

# *Research on the Demand Survey and Implementation Path of Digital Rural Construction in Guangxi: Based on the Background of "Digital China" Construction*

Shengkai Liang<sup>1,a</sup>, Tianyue Wang<sup>2,b</sup>, Cui Zhong<sup>3,c,\*</sup>

<sup>1</sup>College of Management, Guangxi Minzu University, Nanning, 530007, China

<sup>2</sup>College of Tourism and Public Management, Guangxi Vocational Normal University, Nanning, 530007, China

<sup>3</sup>Agricultural Science and Technology Information Research Institute, Guangxi Academy of Agricultural Sciences, Nanning, 530007, China

<sup>a</sup>302730699@qq.com, <sup>b</sup>yue935600798@163.com, <sup>c</sup>578944780@qq.com

\*Corresponding author: 578944780@qq.com

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**Abstract:** The construction of digital villages is a crucial initiative aimed at bridging the digital divide between urban and rural areas and stimulating the vitality of rural economic development. Through field research, we have identified the requirements for digital village construction in Guangxi and proposed specific implementation pathways. These requirements encompass digital rural governance, rural information services, digital agriculture, agricultural product sales, logistics and warehousing, agricultural industry chain, agricultural remote sensing, and agricultural research management. Based on these demands, we put forth a concrete implementation path, which includes promoting the digital transformation of rural infrastructure, accelerating the development of "cloud," "network," and "end" facilities for agriculture and rural areas, establishing and enhancing data sharing mechanisms and digital economic governance systems, constructing China's digital rural governance system and digital economy governance system, and establishing a China-ASEAN agricultural digital economy demonstration zone.

## 1. Introduction

Digital countryside refers to rural areas that utilize the potential of the digital economy to establish a comprehensive digital system for rural production, life, ecology, and culture, thereby promoting the digital transformation across all sectors in rural areas, and accelerating intelligent agricultural practices, digital governance, and agricultural modernization. It encompasses the application of the digital economy in the economic and social development of agriculture and rural areas, as well as the inherent process of agricultural and rural modernization that enhances farmers' proficiency in modern information skills. Developing digital countryside is both a strategic direction for rural revitalization and an integral component of China's wider digitalization efforts.

In October 2019, the Guangxi Big Data Development Bureau released the Action Plan for

Accelerating Digital Rural Development in Guangxi (2019–2022). The plan recognizes the digital countryside as a crucial pillar for rural revitalization and an integral part of Guangxi's digital transformation. It emphasizes the need to promote the seamless integration of emerging technologies such as the Internet, cloud computing, big data, artificial intelligence, and other new-generation information technologies with rural economic development, fostering a new era of urban-rural integration. However, building the digital countryside is a complex endeavor, and notable challenges persist. These problems include inadequate network infrastructure, incomplete data collection and application systems, insufficient integration of digital information technology with the rural industry, and a tendency toward homogeneous construction. This study explores the digital village landscape across different regions of Guangxi, highlighting key requirements for digital village development. Its aim is to provide valuable insights for decision-making processes concerning future digital village initiatives and their deep integration with rural industries.

## 2. Literature Review

Digital rural construction has garnered significant attention from scholars, with previous literature primarily focusing on studying its current status, spatial and temporal evolution, impact on agriculture, and analysis of influencing factors. The level of digitalization in rural areas in China has been steadily increasing. However, the rate of development experienced a decline after 2020 (Cao X Z et al., 2023)<sup>[1]</sup>. Digital rural construction has often placed excessive emphasis on the application of technology in rural areas, while neglecting its significant impact on the development potential and resilience of rural communities (Young J C, 2019)<sup>[2]</sup>. While technology is undoubtedly a crucial aspect of digital rural construction, it should not overshadow the broader implications and considerations that are essential for the sustainable growth and well-being of rural communities. These include factors such as promoting economic development (Roberts E et al., 2023)<sup>[3]</sup>, promoting urban-rural integration (Wang Y F et al., 2023)<sup>[4]</sup>, fostering social inclusion, preserving local culture and traditions, strengthening community networks, and enhancing the capacity of rural residents to adapt and thrive in the digital era. By adopting a more comprehensive approach, digital rural construction can effectively harness the power of technology while ensuring the overall advancement and resilience of rural communities.

In terms of the specific mechanism of action, the construction of digital villages can unleash the development potential of rural enterprises and create new opportunities for small and medium-sized enterprises (Tiwasing P et al., 2022)<sup>[5]</sup>. This can be achieved by optimizing resource allocation, facilitating deep integration among rural sectors, fostering practical connections between urban and rural markets (Tian Y et al., 2023)<sup>[6]</sup>, and enhancing the resilience of rural communities (Rundel C T et al., 2023)<sup>[7]</sup>. Furthermore, the establishment of digital villages can promote entrepreneurship in digital economy-related industries, thereby driving high-quality rural economic development (Mei Y et al., 2023)<sup>[8]</sup>. To bridge the digital divide between urban and rural areas, it is crucial to accelerate the construction of digital villages (Lorna P et al., 2017)<sup>[9]</sup>, enhance the digital literacy and technological capacity of individual farmers (Wang, M et al., 2023)<sup>[10]</sup>.

## 3. Analysis of the Demand for Digital Rural Construction in Guangxi

Based on the current situation of poverty alleviation and industrial development in Guangxi's rural areas, as well as an analysis of the application of digital technology in agriculture and rural sectors, we have identified seven key areas of focus for Guangxi's agricultural and rural development in relation to the demand for digital rural construction.

## **3.1 Digital Governance in Rural Areas**

### **3.1.1. Digitalization Of Village Government Affairs**

To facilitate digital village affairs management, it is essential to deepen the application of Guangxi's digital government integration platform in rural areas. The implementation of "Digital e-government affairs" should be expedited to benefit the rural regions. Furthermore, there is a need to enhance the establishment of data infrastructure for village decision-making, disclosure of village affairs, village supervision, collective economy, legal system, healthcare, and convenient services. Specifically, efforts must be made to structure data related to projects aimed at improving the well-being and livelihoods of rural communities. Additionally, online registration and approval mechanisms should be established for the management of rural capital, villagers' land transfer, investment promotion, training, and employment, aiming to optimize the process of village-level operations.

Digital e-government plays a crucial role in the transformation of rural governance, shifting from traditional models to integrating information technology and big data. This transition is facilitated through the establishment of an intelligent rural government platform. By creating a government WeChat public account or developing an intelligent government app, real-time dissemination of village-level government information, online participation in "three meetings and one lesson," democratic deliberations, statistical analysis of collective economic development data, and external showcasing of achievements have become attainable functions.

### **3.1.2. The Digital Construction of Projects for the Well-Being and Prosperity of the People**

The digitization of rural employment services is crucial in leveraging the "Internet+" approach to enhance pastoral employment training, employment guidance, and related services. In this regard, the establishment of a "New Rural Digital Bookstore" is vital, as it serves as a repository for digital books covering topics such as rural policies and laws, rural public administration and social development, rural economic growth and business management, practical rural science and technology, skills training, traditional Chinese culture and ethics, folk customs and traditions, outstanding literary works and biographies, rural healthcare and medical services. By making these digital books accessible, farmers can read and study them from the comfort of their homes. Furthermore, the development of online registration systems for employment, recruitment, and matching services has simplified the process for villagers in selecting suitable job opportunities while facilitating nearby township enterprises in recruiting local workers.

The digitalization of science, education, culture, and health public services in rural areas is being actively pursued. By adopting a county-based approach, efforts are being made to promote the digitization of grassroots science, education, culture, and health institutions, thereby achieving the digital transformation of public services at the grassroots level. One key aspect of this endeavor is the integration of county and township library resources, leading to the establishment of village-level digital libraries. These digital libraries enable the sharing of public digital book resources and provide villagers with a range of online services such as reading materials, training programs, and recreational activities like online chess and card games. By enriching the daily lives of villagers and enhancing their overall happiness index, these initiatives contribute to the well-being of rural communities.

The digitization of rural land management is a pivotal step towards efficient and transparent processes. By leveraging information technology, establish the "Digital Rural Land Property Rights Trading and Management Center" and create a comprehensive "one map" big data platform for rural land. This platform provides valuable statistics on crucial land information, including soil composition, area, location, and ownership. The center aims to solve the challenges related to remote

land transactions and management by implementing online land supply and demand registration, electronic contracts, and rights registration.

## **3.2 Rural Information Services**

### **3.2.1 Project for Information Dissemination from Villages to Households**

The government must continue its efforts in promoting the expansion of information access to villages and households, including enhancing the infrastructure of village-level information stations and improving the overall capabilities of information stations at all levels. It is crucial to integrate the service resources of the Guangxi Beneficial Agricultural Information Society and broaden the functionalities of the Guangxi Beneficial Agricultural Information Platform. These enhancements should primarily focus on bolstering e-commerce services, brand promotion, and project implementation. By leveraging the concept of the digital economy, the government and relevant departments aim to establish a scientifically designed, reasonable, and practical ecosystem of information services that cater to the needs of farmers in Guangxi.

### **3.2.2 Rural E-Commerce**

The government should expedite the integration and fusion of big data with the real economy. Moreover, efforts should be made to nurture and integrate the rural e-commerce industry. A digital "one map" of Guangxi's agricultural product production and marketing should be developed. This entails leveraging technologies such as big data, intelligent Internet of Things (IoT), and others to facilitate efficient and flexible allocation of resource elements, enabling seamless flow within the agricultural sector. This approach will cater to the application needs of users, allowing them to swiftly and accurately search for information pertaining to sources, orders, distribution, warehousing, refrigeration, and preservation of fresh produce.

### **3.2.3 Training on Agricultural and Rural Science and Technology**

The agricultural technology extension departments should strive to innovate the training mode for agricultural and rural science and technology. A digital Guangxi Rural Revitalization Training School should be established. It is essential to integrate social resources to encourage participation from various enterprises, associations, science and technology specialists, and other institutions or individuals in Guangxi's digital agricultural and rural training system. Additionally, the Agricultural Radio and Television School should establish and enhance both online and offline training performance appraisal mechanisms. This will create a win-win situation where farmers are satisfied and teachers benefit, effectively motivating science and technology workers to impart their skills, teach, and foster an environment of innovation.

## **3.3 Digital Agriculture**

### **3.3.1 Digital Transformation in Crop Farming**

The Guangxi Crop Farming Administrations should actively promote the development of an agricultural monitoring, precise management, and industrial big data platform for the planting industry. Government departments must allocate funds for the construction of Guangxi's agricultural big data platform. This platform should integrate technologies such as satellite remote sensing, drones, Beidou, and big data to enhance the functionality of the agricultural information management system for the planting industry. Priority should be given to improving the timeliness of agricultural

information and updating Guangxi's database with information on the monitoring of major crop pests and diseases. By focusing on Guangxi's "10+3" industries and locally advantageous sectors, it is possible to establish a precise management system for planting bases which facilitates water and fertilizer integration, remote intelligent monitoring, scientific soil testing, formula fertilization, automatic positioning and identification of planting plots, traceability of agricultural product quality, and e-commerce in planting bases. Emphasis is placed on enhancing the digital infrastructure for key planting industries in Guangxi, such as sugarcane, citrus, passion fruit, dragon fruit, mulberry silkworms, and woody oil crops. This includes improving agricultural input traceability, seedling traceability, soil testing, registration of "three products and one label," trademark registration, and other related areas.

### **3.3.2 Digital Transformation in the Animal Husbandry Industry**

The Guangxi Animal Husbandry Administrations should actively promote the development of an intelligent animal husbandry and big data platform for the industry. They should encourage production enterprises to adopt IoT technology to intelligently monitor the physical conditions of pigs, cattle and other animals in farms, which will improve the ability of enterprises to prevent and control animal diseases, reduce the risk of large-scale epidemics, and improve breeding efficiency. The animal husbandry administrations should also facilitate the construction of an informatization system for animal husbandry and veterinary services in Guangxi, including expanding the scope of data collection from farms, implementing comprehensive management through a unified mapping system, and strengthening horizontal collaboration and vertical information interconnection within the animal husbandry industry.

### **3.3.3 Digital Transformation in the Fishery Industry**

The Guangxi Fishery Industry Administrations should actively promote the gradual adoption of mechanized, automated, intelligent, and digital technologies in aquaculture enterprises. These technologies can be applied in various aspects, including environmental monitoring, automatic fish feeders, aquaculture disease monitoring and warning systems, control of circulating water equipment, and remote monitoring of deep-water networks. In addition, the government should establish a comprehensive big data platform for fishery production, utilizing remote sensing technology to conduct an environmental assessment of fishery resources and spatial monitoring of aquaculture waters. They should also develop a digital fishery production and marketing platform, leveraging big data and Internet of Things technology to enable online supply and marketing of fishery products within the region.

### **3.3.4 Digital Transformation in the Seed Industry**

The Guangxi Seed Industry Administrations should promote the digitalization of the seed industry across scientific research institutions, large-scale breeding enterprises, regional experiment stations for crop varieties, and seed stations. By implementing digital applications, the management efficiency and market core competitiveness of breeding units can be improved. The government's seed management organization should establish a big data platform for resource-sharing services in Guangxi's seed industry. This platform aims to promote the utilization and development of advantageous, excellent, and newly validated varieties, thereby fostering the high-quality development of both the seed industry and agriculture sector. Additionally, multimedia, AI, holographic images, and other technologies should be utilized to establish digital growth models for different varieties, enabling dynamic visualization of their growth patterns. The government should also develop an intelligent terminal app that provides comprehensive one-stop services, including



seed industry data, technology, service, policy, and legal information for multiple stakeholders in the seed industry.

### **3.3.5 Digital Transformation in Agricultural Machinery**

The Guangxi Agricultural Machinery Administrations should continue to enhance the mechanization of the sugarcane and rice industries, particularly focusing on the development of machinery for cutting sugarcane in mountainous areas. To achieve the goals of "reducing labor" and "increasing efficiency," enterprises will receive subsidies to strengthen the development of intelligent agricultural machinery and equipment, particularly for labor-intensive industries such as fruit trees and vegetables. Furthermore, the application of plant protection drones should be promoted across industries including sugarcane, fruit trees, woodlands, and rice production. The agricultural advocacy departments should establish county- and township-level agricultural machinery service public platforms, ensuring transparent pricing for agrarian machinery services. Additionally, small farmers should have access to quick and nearby services such as substitute plowing and planting, as well as comprehensive one-stop services integrating "full mechanization + comprehensive agricultural affairs."

### **3.3.6 Digital Transformation in the State Farms Group**

The Guangxi State Farms Group encompasses a vast cultivation area with numerous large-scale enterprises. In the era of big data, the primary focus is on addressing the digital transformation of both the production and operation in the reclamation area and the administrative processes within the group. The digital transformation of reclamation production and operation primarily involves two aspects. Firstly, it focuses on intelligent production in the reclamation area. Secondly, it emphasizes the digital application of production and marketing in the reclamation area. As for the administrative digital transformation of the group, the primary focus is on integrating the group's agricultural, technical, human, and project resources into digital platforms. This entails establishing a big data platform for farming resources within the Reclamation Group, utilizing remote sensing technology, and creating a digital map of the reclamation area. Additionally, a big data platform should be set up for the administrative management of the Reclamation Group.

## **3.4 Logistics and Warehousing in the Agricultural Product Industry**

The government should persist in expanding the construction of logistics and warehousing infrastructure at both the county and township levels. Priority should be given to cities and counties that host agricultural characteristic advantage zones, agricultural industrial parks, and agricultural science and technology parks at the autonomous region level or higher. It is critical to encourage leading enterprises to establish a comprehensive Guangxi agricultural products logistics and warehousing big data platform, which should effectively collect real-time data from all registered cold storage and logistics facilities. By leveraging the capabilities of the Big Data Platform, online ordering, dynamic monitoring, access management, vehicle tracking, and product traceability can be seamlessly integrated into the logistics and warehousing operations.

## **3.5 Digital Transformation of the Agricultural Industry Chain**

The government should actively promote the development of a comprehensive industry chain digitization focused on Guangxi's distinctive single-species agricultural products, which requires subsidies for rural enterprises to establish digital application systems covering different aspects of production, operation, management, sales, logistics, and distribution. These are all produced around

a single product. Furthermore, enterprises should be encouraged to integrate digital economy concepts and technologies throughout the entire lifecycle of the single-product, from planning, seedling cultivation, production, harvesting, processing, transportation, e-commerce, warehousing, to brand establishment, as well as other aspects related to big data management and services for single products. The primary objective is to establish a robust big data platform that covers the entire industry chain of single products such as sugarcane, rice, edible fungi, citrus fruits, pigs, cattle, and poultry.

### **3.6 Digital Transformation of Agricultural Remote Sensing**

To cater to the requirements of regional agricultural industry planning, park development, and other relevant aspects, the government should consider integrating existing resources and establishing a comprehensive big data platform for Guangxi's regional agricultural planning. This platform should encompass an agrarian policy database, a planning retrieval database, and a visual "map" showcasing the distribution of agricultural industry resources. Its primary objective is to fulfill the basic needs of planners by providing them with access to essential texts and data.

### **3.7 Digital Transformation of Agricultural Scientific Research Management**

Scientific research management plays a crucial role in agricultural research, directly influencing the progress, achievements, funding utilization, and benefits of scientific research units. Considering the relatively limited level of informatization in Guangxi's agricultural research institutions, it is imperative to implement a phased approach towards promoting their digital transformation. The primary focus should be on achieving an excellent digitization of seed industry resources and ensuring comprehensive management of scientific research resources, including talent, research equipment, papers, new varieties, new technologies, and patent achievements. Agricultural research institutions should actively establish scientific research information sharing systems and interdisciplinary academic exchange platforms to realize digital management of project declaration, project establishment and implementation.

## **4. Optimizing the Implementation Path of Digital Village Construction**

### **4.1 Promoting the Digital Transformation of Rural Infrastructure**

The government should actively coordinate and promote the synergistic integration of information and communication networks, essential broadcasting and television networks, as well as public infrastructure such as roads, electricity, and cold chain logistics. Moreover, it should prioritize and expedite the development of rural broadband communication networks, mobile internet services, digital television networks, and next-generation internet technologies. These initiatives aim to provide vital foundations support for the digital transformation of rural industries.

### **4.2 Accelerating the Construction of Agricultural and Rural "Cloud," "Network," and "End" Facilities**

The government should actively promote the development of information terminals, technical products, and mobile internet applications (apps) tailored to the specific needs and characteristics of rural industries. It should also encourage research, development, and application of audio and video technologies in ethnic languages, while expediting the construction of "cloud," "network," and "end" facilities in agricultural and rural areas. The agricultural administration should establish an integrated three-dimensional monitoring and sensing network, leveraging satellites, drones, and IoT data

collection equipment to achieve precise access to agricultural information such as farmland hydrology, soil conditions, meteorological data, pests, crop management, yield, growth patterns, and other relevant data. Additionally, focus should be placed on intelligent detection and construction of the information supervision platform that enables real-time analysis of agrarian information, supporting decision-making and early warning systems.

#### **4.3 Establishing a Robust Data-Sharing Mechanism and Digital Economy Governance System**

The government should explore the establishment of a standardized system for the digital development of rural industries and promote the creation of shared and applicable common data. The information management department should establish an information exchange and sharing mechanism specific to the rural industry. This mechanism should integrate various digital technology applications and management data systems, enabling seamless connections between different aspects of production, management, and trading within the rural industry. Furthermore, it should facilitate the integration and consolidation of data resources in the rural industry, allowing for synergistic collaboration and open sharing of data. Universities and agricultural administrations in Guangxi should establish a long-term cooperation mechanism between industry, academia, and research. They should also provide guidance to research institutions, colleges, universities, and enterprises to engage in the research, development, and application of critical technologies in digital agriculture, which will promote extensive participation from scientific and technological personnel as well as various sectors of society.

#### **4.4 Construction of the China-ASEAN Agricultural Digital Economy Demonstration Zone**

The government should encourage information technology enterprises to prioritize cloud computing, big data, AI, and e-SIM technology breakthroughs, with the ultimate goal of promoting innovation and cooperation in the digital economy between China and ASEAN countries, especially in the field of agriculture, which includes attracting innovation Resources, elements, products, technologies and talents to support the research on key technologies related to ASEAN Internet + smart agriculture. The focus should be on developing repeatable and scalable products and services. Guangxi province should lead in establishing at least two ASEAN agricultural digital economy demonstration zones. Additionally, there is a requirement to explore the creation of data channels for the Internet of People and the Internet of Things between China and ASEAN, ultimately facilitating the implementation of digital economy industries and promoting innovation cooperation between China and ASEAN.

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