

Challenges and Countermeasures in Realizing Chinese Agricultural and Rural Modernization

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Abstract: With the rapid development of China's economy, the modernization of agriculture and rural areas has become an urgent need for national development. However, a series of challenges have emerged in this process. First of all, the demand for the continuous improvement of agricultural science and technology has put forward higher requirements for the support of scientific research institutions and the scientific and technological literacy of farmers. Secondly, under the pressure of agricultural production mode transformation, effective policy guidance and technical support are needed to promote agriculture to a more sustainable and efficient direction. At the same time, the backwardness of rural infrastructure construction, especially in transportation and water conservancy, has restricted the development of rural modernization. Land system reform has also become a key project, involving land circulation, land confirmation and other issues, which need systematic policy system to support. Finally, with the outflow of rural population and the acceleration of urbanization, the problem of rural ecological environment protection is prominent, and more practical and effective measures are needed to deal with it. In order to solve these challenges, the paper puts forward a series of countermeasures. This series of countermeasures will help to solve many problems in rural development, at the same time, push Chinese-style agricultural and rural modernization to a new stage and realize the coordinated growth of economic, social and ecological benefits.

1. Introduction

As China advances steadily towards modernization, the modernization of agriculture and rural areas has emerged as a crucial component within the national development strategy. Agriculture, serving as the bedrock of China's economy, and rural regions, acting as the linchpin for achieving the comprehensive construction of a socialist modern nation, hold pivotal significance. Yet, amid the pursuit of Chinese-style agricultural and rural modernization, numerous substantial and intricate challenges have surfaced.

China's prevailing agricultural production model remains rooted in the traditional small-scale peasant economy, characterized by a comparatively modest level of agricultural output and a less advanced degree of agricultural modernization. This hampers efforts to enhance agricultural production efficiency and quality, impeding the sustainable development of the agricultural sector. Additionally, the significant exodus of the rural population contributes to a shortage in the rural labor force, lags in rural infrastructure development, and a subpar level of public services[1]. These factors not only limit improvements in the living standards of rural residents but also impede the progress of agricultural and rural modernization. Moreover, environmental challenges such as pollution and resource scarcity pose substantial obstacles to the modernization of agriculture and rural areas. Conventional agricultural practices excessively reliant on chemical fertilizers, pesticides, and other chemicals have resulted in soil and water pollution, exacerbating the degradation of the farmland's ecological environment[2-3].

To address these challenges, it is imperative to grasp the urgency and significance of achieving

Chinese-style agricultural and rural modernization. This paper endeavors to propose a set of viable countermeasures by conducting a thorough analysis of the prevalent issues. The objective is to present a sustainable, scientifically grounded, and effective developmental trajectory for China's agricultural and rural modernization, thereby fostering the robust advancement of the agricultural economy and facilitating the comprehensive rejuvenation of rural areas.

2. Importance of realizing agricultural and rural modernization in China

China, being a prominent agricultural nation, considers its rural areas as the bedrock of national modernization. In the comprehensive construction of socialist modernization in China, the pivotal role played by agricultural and rural modernization cannot be overstated. Agriculture, serving as the cornerstone of China's national economy, holds direct relevance to the nation's food security and the welfare of its people. Through the process of agricultural and rural modernization, enhancements in agricultural production efficiency, the elevation of agricultural product quality, and the optimization and upgrading of the agricultural structure become achievable. This not only caters to the demands of the domestic market but also enhances the international competitiveness of agricultural products, providing robust support to the national economy[4].

Rural modernization is not only the modernization of agricultural production mode, but also the overall improvement of rural society and life. By developing rural tourism and promoting agricultural products processing industry, rural residents are expected to gain more employment opportunities and entrepreneurial space, improve their income level and improve their living conditions. This will effectively slow down the outflow of farmers and encourage more people to stay in their hometowns to build their homes.

Agricultural and rural modernization is an important means to realize the coordinated development of urban and rural economy. By strengthening urban and rural infrastructure construction and promoting rural industrial upgrading, the gap between urban and rural development can be narrowed, the rational allocation of resources can be promoted, and the benign interaction between urban and rural economies can be realized. This can not only promote the prosperity and development of cities, but also contribute to the overall revitalization of rural areas.

Agricultural and rural modernization is also closely related to the construction of ecological civilization. By promoting sustainable agricultural production mode, reducing environmental pollution and protecting rural ecological environment, it is helpful to build a green and sustainable agricultural ecosystem. This is of great strategic significance for achieving the goal of national ecological civilization construction[5-6].

On the road of realizing Chinese-style agricultural and rural modernization, whether it is economic construction, social development or ecological civilization construction, it is inseparable from the comprehensive promotion of agricultural and rural modernization. This is not only to meet the needs of national development, but also to realize the common prosperity of all farmers, build a harmonious society and promote sustainable development. Therefore, the importance of China's agricultural and rural modernization cannot be underestimated, and its far-reaching influence will help China to move towards a more prosperous, stable and sustainable future.

3. The challenge of agricultural production mode

Realizing Chinese-style agricultural and rural modernization is an important task facing China at present. However, there are many challenges in this process. The rural population structure in China is still relatively young, but with the advancement of urbanization, the rural population outflow has increased. This results in a deficiency in the rural labor force, impacting the stability and effectiveness of agricultural production. Simultaneously, the shift in age structure has introduced fresh challenges to rural social pension and education systems. Within the context of agricultural modernization, conflicts arise between traditional agricultural models and contemporary agricultural concepts. Some farmers exhibit a low level of acceptance towards new technologies and models, necessitating training and policy guidance to enhance farmers' understanding and application

proficiency in modern agricultural practices[7].

Figure 1 shows the differences in various aspects of agricultural modernization in different regions of China. The level of mechanization indicates the percentage of agricultural mechanization in each region. Internet access represents the percentage of Internet access in rural areas. Education level indicates the percentage of farmers with secondary education or higher education.

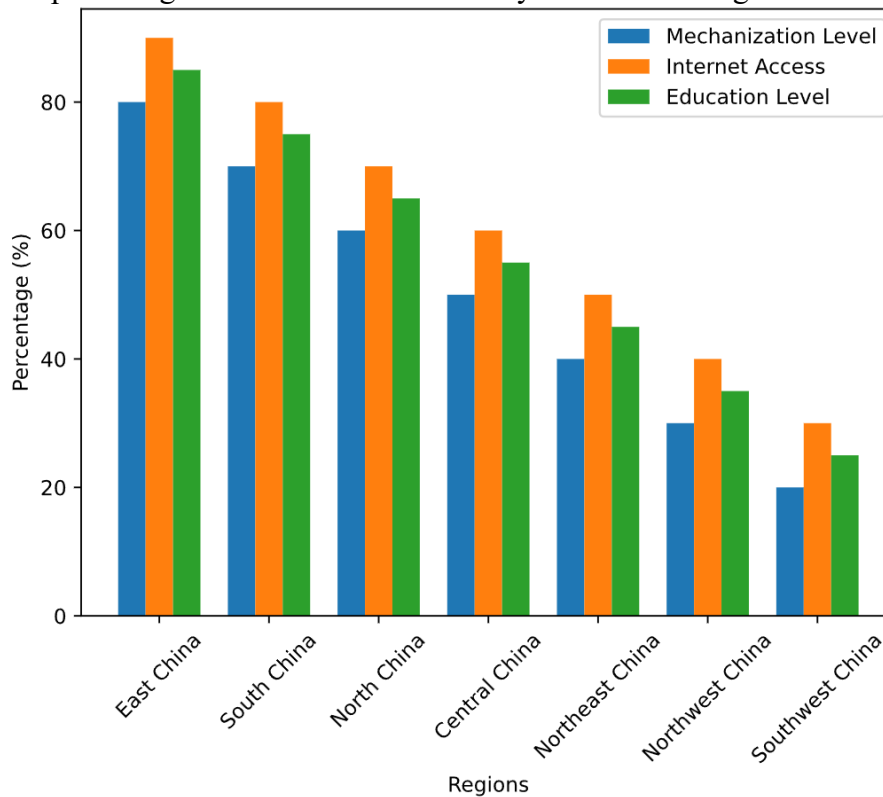


Figure 1 Differences in various aspects of agricultural modernization in different regions of China (data source: open data)

The data shows that the level of mechanization in East China is the highest (80%), while that in Southwest China is the lowest (20%). Similar to the level of mechanization, East China also ranks first in this indicator (90%), while Southwest China is at the lowest end (30%). Education level also shows that East China is ahead (85%), while Southwest China is behind (25%). It reveals the differences in agricultural modernization in different regions, especially in technology application, information acquisition and education level.

Land is the basic resource of agriculture, but problems such as fragmentation and poor circulation of land still exist. Intensive use and rational allocation of land are facing challenges. At the same time, the transformation of agricultural land involves a series of problems such as rural land management rights and farmers' income distribution, which need to consider the interests of all parties comprehensively. Agricultural modernization needs to rely on advanced scientific and technological means, including the Internet of Things, big data and artificial intelligence[8-9]. However, the popularization of scientific and technological innovation in some rural areas is slow, the investment is insufficient, and farmers' acceptance of new technologies is limited, which hinders the process of agricultural modernization.

With people's increasing concern about food safety, the quality and safety of agricultural products have become an important factor restricting agricultural modernization. To realize the modernization of agriculture and rural areas, it is necessary to strengthen the quality supervision of agricultural products and improve production standards. Agricultural modernization cannot be at the expense of ecological environment. Agricultural activities have a certain impact on water resources, soil, air and other environments. Therefore, in the process of promoting agricultural modernization, we need to pay attention to the protection and sustainable utilization of the ecological environment. The level of rural infrastructure is directly related to the promotion of agricultural modernization. In

some rural areas, infrastructure construction lags behind, and problems such as transportation and water and electricity have affected the circulation of agricultural products and the benefits of agricultural production. On the whole, it is a complex and systematic project to realize Chinese-style agricultural and rural modernization, which requires the efforts and cooperation of the government, farmers and enterprises.

4. The path and strategy of rural comprehensive revitalization

4.1. Strengthen agricultural science and technology innovation

We should increase the government's financial support for agricultural scientific research and development, encourage enterprises to increase investment in scientific research, and cultivate a number of powerful agricultural scientific research institutions[10]. This will provide more innovation power and technical support for agriculture. Establish a sound agricultural science and technology innovation system and promote cooperation among agricultural scientific research institutions, universities and enterprises. By building a platform that combines Industry-University-Research and agriculture, we will promote scientific and technological innovation to better serve the actual agricultural production. Strengthen the application of agricultural information technology, and promote the wide application of Internet of Things, big data, cloud computing and other technologies in agriculture. This will improve the intelligent level of agricultural production and make the production process more accurate and efficient. The government should give more policy support to agricultural enterprises to stimulate their innovation vitality. Encouraging enterprises to invest in research and development is crucial for promoting new technologies, varieties, and models in agriculture, with the goal of forming internationally competitive agricultural science and technology enterprises. This initiative can be further enhanced by strengthening the publicity and promotion of agricultural scientific and technological achievements. Such efforts are essential for ensuring that scientific and technological innovations are swiftly transformed into tangible productive forces, thereby boosting the agricultural sector's efficiency, sustainability, and global competitiveness. By establishing demonstration bases and training farmers, we will ensure that advanced agricultural science and technology can be widely used in farmland. Local governments need to establish a perfect training system for agricultural science and technology talents and train more agricultural science and technology talents. Encouraging enterprises to invest in research and development is crucial for the promotion of new technologies, varieties, and models in agriculture, aiming to form internationally competitive agricultural science and technology enterprises. This initiative can be further enhanced by strengthening the publicity and promotion of agricultural scientific and technological achievements. Such efforts are essential in ensuring that scientific and technological innovations are swiftly transformed into tangible productive forces. This approach is key to boosting the agricultural sector's efficiency, sustainability, and global competitiveness, creating a dynamic where innovation and practical application go hand in hand. Promote the transformation of agricultural production mode

Promoting the transformation of agricultural production mode is a key link to realize the modernization of Chinese agriculture and rural areas. The government should introduce incentive policies, including financial subsidies and tax incentives, to encourage farmers to adopt advanced and sustainable agricultural production methods. This will help reduce the economic pressure of farmers and promote them to participate more actively in the transformation of production methods. Precision agriculture technology, including satellite remote sensing, unmanned aerial vehicles, sensors, etc., can improve the accuracy and efficiency of the production process. The government and agricultural scientific research institutions should increase the research, development and popularization of these technologies, so that farmers can make better use of modern technologies to manage farmland. The government should build a perfect agricultural technology extension network and transfer advanced agricultural production technology to farmers quickly. This requires the establishment of a professional and efficient technology extension team to show the application effect of new technologies to farmers through agricultural technology extension stations and

demonstration bases.

Farmers can also be encouraged to adopt organic and green agricultural production methods through financial support and preferential market policies. This will help to improve the quality and safety of agricultural products and meet consumers' demand for healthy food. Local governments should establish modern agricultural supply chain, optimize production, processing and circulation through agricultural industry consolidation, improve resource utilization efficiency, reduce costs, and promote the transformation of agricultural production mode to a more modern and intensive direction. Encouraging agricultural cooperatives, leading agricultural enterprises, and other new business entities to adopt advanced production methods is a vital step towards modernizing agriculture. This encouragement can be further supported by providing these entities with essential financing and technical support. This strategy aims to facilitate the adoption of innovative and efficient farming techniques, ultimately leading to increased productivity and sustainability in the agricultural sector. By ensuring access to necessary resources and expertise, these entities are better equipped to implement cutting-edge practices and technologies, which can significantly contribute to the overall growth and development of the agriculture industry. This will help to promote the wide implementation of the transformation of agricultural production mode.

4.2. Strengthen the construction of rural infrastructure

The government should increase capital investment in rural infrastructure construction, and ensure adequate financial support for infrastructure construction by setting up special funds and guiding the participation of social capital. This will help solve the problem of lagging rural infrastructure. Local governments need to make comprehensive and long-term plans for rural infrastructure construction, and make overall plans for rural infrastructure construction in the fields of transportation, water conservancy, electric power and information. Through overall planning, we will ensure the coordinated development of various infrastructures and form a mutually supportive system. Road is an important part of rural infrastructure, and it is the link between rural areas and cities, rural areas and rural areas. The government should strengthen the hardening, reconstruction and extension of rural roads, improve the convenience of rural transportation, and promote agricultural products to enter the market faster and more conveniently.

By popularizing the Internet, cell phone signal coverage and other means, farmers can obtain market information and weather information more conveniently, and improve the intelligent level of their production and management. High-quality education and medical resources are the focus of farmers' concern. The government should strengthen the construction of rural schools and medical facilities, improve the level of education and medical services, and attract more outstanding talents to stay in rural areas and engage in agricultural production. Local governments also need to strengthen the construction of rural living facilities, including rural sewage treatment, garbage disposal, cultural and sports venues and so on. Improve the quality of life of farmers and provide them with a better living environment.

4.3. Promote the reform of rural land system

The state needs to establish and improve the rural land ownership system, clarify land ownership, and enhance farmers' sense of security in land property rights. Through a clear property right system, we will improve the security of land use and encourage farmers to participate more actively in modern agricultural production. We will improve the registration system of rural land ownership confirmation, clarify farmers' land rights and interests, and protect farmers' land property rights through ownership confirmation work. In the process of confirming the right, we should protect the legitimate rights and interests of farmers and prevent disputes in the process of land transfer. Encourage land circulation, promote scale operation and improve land use efficiency. By establishing a clear and convenient circulation system of land management rights, contracting rights and circulation rights, local governments can stimulate farmers' enthusiasm for operation and form intensive and large-scale operation of agricultural production. Establishing and improving the market trading system of land contractual management rights is a strategic approach to promote the circulation of land resources through market-oriented means. This involves creating a framework

where land contractual rights can be traded in a regulated and transparent market. The aim is to facilitate efficient land use and encourage the optimal allocation of agricultural resources. By providing a platform for land rights transactions, it becomes easier for farmers and agricultural enterprises to access land for productive use, enhancing the overall efficiency and productivity of the agricultural sector. This system not only supports the consolidation of farmland for large-scale, efficient farming but also helps in safeguarding the rights and interests of landowners and farmers. Such a market-driven approach can lead to more sustainable and profitable agricultural practices, contributing to the sector's modernization and growth. The government can set corresponding market rules to ensure fair and transparent land transactions and avoid illegal operations in land circulation.

The state should explore the flexible management system of rural land circulation and formulate flexible land circulation policies according to regional characteristics, land types and other factors. Giving full consideration to farmers' wishes is essential in encouraging and guiding land circulation, aimed at better meeting the needs of agricultural modernization. This involves adopting various forms of incentives and guidance strategies to facilitate the process of land circulation, ensuring it aligns with both the modernization goals and the preferences of farmers. A key aspect in this approach is the establishment of a guarantee mechanism for farmers' economic interests during land transfer. This mechanism is crucial to ensure that farmers are not only fairly compensated but also share in the economic benefits arising from land circulation. By safeguarding the economic interests of farmers, this strategy helps to maintain a balance between advancing agricultural modernization and protecting the rights and livelihoods of the farming community. The overall goal is to create a win-win situation where land circulation contributes to agricultural efficiency and growth while also ensuring the welfare of the farmers involved. Farmers' interests in land transfer can be guaranteed by means of government purchasing services and financial incentives. Local governments need to encourage new business entities such as agricultural enterprises and cooperatives to participate in land management and improve management level and efficiency. Helping land operators to better utilize modern management concepts and technical means involves providing them with training and technical support. This approach is geared towards enhancing their capabilities in using advanced agricultural techniques and management practices. Training can cover a wide range of topics, from the latest farming technologies and sustainable practices to efficient business management and market analysis. Technical support can include access to modern farming equipment, information technology tools, and expert advice on crop management, soil health, and resource optimization. By equipping land operators with these skills and resources, they are better positioned to increase productivity, reduce costs, and manage agricultural operations more effectively. This support not only benefits individual operators but also contributes to the overall modernization and competitiveness of the agricultural sector. In the reform of land system, we should guide the land to develop in an efficient, environmentally-friendly and sustainable direction and promote agricultural modernization. Farmers can be encouraged to adopt advanced and environmentally friendly agricultural production methods through reward and punishment policies.

4.4. Strengthen the protection of ecological environment

Strengthening ecological environment protection is an indispensable countermeasure to realize Chinese agricultural and rural modernization. Farmers should be encouraged to adopt green planting patterns such as organic agriculture and ecological agriculture to reduce the use of agricultural fertilizers and pesticides and reduce environmental pollution. The government can encourage farmers to turn to more environmentally friendly agricultural production methods by providing financial subsidies and tax incentives. Monitoring and controlling water pollution caused by agricultural activities through scientific and technological means. Local governments need to strengthen the control of agricultural non-point source pollution, promote the construction of rural environment-friendly farmland, and adopt reasonable farmland layout, scientific fertilization and farmland protection to reduce the impact of agriculture on the water environment. Encouraging farmers to adopt ecological planting modes like multi-level mixed farming and rotation fallow

methods is key to enhancing the stability of the land ecosystem. These practices, integrating diverse crop combinations and allowing periodic rest for the soil, contribute significantly to biodiversity, improve soil health, and promote sustainable land use. By adopting such methods, farmers can maintain the natural balance of nutrients, control pests and diseases more effectively, and improve the overall resilience and productivity of their land. This approach plays a crucial role in advancing sustainable agricultural practices. This is helpful to alleviate the problems of poor soil and ecological imbalance caused by continuous cropping of single crop. Local governments also need to strengthen the implementation of rural ecological restoration projects, focusing on controlling soil erosion, grassland degradation and other issues. Through afforestation and grassland restoration, we will improve the rural ecological environment and improve the resistance and stability of the ecosystem. Strengthen the management and protection of rural water resources to ensure the scientific and rational use of agricultural water. By strengthening soil and water conservation projects, improving irrigation facilities and popularizing water-saving agricultural technologies, the excessive utilization and pollution of water resources by agriculture can be reduced.

5. Conclusions

Chinese-style agricultural and rural modernization is a comprehensive and complex systematic project, facing numerous challenges. In the process of promoting agricultural and rural modernization, we should not only pay attention to the improvement of economic benefits, but also pay attention to the protection of ecological environment and sustainable social development. For these challenges, we must take practical countermeasures and form a systematic policy system to promote rural modernization and achieve more remarkable results. In the process of realizing Chinese-style agricultural and rural modernization, all stakeholders should form a win-win situation and work together to solve the above challenges. The government, farmers, enterprises, scientific research institutions and other parties should strengthen communication and cooperation, form a joint force, and contribute to the smooth realization of Chinese agricultural and rural modernization. Only through the joint efforts of the whole society can we build a modern, eco-friendly and socially harmonious Chinese-style agricultural countryside.

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