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Digital Infrastructure Empowering the High-Quality Development of China's Agricultural Exports: Mechanisms and Pathways

Rongyi Su
School of Economics, Foshan University, Foshan, Guangdong 528000, China

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Abstract

In the digital economy era, digital infrastructure has become a key force reshaping international trade. Based on technology diffusion theory, this study explores how digital infrastructure promotes the high-quality development of China's agricultural exports through three core pathways: reducing trade costs, enhancing production efficiency and product value added, and optimizing international market matching. China has made notable progress in digital village construction, smart agriculture, and cross-border e-commerce. However, challenges remain, including the urban-rural digital divide, shortage of interdisciplinary digital talents, and lack of unified digital standards. To fully unleash the enabling effects, efforts should focus on targeted infrastructure investment in rural areas, talent cultivation, building internationally compatible digital standards and traceability systems, and innovating financial support instruments, thereby building new "digital capability"-centered competitive advantages for China's agricultural exports.

Keywords

Digital infrastructure; Agricultural exports; Technology diffusion

1. Introduction

With the deep evolution of new-generation information technologies, new types of digital infrastructure, represented by 5G, industrial internet, big data centers, and artificial intelligence, are increasingly becoming a core engine for high-quality economic and social development[1]. Meanwhile, China's agricultural export trade is at a critical stage of transformation, needing to shift from scale expansion to value-added, brand-driven, and internationally competitive growth. In 2025, China's agricultural exports approached US$104.16 billion, but growth slowed amid increasing trade barriers and competition. How to achieve dual improvements in "quality" and "quantity" has become a pressing issue.

Traditional research focuses on conventional infrastructure like transport and ports. However, in the digital trade era, digital infrastructure—enabling information flow

and intelligent transactions—plays an increasingly prominent role. Given the perishable, seasonal, and low-standardization nature of agricultural products, digital infrastructure's enabling effect may be more significant than in other industries[2]. Existing literature has preliminarily explored the role of information infrastructure, such as the internet, in promoting manufacturing exports, but systematic analysis of the mechanisms by which digital infrastructure affects the high-quality development of agricultural exports, combined with in-depth interpretation of China's rich practices, remains relatively insufficient[3]. Therefore, this research constructs a theoretical framework based on technology diffusion theory, revealing the internal logic of digital infrastructure enabling agricultural exports, supported by policies and cases.

2. Mechanisms of Digital Infrastructure Affecting High-Quality Development of Agricultural Exports

Digital infrastructure accelerates the diffusion of "technology-information" along the agricultural value chain, promoting export upgrading through three interrelated pathways.

2.1. Reducing Trade Costs

Traditional agricultural exports face high costs in accessing international market information. Digital facilities like cross-border e-commerce and agricultural big data platforms enable real-time querying of global supply-demand dynamics and regulations, reducing information search costs and information asymmetry[4]. Technologies such as 5G, IoT, and cloud computing support online meetings, e-contracts, and supply chain management systems, improving coordination among exporters, importers, logistics providers, and customs. In case of delays or quality disputes, real-time data sharing reduces cross-border communication costs. More critically, blockchain-based traceability—uploading cultivation, fertilization, pesticide use, processing, inspection, and transport data onto an immutable ledger—enhances buyer trust, reduces returns and claims, lowers performance and trust costs, and helps high-quality products overcome non-tariff barriers.

2.2. Enhancing Production Efficiency and Product Value Added

In the pre-production stage, big-data-based market demand analysis and climate prediction models guide precise planting planning, avoiding unsold risks. In the production stage, IoT sensors, intelligent irrigation, drone plant protection, and automated sorting lines enable precise, standardized production. Sensors monitor soil moisture, nutrients, and pests in real time, guiding on-demand application of water, fertilizer, and pesticides, ensuring stable and uniform quality—critical for meeting stringent international standards. In the post-production stage, digital processing and packaging equipment automatically grade products by size, color,

and sugar content, meeting differentiated overseas market needs[5]. Meanwhile, QR codes and RFID tags create electronic profiles and brand stories, conveying "green, safe, high-quality" signals to consumers, enhancing brand value and premium capacity.

2.3. Optimizing International Market Matching and Expansion

Traditional agricultural export market development relies heavily on offline channels such as international exhibitions and overseas office promotions, which require large investments, long cycles, and high risks. Digital infrastructure, especially various digital trade platforms, provides new low-cost, high-efficiency access channels for agricultural exports. Small and medium-sized agricultural export enterprises and new agricultural business entities can directly reach overseas wholesalers, retailers, and even end consumers by joining cross-border e-commerce platforms, bypassing the complex distribution layers of traditional trade. Digital marketing tools based on user profiles and interest recommendations can help enterprises precisely target potential customers at lower cost, quickly test market reactions to new products and new packaging, and achieve agile iteration[6]. Furthermore, the "live-streaming + cross-border e-commerce" model is spreading from domestic to international markets, with some enterprises collaborating with overseas influencers to showcase product origins and processing through live broadcasts, building emotional connections. The digital management of overseas warehouses enables localized services for stocking, shipping, and returns, greatly improving overseas consumers' shopping experience and promoting repeat purchases.

3. Practices, Achievements, and Challenges in China

In recent years, the Chinese government has attached great importance to the enabling role of digital infrastructure in agricultural and rural modernization, achieving significant progress in policy promotion, infrastructure construction, and practical exploration, while also facing some deep-seated constraints.

3.1. Policy Support and Infrastructure Construction Achievements

At the national level, documents such as the "Digital Village" development strategy, theDigital Agriculture and Rural Development Plan (2019–2025), and theNational Smart Agriculture Action Plan (2024–2028)have been successively released, clearly identifying key tasks such as bringing information to villages, agricultural IoT, and rural e-commerce. By the end of 2025, the proportion of administrative villages in China with access to fiber optics and 4G/5G exceeded 99%, and the rural internet penetration rate had risen to about 66.5%, laying a solid material foundation for the collection, transmission, and application of agricultural data. Pilot projects such as "Broadband to the Border" and "Universal Telecommunications Services," jointly

promoted by the National Development and Reform Commission and the Ministry of Agriculture and Rural Affairs, are focusing on central and western agricultural production areas and border trade zones, striving to bridge the "digital divide" between urban and rural areas and between the east and west[7]. These policies and investments have created favorable conditions for digital infrastructure to enable agricultural exports.

3.2. Typical Cases and Successful Experiences

Driven by policies and infrastructure improvements, many successful practical cases have emerged across China. Shouguang in Shandong Province, known as the "Hometown of Vegetables in China," has actively built smart agricultural parks, widely deploying IoT environmental monitoring and integrated water and fertilizer automation control systems. Through digital transformation, Shouguang's exported vegetables have achieved full-process standardized production, significantly improving product uniformity and pesticide residue control, successfully entering the highly demanding markets of Japan, South Korea, and the European Union. Zhejiang Province, relying on its developed e-commerce ecosystem, has actively promoted the "brand going global" of agricultural products. Through platforms such as Alibaba International Station and AliExpress, specialty agricultural products including Linhai's mandarins, Longjing tea, and Zhoushan's aquatic products have reached global markets. The local government has also established an agricultural product cross-border e-commerce incubation center, providing full-chain services from platform operation to overseas marketing for small and medium-sized export enterprises. Ningxia's goji berries have utilized blockchain technology to establish a quality and safety traceability platform. Each package of exported goji berries has a unique digital identity; overseas consumers can scan the QR code to view information about the planting base, inspection reports, and logistics trajectory. This initiative has greatly enhanced international reputation, enabling the product to be stably exported to high-end markets such as Europe, the United States, and Southeast Asia at a price higher than the market average[8].

3.3. Main Challenges Faced

Despite progress, challenges persist. The urban-rural digital divide remains: remote production areas lack network stability, and farmers' digital skills are low. There is a severe shortage of interdisciplinary talents who understand agricultural production, digital operations, and international trade rules. The digital standardization system for agricultural products is incomplete, with low mutual recognition of China's digital certifications and traceability standards with major trading partners like the EU and US, raising compliance costs. Additionally, the high investment cost and long payback period of digital agriculture pose difficulties for small and medium-scale operators.

4. Conclusions and Policy Implications

Based on technology diffusion theory, this research systematically analyzes the theoretical mechanisms through which digital infrastructure affects the high-quality development of agricultural exports and, combined with China's practices, draws the following conclusion: Digital infrastructure effectively promotes the transformation of agricultural exports from scale expansion to quality- and efficiency-oriented growth through three core pathways: reducing trade costs, enhancing production efficiency and value added, and optimizing international market matching. China has made remarkable achievements in digital village construction, smart agriculture applications, and cross-border e-commerce development, but it also faces practical challenges including the digital divide, talent shortages, lack of unified standards, and high input costs.

To fully unleash the enabling effect of digital infrastructure, this research proposes the following policy recommendations. First, bridge the "last mile" digital divide by directing infrastructure investment toward agricultural production areas and border trade zones, and lower the threshold for small and medium-sized farmers to purchase smart terminal devices through government subsidies. Second, build a talent support system that combines attraction and cultivation: attract urban digital technology talents to rural areas, while carrying out large-scale digital skills training through vocational education and e-commerce service centers, focusing on improving capabilities in data analysis, platform operation, and cross-border e-commerce practices. Third, accelerate the establishment of a unified, open, and internationally compatible digital standard system for agricultural products, actively participate in bilateral and multilateral mutual recognition of digital certification and traceability standards, and reduce institutional compliance costs for agricultural exports. Fourth, innovate financial support instruments: guide financial institutions to develop specialized credit and insurance products for digital agriculture scenarios, and establish guiding funds for digital agriculture development, providing long-term, low-cost, and risk-controlled financial support for the digital transformation of small and medium-sized entities. Through these comprehensive measures, digital infrastructure will truly become a powerful engine driving the high-quality development of China's agricultural exports, building new competitive advantages centered on "digital capabilities" in global agricultural trade.

References

[1] Huang J, Xiang Y, Duan X, et al. Digital Infrastructure Construction and Energy Efficiency: A Quasi-Natural Experiment with Double Machine Learning[J]. Emerging Markets Finance and Trade, 2026, 62(8): 2646-2660.

[2] Yi S. Digital infrastructure and employment inequality: Evidence from the Broadband China Strategy[J]. Structural Change and Economic Dynamics, 2026, 78: 372-386.

[3] Zhang J, Weiss G V V, Zhao Y. The impact of the depth of free trade agreements on the

quality of China's exported agricultural products[J]. Journal of Industrial and Business Economics, 2026: 1-19.

[4] Luo Y, Zeng D, Zhu J, et al. The Impact of Digital Infrastructure Construction on Urban–Rural Consumption Inequality in China: Evidence from Difference-in-Differences and Double Machine Learning[J]. Sustainability, 2026, 18(10): 4707.

[5] Jia L, Wang Y, Shang D, et al. Digital Infrastructure and Sustainable Industrial Upgrading in China's Edible Fungi Sector: Separating Scale from Value[J]. Sustainability, 2026, 18(9): 4435.

[6] Roelfsema H, Findlay C. Beyond the Farm Gate: Servicification, Global Value Chains, and Upgrading in Agricultural Exports[J]. Land, 2026, 15(3): 451.

[7] Jiang Z, Wang X, Liu P. Can agricultural digitalization improve agricultural export quality?[J]. PloS one, 2026, 21(5): e0347210.

[8] Zhang Y, Ma L, Wei F. Digital Infrastructure and Agricultural Global Value Chain Participation: Impacts on Export Value-Added[J]. Agriculture, 2025, 15(15): 1588.