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Agricultural IoT Technology

Agricultural Internet of Things Technology

Agricultural Internet of Things refers to the Internet of Things that participates in automatic control through real-time display of various instruments or as parameters of automatic control. It can provide a scientific basis for precise control of greenhouses to achieve the purpose of increasing production, improving quality, adjusting growth cycles, and improving economic benefits.

In the greenhouse control system, the temperature sensors, humidity sensors, pH sensors, light intensity sensors, **CO2 sensors** and other equipment of the Internet of Things system are used to detect physical parameters such as temperature, relative humidity, pH value, light intensity, soil nutrients, CO2 concentration, etc. in the environment to ensure that crops have a good and suitable growth environment. The realization of remote control enables technicians to monitor and control the environment of multiple greenhouses in the office. **Wireless networks** are used to measure and obtain the best conditions for crop growth.

The general application of the **agricultural Internet of Things** is to form a monitoring network with a large number of sensor nodes, collect information through various sensors, so as to help farmers find problems in time and accurately determine the location of the problem. In this way, agriculture will gradually shift from a production model centered on manpower and relying on isolated machinery to a production model centered on information and software, thereby using a large number of various automated, intelligent, and remotely controlled production equipment.

Basic introduction

With the policy inclination of governments around the world towards the Internet of Things industry and the strong support and investment of enterprises, the Internet of Things industry has been rapidly spawned. According to domestic and foreign data, the Internet of Things has developed greatly since 1999 and has penetrated into every industry field. It is foreseeable that more and more industry fields, technologies, and applications will intersect with the Internet of Things. The transformation and optimization towards the Internet of Things has become the development direction of the times. The development of the Internet of Things and the acceleration of scientific and technological integration.

Agricultural Internet of Things: The Internet of Things is recognized by the world as the third wave of the world's information industry after computers, the Internet and mobile communication networks. It is a network that realizes the comprehensive interconnection of people, people and things, and things and things based on perception. Behind this, various microchips are implanted in objects, and these sensors are used to obtain various information of the physical world, and then they are interactively transmitted through various communication networks such as local wireless networks, the Internet, and mobile communication networks, so as to realize the perception of the world.

In traditional agriculture, farmers rely on experience and feelings for watering, fertilizing, and spraying. Today, the production base of facility agriculture sees a different picture: Should fruits and vegetables be watered? Fertilizing and spraying, how to maintain precise concentration? How to implement on-demand supply of temperature, humidity, light, and carbon dioxide concentration? A series of problems that were once "fuzzy" in different growth cycles of crops are all "precisely" checked in real time by the information-based intelligent monitoring system. Farmers only need to press a switch, make a choice, or completely listen to "instructions" to grow good vegetables and flowers.

Principle

On the basis of computer Internet, using RFID, **wireless data communication** and other technologies, construct an "Internet of Things" covering everything in the world. In this network, objects (commodities) can "communicate" with each other without human intervention. Its essence is to use **radio frequency automatic identification (RFID)** technology to realize the automatic identification of objects (commodities) and the interconnection and sharing of information through the computer Internet.

Steps

(1) Identify the attributes of the object, including static and dynamic attributes. Static attributes can be directly stored in the tag, while dynamic attributes need to be detected by the sensor in real time.

(2) The identification device is required to complete the reading of the object attributes and convert the information into a data format suitable for network transmission.

(3) The object information is transmitted to the information processing center through the network (the processing center may be distributed, such as a computer or mobile phone at home, or centralized, such as China Mobile's IDC), and the processing center completes the relevant calculations of the object communication.

IoT Applications

Real-time Monitoring Function

The air temperature, air humidity, carbon dioxide, light, soil moisture, soil temperature, temperature outside the greenhouse and wind speed data in the greenhouse are collected in real time through the sensor equipment; the data is transmitted to the service management platform through the mobile communication network, and the service management platform analyzes and

processes the data.

Remote Control Function

For greenhouses with better conditions, electric roller shutters, exhaust fans, electric irrigation systems and other electromechanical equipment are installed to realize remote control function. Farmers can log in to the system through mobile phones or computers to control the switches of water valves, exhaust fans, and roller shutters in the greenhouse; they can also set the control logic, and the system will automatically open or close roller shutters, water valves, fans and other greenhouse electromechanical equipment according to the internal and external conditions.

Query function

After farmers log in to the system using mobile phones or computers, they can query the various environmental parameters, historical temperature and humidity curves, historical electromechanical equipment operation records, historical photos and other information in the greenhouse (shed) in real time; after logging in to the system, they can also query local agricultural policies, market conditions, supply and demand information, expert notices, etc., to achieve targeted comprehensive information services.

Warning function

The warning function requires pre-setting of upper and lower limits suitable for the conditions. The set values can be modified according to the type of crop, growth cycle and seasonal changes. When a certain data exceeds the limit, the system immediately sends a warning message to the corresponding farmer, prompting the farmer to take timely measures.

Work Plan

In order to implement the spirit of the 18th CPC National Congress, effectively promote the synchronous development of industrialization, informatization, urbanization and agricultural modernization, make full use of modern information technology to transform traditional agriculture, continuously improve the utilization rate of agricultural resources and labor productivity, promote the transformation of agricultural development to intensive and large-scale, and improve the level of agricultural modernization.

The Ministry of Agriculture decided to launch the regional pilot project of agricultural Internet of Things (hereinafter referred to as the regional pilot project), and selected Tianjin, Shanghai and Anhui, which have a certain working foundation, to take the lead in carrying out pilot tests. To ensure the smooth progress of the regional pilot project, the following plan is formulated.

1. The implementation of the regional pilot project of agricultural Internet of Things is of great significance

At present, China's agricultural modernization process has been significantly accelerated, but it is also facing multiple constraints of resources, environment and market. The pressure to ensure food security, food safety and ecological security still exists, and the task of ensuring stable increase in farmers' income is becoming more and more heavy. The implementation of the regional pilot project is of great significance for exploring the theoretical research, system integration, key areas, development model and promotion path of agricultural Internet of Things, improving the theoretical and application level of agricultural Internet of Things, and promoting the transformation of agricultural production methods and increasing farmers' income.

(I) Implementing the regional pilot project is conducive to grasping the characteristics of information technology such as the Internet of Things and its application rules in the agricultural field, and exploring the development model of the agricultural Internet of Things. Information technology is a new thing, an integration of multiple disciplines and technologies, and is both systematic and holistic.

Agriculture is an ancient industry, with both regionality, seasonality and diversity, which determines the complexity and arduousness of information technology transformation of traditional agriculture. Implementing the regional pilot project, studying the integration, assembly mode and technical implementation path of the Internet of Things technology in different products and fields, gradually building an agricultural Internet of Things application model, promoting basic theoretical research, applicable technology and product development of the agricultural Internet of Things, and exploring the construction of a national agricultural Internet of Things standard framework system and related public service platforms will lay a solid foundation for promoting the great development of the agricultural Internet of Things industry.

(II) Implementing the regional pilot project is conducive to accumulating experience in the application of the agricultural Internet of Things and promoting the scientific development of the agricultural Internet of Things. At present, the application of China's agricultural Internet of Things is still in the experimental starting stage, and the overall application level and construction scale are obviously lagging behind other industries such as electricity, medical care, and environmental protection. The application demonstration of agricultural Internet of Things in various places is basically a scattered and guerrilla-style development, with many points and wide areas, and a serious lack of top-level design. The phenomenon of demonstration for demonstration is common, the problem of repeated investment is prominent, and there are few sustainable development business models. The implementation of the regional pilot project is conducive to gradually clarifying the development ideas, clarifying the development direction and focus, and accumulating experience for the comprehensive, overall and systematic promotion of agricultural Internet of Things.

(III) The implementation of the regional pilot project is conducive to mobilizing the enthusiasm of local agricultural departments and integrating the forces of all parties to jointly promote the application of agricultural Internet of Things. Although some local agricultural departments are very enthusiastic about developing agricultural Internet of Things, due to the lack of stable

investment, the stamina of system promotion is obviously insufficient, which to a certain extent affects the effect and long-term development of agricultural Internet of Things. The implementation of the regional pilot project is not only conducive to mobilizing the enthusiasm of local agricultural departments, but more importantly, through the demonstration, guidance and promotion of government engineering projects, it can promote the integration of resources from all parties in society, form synergy, and jointly promote the development of agricultural Internet of Things.

2. Goals and key tasks

(I) Project goals. Conduct theoretical research on the application of agricultural Internet of Things, explore the main direction, key areas, development model and promotion path of agricultural Internet of Things application; carry out agricultural Internet of Things technology research and development and system integration, build agricultural Internet of Things application technology, standards and policy systems; build an agricultural Internet of Things public service platform; establish an innovation mechanism and sustainable development business model promoted by the central and local governments, the government and the market, industry, academia and research and multiple departments; promote and apply successful experience models in a timely manner.

(II) Overall idea. Organize and implement in accordance with the overall idea of "unified planning, system design, field focus, integration of unity and division, overall promotion, and leapfrog development". Follow the guiding ideology of "central planning first and then regional testing, centralized platform construction first and then assembly and integration, pilot testing first, accumulation of experience and then promotion and application". While planning and designing the system, support Tianjin, Shanghai and Anhui to carry out experimental demonstrations in key areas such as facility agriculture and aquaculture, full-process monitoring of agricultural product quality and safety, promotion of agricultural e-commerce, and field grain crop production monitoring, based on their respective economic, social and agricultural development levels and industrial characteristics, and strive to explore and form a visible, usable and sustainable promotion and application model of the agricultural Internet of Things, gradually build a theoretical system, technical system, application system, standard system, organizational system, institutional system and policy system for the agricultural Internet of Things, and promote and apply it in stages across the country.

(III) Key tasks

First, study and deploy a public service platform for the agricultural Internet of Things. For major industry applications of the agricultural Internet of Things, focus on breakthroughs in key technologies such as multi-source information fusion, massive information distributed management, and intelligent information services, build a public service platform for the agricultural Internet of Things, and carry out common services in the fields of agricultural resource planning and management, precise management of production processes, and

traceability of agricultural product quality and safety.

Second, study and formulate a number of industry standards for the application of the agricultural Internet of Things. Jointly with industry, academia, research and application units, research and compile the use specifications of barcodes (one-dimensional code, two-dimensional code), electronic tags (RFID), etc. in the agricultural field, formulate and revise a number of standards for agricultural Internet of Things sensors and sensor nodes, data collection, application software interfaces, service object registration, and applications for field, facility agriculture, and agricultural product quality and safety supervision.

Third, pilot and mature a number of key technologies and equipment for agricultural Internet of Things. Focusing on the leading industries in the region, focus on pilot and mature sensors for animal and plant environment (soil, water, atmosphere), life information (growth, development, nutrition, lesions, coercion, etc.), develop sensors for maturity, nutritional components, morphology, harmful residues, product packaging labels, etc., carry out systematic introduction and independent research and development of agricultural Internet of Things technologies and equipment, strengthen digital monitoring methods and model research on animal and plant growth processes, and break through the core technologies and key technologies of agricultural Internet of Things.

Fourth, form a number of popularizable technology application models. For the monitoring and control of facility agriculture and aquaculture, agricultural product quality and safety, agricultural e-commerce, field grain crop production, etc., develop a series of special sensing, transmission, control and other equipment, develop corresponding software and management information systems, so as to build a full-process technical system and sustainable development mechanism.

Fifth, cultivate the agricultural Internet of Things industry. In accordance with the idea of introducing, digesting, absorbing and re-innovating, focusing on the perception and recognition, data transmission, data processing, intelligent control and information services of the agricultural Internet of Things, actively guide and promote the manufacturing of agricultural Internet of Things equipment, software development and related services, cultivate a number of agricultural Internet of Things industrialization research bases, pilot bases and production bases, and promote the development of the emerging agricultural Internet of Things industry.

Sixth, strengthen policy and measure research. Summarize the experience of the regional pilot project, research and propose policy recommendations to promote the application and promotion of the agricultural Internet of Things, actively promote the introduction of relevant policies and measures, and create a good environment for the development of the agricultural Internet of Things.

Experimental layout

Focusing on the characteristic industries and key areas of agriculture in Tianjin, Shanghai and

Anhui, the industry and industrial chain layout are comprehensively considered to gradually realize the penetration of Internet of Things technology in the entire agricultural industrial chain and the overall promotion of pilot provinces and cities.

(I) Tianjin Facility Agriculture and Aquaculture Internet of Things Experimental Zone

Tianjin is adjacent to Beijing, with good economic and transportation conditions and obvious location advantages. Facility agriculture is well developed. At present, it has 600,000 mu of high-standard facility agriculture, 620,000 mu of aquaculture, 55 large-scale aquaculture communities, and high self-sufficiency rates of vegetables and aquatic products. The focus of the experiment is to carry out demonstrations of the application of facility agriculture and aquaculture Internet of Things technology in modern agricultural demonstration bases, leading enterprises, farmers' professional cooperatives and aquaculture communities, explore agricultural Internet of Things application models for different types of agricultural products and different types of agricultural production and operation entities; carry out information management of logistics in agricultural product wholesale markets, explore the use of information technology to build a new agricultural product circulation pattern, effectively reduce transaction links, and improve transaction efficiency.

First, the integrated application of environmental information collection technology products for facility agriculture and aquaculture. Select modern agricultural demonstration bases, leading enterprises, farmers' professional cooperatives and aquaculture communities to explore the application models and sustainable business models of agricultural Internet of Things technologies for different types of agricultural products and different types of agricultural production and operation entities.

Second, the introduction and innovation of life information perception technology for facility agriculture. Actively introduce and digest advanced foreign crop life information perception technology and equipment to achieve online acquisition of key crop physiological and ecological information such as crop runoff, leaf temperature, and transpiration, and to achieve instant irrigation decision-making and online nutrition diagnosis.

Third, the extraction and early warning prevention and control of characteristic information of facility vegetable pests and aquatic diseases. Integrate facility environment, video, and animal and plant life perception information, introduce innovative technology for extracting characteristic information of facility agricultural pests and aquatic diseases, and realize real-time extraction and early warning, pre-prevention and control of key pests and diseases of major crops in facility agriculture and major aquatic diseases.

Fourth, explore the application platform and service model of facility agricultural Internet of Things. Integrate the existing agricultural information service system, build an integrated

application service platform for the Internet of Things of facility agriculture, and provide multi-channel and rich content-rich Internet of Things application services for facility agriculture and aquaculture to agricultural authorities, production bases, farmers' professional cooperatives, grassroots agricultural technicians, farmers, etc.; summarize and form a sustainable and popularizable Internet of Things application service model for facility agriculture and aquaculture.

Fifth, the agricultural product trading and circulation platform. Taking Tianjin Hanjiashu Haijixing Agricultural Products Wholesale Market as the main body, comprehensively utilize modern information technologies such as the Internet of Things to carry out agricultural product quality traceability, realize efficient management of logistics, distribution, and warehousing, and rely on the 26 agricultural product wholesale markets distributed across the country by Shenzhen Agricultural Products Co., Ltd. to explore the construction of a new agricultural product circulation pattern of "loading at the place of production, unloading at the place of sale, online transaction matchmaking, and single variety nationwide interconnection".

(II) Shanghai Agricultural Product Quality and Safety Supervision Experimental Zone

Shanghai is an international metropolis. Agricultural products mainly rely on imports from other places. Ensuring the quality and safety of agricultural products is a major livelihood project. Exploring the application of Internet of Things technology to carry out agricultural product quality and safety supervision experiments is of universal significance to ensure food safety in large and medium-sized cities. The test focuses on the application of Internet of Things technology in the production and processing, cold chain logistics and market sales of agricultural products (rice, green leafy vegetables, animals and animal products). With the help of wireless radio frequency identification technology and barcode technology, a public service platform for agricultural product supervision is built to realize intelligent monitoring of the entire process of agricultural product production and circulation, and effectively trace the information of the entire process of agricultural product production, transportation, storage and consumption.

First, build an Internet of Things system for agricultural product safety production management. Integrate wireless sensor networks, study real-time online collection technology of production environment information, study on-site rapid collection technology of production history information, develop an Internet of Things system for agricultural product safety production management, and realize pre-production prompts, mid-production warnings and post-production feedback.

Second, build an Internet of Things system for agricultural input supervision. In the agricultural production link, establish electronic archives of field operations of agricultural products such as rice and green leafy vegetables, standardize the management of agricultural inputs, and make the source clear, the use clear, and the amount clear.

Third, introduce and innovate Internet of Things technology for agricultural product cold chain logistics. Introduce and digest advanced foreign agricultural Internet of Things technologies. On the basis of digesting and absorbing related technologies, develop cold chain logistics process monitoring equipment that integrates multiple sensors, vehicle positioning, and wireless transmission, and strive to make progress in stability, reliability, low cost, and low energy consumption. Develop a monitoring and early warning system for agricultural products cold chain logistics processes to achieve real-time monitoring and intelligent decision-making based on logistics processes.

Fourth, the construction of an Internet of Things application platform for agricultural product quality and safety supervision and service model innovation. Build a comprehensive database for agricultural product quality and safety supervision, develop an Internet of Things application platform for agricultural product quality and safety supervision, provide Internet of Things comprehensive application services from farmland to table as the main line, and realize multi-mode traceability services with traceability as the core. Cultivate agricultural Internet of Things application demonstration bases, demonstration enterprises, and engineering technology research centers. Actively explore commercial service models.

Fifth, the application demonstration of agricultural product e-commerce platforms. Taking the construction of agricultural product e-commerce platforms as a breakthrough, focus on supporting the deep integration of agricultural product e-commerce and agricultural product traceability systems, accelerate the construction and promotion of application systems for full traceability from agricultural product production to terminal sales, and build an agricultural product production and marketing service information platform.

(III) Anhui Field Production Internet of Things Experimental Zone

Anhui is a typical agricultural province, which is of great significance to ensuring national food security. The experiment focuses on the monitoring service of the "four conditions" (seedling condition, soil moisture condition, pest and disease condition, and disaster condition) of field crops. Through the integrated application of real-time collection of agricultural data information, efficient and low-cost information transmission and computer intelligent decision-making technology combined with remote video monitoring and advanced perception, dynamic monitoring, early warning and production scheduling of field crops throughout the growth period are realized.

First, build a field crop agricultural condition monitoring system. Based on sensor network data collection, integrate and develop a field crop agricultural condition monitoring system to realize dynamic and high-precision monitoring of farmland ecological environment and crop seedling condition, soil moisture condition, pest and disease condition and disaster condition.

Second, establish a field production intelligent decision-making system based on perception data. Based on the perception data of information collection points, integrate the agricultural production management knowledge model, develop a field production intelligent decision-making system, and realize the intelligent management of production measures such as scientific fertilization, water-saving irrigation, and pest and disease early warning prevention and control.

Third, establish an agricultural machinery operation quality monitoring and dispatching command system based on the Internet of Things. In the main grain-producing areas, based on wireless sensing, positioning navigation and geographic information technology, develop agricultural machinery operation quality monitoring terminals and dispatching and command systems to achieve agricultural machinery resource management, field operation quality monitoring and cross-regional dispatching and command.

Fourth, build a comprehensive service platform for field production information integrated with the 12316 platform. Based on the 12316 platform, integrate existing information resources and various professional service systems to build a comprehensive service platform for field production information, providing all-round information services for agricultural production and operation activities such as agricultural situation monitoring, production decision-making, agricultural product quality and safety management, agricultural machinery dispatching, market monitoring and early warning.

Fifth, build a demonstration area for the application of the Internet of Things technology in field production. Build a demonstration area for the application of the Internet of Things technology in field production in the main producing counties (cities and districts) such as wheat and rice, carry out the application demonstration of the Internet of Things technology such as "four conditions" monitoring and early warning, agricultural production management, and agricultural machinery operation dispatching, and explore the technical application mode and mechanism of the Internet of Things in field crop production.

Sixth, explore the application mode of the Internet of Things in agriculture. In the industries of facility vegetables, animal husbandry, fishery, tea, fruit, etc., relying on national and provincial modern agricultural demonstration zones, leading enterprises, provincial farmer professional cooperative demonstration societies and large-scale breeding farms, carry out agricultural Internet of Things application pilot projects, and explore agricultural Internet of Things application models suitable for different types of agricultural products and different types of agricultural production and operation entities.

Conditions and guarantees

(i) Strengthen organizational leadership. In order to promote the tasks of the regional pilot project in an orderly and efficient manner, a strong organizational guarantee must be established. The regional pilot work is led by the Agricultural Informatization Leading Group of the Ministry of

Agriculture, and a regional pilot project technical expert group is established. Experts from relevant national scientific research and education systems participate in the research and formulation of the overall technical solution for the regional pilot project, guide the construction of the regional pilot project, research and break through key technologies, and formulate relevant standards for the agricultural Internet of Things. Pilot provinces and cities should establish a leading group and a technical expert group with the provincial and municipal leaders in charge as the group leader, the main responsible comrades of the agricultural department as the deputy group leader, and the agricultural departments as members, responsible for promoting the provincial pilot project.

(ii) Clarify the division of work. The Ministry of Agriculture is responsible for organizing the formulation of the overall implementation plan for the regional pilot project, coordinating the promotion of the regional pilot project, organizing experts to carry out research and maturation of agricultural Internet of Things application theory, standards and specifications, common technologies and equipment, building an agricultural Internet of Things public service platform, and promoting application models and experience; the leading groups of pilot provinces and cities and agricultural authorities are responsible for formulating implementation plans for their regions, implementing supporting funds, promoting the demonstration and promotion of regional pilot projects and technological achievements, strengthening fund supervision and improving the efficiency of the use of subsidy funds.

(iii) Ensure stable investment. According to the overall plan of the regional pilot, a stable investment mechanism should be established to ensure the overall and steady progress of the regional pilot project. The Ministry of Agriculture is responsible for supervising the use of central subsidy funds. Pilot provinces and cities should implement supporting funds at a ratio of no less than 1:1 and formulate corresponding fund management methods; focus on actively guiding relevant IT companies and powerful agricultural production and operation entities to invest in and participate in the regional pilot project, and gradually form a diversified investment pattern. Focus on the cultivation of business models and explore sustainable development mechanisms.

China Agricultural Internet of Things Cases - Agricultural IoT Technology Examples

China Agricultural Internet of Things Case 1

Shishan Internet of Things Agricultural Town

In June 2015, the construction of the first Internet agricultural town in Hainan, China was officially started in Shishan Town, Xiuying District, Haikou, and was designed, constructed and operated by Lukun Group.

Hainan "Shishan Internet Agricultural Town" is the first smart agricultural town in the country. It is a new agricultural town created by Lukun Group using the concept, thinking and technology of "Internet +" and the "1+2+N" operation model throughout the entire industrial chain of agricultural production, operation, management and services.

China Agricultural Internet of Things Case 2

Dayu Internet of Things Town

Dayu Internet of Things Town takes "Internet + Agriculture" as its business strategy, and uses a variety of technologies such as the Internet, mobile communications, and cloud computing to create a new type of agricultural town that is networked, information-based, intelligent and modern.

China Agricultural Internet of Things Case 3

Gaoceng Town, Yixing City, Jiangsu Province is famous for its hairy crab farming, with a breeding area of more than 50,000 acres. However, as the scale of breeding continues to expand, crab farmers generally reflect that the survival rate of crab seedlings and the quality of crab breeding are affected due to lack of manpower.

Remote oxygenation, intelligent feeding, early warning information, in the eyes of crab farmers, the tedious and tiring work in the past can now be achieved through the Internet of Things technology platform, which is not only easier to manage, but also more profitable. Crab farmers can log in to the "Aquaculture Monitoring and Management System" through the Internet and mobile terminals to understand the dissolved oxygen content, temperature, water quality and other index parameters in the breeding pond anytime and anywhere. Once a warning of dissolved oxygen index in a certain area is found, just click "Turn on the oxygenator" to achieve remote control.

Yixing City introduced a technical team led by Professor Li Daoliang of China Agricultural University (formerly the founder of Jiangsu Zhongnong Internet of Things Technology) to actively carry out the research and development and demonstration of agricultural Internet of Things projects, and continuously explore the organic combination of information technology and modern agriculture, and create the "Yixing Model of Agricultural Internet of Things".

In August 2011, the Yixing Experimental Station of Agricultural Internet of Things China Agricultural University was officially settled in Gaocheng Town, Yixing City, thus opening the curtain to build a national agricultural Internet of Things demonstration base.

China Agricultural Internet of Things Case 4

In the Daxing Precision Agriculture Demonstration Zone in Beijing, China, the Internet of Things "perception" precision agriculture technology is experienced everywhere. In the control room of the fresh cut flower production base in Caiyu Town, a large screen for greenhouse environment monitoring is hung on the wall. In the digital strobe table, the temperature, humidity, light, and carbon dioxide concentration in 59 greenhouses are clearly visible.

Suddenly, the humidity display of A1 greenhouse changed from green to red: 85%! The technician immediately turned on the network video voice monitoring system next to it, clicked on "a row of greenhouses" and issued an order: "The humidity is high, please open the vents and skylights!"
On the video screen, a farmer operator immediately took action.
10 minutes later, the system sent a voice reply: "All open." On the large screen, the red number immediately dropped and soon returned to green: 70%.

"These real-time monitored environmental indicators can automatically alarm, green means normal, and red means alarm." Dr. Chen Liping from the Agricultural Information Technology Research Center of the Municipal Academy of Agricultural Sciences introduced that this greenhouse environment monitoring and intelligent control system "captures" various data through indoor sensors, which are summarized by the data acquisition controller and analyzed and processed by the computer in the control room, and the results are displayed on the screen immediately.

Managers can give orders at any time through another technology - video and voice monitoring system. Base manager Li Chungui has been farming for more than 20 years and is considered a good farmer, but now he listens to the "system" for all the orders. He said: "In the past, I relied on my feelings. If I felt the greenhouse was cold, I would heat it up, and if I felt it was dark, I would add light. Everyone is convinced by the scientific data under intelligent monitoring!" Like the fresh cut flower production base in Caiyu Town, Daxing has demonstrated and promoted precision agricultural technology in 5 towns and 6 villages, including intelligent greenhouse dolls, automatic outdoor weather monitoring, negative head precision irrigation, liquid fertilizer precision application, electrostatic precision spraying... 16 information technology patents, real-time quantitative monitoring of the temperature, humidity, light, carbon dioxide concentration, etc. required by crops in different growth cycles, adjusting the input of water, fertilizer and medicine, and helping farmers achieve a higher level of intensive farming.

China Agricultural Internet of Things Case 5

In order to improve planting efficiency, Cangshan County introduced Zhejiang Top Agricultural Internet of Things technology in the Modern Agricultural Demonstration Park. Agricultural Internet of Things monitoring equipment was installed in all the vegetable greenhouses it built. The agricultural "Internet of Things" technology was used to monitor the temperature, humidity, light, carbon dioxide concentration and other growth environments of greenhouse vegetables in real time. Vegetables were accurately managed based on the intelligent monitoring information generated. Wireless sensors were used to automatically and manually adjust the greenhouse

environment. When the temperature was high, fans and other equipment were automatically turned on to cool down. Soil moisture sensors were used to automatically control irrigation, so that water was applied when it was necessary to water and fertilizer was applied when it was necessary to fertilize. This fully automated system promoted the development of organic and efficient agriculture.

With a small wireless sensor installed, the vegetables in the greenhouse can speak, feel and think. If the temperature in the greenhouse is high, it will warn the grower. If the humidity in the soil is low, it will notify the grower, telling the grower more accurately about the demand for vegetables.

"After using the Internet of Things, growers can immediately 'talk' to the vegetables in the greenhouse." Walking into the greenhouse, the agricultural technician said, "What temperature does the vegetable need? When should it be watered? When should it be fertilized? How much water should be poured? How much fertilizer should be applied? You don't know completely, or you only know roughly.

But with a small sensor installed, it will speak, feel, and have thoughts. It will warn you when the temperature in the greenhouse is high, and it will notify you when the humidity in the soil is low, telling you more accurately what it needs, so that the growth environment required by the plants in the greenhouse will always be kept in the best state." The agricultural technician knows a little about the "Internet of Things".

He also pointed to a pair of "antennas" set up near the middle of the shed, with several small boxes hanging on it, and said, "This is the sensor, which collects environmental temperature, humidity, soil temperature, moisture, light, and carbon dioxide concentration. The data is collected every 5 minutes and sent to the host computer system through smart sensors and wireless Internet of Things gateways embedded with 3G modules." Haha, the agricultural technician knows quite a bit.

Agricultural technicians now only need to sit in the office, with the page of their notebook or computer staying on a few vegetable leaves, and zoom in with the mouse, and they can clearly see a few small aphids lying on the leaves. In this way, agricultural technicians can discover the "enemy situation" through the remote monitoring system of the Internet of Things, and can immediately remind the agricultural workers in the shed. Take protective measures early.

Although the benefits of the Internet of Things for agricultural development are obvious, there is no rigid demand for its use.

As an emerging thing, the agricultural Internet of Things is in the stage of trial and demonstration, and has broad application prospects. For traditional agriculture, the cost of the Internet of Things is too high, and it is difficult for farmers to invest in advance before seeing the benefits. Therefore, for this new thing, many farmers, even some agricultural cadres and government departments, still need a process of acceptance, and urgently need to change their concepts.

While increasing government support and establishing a subsidy system, a business model that adapts to the needs of agricultural development should be established as soon as possible. Being guided by the market and asking for money from the market is an effective way to promote the

development of the Internet of Things.

China Agricultural Internet of Things Case 6

In April 2022, at Xuanyuan Chunqiu Farm in Wangmudu Town, Ganxian County, Ganzhou City, Jiangxi Province, China, high-precision sensors and camera monitoring points are like "eyes in the sky" in the fields, recording and transmitting various production environment data of crops. Liu Yang, head of the farm's operation team, said that the farm implements digital orchard planting standards and relies on Internet of Things technology to implement real-time "four conditions" (insect conditions, disaster conditions, seedling conditions, and soil moisture conditions) monitoring of crops.

Farmers can accurately control water, fertilizers, and medicines during the planting process through mobile phones or computers, effectively reducing production costs by more than 10% and reducing soil erosion by more than 50%.

In addition, Ganzhou City, China, has focused on guiding a number of enterprises to carry out agricultural Internet of Things technology applications, such as the Internet of Things Demonstration Base of Taoxian Ecological Agricultural Park in Xingguo County, introducing the most advanced intelligent Internet of Things vegetable planting model, integrating modern vegetable planting, seedling breeding, agricultural product sales, and logistics distribution to achieve intelligent production.

With a view to improving the intelligence of fishery production, the city has built 12 fishery Internet of Things projects for online water quality monitoring, intelligent control management, remote consultation, video monitoring, and mobile phone intelligent control.

Ganzhou City, China, has also combined 5G, the Internet of Things, big data, blockchain and other technologies to build a "smart orchard". Relying on the 5G Gannan Fruit Industry Big Data Service Platform, it has realized functions such as digital orchards, precision planting, scientific early warning, smart marketing, blockchain traceability and agricultural guidance.

At present, more than 2,000 orchards covering 350,000 mu in Huichang, Anyuan, Xinfeng and other counties in the city have been included in the platform to help the digital transformation and development of the Gannan fruit industry.

Solutions

Solution Introduction

The front-end equipment of the agricultural remote diagnosis system supports multiple sensor

interfaces, as well as audio and video functions, which can effectively provide agricultural experts with first-hand on-site professional data; in addition, agricultural experts can also log in to the agricultural diagnosis system through PC terminals to remotely control irrigation and other operations, solving the current situation of extreme shortage of agricultural experts and playing an important role in realizing agricultural modernization.
This solution has excellent features, as follows:

Supports H.264 encoding, can achieve smooth video transmission under narrow bandwidth, with ultra-low bit rate and bandwidth adaptive functions. Its single card transmission CIF image can reach up to 8 frames/second in 2.5G network environment; dual cards can transmit CIF images up to 15 frames/second; in 3G network environment, it can reach 15 frames/second.
The front-end device is an intelligent acquisition terminal integrating sensor interface, video acquisition and wireless transmission. It adopts a portable design, comes with its own power supply, and can be used for 2-4 hours on a single charge; supports variable magnification cameras and adjustable cameras to meet the needs of close observation of diagnostic plants.

The back-end software platform supports flexible management and scheduling functions, meets the needs of one expert for agricultural consulting support for multiple front-ends, and supports remote two-way voice intercom functions for agricultural experts.
Supports hierarchical user authority management and adopts data stream encryption technology to ensure network communication security.
Supports multiple PTZ protocols, which are extensible and have industrial standard control I/O.

Advantages

1. Scientific cultivation: Through sensor data analysis, it can determine the type of crops suitable for cultivation in the soil, and through climate and environmental sensors, it can collect crop growth environment data in real time.
2. Precise control: Through the deployment of various sensors, the system quickly regulates the temperature and humidity, carbon dioxide concentration, light intensity, etc. of the cultivation base according to the requirements of crop growth.
3. Improve efficiency: Unlike traditional agricultural cultivation methods, the Internet of Things agricultural cultivation method basically realizes system automation, intelligence and remoteness. It is more accurate and efficient than the manual cultivation mode.
4. Green agriculture: It is difficult for traditional agriculture to record all monitoring data in the cultivation process, while the Internet of Things agriculture can save all monitoring data through various monitoring sensors and network systems, which is convenient for tracing the source of agricultural products and completing the green and pollution-free agricultural production.

Future

The Internet of Things is not a technological fantasy, but another technological revolution.

PDF Author: IoT Cloud Platform

The Internet of Things has made a qualitative leap in the functions of goods and services. These new functions will bring further efficiency, convenience and security to users, thus forming an emerging industry based on these functions. The Internet of Things requires the establishment of an information highway. The rapid development of mobile Internet and the popularization of fixed-line broadband are the basis for the massive information transmission and interaction of the Internet of Things. Relying on network technology, the Internet of Things will deeply reorganize production factors and supply chains and become a realistic carrier for informatization to drive industrialization. According to industry insiders, China's Internet of Things industry chain will create an output value of about 100 billion yuan this year, and it has become the biggest market excitement point in the post-3G era.

Cultivation Internet of Things

Main components of field cultivation monitoring system

1. Data collection

(1) Ground information collection: Use sensors such as temperature and humidity, light, rainfall, wind speed, wind direction, and air pressure to collect ground climate information. When climate information exceeds normal values, timely measures can be taken to reduce the losses caused by natural disasters.

(2) Underground information collection: Use soil temperature, moisture, water level, nutrient content (N, P, K), dissolved oxygen, pH value and other information monitoring to achieve reasonable irrigation, eliminate water waste and soil nutrient loss caused by excessive irrigation.

2. Intelligent control

Top Instruments innovatively combines information technologies such as the Internet of Things and cloud computing with water-fertilizer integration technologies to truly realize land visualization data to directly control water-fertilizer integration equipment and achieve precision agriculture.

3. Software platform

Top Cloud Agriculture Internet of Things software platform is not just an operation platform, but a huge management system. The field cultivation monitoring and early warning system transmits field data to the monitoring and early warning base through GPRS transmission, solving the problem of space and time. The system software platform can organize and analyze the data collected by each network node and display and store it in the form of tables, curves, and bar

charts, making it convenient for users to check and accumulate cultivation experience at any time.

About IoT Cloud Platform

IOT Cloud Platform (**blog.iotcloudplatform.com**) focuses on IOT solutions, IoT design, IoT programming, space IoT, marine IoT, satellite IoT, security IoT, industrial IoT, military IoT, medical IoT, best IoT projects, IOT modules, embedded development, IOT circuit boards, Raspberry Pi development and design, Arduino programming, programming languages, RFID, lora devices, IoT systems, sensors, smart homes, smart cities, new energy, semiconductors, smart hardware, photovoltaic solar energy, lithium batteries, chips and other scientific and technological knowledge and IoT products.

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