

The Digital Transformation Path of Agricultural Machinery and Equipment Manufacturing Industry from the Perspective of Smart Agriculture

——Focus on the Practical Path at the Enterprise Level

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ABSTRACT

This article explores the digital transformation path of agricultural machinery and equipment manufacturing industry from the perspective of smart agriculture, and focuses on the practical path at the enterprise level. The article analyzes the background of smart agriculture, summarizes the construction experience of smart agriculture at home and abroad, and points out the achievements and shortcomings of China's agricultural machinery and equipment manufacturing industry in digital transformation. Suggestions have been put forward to address the issues, including breakthroughs in key core technologies, popularization of information technology and promotion of agricultural machinery and equipment, and introduction of new agricultural professionals, in order to accelerate the pace of digital rural construction and promote the modernization and intelligent transformation of agriculture.

KEYWORDS

Smart agriculture; Agricultural machinery and equipment; Digital transformation

1. INTRODUCTION

Since the 18th National Congress, the Party and the state have attached great importance to the digital construction of rural areas. Among them, the four departments jointly issued the "Key Points for Digital Rural Work", requiring the use of information technology to drive the modernization of agriculture and rural areas, promote high-quality and efficient agriculture, livable and business friendly rural areas, and prosperous farmers, providing solid support for accelerating the construction of an agricultural power. Smart agriculture refers to an economic model that combines modern science and technology with agricultural planting to achieve unmanned, automated, and intelligent management. As a carrier of smart agriculture, the construction of unmanned smart farms has opened a window for us and shown us the future of agriculture. Build a smart agriculture platform through the application of new technologies such as the Internet of Things, artificial intelligence, big data, and geographic information technology. The application of agricultural machinery and equipment, as the foundation for building smart farms, should not be underestimated in terms of its digital transformation. In terms of digital rural construction, this article intends to analyze the background of smart agriculture and the digital transformation path of agricultural machinery and equipment manufacturing enterprises based on actual work situations.

2. EXPERIENCE IN SMART AGRICULTURE CONSTRUCTION AT HOME AND ABROAD

Abroad, countries such as Germany, Egypt, and Australia have continuously promoted the transformation of agriculture towards digitalization and intelligence by formulating digital agriculture plans, developing intelligent agricultural machinery and equipment, and establishing farm information platforms, promoting sustainable agricultural development. Among them, Germany has promoted the pilot experience and technological achievements of digital agriculture. The German government has specifically formulated a future plan for the "Agricultural Digital Policy" and released the "German Farmland Strategy 2035" in 2021. Egypt implements a national strategy for modernizing irrigation, reducing agricultural water consumption through intelligent irrigation systems. The Australian government is accelerating the construction of agricultural IoT infrastructure and improving farm operational efficiency through the application of digital technology.

In China, taking Tianchang City in Anhui Province as an example: 52 year old Zhang Jianchang founded Fengcang Machinery Planting Cooperative, mainly providing agricultural machinery services; The Tianchang Smart Agriculture Command and Dispatch Center has launched an agricultural monitoring system; Young man Wang Ye returned to his hometown and founded the Huai Land Family Farm in Tianchang City.

Based on rich construction experience at home and abroad, it can be clearly pointed out that government support plays a key role in promoting the process of digital rural construction. This support system not only includes providing funds to ensure sufficient project funding, but also involves the introduction of sound policies and research and development technologies and applications. In addition, as the production process is the primary link and driving force of the industrial chain, the digital transformation of agricultural machinery and equipment is not only the fundamental support for digital rural construction, but also a prerequisite for promoting agricultural modernization and intelligent transformation. It not only significantly improves agricultural production efficiency and precision, but also lays a solid material foundation and technical guarantee for building smart agriculture and achieving comprehensive rural revitalization. Therefore, strengthening the digital upgrading of agricultural machinery and equipment has extremely important strategic significance for accelerating the pace of digital rural construction.

3. DEVELOPMENT STATUS OF CHINA'S AGRICULTURAL MACHINERY AND EQUIPMENT MANUFACTURING INDUSTRY

3.1. Achievements Already Achieved

Against the backdrop of rapid development in the digital economy and smart agriculture, China's agricultural machinery and equipment manufacturing industry has achieved certain accomplishments in digitalization after years of development. With the acceleration of agricultural modernization, the demand for agricultural machinery and equipment in agricultural production has increased, and enterprises have made improvements in many aspects of the production process. By introducing international advanced technology, optimizing production processes, and improving product quality, measures have effectively improved production efficiency and product quality, greatly liberating agricultural labor. In addition, China's agricultural machinery and equipment manufacturing industry has made certain breakthroughs in technological innovation in recent years. In some agricultural provinces, upstream and downstream enterprises in the relevant industry chain have collaborated to innovate, forming multiple agricultural machinery and equipment supporting industry clusters to jointly promote industrial development, especially in the fields of intelligent agricultural machinery, unmanned driving, precision agriculture, etc., increasing research and development efforts and innovation in intelligent technology. The application of new agricultural machinery and equipment

such as unmanned tractors, crop protection drones, and intelligent harvesters has significantly improved the efficiency and automation level of agricultural production, enhanced the level of agricultural mechanization management organization, and promoted the development of intelligent, large-scale, and intensive agricultural production in China.

3.2. Remaining Shortcomings

Although the agricultural machinery and equipment manufacturing industry has achieved the above achievements, there are still shortcomings that need to be strengthened. In equipment manufacturing, our key core technologies are controlled by others and lack self-developed core technologies. The technological shortcomings have led to a large number of products and technologies being imported from abroad, resulting in a low domestic production rate. On the other hand, the research and development cost of agricultural machinery equipment itself is high, and the government's corresponding financial investment is low. Manufacturing enterprises lacking research and development funds will compress the investment cost of technology research and development. In addition, there are barriers to the relevant R&D data resources between agricultural machinery equipment manufacturing enterprises, research institutions, and universities, and there is a lack of information platforms for multi-party sharing of data resources, making it difficult to achieve data resource sharing, resulting in duplicate R&D data and hindered R&D progress. The above issues have made it difficult to solve the problem of our core technology falling behind developed countries for a long time. In terms of the popularization and application of digital agricultural machinery and equipment, there are significant differences among different regions in China. Due to the high cost of purchasing agricultural machinery and the fact that the popularity of agricultural technology information is far behind the development progress of agricultural machinery and equipment, farmers have insufficient knowledge of the performance, use, advantages, and other aspects of agricultural machinery and equipment, resulting in many farmers unwilling to invest in their use. Therefore, although the product structure of digital agricultural machinery and equipment has been optimized, traditional farming machinery still dominates. In addition, the industry has a strong demand for new agricultural professionals, while the talent supply in China's agricultural machinery and equipment manufacturing industry is slightly insufficient. According to relevant departments' predictions, the talent gap in China's agricultural machinery and equipment industry may reach 440000 people by 2025.

4. SUGGESTIONS

4.1. Breakthrough in Key Core Technologies

In terms of breakthroughs in key core technologies, agricultural machinery equipment manufacturing enterprises should increase cooperation with relevant scientific research institutions and universities, focusing on the key areas of technology released in "Made in China 2025", with a focus on technological breakthroughs in iconic high-end major equipment and key core components that are efficient, intelligent, energy-saving, and environmentally friendly. Through original innovation, integrated innovation, and introduction, digestion, absorption, and re innovation, they can narrow the gap with international advanced levels, fill domestic gaps, replace imports, and improve domestic production rates. In terms of research and development investment, enterprises should not only fully utilize government financial investment, but also integrate social funds to increase the cost of developing key core technologies. To address the issue of data barriers, manufacturing companies should collaborate with multiple parties to solve the problem of data silos. Collaborate with agricultural enterprises, institutions, research institutes, and agricultural management departments to promote the establishment of a data sharing platform by relevant units, jointly carry out the construction of basic databases such as agricultural geographic information, soil characteristics, meteorological data, agricultural knowledge models, and agricultural machinery operation

mechanism models, and promote the application of agricultural machine numerical control technology in farmland cultivation. At the same time, relevant laws and regulations should be formulated to clarify the ownership, access, and usage rights of data, ensuring the security of data during the sharing process and the legitimate rights and interests of the providing units or individuals.

4.2. Popularization of Information Technology and Promotion of Agricultural Machinery and Equipment

Promotion and publicity are necessary business models for agricultural machinery and equipment manufacturing enterprises to promote digital transformation, which can improve the overall application rate and popularity of intelligent agricultural machinery and equipment in the region. At present, the organic integration of popularizing new information technologies and traditional promotion systems is the main development trend. The application of 5G and mobile Internet technology will effectively remedy the blind spot of traditional agricultural technology promotion, and make information dissemination more convenient and efficient. At the same time, more efforts will be made to provide information technology training for agricultural technicians and farmers, which is conducive to fully improving the utilization rate of agricultural machinery and equipment installed by farmers and maximizing benefits.

4.3. Introduction of New Agricultural Science Professional Talents

For agricultural machinery and equipment manufacturing enterprises, new agricultural science professionals are essential. They provide solid support for the digital transformation of enterprises and help key core technologies break through blockages. However, the current shortage of professional talents in the field of agricultural technology has become a major obstacle to the deepening development of smart agriculture. Since the "smart agriculture" was first introduced into the "No. 1 central document" in 2016, the demand for talents in smart agriculture has also risen rapidly, requiring interdisciplinary talents in agricultural science, biotechnology, agricultural economy and environmental science. In fact, the professional and technical requirements for smart agriculture are high, and the cultivation of talents currently relies heavily on agricultural universities, resulting in a supply of graduates far less than what agriculture needs every year. Enterprises can take measures such as increasing salary and benefits, and increasing welfare incentives to attract more versatile talents to join the digital transformation path of the enterprise.

In short, the importance of digital transformation for the agricultural machinery and equipment manufacturing industry and related enterprises is self-evident. China's agricultural machinery and equipment manufacturing industry has both achievements and shortcomings in technological innovation, capital investment, data sharing, and talent cultivation. In response to existing problems, efforts should be made to strengthen breakthroughs in key core technologies, popularize information technology, promote agricultural machinery and equipment, and attract new agricultural professionals, in order to provide strong support for the digital transformation of enterprises.

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