WEP Warwick Evans Publishing

International Journal of Global Economics and Management

ISSN: 3005-9690 (Print), ISSN: 3005-8090 (Online) | Volume 9, Number 1, Year 2025
DOI: https://doi.org/10.62051/ijgem.v9n1.03
Journal homepage: https://ijgem.org

Application Problems and Suggestions of Digital Management of Agricultural Machinery in Agricultural Production

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ABSTRACT

This article focuses on the application of digital management of agricultural machinery in agricultural production, analyzes the management upgrading value brought by the Internet of Things, big data and other technologies, and deeply explores the problems of inconsistent policy standards, high technology landing cost, weak infrastructure, and prominent data security risks faced in practice. Through targeted suggestions such as improving the policy system, increasing financial technical support, strengthening infrastructure, and building a data security protection system, it provides reference for breaking through the bottleneck of digital management and promotion of agricultural machinery and helping agricultural mechanization move towards a new stage of digital intelligence.

KEYWORDS

Digital management of agricultural machinery; Agricultural production; Policy standards; Infrastructure

1. INTRODUCTION

With the deep integration of information technology and agricultural production, agricultural mechanization is gradually moving towards a new stage of digitalization and intelligence. As the core equipment of agricultural production, the innovation of agricultural machinery's management mode directly affects the efficiency and modernization process of agricultural production. By integrating the Internet of Things, big data, Beidou positioning and other technologies, the digital management of agricultural machinery has realized the intelligent upgrading of agricultural machinery file management, operation monitoring and resource scheduling, providing technical support for solving problems such as "machine shortage" and "insufficient subsidy accuracy". However, in practical promotion, the digital management of agricultural machinery still faces many constraints such as policies, technology and infrastructure. In-depth analysis of these problems and effective suggestions are of great practical significance to promoting the high-quality development of agricultural production.

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2. PROBLEMS FACED BY THE DIGITAL MANAGEMENT OF AGRICULTURAL MACHINERY IN AGRICULTURAL PRODUCTION APPLICATIONS

2.1. Policy Standards Are Not Unified, Which Restricts Cross-Regional Coordination And System Compatibility

At present, special laws, regulations and unified standards for the digital management of agricultural machinery have not been issued at the national level. There is a lack of clear policy guidance and technical standards in promoting the digital construction of agricultural machinery in various places, resulting in differences in data collection format, interface standards, functional design and other aspects of agricultural machinery digital management systems in different regions. Different, the system compatibility is poor, and it is difficult to realize cross-regional data sharing and collaborative management. [1] For example, some areas adopt self-developed file management systems, which cannot be connected with scheduling platforms in other regions, and the data cannot be interoperable when agricultural machinery operates across regions, which increases the difficulty of scheduling;At the same time, the land confirmation information has not been networked nationwide, and some projects are difficult to promote due to the lack of basic data, which further affects the overall efficiency of the digital management of agricultural machinery. In addition, some areas have not yet established a perfect digital management system for agricultural machinery. The file management process is not clear and the division of responsibilities is vague, resulting in incomplete data collection and untimely update, affecting the accuracy and reliability of digital management.

2.2. The Cost of Technology Implementation is High, and the Acceptance of Farmers and Grass-Roots Level is Insufficient

The promotion of digital management of agricultural machinery depends on the investment of hardware equipment and software systems. At present, the cost of Beidou positioning terminals, intelligent sensors, data storage servers and other equipment is relatively high. At the same time, system research and development and maintenance also requires continuous financial support. For grass-roots agricultural machinery management departments and ordinary farmers in economically underdeveloped areas It is difficult to bear this cost. On the one hand, the price of smart agricultural machinery is much higher than that of traditional agricultural machinery, the investment recovery period is long, and the willingness of farmers to buy is low; on the other hand, the grass-roots agricultural machinery management department has limited funds, and it is difficult to purchase digital management equipment on a large scale and build a visualization platform, resulting in difficulties in technology implementation. In addition, some farmers and grass-roots workers are conservative, the acceptance and operation ability of digital technology are insufficient, and the relevant training and technical support are not in place, resulting in the inability of the completed digital system to give full play, and the phenomenon of "building but not using" and "using but not refined".

2.3. Weak Infrastructure Affects The Stability of Data Transmission and System Operation

The effective operation of digital management of agricultural machinery depends on perfect network infrastructure and power security, and in some remote rural areas of China, the problems of insufficient network coverage and unstable signal are still prominent. When agricultural machinery is operating in the field, the communication signal is often interrupted due to complex terrain and harsh climate, affecting the real-time transmission of operation data, resulting in data loss, delay and other problems, which in turn affects the accuracy of operation monitoring and scheduling decision-making.[2] At the same time, the power supply in some rural areas is unstable, especially during the

peak of electricity consumption during the agricultural season, which is prone to power outages, resulting in the inability of normal operation of digital equipment and affecting the continuity of digital management of agricultural machinery. The weak infrastructure has become an important bottleneck restricting the promotion of digital management of agricultural machinery in remote areas, further widening the gap in the development of agricultural mechanization between regions.

2.4. Data Security Risks Are Prominent, And The Privacy Protection Mechanism is Not Perfect

In the process of digital management of agricultural machinery, a large amount of agricultural production data and farmers will be collected. Personal information, including the location of agricultural machinery, operation area, farmer identity information, land management information, etc., if these data are not effectively protected, it is easy to face the risk of leakage and abuse. At present, the security protection measures of the digital management system of agricultural machinery in some areas are not perfect, and there is a lack of professional security technicians and emergency response mechanisms. They are prone to security threats such as network attacks and data tampering. At the same time, the division of permissions in the process of data sharing is not clear, and some departments or enterprises can obtain sensitive Data, there is a risk of privacy leakage. Data security issues will not only harm the legitimate rights and interests of farmers, but also reduce farmers' trust in the digital management of agricultural machinery and hinder their promotion and application.

3. SUGGESTIONS TO PROMOTE THE APPLICATION OF DIGITAL MANAGEMENT OF AGRICULTURAL MACHINERY IN AGRICULTURAL PRODUCTION

3.1. Improve the Policy Standard System and Strengthen Top-Level Design and Collaborative Management

At the national level, we should speed up the introduction of special laws, regulations and technical standards for the digital management of agricultural machinery, clarify the development goals, implementation paths and responsible subjects of digital management, and provide unified guidance for local construction. On the one hand, formulate national unified data collection standards, interface standards and system compatibility specifications, promote the interconnection of agricultural machinery digital systems in different regions and departments, and realize data sharing and collaborative management; on the other hand, improve the land confirmation information networking mechanism, and integrate the foundation of agriculture, agricultural machinery, land and other departments. Data provides complete basic data support for the digital management of agricultural machinery. At the same time, local governments should formulate supporting management systems and practical The detailed rules are implemented to clarify the process and responsibilities of file management, data collection, system maintenance and other links, so as to ensure the standardization and standardization of digital management. In addition, we should establish a cross-regional collaborative work mechanism, strengthen the cooperation in the digital management of agricultural machinery between provinces and cities, coordinate and dispatch agricultural machinery resources, and improve the efficiency of cross-regional operations.

3.2. Increase Capital and Technical Support To Reduce Landing Costs and Improve Acceptance

In view of the high cost of technology implementation and insufficient acceptance of farmers, it is necessary to build a diversified input mechanism of "government guidance, market participation, and farmers' benefits". The government should set up special support funds for the digital management

of agricultural machinery, subsidize grass-roots management departments to purchase digital equipment and build visualization platforms, and at the same time provide high purchase subsidies and low-interest loans for farmers to purchase smart agricultural machinery, so as to shorten the investment payback period and stimulate farmers' willingness to buy. Encourage scientific research institutions to cooperate with enterprises to increase the research and development of low-cost and high-performance Beidou positioning terminals, sensors and other equipment, and reduce hardware costs; at the same time, develop a digital management system that is easy to operate and practical, optimize the interface design, and improve the operation experience of grassroots staff and farmers. [3] In addition, strengthen technical training and promotion services, set up a professional training team, carry out digital technology training on agricultural machinery in rural areas, formulate personalized training plans for different groups, and improve their operational ability and application level; establish technical support hotlines and offline service sites to solve the problems encountered by farmers in the process of use in a timely manner. The problem is to ensure that the digital system gives full play to its role.

3.3. Strengthen Infrastructure Construction and Make Up for the Shortcomings of Regional Development

General farmer The construction of village network infrastructure and power security should be included in the key projects of rural revitalization, increase investment in remote rural areas, promote the extension of 5G networks and Internet of Things base stations to fields, improve network coverage and signal stability, and ensure the real-time and stable transmission of agricultural machinery operation data. Optimize the rural power supply network, strengthen the power security during the busy season, and avoid the suspension of digital equipment due to power outages. At the same time, in combination with the layout of agricultural production, data processing centers and emergency power supply facilities will be built in concentrated areas of agricultural machinery operations to provide hardware support for the digital management of agricultural machinery. In addition, we should establish a long-term maintenance mechanism for infrastructure, clarify the main body responsible for maintenance, regularly overhaul network equipment and power facilities, ensure the continuous and stable operation of infrastructure, and gradually narrow the gap in the development of digital management of agricultural machinery between regions.

3.4. Build a Data Security Protection System To Ensure Information Security and Privacy

Establish and improve the digital management data security protection mechanism of agricultural machinery, and build a strong safety defense line from the three levels of technology, management and system. At the technical level, data encryption, access control, intrusion detection and other technologies are used to provide security protection for the whole process of data collection, transmission, storage and use of agricultural machinery to prevent data leakage and tampering; a data backup and disaster recovery system is established to ensure that data can be quickly restored in the event of natural disasters or network attacks. At the management level, clarify the responsibility of data management and set up a special The security management position of the door is equipped with professional and technical personnel, and regularly carries out data security risk assessment and hidden danger investigation; standardize the data sharing process, establish a data sharing authorization mechanism, and do not provide sensitive data to third parties without authorization. At the institutional level, measures for the safety management of agricultural machinery data should be introduced, the mechanism for data security responsibility should be clarified, data leakage, abuse and other acts should be seriously dealt with in accordance with laws and regulations, the legitimate rights and interests of farmers and data security should be effectively protected, and farmers' trust in the digital management of agricultural machinery should be improved.

4. CONCLUSION

The digital management of agricultural machinery is the key path for agricultural mechanization to digitalization and intelligence, which is of great significance to improving agricultural production efficiency and promoting agricultural modernization. Although it is currently facing many constraints in its application, such as policy, cost, infrastructure, safety, etc., these problems can be effectively solved by improving the top-level design, strengthening resource investment, making up for the shortcomings of facilities, and building a strong security defense line. In the future, we will continue to promote the optimization and implementation of the digital management of agricultural machinery, and we will definitely further explain Release technology to empower the value, inject stronger impetus into the high-quality development of agricultural production, and accelerate the process of agricultural modernization.

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