

Research on Countermeasures for Promoting the Digital Transformation and Development of Agriculture in Liaoning Province

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Abstract

The digital economy is a new driving force for promoting high-quality economic development at present. Against the backdrop of rapid development of the digital economy, agricultural modernization has entered a new stage of development, bringing unprecedented opportunities and challenges to the digital transformation of agriculture in Liaoning Province. This article aims to systematically analyze the current situation and challenges faced by the digital transformation of agriculture in Liaoning Province, and propose corresponding countermeasures and suggestions, in order to provide practical experience that can be referenced for Liaoning Province and other regions in the country.

Keywords

High-quality Development of Agriculture; Digital Transformation; Liaoning Province.

1. Introduction

In today's global wave of informatization and digitization, agricultural modernization has become an important strategic direction for national development. As an advanced stage of agricultural modernization, agricultural digital transformation can not only effectively improve agricultural production efficiency, but also promote the optimization and upgrading of the agricultural industry chain, providing strong impetus for rural revitalization and sustainable agricultural development[1]. As a major agricultural province, Liaoning Province has abundant agricultural resources and a solid industrial foundation. Promoting agricultural digital transformation is of great significance for enhancing agricultural competitiveness and achieving high-quality agricultural development. However, Liaoning Province still faces many challenges in the process of agricultural digital transformation, such as the lack of systematic collaborative promotion of agricultural digital transformation, and the poor digital literacy ability of farmers themselves, which seriously restricts the pace of agricultural digital transformation. Therefore, conducting in-depth research and formulating scientifically reasonable countermeasures to accelerate the digital transformation and development of agriculture in Liaoning Province has become an urgent problem to be solved.

2. Current Situation of Digital Transformation and Development of Agriculture in Liaoning Province

2.1. Liaoning Provincial Government Provides Policy Support for Agricultural Digital Transformation

The Liaoning Provincial Government has actively responded to the national call and formulated multiple policies and plans related to agricultural digital transformation, such as the "Opinions on Several Policy Measures to Promote High quality Development of County Economy", which clarify the direction and goals of agricultural digital transformation. The government regards

the digital transformation of agriculture as an important measure to promote rural revitalization and high-quality development of county-level economy. By deploying key tasks such as building digital villages and promoting the digital transformation of industrial parks, strong support has been provided for the digital transformation of agriculture. The Liaoning Provincial Government has allocated special financial funds to support the implementation of agricultural digital transformation projects. For example, providing financial support for smart agriculture application scenario construction projects, agricultural IoT platform construction, etc., to reduce the costs and risks of farmers and enterprises' transformation. By guiding and supporting a number of key demonstration projects, such as smart agriculture application bases, digital agriculture innovation centers, etc., we will promote the in-depth development of agricultural digital transformation. These demonstration projects not only demonstrate the effectiveness and advantages of agricultural digital transformation, but also provide valuable experiences and models for other regions to learn from.

2.2. The Construction of Digital Infrastructure is Relatively Complete

In recent years, Liaoning has accelerated the construction of new 5G base stations. As of the end of March 2024, the total number of 5G base stations in the province has exceeded 110000, with 26.2 5G base stations per 10000 people. This number not only demonstrates Liaoning's significant achievements in 5G infrastructure construction, but also lays a solid foundation for its subsequent digital economy development. Liaoning actively implements the "Gigabit City" project, and multiple prefecture level cities in the province have reached the evaluation standards for gigabit cities. At the same time, through the "Rural Lighting up" project, the 5G access rate of administrative villages in the province has also reached a high level, providing strong support for the construction of digital villages. Liaoning's industrial Internet work started early and was promoted quickly. In the list of national industrial Internet enterprises determined by the Ministry of Industry and Information Technology, the number of Liaoning enterprises on the list accounted for a high proportion of the total. The province accelerated the promotion of the typical application of "5G+Industrial Internet", enabling enterprises to explore new paths for transformation and upgrading. In addition, Liaoning Province has planned multiple digital infrastructure construction projects during the 14th Five Year Plan period, including new infrastructure construction projects, digital government construction projects, digital industry projects, and industrial digitization projects. The implementation of these projects will further promote the improvement and development of digital infrastructure in Liaoning.

2.3. Digitization Helps Agricultural Digital Transformation

Liaoning Province actively promotes the deep integration of digital technology and agriculture. By utilizing modern information technologies such as big data, cloud computing, and the Internet of Things, agricultural production efficiency and management level can be improved. Liaoning Province has built multiple big data centers and IoT platforms, providing strong support for the collection, storage, analysis, and application of agricultural data. Through IoT technology, real-time monitoring of farmland environment, crop growth and other data can be achieved, providing scientific basis for precision agriculture. In some areas of Liaoning Province, intelligent irrigation and fertilization systems have been widely used. These systems monitor soil moisture and crop nutrient requirements in real-time through sensors, automatically adjust irrigation and fertilization rates, improve water and fertilizer utilization efficiency, and reduce production costs. By utilizing the Internet of Things and artificial intelligence technology, Liaoning Province has also established a system for monitoring and controlling pests and diseases. By real-time monitoring of crop growth environment and the occurrence of pests and diseases, the system can promptly detect and warn of pest and disease risks, providing farmers with scientific prevention and control suggestions. Liaoning Province is actively promoting the

construction of a traceability system for agricultural products, utilizing technologies such as blockchain to achieve full traceability of agricultural products. This not only improves the safety and credibility of agricultural products, but also provides consumers with more convenient purchasing channels and personalized consumption experiences.

3. Existing Problems in the Digital Transformation of Agriculture in Liaoning Province

3.1. Lack of Systematic Collaborative Promotion of Agricultural Digital Transformation

Liaoning Province has issued a series of policy documents, such as the "14th Five Year Plan for Digital Agriculture and Rural Development in Liaoning Province" and the "Feasibility Study Report on the Construction Project of Liaoning Smart Agriculture Center". These documents provide policy guidance and planning support for the digital transformation of agriculture. However, in the actual implementation process, there may be problems such as inadequate policy implementation and unsystematic planning and execution. The digital transformation of agriculture involves multiple departments and fields, requiring collaborative efforts from government, enterprises, research institutions, and other parties. However, in practical operation, there may be issues of poor communication and collaboration between departments, resulting in ineffective integration and utilization of resources. Meanwhile, there are differences in the progress of agricultural digital transformation among different regions within the province. Some developed regions may have achieved significant results, while some underdeveloped regions have made slow progress. The uneven development between regions also affects the overall effectiveness of collaborative promotion.

3.2. The Popularization of Digital Agricultural Technology Application is Relatively Slow

Firstly, there is insufficient application of technology. The "3S" technology (GPS global satellite positioning system, RS remote sensing technology, GIS geographic information system) has not been widely adopted for field crops in Liaoning Province. Some facilities in agriculture have not yet achieved functions such as automatic sowing, irrigation, fertilization, weeding, and pest control, resulting in a low level of intelligent agricultural production. Secondly, the rate of intelligent control of farming machinery is very low, making it difficult to achieve intelligent production in agricultural cultivation. At the same time, there are few regions that can achieve traceable digital management of agricultural products from sowing, maintenance, harvesting, processing, packaging, storage to transportation. In addition, in the development process of digital agriculture, the government lacks unified planning and effective guidance. Lack of effective guidance in the implementation of bases and projects, core technologies and integrated systems, and operational models has led to low standardization and integration of smart agriculture information data.

3.3. Poor Digital Literacy Ability of Farmers Themselves

The relatively low education level of some farmers directly affects their ability to accept and understand new technologies and knowledge. The improvement of digital literacy requires certain basic knowledge support, such as computer operation, network applications, etc., and insufficient education level may lead to the lack of these basic knowledge [2, 3]. At the same time, the information infrastructure in rural areas is relatively backward, and farmers have limited channels to obtain information. Although the rural Internet penetration rate has improved in recent years, some farmers still have difficulty in obtaining information and resources related to the improvement of digital literacy through effective channels. The limitations of economic conditions are also an important factor affecting the improvement of

farmers' digital literacy. Some farmers may not be able to afford the cost of purchasing digital devices such as computers and smartphones, or pay for internet access due to economic pressure. This limits their opportunities to access and use digital technology. In addition, digital literacy training resources in rural areas are relatively scarce, making it difficult for farmers to obtain professional training and guidance. Even if there is an opportunity to be exposed to digital technology, it may not be possible to fully unleash its potential due to a lack of necessary guidance and support.

4. Suggestions for Promoting the Digital Transformation of Agriculture in Liaoning Province

4.1. Strengthening the Top-level Design of Agricultural Digital Transformation

Firstly, clarify the development goals and strategic planning. Based on the current situation and future trends of agricultural development in Liaoning Province, formulate specific, quantifiable, and achievable goals for the digital transformation and development of agriculture. Develop the 'Strategic Plan for Agricultural Digital Transformation in Liaoning Province', clarifying the overall ideas, development path, key tasks, and guarantee measures for agricultural digital transformation. Strategic planning should have foresight and operability, and be able to guide various tasks of agricultural digital transformation throughout the province. Secondly, strengthen policy guidance and support. Introduce a series of policy measures to support the digital transformation of agriculture, such as fiscal subsidies, tax incentives, financial support, etc. These policies should be able to reduce the costs and risks of digital transformation for farmers and businesses, and stimulate their enthusiasm. Establish a special fund for agricultural digital transformation, focusing on supporting the research and application of key technologies such as agricultural Internet of Things, big data, and artificial intelligence. Encourage social capital to invest in the field of agricultural digital transformation and form a diversified investment pattern. Finally, a reasonable layout of agricultural digitalization pilot projects should be established. Select representative regions throughout the province to carry out agricultural digitalization pilot projects, and explore agricultural digitalization transformation models and paths that are suitable for local realities. Through the demonstration and guidance of pilot projects, promote the in-depth development of digital transformation in agriculture throughout the province. Enhance farmers' and enterprises' awareness and application capabilities of digital technology, and promote the widespread application of digital technology in agricultural production, operation, management, and other aspects.

4.2. Encourage Technology Enterprises to Empower Digital Agriculture

Firstly, guide and support through policies. The government should introduce special policies to empower digital agriculture for technology enterprises, clarify development goals, key tasks, and guarantee measures, and provide policy support and guidance for technology enterprises. Provide tax reductions, subsidies, and other preferential policies to technology enterprises that have achieved significant results in the field of digital agriculture to stimulate their innovation vitality. Secondly, strengthen technological innovation and research and development. Support technology enterprises to increase their research and development investment in cutting-edge technologies such as the Internet of Things, big data, artificial intelligence, and blockchain, and promote the deep integration of technological innovation and agricultural production. Build a digital agricultural technology innovation platform, promote the deep integration of industry, academia, research and application, and accelerate the transformation and application of scientific and technological achievements. Encourage technology enterprises to participate in the formulation and revision of standards related to digital agriculture, and improve the standardization level of digital agriculture technology. Encourage technology companies to

develop and promote intelligent terminal devices suitable for farmers, and improve the level of agricultural production intelligence. Finally, create a demonstration project. Support technology enterprises to build digital agriculture demonstration projects in agricultural parks, characteristic agricultural product advantage areas and other regions, and play a leading role in demonstration.

4.3. Strengthening the Comprehensive Talent Cultivation of Agricultural Digitization

Firstly, improve the system for cultivating farmers' digital literacy. Integrate various resources such as government, enterprises, schools, and social institutions to form a joint force and jointly promote the improvement of farmers' digital literacy. Design training courses suitable for new agricultural operators, returning migrant workers, left behind women and other groups, especially for the characteristics of farmers in Liaoning Province. Strengthen training in e-commerce, live streaming, inclusive finance, and other areas to enable farmers to master the application skills of modern digital tools, enhance their market participation ability and financial service level. Secondly, innovative technology services and training methods. Based on grassroots agricultural technology promotion and social service organizations, customized services are provided, and targeted training and guidance are provided according to the actual needs and levels of farmers. Strengthen the application of software tools in the production process, develop information skills training apps suitable for local farmers, so that farmers can learn new knowledge and skills anytime and anywhere. Explore various guidance methods such as online teaching and building night school platforms. At the same time, local research institutes and Internet enterprises are encouraged to carry out project practice at the grassroots level, communicate with farmers face to face, and solve their practical problems. Finally, encourage universities to establish majors and courses related to digital agriculture, and cultivate more agricultural talents with digital literacy. Support agricultural research institutions, universities, and enterprises to jointly establish training centers, forming an integrated training system of industry, academia, research, and application.

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