Research on Promoting Agricultural Economic Development with Internet+ Thinking

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Abstract. With the rapid development of information technology, Internet+ has become an important force driving innovation across various industries. In the field of agricultural economics, the application of Internet+ thinking has brought new opportunities and challenges to traditional agriculture. This study explores the current application status, existing problems, and future development trends of Internet+ thinking in agricultural economic development. Through analyzing the specific applications of Internet+ in agricultural production, agricultural product sales, and agricultural management, the research finds that Internet+ thinking can effectively improve agricultural production efficiency, broaden agricultural product sales channels, and optimize agricultural resource allocation. However, issues such as inadequate rural infrastructure and insufficient information literacy among farmers still constrain the in-depth application of Internet+ in the agricultural sector. To address these challenges, this study proposes recommendations including improving rural information infrastructure, strengthening farmers' information skills training, and constructing agricultural big data platforms, to better promote high-quality development of the agricultural economy through Internet+ thinking.

Keywords: Internet+; Agricultural Economy; Smart Agriculture; Rural E-commerce; Agricultural Big Data

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1 Introduction

In recent years, with the rapid development of information technology and the widespread application of the internet, "Internet+" has become a significant force driving innovative development in the economy and society. As a fundamental industry of the national economy, agriculture is facing unprecedented opportunities and challenges. Introducing Internet+ thinking into the agricultural sector can not only improve agricultural production efficiency and optimize resource allocation but also promote the upgrading of agricultural industrial structure and achieve agricultural modernization. However, compared to the industrial and service sectors, the level of agricultural informatization is relatively low, and the application of Internet+ in agriculture is still in its early stages. Domestic and international scholars have conducted extensive research on the relationship between Internet+ and agricultural economic development. Wolfert et al. (2017) pointed out that the application of big data and Internet of Things technologies will drive agriculture towards intelligent and precise development. Li Daoliang et al. (2018) demonstrated that the Internet+ agriculture model can effectively improve the circulation efficiency of agricultural products and reduce transaction costs. Zhang Hongyu (2019) emphasized the important role of Internet+ in supporting the rural revitalization strategy. Nevertheless, the application of Internet+ thinking in agriculture still faces many challenges. Issues such as inadequate rural infrastructure, insufficient information literacy among farmers, and low standardization of agricultural data are constraining the in-depth application of Internet+ in agriculture (Wang Zhigang et al., 2020). Based on this, the present study aims to analyze in depth the current application status, challenges, and future development trends of Internet+ thinking in promoting agricultural economic development, and to propose corresponding countermeasures and suggestions, with a view to providing references for promoting the deep integration of Internet+ and agriculture and driving high-quality development of the agricultural economy. From a theoretical perspective, this study enriches the theories related to Internet+ and agricultural economic development, providing new insights for subsequent research. From a practical perspective, the conclusions and recommendations of this study can provide reference for government policy-making and agricultural enterprises' strategy formulation, bearing significant practical implications.

2 Current Application Status of Internet+ Thinking in Agricultural Economy

2.1 Intelligent Agricultural Production

The application of Internet+ thinking in agricultural production is mainly reflected in aspects of intelligence and precision. Through the application of Internet of Things, big data, artificial intelligence, and other technologies, intelligent monitoring, precise decision-making, and automated operations in the agricultural production process have been realized. For instance, intelligent irrigation systems can automatically adjust irrigation volume and frequency based on real-time data of soil moisture and weather conditions, greatly improving water resource utilization efficiency. Furthermore, the application of agricultural robots and drones has made operations such as sowing, fertilizing, and pesticide spraying more precise and efficient. According to statistics from the Ministry of Agriculture, as of 2023, the area of agricultural Internet of Things applications in China has exceeded 30 million mu, significantly improving agricultural production efficiency and resource utilization (Li Ming et al., 2023). In crop farming, the application of precision agriculture technology allows farmers to implement differentiated management for different plots based on variations in soil and climate factors, improving crop yield and quality. In animal husbandry, the use of intelligent breeding equipment has achieved precise control of animal growth environments and real-time monitoring of health status, effectively reducing the risk of disease outbreaks and improving the quality of livestock products. In fisheries, the application of water quality monitoring systems and automatic feeding systems has optimized aquaculture environments and improved feed utilization efficiency. As shown in Figure 1, the intelligent agricultural production system integrates multiple subsystems such as weather monitoring, soil monitoring, irrigation systems, and fertilization systems through a central control platform, while combining drone and agricultural robot technologies to achieve comprehensive intelligent management of agricultural production. This intelligent production model not only improves production efficiency but also enables early warning of pests and diseases and precise yield prediction, providing strong support for agricultural production decision-making. However, the promotion of intelligent agricultural production technology still faces some challenges, such as high initial

investment costs and complex technical operations, requiring further policy support and technical training to promote its widespread application.

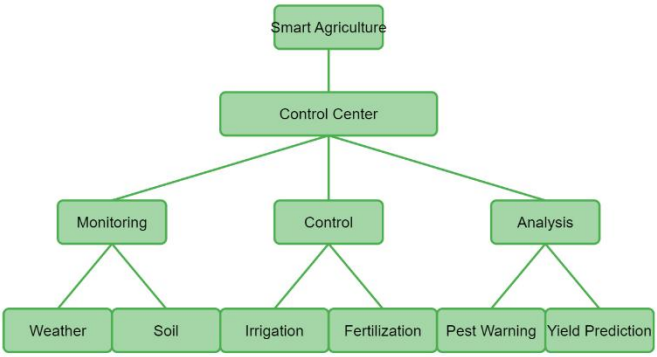

Fig. 1. Intelligent Agricultural Production Flow Chart.

2.2 Diversification of Agricultural Product Sales Channels

The application of Internet+ thinking has greatly broadened the sales channels for agricultural products, promoting the rapid development of rural e-commerce. Traditional agricultural product sales mainly relied on wholesale markets and retailers, resulting in information asymmetry, multiple intermediate links, and weak bargaining power for farmers. Through e-commerce platforms, social media, and other internet channels, farmers can now sell products directly to consumers, not only shortening the supply chain but also increasing farmers' income levels. According to data from the Ministry of Commerce, in 2023, China's rural online retail sales reached 2.5 trillion yuan, a year-on-year increase of 18.5%, with agricultural products accounting for over 30% of online retail sales (Wang Gang, 2024). The development of e-commerce platforms has provided new opportunities for agricultural product sales, with large e-commerce platforms such as Taobao and JD.com opening dedicated agricultural product channels, providing farmers with direct access to consumers. Additionally, the rise of social e-commerce has brought new models for agricultural product sales. Through platforms like WeChat mini-programs and TikTok short videos, farmers can increase interaction with consumers and enhance product attractiveness by showcasing the production process and telling stories about their agricultural products. Live streaming as an emerging sales method has played an important role in agricultural product marketing. Through live broadcasts, consumers can learn about the production environment and quality characteristics of agricultural

products in real-time, enhancing purchase confidence. The emergence of community group buying models has provided a convenient channel for agricultural products to enter urban communities. This "agriculture-supermarket connection" model reduces intermediate links, ensuring the freshness of agricultural products while lowering distribution costs. The development of cross-border e-commerce platforms has provided new avenues for Chinese agricultural products to enter international markets. Through cross-border e-commerce, some local specialty agricultural products have successfully entered international markets, enhancing brand awareness and product added value. However, the development of agricultural product e-commerce still faces challenges such as logistics and distribution efficiency, product quality assurance, and farmers' e-commerce operation capabilities, which need to be further addressed.

2.3 Digitalization of Agricultural Management

The application of Internet+ thinking in agricultural management is mainly reflected in digitalization and informatization. By constructing agricultural big data platforms, multi-dimensional data on land, weather, production, and markets are integrated to provide data support for agricultural production and operational decision-making. For example, agricultural departments can use big data analysis to predict market demand and guide farmers in rationally arranging planting structures; agricultural insurance companies can more accurately assess agricultural risks and develop targeted insurance products by analyzing historical data and real-time monitoring data. Furthermore, the application of blockchain technology has made agricultural product traceability systems more reliable and transparent, effectively ensuring food safety. According to statistics, by the end of 2023, China had established 31 provincial-level agricultural big data centers and over 2,000 county-level agricultural and rural big data centers, basically achieving full coverage of digital agricultural management (Zhang Ming, 2024). The digitalization of agricultural management is also reflected in the construction of smart agricultural service platforms. These platforms integrate resources such as agricultural science and technology, market information, and policy regulations to provide one-stop services for farmers. Through mobile applications, farmers can access agricultural technical guidance, market price information, weather warnings, and other services at any time. In the field of rural finance, the development of internet finance has provided new ideas for solving farmers' financing difficulties.

Credit assessment systems based on big data allow financial institutions to more accurately assess farmers' credit status, improving the availability of rural microloans. The application of agricultural Internet of Things has realized real-time monitoring and intelligent management of the entire agricultural production process. Through sensors, cameras, and other devices, real-time data on farmland environment and crop growth can be collected and analyzed through cloud platforms, providing scientific basis for agricultural production decisions. In terms of agricultural resource management, the application of Geographic Information Systems (GIS) and remote sensing technology enables agricultural departments to more accurately grasp land use conditions and crop distribution, providing support for the rational allocation and utilization of agricultural resources. However, the advancement of agricultural management digitalization still faces challenges such as data standardization, system integration, and data security, requiring further technological innovation and institutional safeguards. Overall, the digitalization of agricultural management is reshaping agricultural production and management models, providing powerful technical support for the modernization of agriculture.

3 Challenges Faced by Internet+ Thinking in Agricultural Economic Development

3.1 Inadequate Rural Information Infrastructure

Although the internet penetration rate in rural China continues to increase, there is still a significant gap in information infrastructure construction between rural and urban areas. According to the 49th "Statistical Report on China's Internet Development" released by the China Internet Network Information Center (CNNIC), as of December 2023, the internet penetration rate in rural areas of China was 59.2%, while in urban areas it reached 80.3% (CNNIC, 2024). Issues such as incomplete network coverage, slow internet speeds, and poor network stability in rural areas severely constrain the in-depth application of Internet+ in the agricultural sector. Especially in some remote mountainous areas, due to complex terrain and scattered populations, the high cost and difficulty of network infrastructure construction have led to a more pronounced digital divide in these regions. Furthermore, hardware facilities in rural areas are relatively backward, with many rural households lacking smart terminal devices and unable to fully utilize internet resources. The level of

informatization in rural public places such as libraries and cultural stations is also low, making it difficult to provide farmers with convenient internet access environments. The instability of rural power infrastructure also affects the normal use of information equipment, especially in areas prone to natural disasters where power outages can lead to network interruptions, affecting the continuity of agricultural production and management. On the other hand, the maintenance and upgrade of rural information infrastructure also face challenges. Due to the shortage of technical personnel and high maintenance costs, many existing rural information facilities cannot receive timely and effective maintenance, resulting in equipment aging, performance degradation, and inability to meet the growing demands of agricultural informatization. The existence of these problems makes it difficult for rural areas to fully enjoy the conveniences brought by Internet+, hindering the process of agricultural modernization. Therefore, improving rural information infrastructure construction and narrowing the urban-rural digital divide are key prerequisites for promoting the in-depth application of Internet+ thinking in the agricultural economy.

3.2 Need for Improvement in Farmers' Information Literacy

The level of farmers' information literacy directly affects the application effectiveness of Internet+ thinking in the agricultural economy. Currently, the overall information literacy of Chinese farmers remains low, mainly manifested in the following aspects: First, weak information awareness. Many farmers lack sufficient recognition of the importance of Internet+ and are accustomed to traditional production and sales methods, maintaining a wait-and-see or resistant attitude towards new technology applications. Second, limited information acquisition ability. Some farmers are not adept at using search engines, social media, and other tools to obtain agricultural production and market information, resulting in information isolation and difficulty in grasping market opportunities in a timely manner. Third, insufficient information analysis ability. Faced with massive online information, many farmers lack the ability to discern and filter useful information, unable to effectively utilize information to guide production decisions. Fourth, inadequate information technology application skills. Many farmers are unfamiliar with the operation of smartphones, computers, and other devices, making it difficult to proficiently use agricultural apps and e-commerce platforms. Fifth, weak information security awareness. In online transactions, some farmers are easily deceived, resulting in economic losses.

According to survey data from the Ministry of Agriculture and Rural Affairs, in 2023, the proportion of the population with basic information literacy in rural China was only 45%, far lower than the 78% in urban areas (Li Hua, 2024). The lack of information literacy among farmers severely constrains the in-depth application of Internet+ in the agricultural sector, affecting the improvement of agricultural production efficiency and the expansion of agricultural product sales channels. Therefore, improving farmers' information literacy and cultivating new-type farmers are key links in promoting the deep integration of Internet+ and agriculture. This requires joint efforts from government, educational institutions, and various sectors of society to enhance farmers' information awareness and application capabilities through various forms of training and education, laying a talent foundation for the digital transformation of the agricultural economy.

3.3 Imperfect Agricultural Data Standardization and Sharing Mechanisms

In the process of advancing Internet+ agriculture, issues of agricultural data standardization and sharing have become increasingly prominent. Firstly, the level of agricultural data standardization is low. Due to the lack of unified standards for data collection, storage, and processing, agricultural data collected by different regions and departments often have inconsistent formats, making it difficult to effectively integrate and analyze. This not only affects the quality and usability of data but also increases the cost and difficulty of data processing. Secondly, the agricultural data sharing mechanism is imperfect. Currently, agriculture-related data are scattered across multiple departments such as agriculture, meteorology, water resources, and land resources, each operating independently, resulting in severe data barriers. The lack of effective data sharing platforms and mechanisms leads to the underutilization of data resources, affecting the value realization of agricultural big data. Thirdly, data security and privacy protection issues are prominent. As the commercial value of agricultural data becomes increasingly apparent, how to protect farmers' privacy rights and data security while promoting data sharing and utilization has become an urgent problem to be solved. Additionally, there are issues with the quality and completeness of agricultural data. Due to the dispersed and complex nature of agricultural production, the collection of some basic data still relies on manual methods, resulting in inaccurate and untimely data. Especially in some remote areas,

due to the lack of advanced data collection equipment and professional personnel, data quality is even more difficult to guarantee. The open sharing of agricultural data also faces legal and policy barriers. At present, China has not established a comprehensive legal and regulatory system for agricultural data open sharing, and issues such as data ownership, usage rights, and benefit rights have not been clearly defined, affecting the enthusiasm of various parties to participate in data sharing. The existence of these problems severely constrains the application and development of agricultural big data, hindering the in-depth application of Internet+ thinking in the agricultural economy. Therefore, establishing and improving agricultural data standardization systems and sharing mechanisms is an important task in promoting the digital transformation of agriculture.

4 Countermeasures and Suggestions for Promoting Agricultural Economic Development with Internet+ Thinking

4.1 Improving Rural Information Infrastructure Construction

Improving rural information infrastructure construction is key to promoting the in-depth application of Internet+ thinking in the agricultural economy. As shown in Figure 2, rural information infrastructure construction involves multiple aspects, including network coverage, smart terminal popularization, power supply guarantee, and maintenance and upgrade mechanisms. The continuous advancement of the "Broadband Village" project will improve network coverage and quality in rural areas. At the same time, the deployment of 5G networks in rural areas will provide high-speed and stable network support for smart agriculture and rural e-commerce development. Building WiFi hotspots in public places such as village committees and cultural stations can provide farmers with free internet access services, facilitating their access to information. Encouraging rural households to purchase and use smartphones, tablets, and other devices through government subsidies and other means will help promote the application of smart terminals in rural areas. Strengthening rural power infrastructure construction is also crucial, as it can ensure the stability of power supply in rural areas, providing a guarantee for the normal use of information equipment. Establishing and improving maintenance and upgrade mechanisms for rural information infrastructure and cultivating local technical

maintenance teams can ensure the continuous stable operation of equipment. The government needs to increase investment, plan comprehensively, and accelerate network coverage in rural areas. Encouraging telecom operators and internet companies to participate in rural information infrastructure construction through market-oriented operations can improve construction efficiency and service quality. Exploring innovative models such as "Internet+ small-scale water conservancy" and applying information technology to rural water conservancy, road, and other infrastructure construction can enhance the intelligence level of infrastructure. The comprehensive implementation of these measures will gradually narrow the digital divide between urban and rural areas, laying a solid foundation for the application of Internet+ thinking in the agricultural economy.

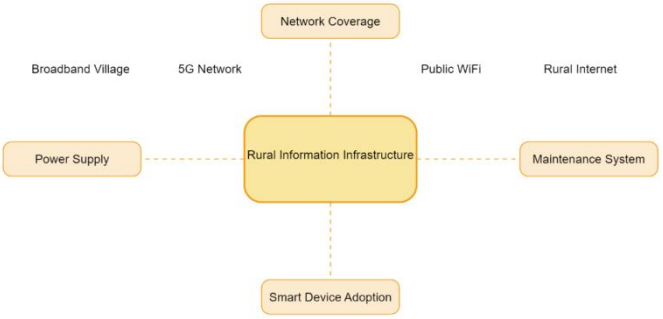

Fig. 2. Rural Information Infrastructure Construction Framework.

4.2 Strengthening Farmers' Information Skills Training

Improving farmers' information literacy is crucial for promoting the in-depth application of Internet+ thinking in the agricultural economy. Establishing and perfecting a farmer information skills training system is an effective approach to achieve this goal. As shown in Figure 3, this system should cover multiple aspects including information awareness, information acquisition, information analysis, and information technology application. Innovation in training methods is also important; in addition to traditional classroom teaching, online courses, mobile learning apps, and WeChat official accounts can increase the flexibility and convenience of training.It is also necessary to design targeted training content and methods for farmers of different age groups and educational levels. For young farmers, the focus can be on training in e-commerce and smart device operation skills; for middle-aged and elderly farmers, the emphasis can be on basic internet applications and

information security knowledge. Selecting households or cooperatives with high levels of informatization in each township as demonstration points can promote the application of Internet+ thinking through a "point-to-area" approach. Encouraging farmers to participate in practical activities such as agricultural app development testing and online marketing of agricultural products can help them improve their information skills through practice. Establishing farmer information skills assessment and incentive mechanisms, regularly evaluating farmers' information skill levels, and rewarding outstanding performers can stimulate learning enthusiasm. Cultivating new-type professional farmers, Cultivating new-type professional farmers, focusing on supporting a group of farmers with higher cultural literacy and information skills, can make them the backbone in promoting agricultural informatization. Leveraging the driving role of rural youth, encouraging returned college graduates and rural youth to actively participate in agricultural informatization construction can help surrounding farmers improve their information skills. Strengthening information technology training for rural grassroots cadres and improving their information literacy can enable them to better guide and serve farmers. Establishing a long-term information skills training mechanism and incorporating information skills training into the rural vocational education system can ensure the continuity and systematization of training. The implementation of these measures will gradually improve farmers' information literacy, cultivating a talent foundation for the in-depth application of Internet+ thinking in the agricultural economy.

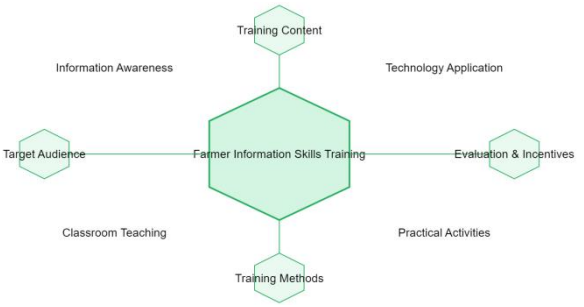

Fig. 3. Farmer Information Skills Training System Diagram..

4.3 Constructing Agricultural Big Data Platforms

Constructing agricultural big data platforms is a key infrastructure for promoting the in-depth application of Internet+ thinking in the agricultural economy. The

construction of this platform requires efforts in multiple aspects. As shown in Figure 4, the agricultural big data platform includes multiple levels such as data collection, storage and processing, analysis, and application services. Establishing unified agricultural data standards is a primary task, which includes formulating data collection, storage, processing, and sharing standards covering the entire industrial chain of agricultural production, processing, circulation, and consumption, to achieve standardization of agricultural data. Integrating multi-source data resources is also important, requiring the aggregation of data from various departments such as agriculture, meteorology, water resources, and land resources to establish a unified agricultural big data resource pool. Establishing agricultural big data centers at national, provincial, municipal, and county levels can form a vertically integrated and horizontally interconnected data sharing network. Developing application systems for agricultural production monitoring, market early warning, and decision support based on big data technology can provide precise services for government, enterprises, and farmers. Promoting the open sharing of agricultural data, establishing an agricultural data open catalog, and clarifying the scope and degree of data openness can promote the effective circulation and utilization of data resources. Strengthening agricultural data security protection is also crucial, requiring the establishment and improvement of agricultural data security management systems, enhancing data encryption, access control, and other technical measures to protect farmers' privacy and trade secrets. Cultivating agricultural big data talents is a long-term task that can be achieved through strengthening cooperation with universities and research institutes to train a group of compound talents who understand both agriculture and information technology. Establishing an agricultural big data industry alliance, encouraging the participation of agricultural enterprises, IT companies, research institutions, and other parties, can help form an ecosystem of collaborative innovation in production, education, research, and application. Improving agricultural big data-related regulations, clarifying the ownership, usage rights, and benefit rights of agricultural data, can provide legal protection for the development of agricultural big data. Promoting the construction of agricultural Internet of Things, deploying sensors, cameras, and other equipment in key agricultural areas, can achieve real-time monitoring and data collection of agricultural production processes. The implementation of these measures will gradually build a comprehensive, accurate, and timely agricultural big data platform, providing strong data support for the application of Internet+ thinking in the agricultural economy.

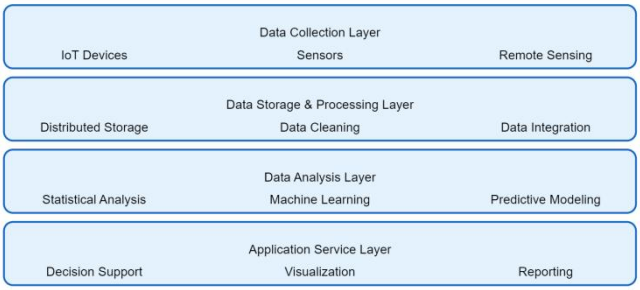

Fig. 4. Agricultural Big Data Platform Architecture Diagram.

5 Conclusion

The application of Internet+ thinking in agricultural economic development is a systematic project that requires joint efforts from government, enterprises, farmers, and other parties. Through analyzing the current application status of Internet+ thinking in agricultural production, sales, and management, this study finds that it has played an important role in improving production efficiency, broadening sales channels, and optimizing resource allocation. However, issues such as inadequate rural information infrastructure, insufficient information literacy among farmers, and imperfect agricultural data standardization and sharing mechanisms still constrain the in-depth application of Internet+ thinking in the agricultural economy. To address these challenges, this study proposes countermeasures and suggestions including improving rural information infrastructure construction, strengthening farmers' information skills training, and constructing agricultural big data platforms. In the future, with the continuous development of emerging technologies such as 5G, artificial intelligence, and blockchain, the application of Internet+ thinking in the agricultural economy will become more in-depth and extensive. This will not only drive the transformation of agricultural production methods, improving agricultural production efficiency and quality, but also reshape the agricultural product circulation system, optimize the agricultural industrial structure, and promote the integration of primary, secondary, and tertiary industries in rural areas. At the same time, the in-depth application of Internet+ thinking will also provide new ideas and methods for solving "rural issues," supporting the implementation of the rural revitalization strategy. However, in the process of advancement, we still need to pay high attention

to potential risks such as data security, privacy protection, and digital divide, and take effective measures to prevent them. Only by adhering to innovation-driven development and overall planning can we fully leverage the positive role of Internet+ thinking in promoting high-quality development of the agricultural economy, achieving agricultural modernization and rural prosperity.

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