained limited.This development trend suggests that the central region still faces significant challenges in promoting the improvement of new agricultural productivity forces, particularly due to insufficient technological innovation, financial investment, and policy support, which has constrained the overall pace of improvement.

As shown in Fig. 5(d)From 2012 to 2022, agricultural new productivity forces in the western regions showed a slow upward trend, but the overall level remained relatively low, and there was significant concentration and imbalance in its distribution.Firstly, during the period from 2012 to 2014, agricultural new productivity forces in the western regions were mainly concentrated in the lower range (0.15 to 0.2), with a high peak in the kernel density, indicating that agricultural productivity in most areas developed slowly.The distribution characteristics during this period reflect that agricultural development in the western regions was limited by poor infrastructure, weak economic strength, and insufficient promotion of modern agricultural technologies, showing a high degree of concentration.At this stage, the improvement of agricultural new productivity forces was still in its infancy, with many areas facing significant development barriers.From 2014 to 2022, agricultural new productivity forces in the western regions gradually improved, with the distribution curve shifting to the right, indicating some progress in certain areas.However, the overall improvement remained slow. The agricultural new productivity forces levels in most regions were still concentrated below 0.2, with very few high-level areas, and the kernel density distribution curve remained narrow.This indicates that, despite some progress, the level of agricultural new productivity forces in the western regions still lags behind other regions.Additionally, there were clear regional disparities in the development of agricultural new productivity forces in the western regions. Some areas saw improvements due to policy support and infrastructure improvements, but most regions remained at lower levels and failed to achieve balanced development.This imbalance mainly stems from differences in geographical conditions, resource distribution, and economic development foundations, particularly in areas with significant natural constraints, where development has been slower.An analysis of the causes shows that the slow development of agricultural new productivity forces in the western regions is mainly due to natural and geographical constraints, weak economic foundations, insufficient technology promotion, and relatively limited policy support.

4 Conclusions and Implications

4.1 Conclusions

This study focuses on the connotations and characteristics of agricultural new productivity forces and constructs an evaluation index system for the level of agricultural new productivity. The entropy method is used to measure the dynamic level of agricultural new productivity forces development across 31 provinces in China from 2012 to 2022.Additionally, the Kernel density estimation method is employed to further analyze the spatiotemporal characteristics of the evolution of agricultural new productivity forces in China.The results of the study show:

From 2012 to 2022, the overall agricultural new quality productivity forces in China showed a trend of annual improvement.This development is primarily reflected in the steady improvement of productivity levels and the gradual narrowing of regional disparities.However, the differences between regions remain significant, with the eastern regions leading and the central and western regions still facing considerable pressure for improvement.In the early stage (2012-2014), China's agricultural new quality productivity forces was generally low, reflecting the lag in agricultural development in most regions and the weak modern agricultural infrastructure.Particularly in many areas of the western and central regions, the level of agricultural productivity remained low, and the process of agricultural modernization was slow.At this time, the improvement of agricultural new quality productivity was still in its infancy, and many regions faced various development obstacles.Since 2016, with increased national investment in agricultural modernization, particularly in support of technological innovation and infrastructure development, agricultural new quality productivity forces has gradually improved.The rightward shift of the kernel density curve signifies that the productivity level is gradually concentrating in higher-level areas, with some regions having already achieved the initial transformation of modern agriculture.With the continuous promotion of modern agricultural technologies, agricultural production efficiency has steadily improved, and the overall quality of productivity and regional balance have also improved.

There are significant differences in the speed and level of agricultural new quality productivity forces improvement across regions.The eastern region has seen the most significant improvement in agricultural new quality productivity forces, with productivity levels gradually concentrating in the mid-to-high range.This is mainly due to the strong economic foundation, advanced technological support, and well-developed modern agricultural infrastructure in the eastern region.The eastern region has largely achieved the modernization transformation of agriculture, with not only a quantitative increase in agricultural new quality productivity forces but also significant improvements in quality, technology, and management.Although the central region has made some progress, the overall improvement has been slower. This situation is closely related to factors such as the weaker economic foundation, insufficient agricultural technology promotion, and delayed infrastructure development in the central region.In contrast, the western region has seen the slowest improvement in agricultural new quality productivity forces, with the lowest productivity levels and significant regional disparities.The western region is constrained by multiple factors such as complex natural conditions, a weak economic foundation, and insufficient technological application, leading to a lower overall level of agricultural new quality productivity forces.

4.2 Implications

(1)Adapting to Local Conditions, Differentiated Development

The improvement of agricultural new productivity requires the implementation of differentiated policies and development strategies based on the specific characteristics of different regions.Eastern Region: The region should continue to leverage its strong economic and technological advantages to promote the digitalization, intelligentization, and green sustainability of agriculture. Investment in cutting-edge technology research should be increased to establish a leading edge in agricultural new productivity forces, particularly by optimizing agricultural supply chains and enhancing automation, further advancing agricultural modernization towards higher quality.Central Region: Focus should be placed on strengthening agricultural infrastructure, particularly in the areas of agricultural mechanization and informatization, to improve the application of agricultural technology. Additionally, optimizing the agricultural industrial structure is crucial, with a focus on developing high-value-added specialty agriculture, extending the industrial chain, and creating new economic growth points to promote sustainable agricultural development.Western Region: Given the region’s natural constraints and weaker economic foundation, more policy support should be provided, particularly for strengthening infrastructure and promoting agricultural technology, to help overcome development bottlenecks. Furthermore, the western region should leverage its unique natural resource advantages to develop ecological agriculture and specialty industries, gradually improving agricultural new productivity forces.

(2)Strengthening Agricultural Technology Innovation and Promotion

Technological innovation is the core driving force for improving agricultural new productivity forces. Investment in research on key agricultural technologies should be increased, particularly in the areas of seed innovation, smart agriculture, and precision farming. At the same time, a comprehensive agricultural technology promotion system should be established to increase the dissemination and application of agricultural technologies, helping the central and western regions modernize agricultural production methods and accelerating the transformation and application of agricultural technological achievements.

(3)Improving Agricultural Infrastructure

Comprehensive infrastructure is a solid guarantee for the development of agricultural new productivity forces. Investment in agricultural infrastructure should be increased across regions, particularly in farmland irrigation facilities, irrigation systems, rural transportation, and digital infrastructure. Special attention should be given to the central and western regions, prioritizing the development of rural internet and information networks, driving the transformation of agricultural production toward intelligent and precise farming, narrowing the infrastructure gap between urban and rural areas, and promoting the overall improvement in agricultural development quality.

(4)Optimizing Agricultural Industrial Structure

Promoting the transformation and upgrading of the agricultural industry is key to improving agricultural new productivity forces. Efforts should be made to accelerate the development of high value-added modern agriculture, green agriculture, and specialty agriculture, extending the agricultural industrial chain and increasing the added value of agricultural product processing and sales to form a complete agricultural industry system that covers production, processing, and sales. At the same time, strengthening the integration of agriculture with other industries and promoting deep collaboration with the service and tourism industries will further expand agricultural development space and enhance overall competitiveness.

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(5)Increasing Policy Support

The government needs to strengthen policy support for the development of agricultural new productivity forces, particularly by increasing investment in funds, technology, and talent in the central and western regions. Through fiscal subsidies, tax incentives, financial support, and other measures, agricultural enterprises and farmers should be encouraged to increase their enthusiasm, driving the modernization of agriculture. At the same time, a sound talent recruitment mechanism should be established to encourage agricultural science and technology professionals to move to the central and western regions, providing intellectual support and technical guarantees for local agricultural modernization.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

The author(s)declare that only generative Al tools (e.g., GPT)were used for translation purposes. No generative Al technologies were employed in the writing or editing of the other content in this manuscript.

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