

# Challenges in Chinese Path to Modernization of Agriculture and Rural Areas: A Comparison With the U.S.

Yuying Yang<sup>1</sup>, Chuanbo Chen<sup>1</sup> & Yiying Sun<sup>1</sup>

<sup>1</sup> School of Agricultural Economics and Rural Development, Renmin University of China, Beijing, China

Correspondence: Chuanbo Chen, School of Agricultural Economics and Rural Development, Renmin University of China, Beijing, 100872, China. E-mail: [chris@ruc.edu.cn](mailto:chris@ruc.edu.cn)

Received: May 7, 2024

Accepted: June 18, 2024

Online Published: July 15, 2024

doi:10.5539/jas.v16n8p15

URL: <https://doi.org/10.5539/jas.v16n8p15>

## Abstract

This study establishes, for the first time, an index system for comparing agricultural and rural modernization in China and the United States, which aims to identify key challenges in China's agricultural and rural development by contrasting indicators from both countries. Overall, China's current level of agriculture and rural modernization is akin to that of the United States in the 1960s and 1970s, with an approximate time lag of 60 years. China exhibits the largest gap with the U.S. in agricultural modernization and the smallest gap in rural modernization. Three key indicators in China that require improvement compared to the United States are the disposable income of rural residents, the population size supported by each agricultural laborer, and the share of agricultural employment. This research lays down a theoretical foundation and practical strategies for advancing the Chinese path to agriculture and modernization in rural areas.

**Keywords:** robust agriculture, beautiful landscapes, prosperous farmers

## 1. Introduction

During the Centenary of the Communist Party of China, President Xi solemnly declared that China had pioneered a new and uniquely Chinese path to modernization and created a new model for human advancement. The Chinese path to modernization of agriculture and rural areas is essential to the new road of the Chinese path to modernization. The No. 1 central document for 2024 emphasized that China should prioritize the development of modern agriculture and accelerate the modernization of agriculture and rural areas (Jiang, 2024).

While significant progress has been made in China's rural development over the past four decades of reform and opening up, challenges persist in achieving a comprehensive revitalization of the countryside. Issues such as inadequate infrastructure, unbalanced industrial structure, and the complex task of environmental governance are impeding progress (Hong et al., 2018; Guo, 2018; Wei et al., 2022). The stark disparity between the thriving urban economy and the underdeveloped rural areas underscores the urgent need for comprehensive reflection and reform. Policymakers and researchers in China are increasingly focusing on formulating strategic plans for enhancing China's strength in agriculture and designing effective policy frameworks to address these pressing issues.

Modernization globally involves advancing and refining industrialization and urbanization, disseminating them from developed nations to those in later stages of development. The modernization of agriculture and rural regions in developing countries represents not only the final phase of modernization but also encounters unique development challenges, leading to distinct political economy implications. To examine and consolidate the Chinese path to the modernization of agriculture and rural areas, it is essential to understand the global trajectory and then analyze potential pathways for modernizing agriculture and rural areas within varied political and economic limitations.

Being a forerunner in global modernization, the United States has gone through an extensive phase of agrarian society and navigated the transition from a traditional agrarian model to a modern one. China and the United States exhibit disparities in resource allocation, industrial structure, and economic frameworks. Nevertheless, overarching economic principles govern rural development in both nations from a comprehensive and long-term perspective. The historical evolution of rural development in the United States serves as a valuable precedent and model for China. Therefore, conducting a comparative analysis of the modernization processes in agriculture and

rural areas between China and the United States holds significant importance in advancing the Chinese path to modernization of agriculture and rural areas.

This paper uniquely centers around using the United States as the reference object, creating the first-ever index system for agricultural and rural modernization between China and the United States, and conducting empirical analyses. The absence of such an index system makes it challenging to evaluate progress in various aspects accurately before. Moreover, a comparative analysis with the United States is necessary to understand the characteristics of China's agricultural and rural modernization, determine its status, and identify areas needing improvement. With a scientific assessment of the significant agricultural and rural modernization initiatives, it is easier to know whether they are effective and how to improve them. By aligning with a scientifically defined understanding of agricultural and rural modernization objectives, the establishment of an indicator system plays a crucial role in steering development, decision-making, and consensus-building processes. The study aims to provide theoretical support and policy recommendations for exploring the development mode and path of agricultural and rural modernization with Chinese characteristics.

## 2. Literature Review

The literature on agricultural and rural development indexes has been extensively researched both domestically and internationally. Chinese scholars have introduced index systems for agricultural and rural modernization tailored to Chinese characteristics (Ye, 2021; Jiang & Li, 2021; Zhang & Oyang, 2019; Zhu et al., 2018) and specific regions, including Anhui province (Zhao, 2019), Henan province (Chen & Li, 2020), Hunan province (Liu et al., 2021), Qinghai province (Li & Li, 2020), Xinjiang Uygur autonomous region (Ba et al., 2020), and Jiangsu province (Ma & Hua, 2021). For instance, Zhang et al. (Zhang & Ou, 2019) devised an evaluation framework comprising 19 indicators encompassing thriving businesses, pleasant living environment, social etiquette and civility, and effective governance. Similarly, Li et al. (Li & Li, 2020) developed an evaluation index system focusing on agricultural and rural modernization at two levels: agricultural modernization and rural modernization. This system incorporates 10 evaluation criteria such as the agricultural industrial system, agricultural policy framework, urban-rural integration, and rural environmental quality. Recent scholarship has emphasized the significance of indicators such as rural social development (Kang et al., 2017), agricultural quality and efficiency, green development (Di & Hu, 2020), and agricultural informatization (Lu et al., 2020) in assessing the progression of agricultural modernization.

Internationally, to obtain an initial estimation of the rural development index, one could utilize various indices designed explicitly for assessing overall development. Examples of such indices include the Gross Domestic Product (GDP) (World Bank, 1997), the UN Human Development Index (UNDP, 2009), and the Multidimensional Poverty Index (Oxford Poverty and Human Development Initiative, 2017). However, one notable limitation is the need for indices adapted in rural regions. This implies that relying on these indices to assess the efficacy of rural development policies, pinpoint areas for public investment, or make decisions in vastly diverse contexts may yield unreliable outcomes. In this context, two specific indices, Kageyama's Rural Development Index (Kageyama, 2008) and Abreu's Rural Development Index (Abreu & Cardoso, 2014), have been devised to assess rural development. Examples of using both indices can be found in the work of Haag (Haag, 2009). He applied Kageyama's index to measure the effectiveness of public policies in Brazil. Similarly, Abreu et al. (Abreu et al., 2019) utilized their index to evaluate the rural development of 15 Portuguese municipalities. Other influential studies include (Georgios & Barraí, 2023; Huang & Yang, 2018; Kim & Yang, 2016; Liu et al., 2013; Michalek & Zarnekow, 2012a, 2012b; Yokoyama, 2019; Zekić et al., 2017), etc.

Regarding theoretical research, western economists engaged in extensive academic discussions on urban-rural relations and the dual economic structure in developing countries after Second World War. Some economists, represented by Lewis, argued that the decline of rural areas resulted from market forces. They contended that shifting surplus agricultural labor to non-agricultural sectors would diminish the dual economy structure, negating the necessity for government intervention. Subsequently, scholars recognized the inconsistency between Lewis's dual economy structure model and the social realities of developing countries (Chen et al., 2022; Lewis, 1954; Yao, 2021; Zhang, 2012). The significant disparities between workers and peasants and urban and rural areas were found to hinder a nation's economic development. Economists emphasized the importance of rural construction and development, advocating for policies to bridge the urban-rural gap and foster the coordinated advancement of workers and peasants (Kuznets, 1955; Ranis & Fei, 1961; IFPRI, 2019; Du, 2005). Chinese scholars have also explored diverse perspectives on the implications, extensions, challenges, and strategies for promoting agricultural and rural modernization (Jiang, 2021; Sun & Fu, 2021; Peng & Liu, 2020; Li et al., 2021; Wang, 2019; Gao, 2023).

The existing research on the evaluation index system of agricultural and rural modernization generally lacks the requisite systematic and comprehensive approach, primarily focusing on the province scale rather than encompassing national and regional perspectives. Presently, studies predominantly rely on qualitative analysis at the domestic level, warranting the inclusion of more cross-temporal comparisons between domestic and international contexts. There is a need for comparative analyses that contextualize China's current development stage historically, similar to the trajectory of the United States. The evaluation index system of agricultural modernization constructed by many scholars measures the level of modern agricultural development that can neither be compared with the agriculture of other countries nor with other industries in China, which has great limitations (Li, 2020), underscoring the importance of addressing these shortcomings during the design of the indicator system for agricultural and rural modernization.

Based on existing research, this paper constructs an evaluation index system for agricultural and rural modernization from the three dimensions of robust agriculture, beautiful landscapes, and prosperous farmers by the actual development of agricultural and rural modernization. Among them, robust agriculture embodies high quality and high efficiency of agriculture, beautiful landscapes embody livable and workable countryside, and prosperous farmers embody the goal of ensuring prosperity among rural populations. The study is dedicated to scientifically measuring the development level of China's agricultural and rural modernization and making international comparisons to optimize relevant macroeconomic decisions and promote the high-quality development of agricultural and rural modernization.

### **3. Research Methods and Data**

#### *3.1 Construction of Index System*

The comparison between China and the United States reveals both similarities and differences in agricultural and rural modernization, encompassing regularities, diversities, as well as country-specific characteristics and temporal disparities. Consequently, the design of the indicator system for agricultural and rural modernization should consider variations in resource endowment and specific national agricultural conditions. Additionally, it should objectively assess the level of agricultural and rural development in China and the United States relative to international standards. Recently, there has been a trend towards harmonizing quantitative and qualitative, objective and subjective indicators in measuring economic and social development due to the increasing complexity of these domains. Many aspects remain challenging to quantify due to the lack of a comprehensive statistical system, as people's aspirations for an enhanced quality of life are often reflected subjectively. OECD countries are increasingly focusing on constructing indicators to measure welfare improvement from the perspective of individual welfare enhancement. Stiglitz argues that while some aspects of economic and social development can be objectively measured, repeatable subjective assessments may be the most suitable method for others (Fitouss et al., 2011). However, we contend that assessing the progress of agricultural and rural modernization in China and the U.S. using this approach is hindered by high data acquisition costs, difficulty in accessing relevant international data, and the risk of introducing arbitrariness and non-scientific evaluation outcomes. Thus, this study emphasizes the utilization of objective indicators. Moreover, in advancing agricultural and rural modernization, insights from international experiences and common trends can serve as a foundation for designing the indicator system, albeit with a cautious approach to maintain a reasonable number of indicators.

First, based on the Law on Promoting Rural Revitalization, the Opinions on Implementing the Rural Revitalization Strategy, a package of policies charting the roadmap for rural vitalization, and an Outline of the 14th Five-Year Plan (2021-2025) for National Economic and Social Development and Vision 2035 of the People's Republic of China, and concerning the history of agricultural and rural modernization in the United States, we have comprehensively analyzed the connotation of the development of agricultural and rural modernization in the United States and the United States and the availability of the data of the indicators.

Second, the integration of the developmental aspects of agricultural and rural modernization in China and the U.S., along with the availability of indicator data, informed the construction of an indicator system focusing on China. President Xi has consistently emphasized rural areas should have robust agriculture, beautiful landscapes and prosperous farmers. This vision prioritizes agriculture, rural areas and farmers in the new era. Hence, this study utilizes these dimensions as primary indicators.

Third, in outlining the second-level construction requirements, the indicators proposed aim to be simple, concise, and easily comprehensible. They aim to capture the essence of agricultural modernization through the continuous enhancement of agricultural productivity and rural modernization through the continual improvement of the quality of life for rural residents. This paper proposes nine indicators in three dimensions, constructed as follows.

### 3.1.1 Robust Agriculture

Agricultural modernization is the top priority for rural revitalization. Rural revitalization must accelerate the construction of a modern agricultural industrial system and business system, improve total factor productivity, and accelerate the transformation from a large agricultural country to a strong agricultural country. Agricultural modernization can be assessed in many ways, and either way, it will lead to a continuous increase in agricultural labor productivity. Therefore, we can use the population size supported by each agricultural laborer to evaluate agricultural modernization (Tang & Han, 2023). There are three basic characteristics of an economy that has modernized its agriculture. The agricultural sector has witnessed a notable transition towards mechanization, where machines have supplanted human labor and livestock as primary production inputs. Advances in agricultural technologies encompassing biological, chemical, and engineering practices have significantly bolstered productivity and output. Furthermore, the adoption of sophisticated operational systems and streamlined food supply chains have enabled the industry to effectively meet the evolving demands of consumers. Together, these factors have led to increasing agricultural labor productivity. Indicators of the population size supported by each agricultural laborer, as measured by the dynamic consumption criterion, can reflect progress on all three fronts.

The National Rural Industry Development Plan (2020-2025) sets forth the implementation of the rural revitalization strategy as a guiding principle. It emphasizes the integrated development of primary, secondary, and tertiary industries and the active promotion of the processing industry for agricultural products to extend the industrial chain, enhance the value chain, foster new development momentum, and generate more opportunities for employment and income. Consequently, the metric “share of agricultural employment” has been established to assess the integration of rural industries by measuring the percentage of the workforce employed in agriculture out of the total job market.

Only by prioritizing efficiency and shifting agriculture from a production-increase orientation to a quality-improvement orientation can the comprehensive efficiency of agriculture be improved. The improvement of comprehensive agricultural efficiency will ultimately be reflected in production efficiency, so the study chose the indicator “share of agricultural added value in GDP” to evaluate the improvement of agricultural production efficiency and quality.

### 3.1.2 Beautiful Landscapes

As an important indicator of the quality of life of rural residents, the human habitat environment has a bearing on building a moderately prosperous society in all respects and on the fundamental well-being of the general public. Improving rural habitat is an essential component of the rural revitalization strategy. For this reason, “the proportion of the rural population with access to improved sanitation” has been included as an indicator in the rating of agricultural and rural modernization.

The city and the countryside form an interdependent community of life. The city serves as the driving force for the development of the countryside, while the rural areas provide essential support for the city’s growth. This reciprocal relationship and integration is fundamental to the establishment of this societal bond. The Decision of the Central Committee of the Communist Party of China on Major Issues Concerning Upholding and Improving Socialism with Chinese Characteristics and Modernizing the State Governance System and Capacity Deliberated and Adopted at the Fourth Plenary Session of the 19th Central Committee of the CPC, emphasizes the need to enhance the institutional framework for promoting the integrated development of urban and rural areas. It also stresses the importance of upholding and improving social systems for urban and rural residents to satisfy the growing expectations for a better life. The document underscores the concepts of integrating urban and rural areas. Consequently, the “urbanization rate” serves as a key indicator to assess urbanization levels and mirror the ongoing modernization process in rural areas.

An adequate, continuous, and safe drinking water supply is crucial for the dignity and well-being of rural residents, significantly contributing to their health improvement. An effective sanitation system is indispensable for maintaining public health in rural areas, indicating social development and progress. Therefore, the indicator “Proportion of rural population with access to improved water sources” has been incorporated as a metric to assess the progression of rural modernization. Water and sanitation systems are fundamental components of a respectable standard of living. If essential public services in rural regions fail to meet the required criteria, the inherent “opportunity imbalance” in rural areas will persist, making it challenging to narrow the urban-rural disparity in the short term. Thus, the modernization of agriculture and rural regions must prioritize addressing these essential issues.

### 3.1.3 Prosperous Farmers

Enhancing farmers' incomes is both the initial and ultimate objective in the development of agriculture, rural areas, and farmers. China has consistently prioritized boosting farmers' income as a cornerstone of its agricultural and rural policies since the inception of the rural revitalization strategy. The National Rural Industry Development Plan (2020-2025) stresses the need to diversify income sources for farmers, uplift the earnings of low-income rural residents, expand the middle-income bracket within rural communities, and ensure that the income growth rate of rural dwellers surpasses that of urban residents. The No. 1 central document for 2021 highlighted the imperative of farmers surpassing urban income growth rates as a key target. The term "prosperous farmers" encompasses the dual goals of increasing absolute income levels and reducing the income disparity between urban and rural regions. Building upon these principles, this study adopts the "ratio of disposable income per capita of rural residents to the national average" as the benchmark for assessing "prosperous farmers" and gauging the urban-rural income gap.

Poverty is an enduring issue in human society and a ubiquitous global challenge. The presence of poverty, together with its associated issues such as hunger, illness, and societal discord, has significantly impeded humanity's journey toward a better standard of living. The aspiration to eliminate poverty represents a longstanding human ideal, with the annals of human progress defined by a relentless battle against destitution. The Chinese Government has consistently prioritized poverty reduction as a critical focus in national development, ensuring that all individuals share economic and social progress benefits. The 20th Party Congress identified fortifying the gains in expanding achievements in poverty alleviation and preventing the return of poverty as a pivotal developmental objective. Being the world's most populated developing nation, with 1.4 billion inhabitants, China has grappled with entrenched poverty due to structural deficiencies and uneven growth. Since the initiation of reforms, particularly following the 18th Party Congress, China has made significant advancements in poverty alleviation for its citizens, concurrently playing a crucial role in global poverty management—a contribution bearing immense global significance. Hence, the metric "incidence of poverty" has been selected to gauge the comprehensive development level of rural populations.

Food and nutrition form the foundation for human survival. Prioritizing the well-being of farmers stands as a crucial lesson in governance and national development for the CPC, reflecting a commitment to serving the people. The report of the 20th CPC National Congress calls for establishing an all-encompassing approach to food. Analysis from the 2022 China and Global Food Policy Report highlights a substantial disparity in dietary quality between urban and rural Chinese populations. In 2020, 11% of urban residents exhibited a highly unbalanced diet, contrasted with a much higher rate of 45% among rural residents. Further stratifying individuals by income levels reveals a more pronounced dietary imbalance among low-income groups, both in urban and rural settings. Notably, the disparity in dietary quality is most severe among low-income individuals in both urban and rural areas, underscoring the significance of addressing the dietary standards of rural residents to drive social and economic progress (IFPRI, AGFEP, & CARD, 2022). This study utilizes "Engel's coefficient for rural residents" as a metric to evaluate enhancements in farmers' welfare. The specific explanations, sources and calculations for each indicator are shown in Table 1.

Table 1. The index system for agricultural and rural modernization in China and the US

Dimension	Indicators	Calculation method	Sources of indicators
Robust Agriculture	The population size supported by each agricultural laborer (+). The size of the population supported by each agricultural labor force by dynamic criteria to assess a country's ability to produce, process, and distribute the required food supply (Tang, 2022).	Total population/number of persons engaged in agriculture.	World Bank.
	Share of agricultural employment (-). The percentage of the workforce employed in agriculture out of the total job market.	Percentage of total employment accounted for by persons employed in agriculture.	FAO, Economic Statistics Collection of Major Capitalist Countries, World Bank.
	Share of agricultural added value in GDP (-). Agricultural value added as a share of GDP.	Value added/GDP generated by productive activities in agriculture and related industries in a given period of time for all resident units.	United States Historical and Statistical Yearbook, World Bank.
	Proportion of rural population with access to improved sanitation (+): Improved sanitation facilities including flush pipe sewer systems, septic tanks or pit latrines; ventilated improved pit latrines, composting latrines or pit latrines with flat slabs	Rural population with access to improved sanitation/total rural population.	World Bank, STANLEY LEBERGOTT (1978).
Beautiful Landscapes	Urbanization rate (+). Measuring urbanization.	Population living in urban areas/total population.	U.S. Statistical Abstract, U.S. Historical Statistics, China National Bureau of Statistics, USDA, WDI.
	Proportion of rural population with access to improved water sources (+). Improved drinking water sources are those that have the potential to provide safe drinking water. They include piped water, bore or tube wells, protected dug wells, protected springs, rainwater, and packaged or conveyed water.	Rural population with access to improved water sources/total rural population.	World Bank, China Ministry of Water Resources official statistics, China Household Survey Yearbook.
Prosperous Farmers	Ratio of disposable income per capita of rural residents to the national average (+). Measuring the urban-rural income gap.	United States: average rural household income/average U.S. household income. China: per capita disposable income of rural residents/per capita disposable income of the whole country.	Statistical Bulletin of the National Economic and Social Development of the People's Republic of China 2022.
	Incidence of poverty (-). Incidence of poverty among the rural population.	China: incidence of rural poverty according to 2011 standards. United States: U.S. Census Bureau (CPS) counts of poverty, adjusted annually for economic level.	China Rural Statistics Yearbook, USDA, official website reports.
	Engel's coefficient for rural households (-). Measuring the standard of living of rural residents.	China: Rural residents' expenditure on food, tobacco and alcohol/total household expenditure. United States: residential food consumption expenditure/total household expenditure.	China Statistical Yearbook, USDA.

*Notes.* In the above indicators, considering data availability and comparability, the timeframe of the U.S. data is 1960-2021, and the timeframe of the Chinese data is 1978-2021. (+)/(-) represents whether the expected direction of the corresponding indicator is positive or negative.

### 3.2 Weight Setting

When establishing the evaluation system for agricultural and rural modernization in China and the United States, a well-designed weighting system for indicators can more accurately reflect reality and offer enhanced reference value. This study consolidated and reviewed diverse assignment methods from various evaluation index systems, analyzed their pros and cons, and enhanced result robustness by opting for the Equal Weight Method and Entropy Weight Method for assignment determination, leading to the construction of a scientific and rational index weight matrix (Kenduiwo et al., 2021; Liu et al., 2022; Ying et al., 2021).

To mitigate the impact of varying quantitative frameworks on outcomes and ensure positive measurement results,

we normalize the aforementioned indicators as positive indicators:

$$x'_{ij} = \frac{x_{ij} - x_{j,\min}}{x_{j,\max} - x_{j,\min}} \tag{1}$$

For the negative indicators:

$$x'_{ij} = \frac{x_{j,\max} - x_{ij}}{x_{j,\max} - x_{j,\min}} \tag{2}$$

In this study, Equal Weight Method and Entropy Weight Method were used to set the weights. The entropy weight method calculation process is as follows:

First, calculate the country  $i$  of the  $j$  weight of the value of the indicator  $y_{ij} = \frac{x'_{ij}}{\sum_{i=1}^m x'_{ij}}$ , where  $m$  is the number of samples.

Second, calculate the information entropy of the  $j$  information entropy of the indicator  $e_j = -K \sum_i y_{ij} \cdot \ln y_{ij}$ , where,  $K = \frac{1}{\ln m}$ .

Third, calculate the weight of the  $j$  weight of the indicator  $w_j = \frac{d_j}{\sum_j d_j}$ , where,  $d_j = 1 - e_j$ .

The weights are calculated according to entropy method and equal weight method as follows:

Table 2. Indicator weights

First level indicators	Secondary level indicators	Equal Weight Method	Entropy Weight Method
Robust Agriculture	The population size supported by each agricultural laborer	0.11	0.28
	Share of agricultural employment	0.11	0.09
	Share of agricultural added value in GDP	0.11	0.06
Beautiful Landscapes	Proportion of rural population with access to improved sanitation	0.11	0.11
	urbanization rate	0.11	0.09
	Proportion of rural population with access to improved water sources	0.11	0.09
prosperous farmers	Ratio of disposable income per capita of rural residents to the national average	0.11	0.16
	Incidence of poverty	0.11	0.05
	Engel's coefficient for rural households	0.11	0.08

## 4. Results Analysis

### 4.1 Evaluation Results

Figures 1-2 presents the comprehensive agricultural and rural modernization scores of China and the United States. Currently, China's agricultural and rural development level aligns with that of the United States during the 1960s and 1970s, indicating a temporal discrepancy of approximately 60 years. Agricultural and rural modernization in the United States experienced a period of acceleration during the 1960s and 1970s, followed by gradual growth from the 1970s to the 1990s, eventually reaching a plateau post-2000. In contrast, China has shown a sustained upward trend in its indicators since 2000, exhibiting a notably accelerated growth rate.

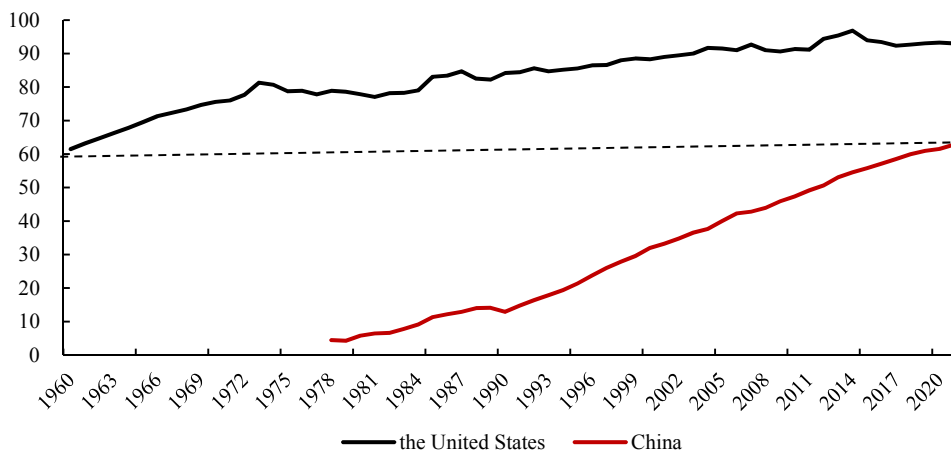


Figure 1. Overall agricultural and rural modernization score: U.S. versus China (Equal Weight Method)

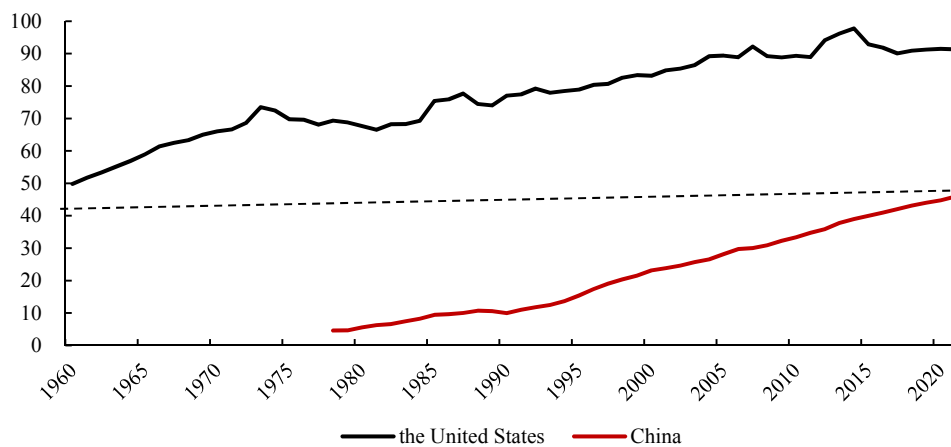


Figure 2. Overall agricultural and rural modernization score: U.S. versus China (Entropy Weight Method)

Figures 3-8 provide a detailed comparison of indicators between China and the United States across three dimensions. In general, the disparity between China and the United States is most pronounced in “robust agriculture,” least significant in “beautiful landscapes,” and intermediate in “prosperous farmers.” The disparity is most notable in agricultural modernization, while it is least significant in rural modernization. In terms of specific dimensions, China’s performance in agriculture and among farmers is comparable to that of the United States pre-1960s. As for rural areas, China has already attained a level akin to the United States in the 1970s.



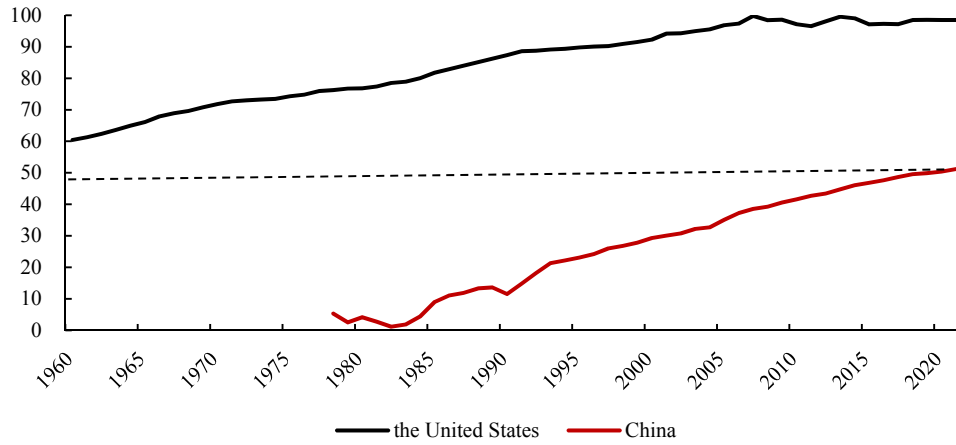


Figure 3. Robust Agriculture score: U.S. versus China (Equal Weight Method)

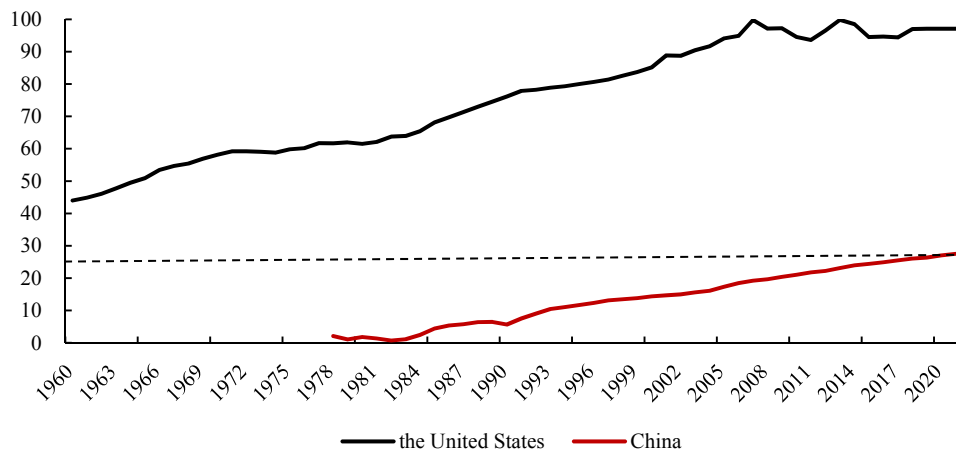


Figure 4. Robust Agriculture score: U.S. versus China (Entropy Weight Method)

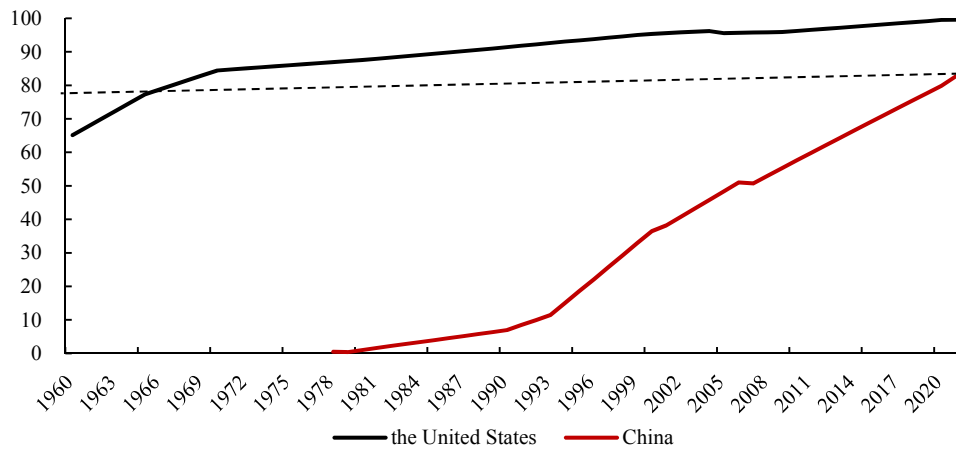


Figure 5. Beautiful Landscapes score: U.S. versus China (Equal Weight Method)

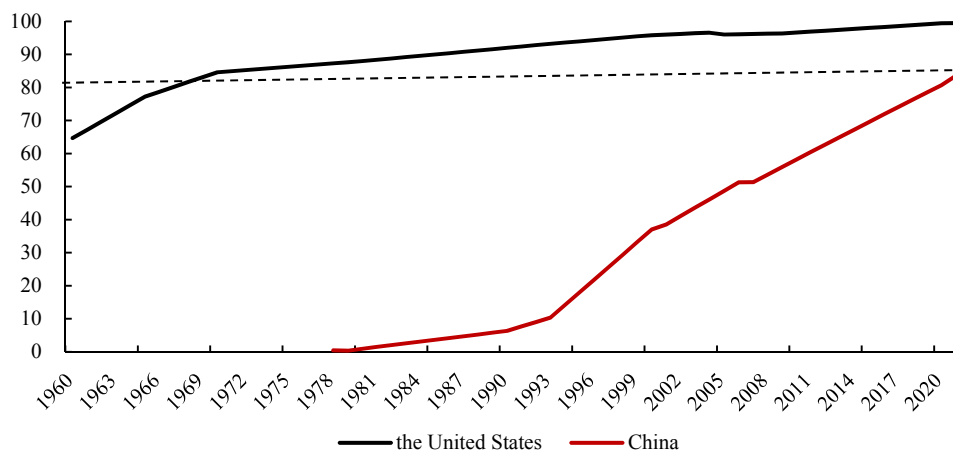


Figure 6. Beautiful Landscapes score: U.S. versus China (Entropy Weight Method)

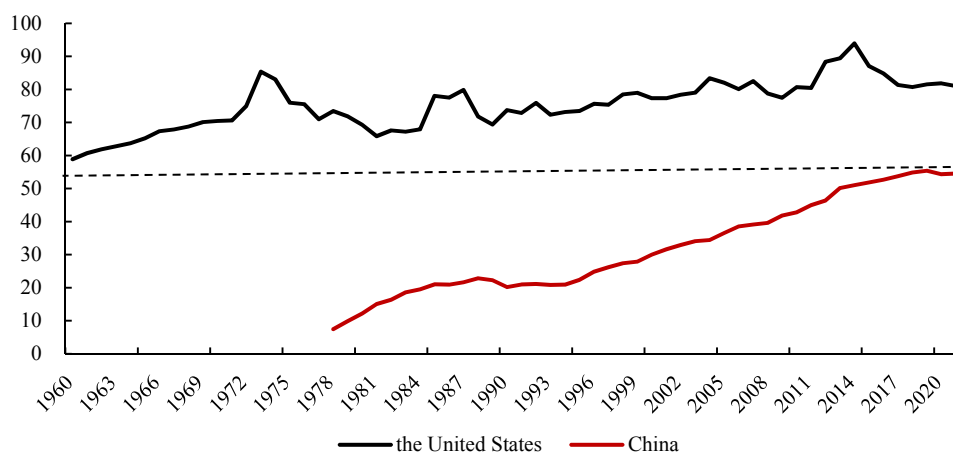


Figure 7. Prosperous Farmers score: U.S. versus China (Equal Weight Method)

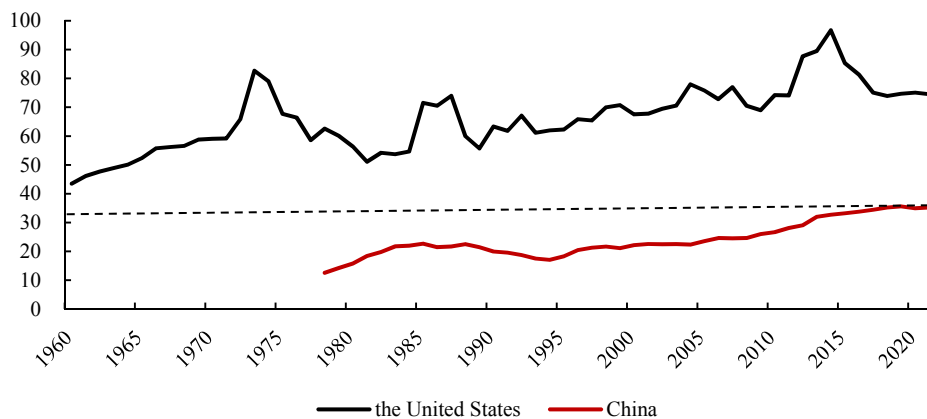


Figure 8. Prosperous Farmers score: U.S. versus China (Entropy Weight Method)

#### 4.2 Key indicators identification

Upon further examination of each indicator, the primary disparity indicators between China and the United States emerge as disposable income for rural residents, the labor force’s support capacity, and the percentage of agricultural employment. Despite the noteworthy rise in annual per capita disposable income for rural residents in China, escalating from 134 yuan in 1978 to 17,131 yuan in 2020, recent data from the National Bureau of

Statistics reveal that the urban-rural income ratio remained high at 2.55 in 2020 (NBS, 2021), nearly unchanged from 1978. In contrast to the U.S. urban-rural income ratio below 1, China exhibits a substantially wider urban-rural divide.

Upon evaluating the agricultural support capacity of the United States—defined as the number of individuals each agricultural laborer can sustain in the country—distinct results emerge. Specifically, the United States can support 144 individuals per agricultural labor force, whereas China’s capacity stands at a significantly lower 8 individuals. This substantial discrepancy underscores China’s considerable lag behind the United States in this aspect. The study posits that for China to achieve agricultural modernization by 2035, a crucial adjustment is indispensable. Specifically, the study suggests escalating the target value by a factor of 1.5 and ensuring that each agricultural worker can sustain ten or more individuals (Tang & Han, 2023).

In the context of modernization, there is a common trend where a country’s total GDP and per capita GDP levels tend to increase simultaneously, along with a growth in absolute agricultural value added. In contrast, the share of agricultural value added to GDP falls in tandem with the share of the rural population. Notably, China exhibits a significantly higher proportion of agricultural employment compared to the United States. This disparity is highlighted by the lack of alignment between China’s agricultural employment share and the share of agricultural value added to GDP, with a disparity of nearly 20 percentage points between these indicators.

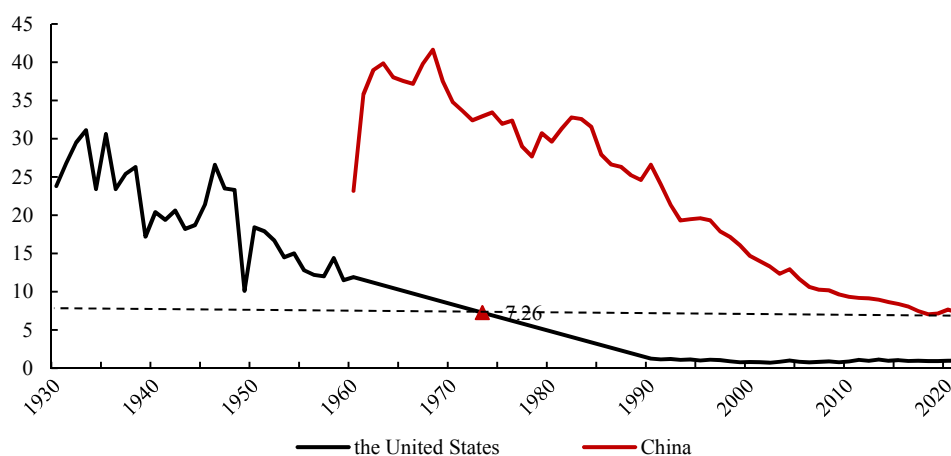


Figure 9. Share of agricultural added value in GDP: U.S. versus China (%)

*Note.* The purple mark represents China’s share of agricultural added value in GDP in 2021.

Data source: Economic Statistics Collection of Major Capitalist Countries 1848-1960, FAO database, World Bank database.

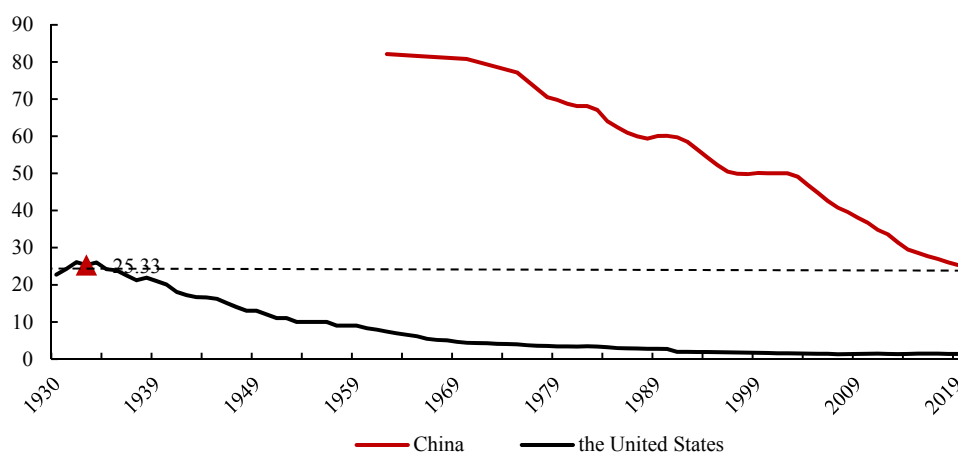


Figure 10. Share of agricultural employment: U.S. versus China (%)

*Note.* The purple mark represents China's share of agricultural employment in 2021.

Data source: Economic Statistics Collection of Major Capitalist Countries 1848-1960, FAO database, World Bank database.

Table 3. Comparison of Key Indicator Gaps between China and the United States in 2021

Indicator	Ratio of disposable income per capita of rural residents to the national average	The population size supported by each agricultural laborer	Share of agricultural employment
China	0.54	8	22.8%
the United States	1.26	144	1.36%

## 5. Conclusions and Policy Recommendations

This study establishes an index system for comparing agricultural and rural modernization in China and the United States, using the latter as a reference point for empirical analysis, which aims to identify key challenges in China's agricultural and rural development by contrasting indicators from both countries. The findings are as follows: (1) Overall, China's current level of agriculture and rural modernization is akin to that of the United States in the 1960s and 1970s, with an approximate time lag of 60 years. (2) In terms of sub-dimension indicators, China lags behind the United States the most in agricultural modernization, followed by affluent farmers and aesthetically pleasing rural areas, with the smallest disparity observed in rural modernization. (3) Three key indicators in China that require improvement when compared to the United States are the disposable income of rural residents, the population size supported by each agricultural laborer and share of agricultural employment. Consequently, this paper proposes the following policy recommendations.

Understanding the long-term process of agricultural and rural modernization. Rural and countryside modernization is a prolonged developmental process. In the 1930s, the United States initiated the establishment of a policy framework to bolster rural development, a journey that has spanned over 80 years with ongoing adjustments and enhancements. China, characterized by a substantial rural populace and inadequate rural infrastructure, faces even more intricate challenges. The strategic vision of the United States in advancing rural development instills in us the understanding that modernizing agriculture and rural areas is not merely a brief project but a long-standing historical undertaking. Consequently, China must prepare for a deliberate and sustained effort to advance rural development in a systematic and targeted manner, adept at addressing contemporary issues. It is imperative for us to navigate the balance between present circumstances and long-term vision, avoiding pitfalls such as undue haste and fleeting gains, while continually refining our strategic acumen and enhancing policy implementation efficiency.

Addressing the discrepancy between agricultural and rural modernization. The transition from agricultural modernization to the modernization of agriculture and rural areas often faces differing rates of progress, necessitating a coordinated approach to promote both aspects effectively. A pressing issue lies in addressing the discrepancy between the proportion of agricultural employment and the contribution of agriculture to GDP. In China, a notable gap of approximately 20 percentage points exists between these indicators, presenting a unique challenge. Resolving this disparity hinges on advancing industrialization and urbanization to transition

small-scale farmers from land-based activities to modern employment opportunities. This strategy not only enhances China's agricultural competitiveness but also strengthens human capital support crucial for rural development, thereby fortifying the structural foundation of the Chinese path to modernization efforts.

Embrace policy synergy and regional variance. While the United States has achieved notable success in promoting modernization, this achievement does not entail that China's solutions for agriculture, farmers, and rural areas must be "Americanized." The execution of the rural revitalization strategy should be grounded in China's specific conditions, honor its unique characteristics, and acknowledge the progressive stages of rural development. The strategies and actions to foster rural advancement must align with those promoting agricultural development and enhancing farmers' incomes. Integrated efforts are essential in promoting rural revitalization, emphasizing the interconnectedness of agriculture, rural areas, and farmers. In comparison with the United States, China still faces inadequacies in rural development, particularly evident in the persisting challenges of low farmer incomes and an inefficient agricultural industry structure. Therefore, the core objective of rural revitalization remains the advancement of modern agriculture with a primary focus on elevating farmers' incomes. By driving the integration of primary, secondary, and tertiary sectors, agriculture can become profitable, enhance overall production capacity steadily, and consequently bolster farmers' incomes.

While this study unveils important insights, limitations include sample loss in the United States before the 1960s and the inability to predict indicator changes. Future studies could theoretically investigate the underlying causes of changes in indicators, alongside examining the experiences and insights gained from the history of agricultural development in the United States to derive further references.

## References

- Abreu, I., Nunes, J. M., & Mesias, F. J. (2019). Can Rural Development Be Measured? Design and Application of a Synthetic Index to Portuguese Municipalities. *Social Indicators Research*, 145(3), 1107-1123. <https://doi.org/10.1007/s11205-019-02124-w>
- Abreu, P. de, & Cardoso, A. I. G. de C. (2014). *Construção de um índice de desenvolvimento rural e a sua aplicação no Alto Alentejo* (Master thesis). Retrieved from <https://comum.rcaap.pt/handle/10400.26/9790>
- Ba, G., Liu, G., & Wang, D. (2020). Measuring the development level of modernization of agriculture and rural areas in Xinjiang under the background of rural revitalization strategy. *Northern Hort.*, 17, 145-152.
- Chen, K. Z., Mao, R., & Zhou, Y. (2022). Rurbanomics for common prosperity: New approach to integrated urban-rural development. *China Agricultural Economic Review*, ahead-of-print. <https://doi.org/10.1108/CAER-12-2021-0256>
- Chen, T., & Li, Z. (2020). Construction and Application of Evaluation Indicator System for Agricultural and Rural Modernization in Henan Province. *Journal of Henan Institute of Science and Technology*, 40(05), 12-17.
- Di, F., & Hu, ZQ. (2020). Construction and application of evaluation index system for agricultural modernization in China. *China Agricultural Resources and Zoning*, 41(06), 46-56.
- Du, R. (2005). *A Chronicle of Major Decisions on China's Rural System Reform*. Beijing: People's Publishing House
- Fitouss, J.-P., Stiglitz, J. E., & Sen, A. K. (2011). *Mismeasuring our lives: Why GDP doesn't add up*. ReadHowYouWant.com.
- Gao, Y. (2023). Theoretical Implications of Chinese-style Agricultural and Rural Modernization. *Problems of Agricultural Economy*, 4, 28-40. <https://doi.org/10.13246/j.cnki.iae.2023.04.001>
- Georgios, C., & Barraí, H. (2023). Social innovation in rural governance: A comparative case study across the marginalised rural EU. *Journal of Rural Studies*, 99, 193-203. <https://doi.org/10.1016/j.jrurstud.2021.06.004>
- Guo, X. (2018). Some Dimensional Observations on the Rural Revitalization Strategy. *Reform*, 3, 54-61.
- Haag, A. (2009). *Performance of the national program for strengthening family agriculture in the State of Rio Grande do Sul*. Universidade Federal Do Rio Grande Do Sul.
- Hong, Y., Liu, W., Gao, P., Jin, B., Yan, K., Gao, S., & Li, Z. (2018). Xi Jinping's Economic Thought on Socialism with Chinese Characteristics for a New Era. *China Social Science*, 9, 4-73+204-205.

- Huang, B.-W., & Yang, Y.-C. (2018). Evaluation indicators and development strategies of agricultural revitalization for rural rejuvenation. *Journal of Reviews on Global Economics*, 7, 269-279. <https://doi.org/10.6000/1929-7092.2018.07.24>
- IFPRI (International Food Policy Research Institute). (2019). *2019 Global food policy report*. International Food Policy Research Institute. <https://doi.org/10.2499/9780896293502>
- IFPRI, AGFEP, & CARD. (2022). *China and Global Food Policy Report: Reforming agricultural support policies to promote agrifood systems transformation*. Retrieved from <https://agfep.cau.edu.cn/module/download/downfile.jsp?classid=0&filename=6dbb930c64de42458dc72edba23fbcdf.pdf>
- Jiang, C. (2021). The History, Experience and Implications of Optimizing the Governance of Rural-Urban Relations in the Century of the Founding of the Party. *Journal of Humanities*, 11, 1-12).
- Jiang, C. (2024). Outstanding Highlights of the No. 1 Document of the Central Government in 2024. *Rural Finance Research*, 1-10. <https://doi.org/10.16127/j.cnki.issn1003-1812.20240209.001>
- Jiang, C., & Li, J. (2021). Research on the Indicator System of Agricultural and Rural Modernization with Chinese Characteristics in 2035. *Globalization*, 4, 92-108+136. <https://doi.org/10.16845/j.cnki.ccieeqqh.2021.04.008>
- Kageyama, A. A. (2008). *Desenvolvimento rural: Conceitos e aplicação ao caso brasileiro conceitos e aplicação ao caso brasileiro*. UFRGS.
- Kang, C., Chen, S., & Zeng, Y. (2017). Evaluation of Chinese farmers' development capacity based on agricultural modernization: empirical evidence at the provincial level. *Jiangsu Agricultural Science*, 45(07), 312-316.
- Kenduiwo, B. K., Carter, M. R., Ghosh, A., & Hijmans, R. J. (2021). Evaluating the quality of remote sensing products for agricultural index insurance. *PLoS ONE*, 16(10), e0258215. <https://doi.org/10.1371/journal.pone.0258215>
- Kim, T., & Yang, S. (2016). Construction of the rural development index: The case of Vietnam. *Journal of Rural Development/Nongchon-Gyeongje*. <https://doi.org/10.22004/ag.econ.251931>
- Kuznets, S. (1955). Economic Growth and Income Inequality. *The American Economic Review*, 45(1), 1-28.
- Lewis, W. A. (1954). Economic Development with Unlimited Supplies of Labour. *The Manchester School*, 22(2), 139-191. <https://doi.org/10.1111/j.1467-9957.1954.tb00021.x>
- Li, G., & Li, S. (2020). Study on the Development Level of Agricultural Rural Modernization in Qinghai Province. *Research on Agricultural Modernization*, 41(1), 24-33. <https://doi.org/10.13872/j.1000-0275.2019.0100>
- Li, Z. (2020). Modern Agricultural Development under the Strategy of Rural Revitalization. *Dong Yue Lun Cong*, 3, 29-36. <https://doi.org/10.15981/j.cnki.dongyueluncong.2020.03.003>
- Li, Z., Wen, T., Wei, H., Du, Z., Li, C., & Jin, W. (2021). Accelerating the modernization of agriculture and rural areas: experts on “three rural areas” interpret the spirit of the No. 1 document of the CPC Central Committee. *China Rural Economy*, 4, 2-20.
- Liu, Q., Gong, D., & Gong, Y. (2022). Index system of rural human settlement in rural revitalization under the perspective of China. *Scientific Reports*, 12(1), 10586. <https://doi.org/10.1038/s41598-022-13334-7>
- Liu, Y., Jin, L., Zhan, Y., Zhu, Q., Huang, Z., & Xiao, J. (2021). Evaluation of the development level of agricultural and rural modernization in Hunan Province. *Hunan Agricultural Science*, 4, 116-120. <https://doi.org/10.16498/j.cnki.hnnykx.2021.004.026>
- Liu, Y., Wang, G., & Zhang, F. (2013). Spatio-temporal dynamic patterns of rural area development in eastern coastal China. *Chinese Geographical Science*, 23(2), 173-181. <https://doi.org/10.1007/s11769-013-0598-5>
- Lu, C., Wen, F., Zhang, H., Li, H., Yang, K., & Duan, L. (2020). Evaluation of the development level of agricultural modernization in Henan Province based on improved TOPSIS method. *China Agricultural Resources and Zoning*, 41(01), 92-97.
- Ma, X., & Hua, J. (2021). Research on the construction of evaluation index system for the effectiveness of rural ecological revitalization—Based on the comparison of Jiangsu, Zhejiang and Anhui Provinces. *China Agricultural Resources and Zoning*, 42(1), 60-67.

- Michalek, J., & Zarnekow, N. (2012a). Application of the Rural Development Index to Analysis of Rural Regions in Poland and Slovakia. *Social Indicators Research*, 105(1), 1-37. <https://doi.org/10.1007/s11205-010-9765-6>
- Michalek, J., & Zarnekow, N. (2012b). Application of the Rural Development Index to Analysis of Rural Regions in Poland and Slovakia. *Social Indicators Research*, 105(1), 1-37. <https://doi.org/10.1007/s11205-010-9765-6>
- NBS. (2021). *Income and consumption expenditure of the population in 2020*. Retrieved from [https://www.stats.gov.cn/xxgk/sjfb/zxfb2020/202101/t20210118\\_1812464.html](https://www.stats.gov.cn/xxgk/sjfb/zxfb2020/202101/t20210118_1812464.html)
- Oxford Poverty and Human Development Initiative. (2017). *Global multidimensional poverty index*. Oxford.
- Peng, C., & Liu, H. (2020). Agricultural and rural modernization in the 14th Five-Year Plan period: situation, problems and countermeasures. *Reform*, 2, 20-29.
- Ranis, G., & Fei, J. C. H. (1961). A Theory of Economic Development. *The American Economic Review*, 51(4), 533-565.
- Sun, H., & Fu, X. (2021). The Political Economy Logic of the Integrated Advancement of Agricultural and Rural Modernization. *Journal of Seeking Truth*, 48(1), 81-89. <https://doi.org/10.19667/j.cnki.cn23-1070/c.2021.01.009>
- Tang, Z., & Han, M. (2023). Key issues in promoting rural revitalisation in China. *Economic and Political Studies*, 11(2), 149-173. <https://doi.org/10.1080/20954816.2022.2132900>
- UNDP (United Nations Development Programme). (2009). *Human development report 2009: Overcoming barriers: Human mobility and development*. United Nations Development Programme.
- Wang, Z. (2019). Re-conceptualization of China's Agricultural and Rural Modernization in the New Era. *Problems of Agricultural Economy*, 8, 76-83. <https://doi.org/10.13246/j.cnki.iae.2019.08.009>
- Wei, H., Ye, X., & Du, Z. (2022). Accelerating the construction of a new development pattern and striving to promote the high-quality development of agriculture and rural areas—Authoritative experts' in-depth interpretation of the spirit of the 20th CPC National Congress. *China Rural Economy*, 12, 2-34.
- World Bank. (1997). Expanding the Measure of Wealth. *Indicators of Environmentally Sustainable Development*.
- Yao, Y. (2021). *Aging problem comes with opportunities*. Retrieved from <https://global.chinadaily.com.cn/a/202105/20/WS60a59e00a31024ad0bac01ef.html>
- Ye, X. (2021). Toward rural China in 2035: Visions, challenges, and strategies. *Management World*, 37(4), 98-112. <https://doi.org/10.19744/j.cnki.11-1235/f.2021.0052>
- Ying, X., Wu, Y., Xu, W., & He, S. (2021). Selection of Policy Evaluation Methods and Construction of Indicator System. *Macroeconomic Management*, 4, 40-47. <https://doi.org/10.19709/j.cnki.11-3199/f.2021.04.009>
- Yokoyama, S. (2019). Sustainable Activities for Rural Development. In C. Asahi (Ed.), *Building Resilient Regions* (pp. 37-52). Springer. [https://doi.org/10.1007/978-981-13-7619-1\\_3](https://doi.org/10.1007/978-981-13-7619-1_3)
- Zekić, S., Kleut, Ž., & Matkovski, B. (2017). An analysis of key indicators of rural development in Serbia: A comparison with EU countries. *Ekonomski Anali*, 62(214), 107-120. <https://doi.org/10.2298/EKA1714107Z>
- Zhang, P. (2012). *Agriculture and industrialization*. CITIC Press.
- Zhang, Y., & Oyang, Z. (2019). Dynamic Evolution and Comparison of the Development Level of Agricultural and Rural Modernization in China. *Statistics and Decision Making*, 35(20), 95-98. <https://doi.org/10.13546/j.cnki.tjyj.2019.20.020>
- Zhao, R. (2019). *Research on the Construction and Comprehensive Evaluation of Agricultural Rural Modernization Indicator System in Anhui Province* (Master thesis, Anhui Agricultural University, China).
- Zhu, Z., Zhang, G., Zhang, J., & Weng, X. (2018). Study on the Development Level and Spatial Distribution Differences of Agricultural Rural Modernization in China. *Jiangsu Agricultural Science*, 46(19), 386-391. <https://doi.org/10.15889/j.issn.1002-1302.2018.19.096>

**Acknowledgments**

Not applicable.

**Authors Contributions**

Conceptualization: Chuanbo Chen; Data curation: Yuying Yang; Formal analysis: Yiyang Sun; Funding acquisition: Chuanbo Chen; Methodology: Yuying Yang; Project administration: Chuanbo Chen; Supervision: Chuanbo Chen; Validation: Yiyang Sun; Visualization: Yuying Yang; Writing—original draft: Yuying Yang; Writing—review & editing: Yuying Yang.

**Funding**

This work was supported by the Area Studies Fund of Renmin University of China. [Project No.AS202203], the Tsinghua Rural Studies PhD Scholarship [202330], and the Student Scientific Research Training Program of School of Agricultural Economics and Rural Development of Renmin University of China [No. 23A07].

**Competing Interests**

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

**Informed Consent**

Obtained.

**Ethics Approval**

The Publication Ethics Committee of the Canadian Center of Science and Education.

The journal's policies adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

**Provenance and Peer Review**

Not commissioned; externally double-blind peer reviewed.

**Data Availability Statement**

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

**Data Sharing Statement**

No additional data are available.

**Open Access**

This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).

**Copyrights**

Copyright for this article is retained by the author(s), with first publication rights granted to the journal.