



Digital Technology and E-commerce in the Process of Rural Zhengxing and Promoting the Construction of a Strong Economy under Rural Revitalization Strategy of China

Wenbo Zhu*

Staten Island Academy, New York City, 10305, USA

*bobzhu567@gmail.com

Abstract. The rural sectors of China have historically encountered economic constraints due to outdated agricultural practices, insufficient market linkages, and underdeveloped infrastructure. Rural Zhengxing or rural transformation has since gained eminent weight as part of the national Rural Revitalization Strategy targeting to modernize the rural economies and lift local livelihoods by 2050. This article investigates how digital technology and e-commerce platforms have become critical in powering the development of rural Zhengxing and how it affects agricultural activities, market integration and provides job opportunities. The use of a thorough literature review and of the case study analysis of the work enables the focus on how digital tools optimize the production environment, improve the supply chains, and enable the rural entrepreneurship. Empirical evidence regarding rural income growth and industrial upgrading demonstrates that digital integration facilitates industrial transformation and income enhancement; however, persistent challenges remain, including inadequate digital literacy and deficient rural digital infrastructure. Policy recommendations on how to achieve a digital innovation-driven but equitable and sustainable rural economic development are also presented at the end of the study.

Keywords: Zhengxing County, Digital Technology, E-commerce, Rural Economy, Rural Revitalization Project

1 Introduction

The rapid urbanization in China over the past decades, particularly since the 1990s, has exacerbated a significant urban-rural gap, which has given rise to an unequal division whereby economic growth and social development have varying degrees in different regions across the country. The normal situation in rural sector has been characterized by low efficiency agriculture, which has had a series of issues as lack of accessibility to markets, the farming technique has proved to be ageing and the labor force has declined because most have migrated to urban areas ^[1]. Being aware of such

issues, the Chinese government has introduced the Rural Revitalization Strategy (RRS) in 2017 with the aim of transforming the Chinese countryside into vibrant economies, sustainable ecology, and healthy societies by 2050 [2].

Another essential element of rural modernization based on Rural Zhengxing is a process of thoroughgoing reform involving industry restructure, construction of infrastructure and social-economic progress. E-commerce and digital technology have come to represent a revolutionary aspect in this context, enabling rural populations to break geographic and information barriers that historically hindered development [3]. Although the potential of the digital economy has been studied by more scholars, with discussions concerning how digital tools could promote rural Zhengxing and the micro-level implications, the exact process behind how digital tools could achieve that is still worth researching.

This paper fills this gap considering the role that digital technology and the e-commerce platform [4] play to enhance the rural economy and Zhengxing under the RRS. It uses literature review of scholarly articles, government reports, and case applications to develop a homogenous knowledge of digital empowerment in rural settings. The general direction in which the paper can be of insight in this matter is to inform policy makers and practitioners interested in harnessing digital innovation as the driver of inclusive rural development.

Digital technology is vital for rural revitalization and economic development, since the usage of such instruments as mobile internet, digital payment system and online training platform enable farmers to increase productivity and to connect with more markets. E-commerce sites improve market access for rural producers, enabling them to sell their products outside of their immediate locale and opening doors to additional income streams and more reliable marketing, logistics, and customer contacts. But there are still challenges in rural digitalization, including digital literacy divides, inconsistent infrastructure quality, and limited access to cutting-edge technologies for small-scale farmers. Strong policy actions are required to support the sustainable digital integration, such as investing in rural broadband, offering training programs; incentivizing digital entrepreneurship while simultaneously establishing arrangements that regard technology access for all rural communities.

This study adopts a qualitative research approach, encompassing a systematic literature review of both Chinese and English literatures, as well as in-depth case study analysis of the case studies of the most representative digital projects of the country, including Taobao Villages and smart agriculture, among others.

2 Overview of Rural Areas in China

Rural revitalization (*nongcun zhenxing*), as a complex transformative process, aims to restructure the agricultural economy into a highly diversified and market-driven system at its core, coupled with industrial, infrastructural and social development [5]. It forms the basis of one of the more ambitious plans in the history of China, the Rural Revitalization Strategy (RRS), which aims to coordinate efforts through the economic, environmental, and social fronts to accomplish sustainable rural

development over the next three decades. The transformation is necessary to help deal with the ongoing urban to rural disunity and to enhance the even development of the country.

The industrial restructuring dimension of rural revitalization focuses on diversifying rural economies by shifting from subsistence agriculture to value-added sectors^[6]. This shift will involve the growth of rural manufacturing industries, agriculture industries as well as facilitation of service industries such as rural tourism and online services. Zhengxing aspires to diversify rural economies to achieve the multiple sources of income, fewer risks to agricultural shocks, and generate an economic resilience in the rural area.

Improvement of infrastructure is crucial in enhancing rural transformation. This entails improved transportation infrastructure to move goods, increased access to clean water and energy, as well as more importantly, digital connectivity via internet based broadband and mobile networks. Such infrastructure serves as the backbone for facilitating efficient industrial operations, enhancing community accessibility, and driving wealth creation in rural areas.

These economic/infrastructural changes are accompanied in part by social development activities that upgrade rural health, education, and cultural amenities. The gains are meant to hold on to residents in the rural areas, and this includes the young people who may take on to seek better opportunities in the cities ^[7]. Accordingly, education and skills training are particularly indispensable for enabling rural inhabitants to participate in modernized economic activities—including those empowered by digital technologies.

It is a holistic partnership that is required in the effort of reducing the income disparities between the urban and rural communities. This approach aims to foster self-supporting rural economies that can receive and maintain human capital that is vital to the long-term development. Moreover, rural transformation constitutes not only the economic necessity but national food security and ecologic sustainability, so that modernization of agriculture should correspond to the objectives of protecting the ecology.

3 Preparing Rural Transformation a Digital Twilight

Digital technology has emerged as a pivotal driver of rural revitalization, alleviating long-standing bottlenecks in production efficiency, market accessibility, and governance at both local and national levels ^[8]. Through the Internet of Things (IoT) devices and drones, big data analytics and artificial intelligence, smart agriculture makes it possible to monitor and manage crops and livestock precisely. An example is the use of soil moisture sensors to plan an effective irrigation process and save on water maintenance, as well as maximizing the crop produce. On the same note, drones are able to notice pest outbreaks or nutrient shortages early enough and avert potential disasters through timely interventions. Such technological advancement minimizes wastage of the input, increases production and decreases environmental pollution and makes agriculture more sustainable.

Hi-tech agriculture integrating satellite imagery and ground-level sensor data is able to enable smallholder farmers to base decisions on their specific plots of land on data. This method further enhances the efficiency of the usage of fertilizer and pesticides, and better management of crops, particularly relevant in the smallholdings type of the farming systems of rural China. Precision farming can directly help the inhabitants of the rural households to come out of poverty and in this way, help Zhengxing to achieve sustainability.

The growth in digital infrastructure has been a great contributor to the rise in digital access, especially rural broadband and mobile internet connectivity. Such connectivity enables farmers to access real-time weather forecasts, market price updates, and agricultural guidance through smartphone applications. Access to such information lessens the information asymmetry that has always resulted in disadvantaging the rural producers since they are now better positioned to make their production and marketing decisions. Moreover, the digital techniques allow farmers, extension personnel, and agricultural specialists to share the knowledge to have a more aware rural population(as shown in Figure 1).

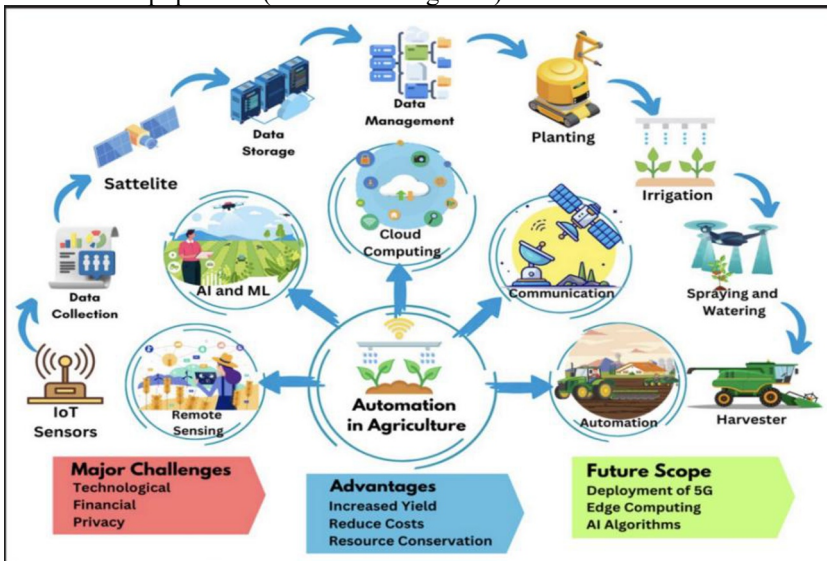


Fig. 1. Automation in Agriculture

The diagram represents the concept of modern farming, with the use of automated machinery in today's agriculture. It represents a full cycle that a farmer can use to collect data with sensors to plant, irrigate, spray and harvest enabled by tools such as Cloud, Internet of Things, Artificial Intelligence, Machine Learning, Satellite, Remote Sensing. The graph also brings out the benefit of digital farming in terms of the higher output of crops, lower expenditure, and enhanced efficiency related to water. It discusses major challenges such as technological limitations, financial barriers, and privacy concerns, as well as emerging concepts including 5G networks, edge computing, and more advanced AI algorithms.

4 The Driving Factor of Rural Economic Development is E-commerce

E-commerce has emerged as a transformative force in rural economic development, overcoming the traditional disconnect between producers and consumers, which previously allowed intermediaries to capture a disproportionate share of farmers' profits [9]. A prominent example is the emergence of "Taobao Villages", the rural populations where a substantial amount of the locals are involved in online retail and deal with the local products (handicrafts, farm produce, regional delicacies). Such villages exploit e-commerce establishment of brand recognition and economies of scale to bring about industrial clusters that create a competitive advantage.

This type of digital clusters has the advantage of increased bargaining power at both national and even international levels. In addition, livestreaming e-commerce has been one of the latest trendy marketing tools, and it can be used by the rural producers to show the quality of their products, as well as tell true stories and establish strong connections between themselves and the buyers. The interactive marketing approach reaches especially well among younger city consumers building up loyal base of customers and increasing the sales.

Rural e-commerce has also created non-agricultural employment opportunities. Jobs in logistics, packaging, digital marketing, and customer service have been generated, providing alternative career paths for rural youth and curbing rural-to-urban migration [10]. Rural employment diversification helps to achieve social stability and economic vibrancy at the local level.

In addition, e-commerce has been linked to increased incomes for rural households. By accessing broader and higher-value markets, farmers can achieve better prices for their products, reducing dependency on local intermediaries and middlemen who often take disproportionate shares of profits (as shown in Table 1).

Table 1. Comparative Analysis of Rural Employment Contributions Pre- and Post-E-commerce Development

Employment Sector	Pre-Digital Integration	Post-Digital Integration
Traditional Agriculture	85–90% of total rural employment	50–60% of total rural employment
E-commerce Logistics	< 1%	15–20%
Digital Marketing & Sales	< 1%	10–15%
New Rural Industries	5–10% (e.g., small-scale manufacturing, local tourism)	10–15% (e.g., skilled services, value-added processing)
E-commerce Logistics	< 1%	15–20%
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5 Issues of Digital-enabled Rural Development

Even though the potential of digital technology and e-commerce to promote rural development is tremendous, several challenges still exist, restraining the potential of the technology and the possibilities to reach people equally.

Fig 1 The digital divide ranks among the most pressing challenges, encompassing disparities in internet accessibility and digital resource availability across regions and demographic groups. The efficiency to take part in the digital species is poor, and the elderly farmers, along with low-income residents cannot find the required skills or tools to engage effectively in the digital sphere, which causes a negative impact on the ability to use digital economic opportunities. This gap will only worsen existing disparities unless special provisions are instituted to offer inclusive digital learning and facilities.

E-commerce penetration is also slow in remote rural places due to difficulties in logistics, in particular the last-mile issue. Transport of goods to remote villages and to inaccessible areas (mountainous areas, etc.) is characterized by high costs and operational inefficiencies, which tends to either delay the commission, or raise the prices. The solution to this problem lies in improving the extent to which logistics is carried out in rural areas due to the existence of innovative solutions that would take into account the peculiarities of the geography and the infrastructure of the area.

Governance mechanisms and regulatory systems on the digital commerce are in the process of development. Inadequate consumer protection regulations, sluggish oversight of internet fraud, and insufficient data privacy safeguards have eroded trust in digital marketplaces. Unless more firm legal protection and enforcement are put in place, the rural citizens will not feel completely comfortable taking part in e-commerce channels.

Also, there is the deficit in infrastructures, and a number of rural locations are influenced by deficient electro supplies, flawed mobile network coverage, etc., thus the user accessibility to digital services is limited and stable. These are the problems which require unified policy efforts and investment on the development of resilient and rural digital infrastructure.

In order to make the process of digital-enabled rural transformation sustainable and inclusive, and, therefore, successful consistently within the Rural Revitalization Strategy, the following main policy steps are required:

Infrastructure Investment: The government and the private business need to be keen on the process of rolling out broadband and mobile internet connectivity to some underserved rural areas due to transmission and stability issues of connecting digital access in every part of the rural world. This is the key step to the release of the potential of digital agriculture and e-Commerce.

Digital Literacy Programs: Specific education and training programs would also be important to impart skills on rural citizens to work their way around digital platforms. Programs should be tailored to diverse age groups and literacy levels, with special focus on vulnerable populations — including elderly farmers and low-income communities—who are at high risk of digital exclusion.

Logistics Innovation: Public-private partnership is necessary to develop the effective and cost-efficient last-mile delivery systems. The use of innovative solutions such as drone delivery and local distribution centres, as well as cooperation-based logistics will make it possible to cut down expenditures and enhance the quality of services in undulating rural territories.

Regulatory Framework: The lawmakers should enhance the provision of law protecting data privacy, consumer protections, and anti-fraud provisions to instill confidence in digital market environments. Accessible, enforceable, and adaptive regulatory policies will not only support the healthy development of rural e-commerce but also safeguard the legitimate interests of rural entrepreneurs and consumers.

Financial Inclusion: It is critical to increase access to digital financial services such as mobile payment and microcredit to enable rural entrepreneurs and farmers to become full members of being involved in a digital economy. Financial inclusion lowers entry barriers for rural businesses, stimulates innovation, and facilitates the integration of rural economies into broader digital value chains.

These aligned initiatives will enable the digital technology and e-commerce to guide the rural development to be inclusive, equitable, and resilient and in line with the rural Zhengxing objectives.

6 Conclusion

Rural Revitalization Strategy in China gives a clear roadmap to revoke the countryside economy via industrializing, infrastructural improvement, as well as socialising. This study underscores that digital technology and e-commerce serve as pivotal growth drivers propelling rural revitalization, as they effectively boost agricultural productivity, expand market access, and diversify employment channels.

Digital agriculture is an opportunity to practice precision farming techniques, which increase yields and sustainability, and e-commerce systems can give rural producers direct access to wider markets and create new jobs outside agriculture. Although these have been realized, issues like the digital divide, infrastructural deficiencies and changing regulatory regimes constrain the potential of the digital rural transformation.

To eliminate such concerns, it is necessary to attract effective policy assistance that is aimed at developing infrastructure, boosting digital literacy, enhancing logistics, reinforcing regulatory frameworks, and financial inclusion. Quantitative assessment of the effects of digital technology on rural incomes and rural livelihoods and regionally specific best practices that may be scaled by digital rural transformation also need to be studied in detail in future work, through methods such as econometric analysis and large-scale surveys.

By prioritizing digital inclusion and technological innovation, China can accelerate the modernization of rural areas, narrow the urban-rural development gap, and ultimately fulfill the balanced and sustainable development outlined in the Rural Revitalization Strategy.

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