Digital Technology Empowers the High-quality Development of Agriculture: Taking Intelligent Agriculture in Dasheng Town, Yubei District, Chongqing as an Example

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Abstract: Taking the smart agriculture in Dasheng Town, Yubei District, Chongqing as an example, this study explores the enabling role of digital technology in the high-quality development of agriculture. By reviewing existing research and combining field investigations, this paper summarizes the positive impacts of digital technology on improving agricultural production efficiency, enhancing the quality of agricultural products, and promoting agricultural sustainability, as well as the successful experience of the Dasheng Town smart agriculture project, providing experience and inspiration for other regions to use digital technology to promote agricultural modernization better. Through these above, the goal of high-quality agricultural development is achieved. Concurrently, in response to the shortcomings identified during the project's implementation, this paper proposes feasible suggestions from multiple aspects, including strengthening talent cultivation and introduction in the field of smart agriculture, enhancing policy support and incentive mechanisms, and promoting collaboration and scaled production. These suggestions serve as references for how digital technology can empower high-quality agricultural development in agriculture and the development of other smart agriculture projects under the context of rural revitalization.

Keywords: Digital Technology; High-Quality Development of Agriculture; Smart Agriculture; Dasheng Town; Rural Revitalization

1. Introduction

During the 14th five-year Plan period, the focus of the work of agriculture, rural areas and farmers shifted to comprehensively promoting rural revitalization and speeding up the modernization of agriculture and rural areas. According to the 14th five-year Plan for the Construction of Digital Agriculture and Rural areas, the state will focus on supporting the construction of the National Agricultural and Rural Big Data Center and Innovation Center, so as to promote the deep integration and innovative development of digitization in the agricultural and rural areas. In addition, the national strategy report clearly points out that by 2035, China will achieve the goal of agricultural modernization. [1]

Digital technology has become prevalent in modern society, leading to revolutionary changes in various industries. Even the agriculture sector, which is a traditional industry, has begun to incorporate digital technology and has achieved some remarkable results. The research aims to explore the application of digital technology in the high-quality development of agriculture, to provide feasible solutions and development ideas for the agricultural field. The primary objective is to promote the deep integration of digital technology and the agricultural industry, and to facilitate the transformation and development of agriculture towards wisdom, efficiency, and sustainability.

The purpose of this study is to explore its enabling effect on the high-quality development of agriculture supported by digital technology. [2-5] Through specific cases, the application of digital technology in agriculture is analyzed. The purpose of the research is to refine the experience in the operation of the project, reflect on the problems existing in the operation of the project, and find practical ways for digital technology to improve agricultural production, optimize the quality of agricultural products and promote the sustainable development of

agriculture. Based on the case study, this paper explores the path of intelligent agricultural projects to promote high-quality agricultural development, and provides reference experience for other intelligent agricultural projects under the background of rural revitalization. Provide new ideas and strategies for the combination of digital technology and high-quality development of agriculture, and make more accumulated contributions to the construction of intelligent agriculture and the improvement of agricultural quality.

2. Current Status of the Use of Digital Technologies in Agriculture

The integration of digital technology in contemporary agriculture has emerged as a critical driver in advancing agricultural progress. Beginning in 2012, the Chinese Government has placed significant emphasis on the growth of digital agriculture, implementing strategies for big data and digital villages, and actively advocating for "Internet plus" modern agriculture, yielding impressive outcomes.

The integration of digital technology and agriculture in rural areas has accelerated, thanks to intelligent perception, analysis, and control technologies. As a result, the agricultural industry's digitization process is rapidly advancing, and the construction of agricultural big data is deepening. The market monitoring and early warning system is also being perfected, which improves the traceability of agricultural product quality and safety. The seed industry and agricultural services are witnessing initial results in the construction of big data, providing strong data support for agricultural production. Moreover, new types of agricultural industries and business models are continuously emerging, including online retail sales of rural and agricultural products. According to the Ministry of Commerce, the annual online sales of rural and agricultural products reached 2.49 trillion yuan and 590 billion yuan, respectively, in 2023, showing the vigorous growth of agricultural e-commerce. In addition, big data service products based on agricultural e-commerce and remote sensing are becoming increasingly abundant, promoting digital industrialization and innovation. Emerging business forms, such as customized agriculture, creative agriculture, adoption agriculture, and cloud farms, are injecting new vitality into traditional agriculture. of digital agriculture.

Advancements in science and technology have greatly improved the integration of digital technologies in agricultural infrastructure. The government has established research centers and innovation alliances dedicated to digital agriculture, and has expedited the creation of smart agriculture laboratories and digital agriculture innovation centers. Higher learning institutions now offer related majors, such as the Internet of Things in agriculture, data science, and artificial intelligence. Moreover, the digital agriculture standard system has been rapidly constructed, and independent intellectual property rights have been acquired for the R&D and application of sensors, drones, agricultural robots, and other technologies. The conditions of facilities and equipment have also improved significantly. Nationwide, fiber-optic and 4G coverage in administrative villages exceeds 98%, which provides a reliable infrastructure for rural informatization. Furthermore, the successful launch of the Gaofen-6 satellite, along with the establishment of a remote sensing, navigation and communication satellite application system for agriculture, has greatly contributed to the development of digital agriculture.[6]

The application of digital technology in agriculture has continued to deepen, and has become an important means of promoting agricultural modernization and improving the efficiency and effectiveness of agricultural production. The digitization of agriculture not only promotes the transformation of agricultural production methods, but also brings new industries and business models, and improves the comprehensive competitiveness of agriculture. In the future, with the continuous development and application of technology, digital agriculture will play an important role in improving agricultural production efficiency and promoting rural economic development.

3. Analysis of Smart Agriculture in Dasheng Town, Yubei District, Chongqing, China

3.1 Background of Smart Agriculture Project Study in Dasheng Township

The strategy for revitalizing rural areas is now closely intertwined with the ongoing wave of digital transformation. Through the

implementation of initiatives like rural revitalization and digital village pilot construction, Yubei District has managed to develop a new approach to rural revitalization, paving the way for a new standard. The Ministry of Agriculture of the People's Republic of China has released its final evaluation report on the National Digital Rural Pilot, revealing that the five pilot areas in Chongqing Municipality have made significant strides in digital rural construction. Among the first batch of national digital countryside pilot areas, which includes Yubei District, Banan District, Rongchang District, Dazu District, and Dianjiang County, Chongqing has seen notable progress in digital countryside construction. As of 2023, Yubei District was ranked sixth in the country and first in the western region in the final assessment conducted by seven departments, including the Ministry of Agriculture and Rural Development.[7]

The following report showcases Chongqing Municipality's exceptional advancements in digital village construction and exemplifies China's incredible successes in rural revitalization through digital transformation. This report not only serves as a significant example for China's agricultural and rural modernization, but also offers valuable insights and guidance for other regions seeking to revitalize their rural areas through digital construction.

By examining the smart agriculture project in Dasheng Town, Yubei District, Chongqing, we can gain a thorough understanding of the impact of digital technology on rural development. This project utilizes cutting-edge digital information technology to seamlessly integrate with all aspects of agriculture and rural growth. As a result, it not only drives the modernization of agriculture, but also enhances the efficiency of rural governance.

3.2 Integration of Smart Agriculture and Digital Technology in Dasheng Township

The development of smart agriculture in Dasheng Town, located in Yubei District of Chongqing Municipality, is a prime example of modern agricultural transformation in China. With the ever-evolving digital technology, Dasheng Town has been proactively exploring the integration of smart agriculture and digital technology to foster high-quality agricultural development. The smart agriculture project implementation in Dasheng Town has successfully demonstrated how scientific and technological innovation, coupled with digital transformation, can achieve efficient and sustainable agricultural growth.

It is important to note the successful implementation of the smart agriculture program in orchard management, particularly in Qinglong Village located in Dasheng Town. This area has a rich history of citrus orchards, however, due to the challenging terrain and limited labor, they have experienced low efficiency and limited returns. Fortunately, the smart agriculture program has transformed this situation entirely. By leveraging cutting-edge technologies such as soil temperature and humidity monitoring, field weather monitoring, and pest detection, combined with satellite remote sensing, drones, and IoT technologies, the orchard management efficiency has significantly improved. With a service team consisting of only 12 individuals, they can manage over 2,800 acres of orchards efficiently, resulting in reduced management costs and improved commercial fruit yield and quality. Currently, the overall cost of orchard management has been reduced by 50%, and the average income per mu has increased by more than 10,000 yuan.

The Harvest Smart Seedling Factory demonstrates the effectiveness of smart agriculture in enhancing agricultural production processes. Here, every step from seeding to delivery is automated and intelligentized. This "industrialized" production model not only improves the efficiency and quality of seedling production, but also realizes the standardization and commercialization of the production process, ensuring the traceability and controllability of production.

In addition to transformation at the production level, the smart agriculture project also involves the optimization of rural governance and livelihood services. The construction of a digital village brain in Xinglong Township provides residents with more convenient and efficient services by integrating technologies such as intelligent monitoring, data analysis and mobile applications. This has not only improved residents' quality of life, but also strengthened community governance.

The success of the digital village pilot has

brought significant economic and social benefits to Dasheng Town. Among them, the construction of rural 5G network infrastructure provides a solid foundation for digital transformation. By the end of 2022, Yubei District had built more than 1,700 rural 5G base stations and more than 9,200 kilometers of communication poles, providing comprehensive digital services in rural areas.[8] The smart agriculture project in Dasheng Township, Yubei District, has not only improved the efficiency and quality of agricultural production, but also facilitated the digital transformation of the countryside and optimized livelihood services. These achievements have not only brought tangible economic benefits to local farmers, but also provided useful experience and templates for China's rural revitalization and modern agricultural development. With the continuous progress and application of science and technology, agriculture in the future will become smarter and more efficient, making greater contributions to rural revitalization and sustainable agricultural development.[9]

Dasheng Township has achieved remarkable results in the combination of smart agriculture and digital technology. Empowered by digital technology, agricultural production has realized the transformation and upgrading from traditional to modern agriculture, providing farmers with better production conditions and quality of life. There is still a need to further increase investment and training in digital technology and improve farmers' application of digital technology to achieve sustainable agricultural development.

4. Digital Technology Enabling Smart Agriculture in Dasheng Township Case Analysis

In order to further understand and analyze and summarize the successful experience of the smart agriculture project in Dasheng Town, Yubei District, and its shortcomings, the project background, operation process and stakeholders' attitudes were investigated through the use of questionnaires, data collection and field surveys, including: interviews with project parties, governmentrelated personnel, and semi-structured interviews with the project operator and the local village committee. In interviews with participating farmers, 203 valid data were collected in the form of questionnaires and analyzed by SPSS data, through literature analysis, analysis of data and field visits, the following summary can be made:

4.1 Experience of the Smart Agriculture Program in Dasheng Township

Located in Yubei District, Chongqing, Dasheng Town is a typical agricultural industry town, and in recent years, empowered by digital technology, smart agriculture has developed rapidly.

First of all, the development of intelligent agriculture in Dasheng Township has benefited from advanced agricultural science and technology facilities. A series of intelligent agricultural equipment and systems have been built in the town, including automated irrigation systems, intelligent greenhouses, and agricultural Internet of Things. The application of these facilities has made agricultural production more precise and efficient, greatly enhancing the yield and quality of crops. [10]Farmers in Dasheng Township actively participate in the promotion and application of smart agriculture. The town government has carried out training and publicity activities to improve farmers' knowledge of digital technology and their ability to apply it. Farmers actively participate in the collection and analysis of agricultural big data, using smartphone APPs to learn about the growth of crops and early warning information on pests and diseases, and take timely measures to prevent and control them. Through the use of intelligent equipment and systems, farmers have realized the refined management of agricultural production and enhanced the efficiency of agricultural production.

Once again, the development of smart agriculture in Dasheng Town also benefits from government support and investment. In October 2020, Yubei District was selected as one of the first batch of national digital countryside pilot areas, and the whole district took this as an opportunity to make up for the short boards of the information infrastructure, explore the digital empowerment of agricultural development and rural governance, and optimize the people's livelihood services. The government has increased financial investment and policy support for smart agriculture, built an agricultural big data center, and provided agricultural informatization

services. The government has also actively promoted cooperation between agricultural enterprises and scientific research institutions, which has facilitated the innovation and application of agricultural science and technology. These initiatives have provided strong support for the development of smart agriculture in Dasheng Town.

To summarize, the development of smart agriculture in Dasheng Township has achieved remarkable results. The application of advanced agricultural science and technology facilities, the active participation of farmers and the support of the government have all provided a solid foundation for the development of smart agriculture. In the future, we should also further strengthen the construction of related facilities and the research and development of technology, promote the popularization and application of smart agriculture in Dasheng Town and even nationwide, and make greater contributions to the high-quality development of agriculture.

4.2 Deficiencies of the Smart Agriculture Project in Dasheng Township

Although the current smart agriculture program in Dasheng Township, Yubei District, has achieved very good results, there are still some shortcomings and challenges in its practice. The data shows that 85% of the participants believe that there is a shortage of professional talents in this smart agriculture program.[11]The development of smart agriculture is highly dependent on professional talents, including agricultural scientists, information technology experts, data analysts and so on. However, currently, there is a relative lack of professionals in the field of smart agriculture. This is partly due to the insufficient integration of traditional agricultural education with modern information technology, and partly due to the lack of attraction of the agricultural field to high-tech talents, which leads to the loss of talents.

Insufficient policy support. Although China's government has recognized the importance of smart agriculture and introduced some supportive policies, it is still insufficient in terms of concrete implementation of policies, financial support and sustainability. The lack of long-term stable policy support and financial investment limits the research and development and promotion of smart agriculture technology.

Lack of cooperation and scale production. The development of smart agriculture requires close cooperation across different industries and fields, including technology providers, agricultural producers, and market operators. However, at present, there is a relative lack of such cross-industry cooperation, and smart agriculture projects are often limited to small-scale trials and applications, making it difficult to form large-scale production. In addition, the lack of cooperation among farmers has led to the dispersion of resources, making it difficult to maximize the effectiveness of smart agriculture.

Access to production technology and market information is too narrow. A core of smart agriculture is the use of big data and information technology to help farmers access production technology and market information. However, at present, many farmers still have limited access to these information channels, which not only affects farmers' knowledge and acceptance of smart agriculture technology, but also limits the application and effectiveness of smart agriculture in a wider range.

The above is a list of the most important problems of this smart agriculture project, in addition to the insufficient production technology to meet the needs of agricultural development, the high cost of carrying out production, which makes it difficult for individuals to maintain, the introduction of production technology, and insufficient efforts to promote it. To realize the wide application and in-depth development of smart agriculture, it requires the joint efforts of the government, enterprises, educational institutions and agricultural producers to overcome these challenges through comprehensive measures, and to explore how digital technology can better empower the high-quality development of agriculture.

4.3 Feasibility Recommendations for Smart Agriculture Program Enhancement in Dasheng Township

Strengthen the training and introduction of talents in the field of smart agriculture. The government and educational institutions can work together to establish specialized training institutes for smart agriculture, offering

courses from basic to advanced levels, to attract and cultivate more talents interested in smart agriculture. At the same time, through industry-university-research cooperation, universities, research institutes and enterprises are encouraged to carry out joint research projects to provide practical opportunities for students and promote the combination of theory and practice. Governments at all levels have actively promoted the development of smart agriculture in Yubei District by increasing support for those involving policies, funds, materials and human resources. This includes comprehensively publicizing smart agriculture in rural areas through the media of newspapers, television and radio to raise the awareness level of farmers and encourage them to actively participate in entrepreneurial and innovative activities according to their literacy level, age and gender characteristics. At the same time, the Government has incorporated the training of professional farmers into the national education and training development plan, utilized the faculty and scientific research base of China's agricultural universities and research institutes, and established a long-term education mechanism to improve farmers' and young students' understanding of the theoretical knowledge of smart agriculture, thereby providing sustained human resource support for the development of smart agriculture.[12]

Enhancing policy and financial support and incentives. In the face of the shortage of funds in the development of smart agriculture, the government has strengthened its policy support and fund-raising, especially in investments in high-cost technologies such as the Internet of Things (IoT) and cloud computing. In order to adapt to the wider radiation range and higher cost inputs of smart agriculture compared with traditional agriculture, the government will strengthen financial investment according to the specific situation of Dasheng Town in Yubei District, utilize domestic and foreign scientific and technological resources, encourage and support large agricultural households and cooperatives to participate in the smart agriculture project, set up demonstration zones, and exchange experiences with other advanced experimental zones, so as to promote the high-quality development of smart agriculture. The government can also provide financial subsidies and tax incentives to farmers and enterprises adopting smart agriculture technologies to reduce their financial burdens and formulate special policies, including standard-setting, project support, and technology promotion, to provide a clear policy orientation for smart agriculture.

Promote cooperation and large-scale production, and broaden access to technology and market information. The government and industry associations can work together to establish a smart agriculture cooperation platform, promote information exchange and resource sharing, and help small farmers and enterprises realize large-scale production. Reduce costs and improve bargaining power through collective purchasing and collective sales, and focus on introducing and applying smart agriculture technologies. Utilizing the Internet and mobile communication technologies, establish a smart agriculture information service system to provide farmers with timely and accurate market information, weather information, and planting techniques. Through the organization of training courses, seminars and exhibitions, it regularly promotes new technologies and equipment to farmers and improves their ability to apply them.

5. Conclusion

The application of digital technology in agriculture has gradually become the focus of attention and plays a key role in promoting the high-quality development of agriculture. In the context of rural revitalization strategy, an in-depth case study of the "Smart Agriculture in Dasheng Town, Yubei, Chongqing" project is conducted. The operational characteristics of the project are comprehensively summarized based on stakeholder theory through questionnaire surveys and field visits. It is found that digital technology plays a significant role in optimizing the efficiency of agricultural production, improving the quality of agricultural products, and enhancing the sustainable development of agriculture.

Through the introduction of digital technology, agricultural production has received comprehensive data support and a basis for decision-making, which is conducive to improving the efficiency of agricultural production and reducing waste. The application of digital technology also promotes the upgrading of farmland management and

traceability of agricultural products. Through the digital management platform, farmers can more conveniently record and manage the basic information of farmland, pesticide use and disaster events, etc., and realize traceability and manageability of the whole process of agricultural production. This is of great significance in improving the quality and safety of agricultural products.

However, the study also revealed the program's shortcomings in some areas. One of the most prominent problems is the lack of professionals in the field of smart agriculture, which suggests the importance of talent training in the future development of smart agriculture. In addition, the indepth application of digital technology in agriculture requires policy support and technical training to enhance farmers' knowledge and ability to use digital technology. The article also puts forward a series of feasible suggestions to address these issues. Obviously, the development and improvement of smart agriculture is a long-term and complex process that requires more exploration and research.

In summary, the smart agriculture project in Dasheng Town, Yubei, Chongqing, has not only achieved remarkable results in promoting the modernization of agricultural production, revealing the important role of digital technology in empowering the high-quality development of agriculture, but also providing important experience and inspiration for the implementation of the rural revitalization strategy. At the same time, the project also exposes some challenges in the development of smart agriculture, which provides an important direction for future development.

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