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Constraints and Countermeasures of Digital Economy Empowering High-quality Development in Chinese Agriculture

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Abstract

With the wide application of networking, informatization, and digitization technologies in agriculture, as well as the improvement of farmers' modern information skills, the digital economy has become an important engine driving high-quality development and digital transformation in agriculture. Digital agriculture is an essential component of the national strategy for "Digital China" and an effective measure to achieve the deep integration of informatization and agricultural modernization. Driven by digital technologies, digital agriculture in rural areas shows tremendous development potential, huge market demand, and broad application prospects. The era of digital-driven agriculture and rural areas "leapfrogging" is approaching. However, the digital economy empowering high-quality development in agriculture also faces various constraints, such as lagging infrastructure construction, slow development of digital agriculture, insufficient endogenous driving forces, and difficulties in practical applications. To address these issues, the government should increase investment, clarify directions, promote industry academia research collaboration, and strengthen core technologies. These measures will enable the digital economy to better empower the high-quality development of Chinese agriculture.

Keywords

digital economy, high-quality development, agriculture

1. Introduction

With the promulgation of documents such as the *Digital Agriculture and Rural Development Plan (2019-2025)*, rural areas have officially embarked on the wave of digital economy development. Against the backdrop of the rural revitalization strategy, it is particularly urgent for agricultural enterprises with weak digital foundations to develop their digitalization. In the Central Document No. 1 of 2021, titled *Opinions of the Communist Party of China Central Committee and the State Council on Comprehensively Promoting Rural Revitalization and Accelerating Agricultural and Rural Modernization,* it is explicitly

stated that efforts should be made to accelerate agricultural modernization and cultivate leading agricultural enterprises as "front runners." Agricultural enterprises must leverage digitization to enhance their own development and create self-generating capabilities, achieving "change lanes and overtake" on the new track of the second centenary goals. *The Key Points for Digital Rural Development in 2023* mainly focuses on the two topics of "digital economy" and "rural construction," and sets digital rural construction as a new goal. This document further promotes the deep integration of the digital economy and traditional agriculture, and represents the Party Central Committee's intensified policy measures and acceleration of agricultural digitalization, continuing the macro empowerment of high-quality agricultural development in recent years.

In recent years, the digital economy has become a new driving force and engine for global economic growth. According to *the 2023 China Digital Economy Research Report released by the China Academy of Information and Communications Technology*, China's digital economy is expected to reach a scale of 50.2 trillion yuan in 2022, accounting for 41.5% of GDP. The penetration rates of the digital economy in the primary, secondary, and tertiary industries are 10.5%, 24.0%, and 44.7% respectively, indicating a deepening recognition of the importance of the digital economy across various sectors in China. Although the digitalization effect in the primary industry is also significant, the penetration rate of the digital economy is notably lower compared to the secondary and tertiary industries. As China is traditionally an agricultural powerhouse, this implies that vigorously promoting the digitalization of the primary industry is not only a general trend but also an essential path for China to transform from an agricultural powerhouse to an agricultural strong nation. The deep integration of the digital economy and agriculture provides new impetus for agricultural development and serves as a crucial direction to promote high-quality agricultural development.

2. Literature Review

2.1 Definition of the Digital Economy

The academic community has not yet formed a unified standard for defining the digital economy. The American author Tapscott, known as "the father of the digital economy", first mentioned the concept of the "digital economy" in his book *The Digital Economy: Prospects and Risks in the Age of Networked Intelligence* in 1996. He systematically expounded on the profound impact of networked effects on social and economic development, as well as how to create new enterprises using new technologies in the context of the new economy. Currently, the definition of the digital economy by the G20 Hangzhou Summit in 2016 is widely recognized in the domestic academic community. It defines the digital economy as a series of economic activities in which digitalized knowledge and information are used as key production factors, modern information networks serve as important carriers, and the effective use of digital technology serves as an important driving force for efficiency improvement and economic structure optimization.

2.2 The Role of Digital Economy in Promoting High-quality Agricultural Development

With the development of information technology, the digital economy has permeated various sectors of China's rural socioeconomic system, emerging as a significant means to activate new drivers for rural development, nurture new forms of rural industries, and promote the revitalization of rural industries (Li, 2023). The digital economy plays a prominent and positive role in promoting high-quality agricultural development (Chen et al., 2023). By driving the transformation and upgrading of industrial structure, the digital economy empowers the high-quality development of agriculture (Lu & Du, 2022). However, the empowerment of the digital economy for high-quality agricultural development faces challenges such as the shallow integration between the digital economy and the agricultural industry (Li, 2023), a shortage of digital professionals (An, 2021), low internet penetration rates, and insufficient digital literacy among rural economic entities (Fu, 2023). The investment in digital agriculture significantly lags behind other industries, presenting a bottleneck for its development (Wang, Wang, & Dai, 2023).

Therefore, the application of digital technology in the whole process of agricultural production has formed three new elements: digital agricultural laborers, digital agricultural labor materials, and digital agricultural labor objects. Under the joint action of these new elements, digital agricultural new quality productivity is generated, which helps to achieve high-quality agricultural development (Wang & Yang, 2023). The development of digital economy has brought "digital dividends" to the high-quality development of agriculture, and optimizing the allocation efficiency of product, capital and labor factors is the three core paths of the digital economy enabling high-quality agricultural development (Yi, Wang, & Zhu, 2023). We should take vigorously promoting digital infrastructure construction as a breakthrough point, focus on developing digital technology, tap the endogenous development potential of agriculture, expand digital application scenarios, promote the deep integration of the digital economy and rural agriculture, build characteristic agricultural product brands, and promote high-quality agricultural development (Zhou & Li, 2022).

3. Mechanism Analysis of Digital Economy Enabling High-quality Agricultural Development

High-quality agricultural development is the foundation of achieving rural revitalization, and the digital economy is an important driving force for high-quality agricultural development (Wang & Qi, 2022). The digital economy drives the traditional agriculture to gradually move towards a higher level of intelligent agriculture and digital agriculture by improving agricultural production efficiency, changing agricultural management methods, and helping to activate the allocation of agricultural factor resources. This will help to promote the process of rural digitization and high-quality agricultural development in a more extensive and deeper level.

3.1 Empowering the Agricultural Value Chain with the Digital Economy to Improve Agricultural Production Efficiency

The digital economy, characterized by its strong penetration, wide coverage, and deep influence, not only enables the innovation of agricultural development methods but also accelerates the digital

transformation of the entire traditional agricultural value chain. The key to improving agricultural production efficiency lies in the innovation and application of digital technologies in agriculture, which involves connecting various stages of production, distribution, circulation, and consumption within the agricultural value chain. With the integration of digital technologies into every aspect of agricultural production, agriculture has transitioned from traditional production methods to a new stage of development driven and supported by modern information and communication technologies, known as digital agriculture and smart agriculture. This digitized development has led to an increase in agricultural production quantity, improvement in quality, and enhanced efficiency and profitability. Digital technologies empower the entire agricultural value chain through precision fertilization, irrigation, pesticide spraying, and other activities, which not only reduce costs but also enhance product quality. In the distribution and circulation processes, cutting-edge technologies such as the Internet of Things and mobile internet enable logistics tracking and automation, further reducing costs. In the consumption stage, internet technologies facilitate product traceability, enhance customer experience, and ultimately improve the efficiency of the entire agricultural value chain.

3.2 The Enabling of Agricultural Resource Allocation by the Digital Economy and Promoting High-quality Development

Resource allocation theory believes that achieving optimal allocation of resources under conditions of resource scarcity is the fundamental path to promoting economic development. The digital economy can optimize production, supply, and marketing decisions through technologies such as big data, cloud computing, and the Internet of Things. It can also allocate agricultural resource factors based on the actual market demand for agricultural products, thereby improving the quality of agricultural development. The digital economy has broken through the spatial and temporal barriers of labor, allowing countless entrepreneurs to achieve cross-temporal entrepreneurship, and can promote the return of labor factors to rural areas, enabling high-quality agricultural development. The digital economy can also provide online consultation and online education, thereby providing endogenous motivation for high-quality agricultural development and supporting high-quality agricultural development.

4. The Constraints on the High-quality Development of Agriculture Empowered by the Digital Economy

4.1 Insufficient Government Investment and Outdated Digital Infrastructure

Infrastructure construction is the prerequisite for economic development and an important indicator of the urban-rural gap. Rural infrastructure construction faces issues such as inadequate funding, redundant construction, and low management efficiency (Zhang & Luan, 2022). Insufficient government funding hinders the development of digital infrastructure in agriculture. Firstly, there is an overall funding shortage. In terms of digital transformation, both frontend data collection and backend digital technology applications require substantial financial investment. However, in reality, most of the support comes from policy measures without sufficient accompanying funding. Moreover, government funds are mostly

allocated to agricultural road construction and basic irrigation equipment, with inadequate investment in digital equipment and facilities. The internet and 5G require comprehensive network coverage and strengthened construction. In remote rural areas, there are often situations of no signal or unstable signal, which severely restricts the application and development of the digital economy in agriculture.

4.2 Lack of Clear Policy Guidance Hampers the Development of Digital Agriculture

The process of digitizing agriculture requires a long investment cycle, substantial funding, and slow returns on investment. Due to the uncertainty of government policies, market players lack enthusiasm and adopt a wait-and-see attitude, resulting in weak willingness for digital development among agricultural enterprises and individuals. The unclear policy guidance and insufficient financial support, combined with the influence of traditional production and operation methods, have led to a weak awareness and willingness for digital development among both farmers and relevant business entities. The interaction between the government and market players is poor, posing a formidable challenge to the development of digital agriculture.

4.3 Insufficient Endogenous Motivation, Serious Decoupling and Breaking of the Chain of Industry, Academia and Research

Firstly, there is a lack of digital knowledge and technological reserve. In rural areas, education is lagging behind, and farmers have low educational attainment and qualifications. They are mostly influenced by traditional agricultural experience in farming and animal husbandry, resulting in weak acceptance of new technologies and concepts. The management personnel and technical staff in agricultural industrial parks have been using traditional management and technological models for a long time, with low digital literacy and a lack of digital management and operational experience. It is difficult for them to integrate digital technologies into the entire agricultural value chain, leading to insufficient endogenous motivation for the digital economy to empower agriculture. Secondly, there is a severe disconnection among the links of production, study, and research. Firstly, universities have made considerable efforts in cultivating students' digital capabilities and literacy, but they have taken almost no action in cultivating the ability to serve local digital transformation. Secondly, related research institutions have become disconnected from reality in terms of digital technology research and development, resulting in most of the developed technologies being unusable in agriculture. Some research achievements are also detached from practical guidance, remaining only at the theoretical level with low efficiency in practical application and transformation. Lastly, there is a lack of collaborative development among enterprises, schools, and research institutions, making it even more challenging to introduce, popularize, and implement the concept of the digital economy.

4.4 Lack of Core Technologies, Difficult to Implement

The lack of core technologies is a key issue restricting industrial development. The high-quality development of agricultural industry with digital economy is a systematic project, which needs advanced digital technologies to support it. However, compared with agricultural developed countries, China's current research and development of key core digital technologies lag behind, and the cost of digital

technology application and maintenance is high, which seriously affects the agricultural digital development. Firstly, the research and development of core technologies lags behind. In the field of core technologies in agricultural digital development, there is a large gap between China and foreign countries. For example, the US computer simulation technology SIRIS model can not only simulate the changes of crop nutrients with growth status, but also simulate the germination date of crops; intelligent operation management software such as production relationship system costing Max, crop growth management system, digital agricultural management system, these technologies and systems are in the leading position in the world, and have achieved excellent economic effects. Secondly, the supporting technical facilities of digital agriculture are backward. The intellectualization of agricultural machinery and equipment is one of the necessary conditions for the transformation of agricultural digitalization. The proportion of large-scale farms in the United States exceeds 40%, and the intellectualization degree of mechanical equipment is high. However, China's agricultural scale is small and technological innovation is insufficient. Except for individual vegetable and fruit planting that has carried out intellectualized planting practice, most growth crop models come from abroad. Domestic facilities are still in a relatively backward state.

5. Strategies for Empowering High-quality Development of Agriculture in China through the Digital Economy

5.1 Strengthening Investment to Fill the Gaps

The government plays a pivotal role as a catalyst for the digital transformation of agriculture and animal husbandry, serving as a guiding mechanism. In rural areas with low economic levels and outdated digital infrastructure, there is significant room for development. Firstly, the government should enhance investment in digital infrastructure and equipment, tailoring solutions to local conditions to promote the development of the digital economy. Secondly, the government should effectively perform its guiding and supervisory functions, increasing funding for the construction of digital infrastructure, directing funds towards innovative digital agricultural entities, and establishing mechanisms to safeguard investment from multiple sources and implement digital technology applications (Heng & Wang, 2023). The focus should be on constructing digital technology application scenarios to empower high-quality development.

5.2 Defining Orientation and Accelerating Development

To promote the sustainable and high-quality development of digital agriculture, corresponding policies and regulations need to be formulated. This includes promoting standardized operations across the entire agricultural product industry chain, orderly advancing infrastructure construction, and accelerating the promotion and application of digital agricultural technologies (Huang, 2022). The government should provide clear guidance and direct funds towards digital agriculture, facilitating enterprises' investment in digitalization within the agricultural sector. Enterprises serve as catalysts for the digital development of agriculture and play a significant role in driving mechanisms. Through government policies,

agricultural enterprises are supported in adapting to the trend of digital transformation, thereby enhancing their ability to utilize digital platforms and devices. Additionally, guiding commercial banks to actively respond to policies by establishing standards and lowering financing thresholds for information asymmetry and small and micro-enterprises can provide financial support for the development of digital agriculture.

5.3 Emphasizing the Collaborative Development of Industry, Academia, and Research to Cultivate Endogenous Motivation

The development and application of digital technology from research and demonstration to widespread adoption requires collaborative development among industries, research institutes, and universities to establish a multifunctional complex that integrates digital technology research and development for agricultural production, demonstration of digital transformation in agricultural production, and cultivation of digital production bases (Li & Xiao, 2023). Firstly, it is necessary to encourage the government to actively explore collaborative platforms for industry, academia, and research cooperation, establish channels for multiparty communication, and promote the industrialization of core technologies for agricultural digital transformation. Secondly, it is important to improve relevant policies and regulations, establish standardized norms, protect patent rights, promote the integration of technology and industry, and create a mechanism for collaborative cooperation between industry, academia, and research to address key technological issues in agricultural digital transformation. Lastly, the introduction of university education mechanisms will cultivate professionals with digital thinking and skills in digital technology from the source, serving the development of agricultural digital transformation. Through the deep integration and connection of industry, academia, and research, a powerful and comprehensive collaborative platform for integrated innovation is formed, integrating the cultivation of digital talents, transformation of digital research achievements, and promotion of digital industrial technology applications.

5.4 Strengthening Core Technologies to Promote Application Implementation

The digital transformation of agriculture requires digital technology as the foundation, thus it is necessary to strengthen the core technologies of digital agriculture and enable agricultural transformation and upgrading. Constant improvement in rural digital infrastructure and promotion of research and application of core digital agricultural technologies (Xu, Hao, & Luo, 2021) are needed. Firstly, it is important to leverage the advantages of latecomers and actively conduct research, experiments, and promotion of digital agricultural technology, breaking through key technological issues that limit the digital transformation of agriculture, and laying a technological foundation for digital development. Secondly, it is crucial to enhance the application of digital technology in remote rural areas, improve infrastructure such as network communication, and enhance the technology of Internet of Things for full coverage, enabling data collection, organization, processing, and analysis throughout the entire agricultural industry chain to assist decision-making optimization for agriculture and animal husbandry entities. Lastly, it is necessary to accelerate the formation of a new generation of information software

technology management models, deepen the integration of agriculture and digitization, and incorporate digital technology into various application scenarios along the entire agricultural industry chain to explore agricultural data resources and achieve data sharing.

6. Conclusion

The digital economy has become an unstoppable global trend. The Chinese government, led by the Central Committee and the State Council, attaches great importance to the development of digital agriculture and regards rural revitalization as a crucial strategy for promoting rural modernization. As one of the main industries in rural Ganzi, the development of the digital economy holds significant importance in achieving rural revitalization. China's agriculture possesses immense market potential and vast market prospects. With the advancement of digital technology and the breakthrough of key bottlenecks, the application and establishment of digital technology in rural areas have gradually formed a complete digital industrial chain, creating a digitally competitive industry on an international scale. Addressing the issues in agriculture, rural areas, and farmers is one of China's key tasks. Empowering agriculture with the digital economy for high-quality development not only consolidates the achievements in poverty alleviation, but also narrows the urban-rural gap, implements rural revitalization, and achieves shared prosperity.

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Reference

An, X. M. (2021). Practical problems and countermeasures for the high-quality development of digital agriculture in Henan Province. *Journal of Henan University of Technology* (Social Science Edition), *37*(5), 1-8.

Chen, H. et al. (2023). Digital economy, industrial structure upgrading, and agricultural high-quality development: Empirical analysis based on panel data in Fujian Province [J/OL]. In *China Agricultural Resources and Regionalization* (pp. 1-13).

Fu, X. M. (2023). Research on digital technology enabling high-quality development of agricultural and rural areas. *Southwestern Finance*, *2023*(7), 81-93.

He, M., & Wang, X. (2023). Digital transformation of the agricultural industry: Importance, obstacles and implementation paths. *Guizhou Social Sciences*, *2023*(9), 161-168.

Huang, W. J. (2022). Digital economy enabling high-quality agricultural development. *Rural Think Tank*, *2022*(3), 67-72.

Li, F. D. (2023). The theoretical logic, practical constraints and realization paths of the digital economy enabling the revitalization of rural industries. *Financial Economy*, 2023(3), 8-15+41.

Li, H. (2023). The significance, problems and countermeasures of the digital economy enabling high-quality agricultural development. *Economist*, *2023*(11), 113-114.

Li, Q., & Xiao, Z. Y. (2023). Practice and Mechanism Innovation of Digital Transformation in Agricultural Production: A Case Study based on Zhejiang Province. *Journal of Jiangnan University* (Social Sciences Edition), *22*(5), 64-76.

Lu, Z. Y., & Du, Y. L. (2022). Empirical research on the digital economy enabling high-quality agricultural development. *China Circulation Economy*, *36*(11), 3-14.

Wang, Q. M., & Yang, J. G. (2023). Research on new digital quality productivity and high-quality agricultural development in China [J/OL]. *Journal of Shaanxi Normal University* (Philosophy and Social Sciences Edition), 1-12.

Wang, W., Wang, X. T., & Dai, J. (2023). Agricultural high-quality development: Towards digital transformation—based on the investigation of digital agriculture in Yangxi County. *Southwestern Finance*, *2023*(5), 59-69.

Wang, Y. J., & Qi, Y. C. (2022). Digital economy and agricultural high-quality development—based on the analysis of China's provincial panel data from 2010 to 2020. *Journal of Economic Development Research*, *2022*(4), 13-28.

Xu, M., Hao, R. J., & Luo, Y. P. (2021). Digital Empowerment for High-quality Development of Agricultural Economy. *Science and Technology in China*, 2021(12), 46-50.

Yi, E. W., Wang, J., & Zhu, J. (2023). Digital economy, resource allocation efficiency, and agricultural high-quality development. *Modern Finance and Economics* (Tianjin University of Finance and Economics), *43*(12), 20-37.

Zhang, Y. P., & Luan, J. (2022). Digital economy enabling rural revitalization: Theoretical mechanism, constraints and promotion path. *Reform*, *2022*(5), 79-89.

Zhou, Q. X., & Li, X. E. (2022). The internal mechanism and empirical analysis of the digital economy and agricultural high-quality development. *Economic Reforms*, *2022*(6), 82-89.