Thoughts on building an intelligent integrated management system of agricultural environment

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Abstract. In modern agricultural production, environmental factors are very important. It determines not only the production cost and benefits, but also the success and difficulty of agricultural production. Agricultural environmental monitoring is the foundation of agricultural environmental management. It is vigorously developing agricultural environmental monitoring to meet the environmental needs of different varieties and planting models. Organically combining agricultural production equipment and agricultural operations is the research focus of agricultural informationization at this stage. In order to better serve the entire industry chain of agricultural forecasting, production and sales, this paper proposes to create an integrated intelligent management system that integrates pre-production, mid-production and post-production.

Keywords: Agricultural Environment Monitoring, Intelligent Greenhouse, Automatic Irrigation, Integrated Management Of Agricultural Environment

1. Background

In modern agricultural production, environmental factors are crucial. It not only determines the production cost and benefits, but also determines the success or difficulty of agricultural production. Traditional farming methods, due to long-term high-intensity farming and a large amount of application of chemical fertilizers and pesticides, caused the destruction of the soil aggregate structure, the accumulation of nitrite, the increased risk of pesticide residues, the growing pests and diseases, which seriously affected the quality of agricultural products and caused consumer confidence Loss, the sustainable development of agricultural production faces challenges.[1-3]

Agricultural environmental monitoring is the foundation of agricultural environmental management. We will vigorously develop agricultural environmental monitoring to meet the environmental needs of different varieties and planting models, build an intelligent, full-featured, and environmentally-friendly environmental monitoring and management system that integrates agricultural production equipment and agriculture. The organic integration of the operation process and the realization of a modernized agricultural production management model are the research focus of agricultural informatization at this stage.[4-6]
2. Agricultural Environmental Monitoring Equipment

Intelligent environment monitoring equipment is an Internet of Things equipment that integrates distributed information processing technology, embedded technology, smart sensor technology, wireless communication technology and network security technology. Intelligent environmental monitoring equipment can accurately sense environmental parameters such as air temperature, air humidity, CO2 concentration, light intensity, soil temperature, and soil water content in real time, and transmit the sensed environmental data to the agricultural environment intelligent monitoring management platform through wireless communication technology to achieve Real-time intelligent monitoring of crop growth environment. Meeting the needs of agricultural enterprises, agricultural management departments, agricultural scientific research units, agricultural planting, breeding cooperatives and the majority of farmers for production environment monitoring and intelligent management has greatly improved the efficiency and scientificity of agricultural production management.[7-9]

The intelligent greenhouse management system mainly completes the control of environmental factors such as greenhouse temperature, humidity, and sunshine. The system is composed of a protective net, a wind exchange system, a fill light and a heating system.[10] It can realize the opening and closing of the protective net and the air exchange system according to the time setting, temperature setting, humidity setting, manual control and other methods. In the case of poor outdoor conditions, supplementary lighting and heating can be used to promote the growth of crops, which greatly reduces the constraints of natural climate on agricultural production and breaks the traditional situation of relying on heaven to eat.[11-13]

The automatic irrigation system can automatically complete the mixing of water and fertilizer according to the environmental factors of the crops and implement irrigation.[14] The system consists of a central control system, valve controller, fertilizer mixer, fertilizer applicator, filter, field pipeline, etc. The proportion of water and fertilizer is preset in the central control system (according to user requirements or system knowledge base), which supports scheduled irrigation and manual operation, and also supports irrigation of soil-related parameters returned by the agricultural environment intelligent monitoring and management platform. The system can realize the timing and quantitative control of irrigation and fertilization, ensure the humidity of the soil, fully improve the utilization rate of water and fertilizer, not only save water and fertilizer, improve the soil environment and improve the quality of crops, but also greatly reduce production costs and labor intensity promotes agricultural production and income.[15-16]

![Figure 1. Intelligent environment monitoring equipment](image-url)
greenhouse management system, and automatic irrigation system. The management platform displays various environmental data collected by the intelligent environmental monitoring equipment in real time to users in intuitive data, lists, and graphics, and provides functions such as sound and light alarms and SMS alarms. At the same time, the intelligent greenhouse management system and the automatic irrigation system are coordinated and managed to realize the comprehensive management of the environmental factors in the shed. The management platform can also be connected to a high-definition live webcam to upload real-time production site equipment operations and crop growth conditions, real-time automatic monitoring of the agricultural production environment, and guidance to users in agricultural production.

3. Social and Economic Benefits
The intelligent monitoring and prompting functions of the agricultural environment intelligent monitoring and management platform can better guide agricultural production and reduce management costs; the management platform can effectively reduce water infiltration and evaporation, improve water utilization efficiency, and better achieve balanced fertilization and concentration. Fertilization reduces fertilizer volatilization and loss, as well as losses caused by excess nutrients, improves fertilizer utilization, and reduces production costs; the management platform can significantly reduce labor and labor intensity, reduce the number of producers, and save labor costs; The precise control of temperature, water and fertilizer can reduce the occurrence of diseases and insect pests, improve the quality of agricultural products, promote high-quality and increase production, and increase farmers' income.

In the past few years, in the provinces of Kangping, Panshan, Linghai, Yixian, Shoushan, Haicheng, Jinzhou, Xiongyue, Dongling, Dengta, Nanpiao and other cities and counties, Shandong outside the province, Shanghai, Yunnan and other regions have conducted large-scale production demonstrations of strawberries, tomatoes, cucumbers, flowers and other crops. The cumulative area is more than 1,000 mu, with an average increase of more than 15%, and the efficiency of acres has increased by more than 30%. The same varieties are listed 7-10 days in advance. The social and economic benefits are obvious and have been recognized by the majority of agricultural producers.

4. Problems

4.1. The policy support is not strong enough
Agricultural production has the characteristics of large investment, long cycle and high risk. The application of agricultural smart equipment increases the initial investment and reduces the willingness of agricultural producers to use it. With the continuous development of information technology, agricultural intelligent equipment is gradually being widely used, but the corresponding supporting policies have not been implemented, which greatly affects the application and promotion of agricultural intelligent equipment. The government should carry out the top-level design as soon as possible to include agricultural smart equipment in the scope of subsidies, while encouraging banks to relax their loan policies and promote their rapid development.

4.2. The quality of agricultural producers needs to be improved
At the present stage, the rural population is experiencing a serious outflow. Most of the people engaged in agricultural production are older and have a low education level. Their ability to accept new things is limited, which seriously hinders the application and promotion of agricultural smart equipment. The government should introduce relevant policies to encourage young and middle-aged people to return to their hometowns for employment, increase publicity on modern agricultural technology, and do a good job in the training of agricultural producers.

5. Building an Intelligent Integrated Management System for the Agricultural Environment
In order to better serve the entire industry chain of agricultural forecasting, production and sales, it is
the goal of the next stage to build an intelligent management system that integrates pre-production, mid-production and post-production, that is, to build an intelligent integrated management system for the agricultural environment.

The intelligent integrated management system for agricultural environment is based on the analysis of the status and development trends of domestic and foreign Internet of Things technology, environmental monitoring technology, big data analysis and application, combined with the characteristics and actual needs of agricultural production and management in our province, integrating intelligent, A practical remote monitoring control management system. The system is based on sensors, computer intelligent decision-making is the core, mobile communication is the carrier, and the actual application of farmers is the terminal. It realizes the integrated management of environmental resources and agricultural resources before, during, and after agricultural production. The system integrates intelligent control algorithms, environmental parameter prediction models, crop growth and development models, and disease prediction models. It can realize the selection of agricultural production varieties and varieties in the early stage of agricultural production according to market demand, soil moisture, and soil testing formulas. Expert advice such as reasonable allocation and the area of the planting area; in the mid-term of agricultural production, provide expert knowledge such as environmental parameters that are most suitable for crops in each growth period through the database of production technology regulations, and send the expert knowledge directly to users to implement control and achieve real-time Agricultural technology guidance; in the later stage of agricultural production, provide the market with information on crop varieties and output in the production area, achieve macro control of the agricultural product market, further provide agricultural product logistics, traceability and other functions to better serve agricultural production, management, scientific research and agricultural products Sales.

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