

Discussion on the Current Situation and Future Development of Unmanned Smart Farmland

Zhao Wang^{1,2,3,4,5, *}, Xunbo Sun^{1,2,3,4,5}

¹ Institute of Land Engineering and Technology, Shaanxi Provincial Land Engineering Construction Group Co., Ltd., Xi'an 710075, China

² Shaanxi Provincial Land Engineering Construction Group Co., Ltd., Xi'an 710075, China

³ Key Laboratory of Degraded and Unused Land Consolidation Engineering, Ministry of Natural Resources, Xi'an 710075, China

⁴ Shaanxi Provincial Land Consolidation Engineering Technology Research Center, Xi'an 710075, China

⁵ Land Engineering Quality Testing of Shaanxi Land Engineering Construction Group Co., Ltd., Xi'an 710075, China

*wangzhaotougao@163.com

Abstract

At present, unmanned smart farmland in China is in the early stage of demonstration and promotion, and technological research mainly focuses on single machine intelligent control technologies such as autonomous driving and precision operation. However, related technologies such as multi machine collaboration, host machine and machine operation collaboration, as well as collaboration between agricultural production scenarios and autonomous agricultural machine operation, are insufficient. Building unmanned smart farmland is an important way to alleviate the shortage of rural labor and promote the modernization of agriculture and rural areas. It provides precise planting, visual management, and intelligent decision-making for agricultural production, and also allows agriculture and rural areas to share the achievements of technological development in the era.

Keywords

Unmanned Smart Farmland; Intelligent Management System; Intelligent Agricultural Machinery.

1. Construction Background and Ideas

① Construction background

Unmanned smart farmland is an advanced stage of agricultural production, integrating new generation technologies such as the Internet of Things, cloud computing, big data, 5G, artificial intelligence equipment, and robots. Relying on the smart agricultural production system deployed on agricultural production sites, it can automatically control facilities, equipment, machinery, etc. or autonomously control robots, achieving intelligent perception, early warning, decision-making, and analysis of the agricultural production environment. The essence of an unmanned production operation mode guided by experts online, which is all-weather, full process, and full space, is to achieve machine replacement in agricultural production. Building unmanned smart farmland is an important way to alleviate the shortage of rural labor and promote the modernization of agriculture and rural areas. It provides precise planting, visual

management, and intelligent decision-making for agricultural production, and also allows agriculture and rural areas to share the achievements of technological development in the era. With the development of information technologies such as the Internet of Things and artificial intelligence, developed countries such as the United States, the United Kingdom, Israel, and the Netherlands have begun to build smart agriculture such as unmanned fields and greenhouses. The combination of the Internet of Things and AI's advanced technology in agricultural production in the United States, including intelligent robots, temperature and humidity sensors, aerial photography, and GPS technology, has greatly improved the operational efficiency of American farmland. At present, unmanned smart farmland in China is in the early stage of demonstration and promotion, and technological research mainly focuses on single machine intelligent control technologies such as autonomous driving and precision operation. However, related technologies such as multi machine collaboration, host machine and machine operation collaboration, as well as collaboration between agricultural production scenarios and autonomous agricultural machine operation, are insufficient. In terms of application, it mainly relies on government guidance and demonstration promotion, and the commercialization process is in the guidance period. As of the end of 2022, there are about a hundred unmanned smart farmland projects in China, most of which are facility agriculture with less field planting. The development of unmanned smart farmland in China has established a certain foundation, but most of it is in the exploratory stage, with a lack of technological maturity and economic efficiency. At present, there is no truly unmanned smart farmland in Shaanxi Province, and there are only some small-scale smart agricultural parks mainly focused on facility agriculture. In terms of unmanned smart farmland in large fields, it is still in the stage of small-scale field experiments.

② Construction ideas

With the unmanned intelligent farmland central control system as the core, supplemented by advanced unmanned agricultural machinery equipment and front-end information collection technology, we comprehensively monitor the operation status of farmland and soil environment, and use big data analysis to achieve intelligent grain production equipment, management informatization, "suitable mechanization" of farmland, precise operation, and scientific warning.

③ Construction objectives

Construction objective: The core goal of the smart farmland project construction is to improve agricultural production efficiency, optimize resource utilization, reduce environmental pollution, and promote sustainable development of agriculture. Through the application of intelligent technology, traditional agricultural production methods can be changed, agricultural production efficiency can be improved, and sustainable development can be achieved.

Construction tasks: a Build smart farmland infrastructure, form unmanned agricultural production information management, and achieve precise management of agricultural materials, personnel, costs, equipment, farming, and harvest; b Promote new technologies, improve the quality of agricultural products, and increase the added value of products; c Improve the efficiency of agricultural production and reduce production costs.

2. Technical Proposal

Unmanned smart farmland includes three parts: an unmanned smart farmland management system, an air space integrated monitoring system, and an unmanned intelligent agricultural machinery equipment.

The unmanned intelligent farmland management system guides production and operation through big data, improving the efficiency of soil, water, fertilizer, medicine, and human resource utilization; The integrated monitoring system of space and space achieves farmland

information perception through satellite remote sensing, drone remote sensing, and the "Four Emotions" ground IoT monitoring station; The unmanned intelligent agricultural machinery equipment perceives the information of the air space integrated monitoring system, analyzes the precise investment of the entire process of unmanned intelligent farmland cultivation, sowing, fertilization, irrigation, and harvesting, clarifies the intelligent control method of key components of cultivation, management, and harvesting, and performs real-time and accurate variable operations through the entire process of unmanned equipment.

① Unmanned intelligent farmland management system

Adopting new generation information technologies such as the Internet of Things, big data, artificial intelligence, 5G, and robots to carry out unmanned intelligent farmland construction, integrating and building a smart agricultural platform centered on big data collection, analysis, management, and application. It can remotely control farmland facilities, equipment, machinery, etc., or complete all agricultural production and management tasks through intelligent equipment and robots' autonomous decision-making and operation, which is a 24-hour, full process. The unmanned production operation mode in the entire space achieves the intelligent management goal of "producing with data, managing with data, and making decisions with data". The system mainly includes smart production, smart agriculture big data construction, and smart agriculture comprehensive display platform.

② Integrated monitoring technology system for space and space

Build an integrated Internet of Things monitoring system for space and space, apply remote sensing systems, Internet of Things measurement and control systems, and field comprehensive monitoring stations and other facilities and equipment to monitor the growth environment and body of wheat and corn in real-time, predict and predict the "four conditions" of soil moisture, seedling, insect, and disaster, and meteorological conditions, and accurately guide the entire digital production decision-making of wheat and corn.

③ Fully mechanized and intelligent technology system

The driverless agricultural machinery covers four major links of tillage, planting, management and harvesting, and is composed of driverless tillage and preparation machine, seeder, self-propelled spray machine, driverless harvester and other parts. In the unmanned intelligent farmland mode, unmanned agricultural machinery will make farmland management more informationized and efficient based on the front-end perception layer and decision-making layer, and make farmland operations more precise and intelligent. Acknowledgments.

Unmanned agricultural production operations can be achieved through mobile intelligent terminals. By building a new 5G base station, full coverage of the 5G network has been achieved. After farmers install an operating system on their mobile terminals, unmanned agricultural machinery can replace professional agricultural machinery operators and plan the optimal operation path.

3. Typical Cases

① Location scale

The unmanned smart farmland for corn in Gongzhuling City, Jilin Province is located in the Jilin Agricultural Science and Technology Demonstration Park on the south side of National Highway 102 in Gongzhuling City. The construction area of unmanned smart farmland is 1000 acres, including 350 acres in the core area.

② Construction content

Mainly including information perception systems, intelligent agricultural machinery equipment, and unmanned intelligent control cloud platforms.

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