Optimization Pathways for New Quality Productive Forces in Empowering Digital Village Construction

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Abstract Digital technology is a pivotal factor in developing new quality productive forces in agriculture and building digital villages. Using digital technology as a foundation to explore viable methods for these forces is an imperative for realizing rural revitalization and fostering circular agricultural development. This paper outlines the theoretical logic of how new quality productive forces empower digital village construction, focusing on accelerating smart village initiatives, promoting rural digital production, and developing unique local resources. Based on the practical challenges currently facing digital village development, it formulates several countermeasures. These include stimulating rural industrial endogenous motivation through urban-rural industrial integration, implementing actions to enhance rural digital governance, building a contingent of rural digital talent, and improving rural digital infrastructure. The aim is to provide insights for better leveraging the dynamic role of new quality productive forces in promoting digital village construction.

Key words New quality productive forces, Digital village construction, Optimization pathways, Digital regulation

0 Introduction

General Secretary Xi Jinping said that "new quality productive forces represent advanced productive forces that are innovation-driven, transcending traditional economic growth models and productivity development paths. They are characterized by high technology, high efficiency, and high quality, and are aligned with the new development philosophy"[1]. Leveraging new quality productive forces to empower digital village construction can bring the value of digital and intelligent technologies into play in areas such as smart agriculture, rural governance, and ecological protection. This aims to transform agricultural production modes, improve rural governance standards, and increase farmers' incomes, thereby accelerating the achievement of rural revitalization goals. It should be noted that digital village construction is a systematic and challenging endeavor. It must be grounded in the actual conditions of rural areas, such as their geographical location, economic foundation, and resource endowments, to explore development models with distinct rural characteristics. This approach ensures that the initiative achieves its expected outcomes and facilitates urban-rural integration.

1 Theoretical logic of new quality productive forces empowering the digital village construction

1.1 New quality productive forces promoting rural digital production New quality productive forces are playing a vital role in transforming and upgrading traditional agriculture toward modernization and intellectualization. As these forces advance, digital technologies like big data, the Internet of Things (IoT), and artificial intelligence provide robust support for the growth of rural digital industries. Take the rural e-commerce sector as an example: it not only opens up new sales channels for agricultural products and increases farmers' economic returns, but also stimulates the development of supporting industries such as transportation and logistics. Furthermore, it even exerts a positive influence on rural tourism. Additionally, the development of new quality productive forces has facilitated the application of advanced digital technologies and intelligent agricultural machinery in production. This contributes significantly to preventing agricultural non-point source pollution, improving agricultural productivity, and building a more mature and complete agricultural product industry chain.

1.2 New quality productive forces accelerating smart village construction Building smart villages is a crucial initiative for achieving rural revitalization, and the development of new quality productive forces provides strong support for this endeavor. In terms of villagers' lives, smart homes and smart healthcare, developed based on these forces, offer more convenient services to rural residents, significantly enhancing their sense of happiness and satisfaction. In rural governance, supervisory platforms built upon new quality productive forces have made village affairs more transparent and open, safeguarding villagers' rights to participate in grassroots political activities. This plays a vital role in preventing minor corruption at the grassroots level and modernizing rural governance systems. In education, online classrooms powered by new quality productive forces enable rural students to share high-quality educational resources from urban schools, contributing to greater educational equity.

1.3 New quality productive forces improving rural digital governance The development and application of new quality productive forces serve as a key driver accelerating the transformation of rural digital governance models. First, these forces possess

Received: October 10, 2025 Accepted: November 6, 2025

Supported by the National Social Science Foundation Project "Research on the Theoretical Logic and Practical Path of the Cultural Mission of Ideological and Political Education in the New Era" (20XKS022).

Xu HE, doctoral degree candidate, research fields: the adaptation of Marxism to the Chinese context and construction of the ruling party.

unique advantages in information acquisition and processing. Leveraging technologies like big data and artificial intelligence, they collect and analyze information from multiple sources, which facilitates more scientific and sound decision-making. Second, using new quality productive forces as a carrier, information-sharing platforms can be established among the government, enterprises, and society. Exchanging views on economic development forecasting and regional development decisions helps modernize rural governance systems and capabilities, thereby enhancing the level of rural digital governance.

1.4 New quality productive forces developing rural characteristic resources Many villages are rich in high-quality, distinctive resources, yet they often fall short in development methods and production efficiency, failing to achieve resource integration and effective exploitation. With the development of new quality productive forces, more advanced technologies are being applied to agricultural production, supporting the rational allocation and integrated development of rural resources and contributing to green and sustainable rural development. For instance, renewable energy technologies such as wind and solar power are introduced to meet the electricity demands of daily life and production, reducing reliance on traditional energy sources. Additionally, new media, the internet, and e-commerce platforms are utilized to market and promote distinctive agricultural products and premium tourism resources, fostering the rural tourism industry. This not only increases villagers' incomes but also upgrades rural industries[2]. Furthermore, new quality productive forces, leveraging carriers like the IoT and blockchain, can link multiple villages within the same region to create a cluster effect. This enables the complementary development of advantageous resources, which is highly beneficial for brand building and collaborative development.

2 Difficulties in digital village construction

2.1 Digital divide between urban and rural areas The deficient digital infrastructure and lagging digital industry in rural areas are the primary reasons for the digital divide between urban and rural China. This divide results in a significantly weaker capacity for rural areas to absorb digital technologies and talent compared to cities. As a result, a disparity in "digital dividends" has emerged, which constrains the digital economic transformation of the countryside and hinders the achievement of rural revitalization goals. According to the *Statistical Report on China's Internet Development*, by the end of 2023, the internet penetration rate in rural China was 60.6%, trailing the urban rate by 16.8 percentage points. In remote and economically less developed villages, the penetration of internet access and the coverage of digital facilities are even lower, posing formidable challenges to digital village construction. Under these conditions, characterized by lagging infrastructure and a shortage of specialized digital talent, the development of the rural digital industry lacks momentum. Furthermore, information technologies like big data, the IoT, and artificial intelligence exert a weak driving force on the development of modern agriculture. This has become one of the pressing issues that digital village construction urgently needs to address.

2.2 Absence of the main body of rural digital governance Rural villages possess different location conditions, economic foundations, and resource endowments. Therefore, digital village construction cannot adopt a uniform approach or mechanically replicate the experiences of others. To mitigate the various risks associated with this process, it is particularly necessary to establish sound rural governance mechanisms and clarify the responsibilities of the main actors in rural digital governance[3]. Many villages currently face the absence of a clear leading body in digital governance, which is mainly reflected in two aspects. First, the lack of a dedicated organization responsible for rural digital construction makes coordinated management and unified deployment impossible. This hinders the smooth promotion of digital information technologies in rural areas, resulting in the implementation of new technologies, equipment, and concepts falling short of expectations. Second, the absence of unified institutional standards for the development and servicing of digital agricultural infrastructure leads to uneven allocation and low utilization efficiency of digital resources. Consequently, significant disparities have emerged in the digital progress across different regions, which is detrimental to coordinated regional development.

2.3 Shortage of rural digital talents Under the dual pressures of increasing urbanization and deepening population aging, the "hollowing out" problem in rural areas is becoming increasingly severe. A shortage of young talent has become a major obstacle constraining digital village construction. First, due to weak supporting industries and limited job opportunities in rural areas, coupled with factors such as the work environment and salary levels, there is insufficient attractiveness for digital professionals. Second, young farmers lack training opportunities and effective channels to understand and learn digital technologies, preventing their transition into "new farmers". Without a talent base to provide support, various policies and plans for digital village construction issued by central and local governments struggle to be effectively implemented. Furthermore, new technologies and equipment related to digital agriculture and smart agriculture cannot be widely promoted and adopted. Therefore, determining how to address the shortage of digital professionals in rural areas has become one of the critical issues that digital village construction must resolve.

2.4 Lack of rural digital infrastructure Digital village construction is a long-term and systematic undertaking. The provision of comprehensive and accessible digital infrastructure is a critical determinant of its success. In recent years, supported by policies from governments at all levels, significant progress has been made in building digital infrastructure in rural areas. However, a gap still remains between the current level of development and the requirements for digital village construction. The absence of a sustained investment mechanism jeopardizes the funding dedicated to

digital infrastructure projects, leaving some remote villages with underdeveloped facilities. In addition, although some villages have established relatively complete digital infrastructure, inadequate maintenance and untimely updates prevent these facilities from delivering their intended value in advancing digital village construction.

3 Optimization pathways for new quality productive forces empowering digital village construction

3.1 Stimulating the endogenous power of rural industry through the integration of urban and rural industries Promoting digital village construction must bridge the urban-rural digital divide, ensuring digital technologies genuinely penetrate rural areas. It involves integrating big data, cloud computing, the IoT, blockchain, and artificial intelligence into all fields and industries of rural development. This process aims to stimulate the endogenous dynamism of digital village construction and, on the basis of liberating and developing digital productive forces, accelerate the realization of rural revitalization goals. The development of new quality productive forces creates favorable conditions for urban-rural industrial integration and plays a significant role in guiding the development of digital villages. First, by empowering digital village construction, new quality productive forces can establish a trinity (data-based, technology-supported, and platform-carried) framework for rural digital industry development. This framework helps tap into rural areas' superior and distinctive resources. Utilizing technologies like big data and cloud computing to analyze market trends and industry prospects assists rural industry leaders in making scientific decisions, providing directional reference for rural industrial development[4]. Second, new quality productive forces facilitate the transition of rural industries from a single structure to a diversified one, which is conducive to the synergistic development of multiple industries. This aids in resource integration and industrial linkage between villages and cities, as well as among different villages themselves. Consequently, it enables complementary development between urban and rural areas and across different regions, thereby activating the endogenous motivation for rural industrial development.

3.2 Implementing rural digital governance promotion action to empower rural governance modernization Giving full play to the innovation-driven role of new quality productive forces has a positive effect on modernizing rural governance systems and capacity, providing strong support for advancing the implementation of the rural revitalization strategy. Local governments should, based on the actual conditions of rural areas, promote the extension of "Internet + government services" to the villages in a manner suited to local conditions and in a step-by-step manner. This will enable rural governance to transition toward refinement and public services to develop digitally. In the aspect of rural living environment governance, the "problem photo-capturing" platform should be widely applied, encouraging villagers to use their mobile phones to photograph and upload environmental pollution phenomena and destructive behaviors around them. Utilizing new quality productive forces to collect problem clues quickly and efficiently facilitates relevant departments to carry out timely problem remediation and accountability, thereby genuinely enhancing villagers' sense of happiness while promoting the construction of rural ecological civilization. In the aspect of village affairs disclosure and supervision, the "Sunshine Village Supervision" platform should be promoted and applied. Each village must disclose and publicize information related to the management of "three resources" (assets, resources, and funds), agricultural subsidies, and rural subsistence allowances on the platform. This not only makes it convenient for villagers to exercise their right to supervision but also makes village affairs more transparent and standardized. By enhancing the level of rural digital governance, the effect of preventing minor corruption at the grassroots level is achieved.

3.3 Setting up a digital talent team to provide intellectual support for digital village construction Talent revitalization is the cornerstone of rural revitalization. To advance digital village construction, it is essential to cultivate a contingent of "new farmers" who are willing to settle in the countryside and possess strong digital literacy. Particularly in the context of continuously evolving digital technologies, building a skilled digital talent team is crucial. This team must constantly acquire, learn, and apply new technologies, ultimately transforming them into advanced productive forces that underpin digital village construction and rural revitalization. (i) Introducing digital talents through multiple channels: Local governments can collaborate with universities to encourage graduates to return to their hometowns for employment and entrepreneurship. This approach not only addresses graduate employment issues but also provides a continuous influx of digital technology professionals and tech-savvy talent for digital village construction. For these returning graduates, it is vital to assign them to professionally matched positions and offer competitive benefits. This enables them to fully utilize their expertise and contribute to digital village construction with practical actions[5]. (ii) Cultivating high-quality farmers and stimulating endogenous drive: It is necessary to provide digital skills training for young farmers in rural areas who have a basic level of education. The training should enable them to master relevant skills, such as the operation and maintenance of digital agricultural machinery and e-commerce management. By enhancing farmers' digital application capabilities, they will become the "main force" driving digital village construction.

3.4 Improving rural digital infrastructure and promoting rural digital transformation Developing comprehensive digital infrastructure is a prerequisite for accelerating the construction of the digital countryside. Generally, in recent years, governments at all levels have increased their attention and investment in rural digital infrastructure. However, to meet the demands of digital rural

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ting targeted technical adaptations and scenario-specific development work.

4 Conclusion

The vigorous development of rural e-commerce in China represents a magnificent chapter jointly authored by policy guidance, market forces, and technological advancement. From initial Internet adoption to the deepening advancement of the "Digital Commerce for Rural Revitalization" strategy, it has not only reshaped rural industrial ecosystems and consumption patterns, but has also emerged as a pivotal force driving rural revitalization and promoting common prosperity. Looking ahead, with the deep integration of new technologies like AI and the continuous improvement of infrastructure, rural e-commerce is poised to continuously break through challenges, injecting stronger momentum into the modernization of agriculture and rural areas, and ushering in a new era of coordinated urban-rural development.

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development, it is essential to establish a long-term investment mechanism to ensure its continuous updating and upgrading. Local governments should incorporate the development of rural digital infrastructure into their budgets. By guaranteeing sufficient funding, they can achieve full 5G network coverage, support the application of cutting-edge digital technologies like cloud computing and blockchain in rural areas, and foster the digital transformation of various rural sectors and industries. For instance, the promotion of a pest monitoring platform can enable dynamic tracking of the population, density, and range of farmland pests, providing technical support for farmers to understand infestation patterns and implement preemptive control measures. Additionally, building an integrated five-level e-government service platform spanning provinces, cities, counties, townships, and villages can enhance rural governance through data sharing.

4 Conclusions

In contrast to traditional productive forces, new quality productive forces can significantly enhance agricultural efficiency and reduce production costs. Moreover, by leveraging digital and intelligent technologies, they can transform agricultural production models and modernize rural governance systems. This progress in rural digital and economic development helps narrow the urban-rural gap and promotes integrated urban-rural development. However, the process of applying new quality productive forces to advance rural digital construction faces challenges, including lagging digital infrastructure and a shortage of digital professionals. Addressing these issues requires a clear understanding of the characteristics of new quality productive forces and the needs of digital village construction. Such measures as promoting urban-rural industrial integration, implementing digital governance systems, training digital professionals, and upgrading rural infrastructure should be taken. Continuously improving the level of new quality productive forces will ensure the steady advancement of digital village construction and contribute to the smooth realization of rural revitalization goals.

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