

# Analysis of the Application Advantages and Technical Characteristics of Agricultural Machinery Automation Technology

Guangfu Zhang

Xihua University, Chengdu, Sichuan 610039

---

**Abstract:** With the rapid development of science and technology, agricultural production needs to be modernized in order to improve efficiency, reduce costs and reduce the burden of farmers. However, there are many disadvantages in the traditional agricultural production mode, which is difficult to meet the needs of modern agricultural development. This paper makes an in-depth analysis of the application advantages and technical characteristics of agricultural machinery automation technology, and puts forward the strategies of deeply understanding the agricultural production needs, strengthening technology research and development and innovation, and paying attention to talent training and introduction. Through the effective application of agricultural machinery automation technology, it is expected to realize the intelligence, precision and adaptability of agricultural production, so as to promote the process of agricultural modernization in China, ensure the national food security and increase farmers' income.

**Keywords:** Automation technology of agricultural machinery; Application advantages; Technical characteristics

---

## Introduction

At present, China's population is growing, the rural labor force is accelerating to the city, and agriculture is facing a severe challenge of modernization transformation. Traditional agricultural production mode has been difficult to meet the growing demand for food, so we need to improve the efficiency and quality of agricultural production through scientific and technological innovation. As an important technical support of modern agriculture, the automation technology of agricultural machinery is gradually moving towards the countryside and injecting new impetus into the agricultural modernization. The wide application of automation technology can significantly improve the efficiency of agricultural production, reduce the production cost, but also can reduce the physical labor of farmers, improve the safety of agricultural production.

### 1. The application advantages of agricultural machinery automation technology

The application of agricultural machinery automation technology brings a series of advantages, among which the most prominent is to improve the production efficiency. This kind of continuous and efficient automatic equipment operation, under the premise of ensuring the quality of operation, greatly saves manpower input, directly, promotes the increase of farmers' income. In addition, through precise control, automation equipment can effectively reduce the use of chemical fertilizers, pesticides and other means of production, and reduce agricultural production costs. Under the traditional agricultural production mode, farmers are engaged in heavy physical labor for a long time, resulting in physical and mental exhaustion. Automation equipment can replace manpower to complete most repetitive physical labor, so that farmers from overwork, and spare more time and energy into other production links or life. Automatic equipment is generally equipped with automatic diagnosis, automatic protection, automatic monitoring and automatic alarm functions, can timely find and deal with abnormal conditions in the process of operation, to maximize the safety of operators and equipment. This automation technology will be more reliable and more secure. In short, agricultural machinery automation technology through improve efficiency, reduce costs, reduce labor intensity, improve safety and other comprehensive advantages, will greatly promote the process of agricultural modernization, for the realization of sustainable and high-quality agricultural development to contribute an important force.

### 2. Technical characteristics of the automation technology of agricultural machinery

Modern agricultural machinery automation technology integrates information technology, sensor technology, artificial intelligence and other cutting-edge technologies, showing its distinctive intelligent characteristics. These automation devices are no longer simple mechanical

devices, but agents with independent “thinking” and decision-making capabilities. The automation equipment can automatically adjust the operation parameters and optimize the operation process according to the real-time environmental data and the operation requirements, and realize the optimal operation. The automation equipment also has built-in high-precision sensors and control system, which can monitor the growth of crops 24 hours online, and according to the results of big data analysis, implement precise control of the input of production factors such as fertilizer and water, to minimize the waste of resources. Different crop varieties, different climate and soil environment have different requirements for agricultural production. Automation equipment can quickly adapt to various production needs by means of parameter setting and module replacement. Through intelligence, precision and adaptability, the modern agricultural machinery automation technology has been endowed with a new scientific and technological connotation, so that it can fundamentally get rid of the limitations of the traditional agricultural mechanization level, and become an important technical support to promote agricultural modernization.

### **3. Analytical strategies for the automation technology of agricultural machinery**

#### **3.1 In-depth understanding of agricultural production needs**

Fully understanding the actual needs of agricultural production is the premise to ensure the smooth implementation of automation technology and play the maximum efficiency. Agricultural production involves a wide range of areas, including planting, animal husbandry, fishery and many other categories. Each type of agricultural production activities faces different environmental conditions, resource input, operation procedures, and the requirements for automation technology are not the same<sup>[1]</sup>. Taking "planting industry" as an example, it is necessary to analyze the variety characteristics, growth cycle, demand for environmental conditions of the planted crops, as well as the specific requirements of key links such as fertilization, irrigation, disease and pest control, so as to choose the most appropriate automation equipment and technical scheme. For example, for some leafy crops with short growth cycle, automatic equipment is required to adapt to all stages of crop growth; for crops with long life cycle, equipment is required to operate stably for a long time to ensure whole-process monitoring and control. In addition, the climate environment and soil conditions in different regions will also put forward unique requirements for the application of automation technology. In arid areas, water-saving automated irrigation equipment is particularly important; in rainy areas, a powerful automated pest control system is needed. Only by conducting a comprehensive and in-depth research and understanding of all aspects of agricultural production, can we match and configure the optimal and customized automation technology solutions, so that they can effectively meet the actual needs of production and give full play to the value of technology.

#### **3.2 Strengthen technology research and development and innovation**

Strengthening the research and development and innovation of automation technology is the internal driving force to maintain the sustainable development of agricultural modernization. With the rapid development of science and technology, the demand for automation technology in agricultural production is also constantly upgrading<sup>[2]</sup>. It is far from enough to stay at the current level. We must follow the forefront of science and technology, take the initiative and constantly bring forth new limits. In the future, emerging technologies such as artificial intelligence, big data and the Internet of Things will be more deeply integrated with agricultural production, giving birth to a number of revolutionary innovative technologies. For example, in the field of artificial intelligence, intelligent agricultural machinery with deep learning ability can be developed to master the essence of agronomic operation and continuously optimize and improve the operation level; in the field of big data, a big data platform covering planting, breeding and meteorology can be established to realize all-round accurate decision-making; in the field of Internet of Things, a sensor network throughout the fields can be built to monitor all aspects of agricultural production in real time. It is also necessary to increase the innovation of agricultural machinery and equipment, and constantly upgrade the core capabilities of intelligence, precision and adaptability of automation equipment, so as to make it more close to the actual needs of agricultural production. Technological research and development innovation also needs to be forward-looking and strategic, take the initiative to plan and layout, and make long-term strategic preparation. By strengthening technology research and development and innovation, we can seize the historic opportunity of scientific and technological revolution and occupy the commanding heights of agricultural modernization.

#### **3.3 Pay attention to talent training and introduction**

Talent is the fundamental driving force of scientific and technological innovation, and it is also crucial in promoting agricultural machinery automation technology. To really give full play to the efficiency of automation technology, cannot leave a high-quality professional and technical personnel team<sup>[3]</sup>. In terms of talent training, universities and research institutes should strengthen talent training in agricultural automation and other related disciplines, improve the talent training system, optimize professional curriculum, strengthen the combination of theoretical teaching and practice, so that students can master solid professional theoretical knowledge and have rich practical experience. We will encourage industry-university-research cooperation, so that students can go deep into the fields to understand the actual needs of agricultural production and enhance their ability to solve practical problems. Attention should also be paid to the re-education and training of existing

employees, so that they can keep up with the pace of technological development, and master the latest operation and use methods of automatic equipment and maintenance skills. Human resources are the basis for the continuous upgrading and continuous innovation of automation technology. Only by persistently cultivating and introducing high-quality talents, can we finally build a strong team of technical personnel, and provide a steady stream of intellectual power for the wide application and sustainable development of agricultural machinery automation technology.

#### 4. Conclusion

The application of agricultural machinery automation technology has significant advantages, and it is an important technical support to realize agricultural modernization and ensure national food security. Through in-depth understanding of agricultural production needs, strengthening technological innovation and research and development, and paying attention to the introduction of talent training and other strategies, China's transformation of agriculture to intelligent, accurate and efficient modern agriculture. Looking forward to the future, with the deep integration of artificial intelligence and other next-generation information technology, such as artificial intelligence, big data and Internet of Things, and agricultural production, agricultural machinery automation technology will realize leap-forward development, leading agriculture towards a new modern new era of intelligence, precision and high efficiency.

---

#### References

- [1] The Sea Buddha into. Application and promotion strategy analysis of agricultural machinery automation technology [J]. Contemporary Agricultural Machinery, 2023 (09): 28-29.
- [2] Wang Qingling. Application characteristics and advantages analysis of agricultural machinery automation technology [J]. Hebei Agricultural Machinery, 2023 (06): 27-29.
- [3] Chen Zhi-yu. Analysis of the application characteristics and development of automation technology in agricultural machinery [J]. Use and Maintenance of agricultural machinery, 2022 (08): 78-80.