The constitution of vegetable traceability system in agricultural IOT

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ABSTRACT

This article introduces the constitution of vegetable traceability system in agricultural IOT. In addition, it discusses the application in the processes of planting, logistics, consumer. Then some existing problems can be analyzed. Finally, this article forecasts the application of vegetable traceability system in the future.

Keywords: Agricultural IOT, Vegetable, Traceability, Constitution.
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INTRODUCTION

With the development of agriculture in modern society, IOT has been the significant means to reduce costs, improve efficiency and achieve intelligent in the field of agriculture. In recent years, the progresses have been made in data collection and transmission, intelligent processing and application service in agricultural IOT. For example, the quality of agricultural products can be improved by collecting and analyzing the variable of soil and air, monitoring the growth of products, balancing the irrigation and fertilization. Additionally, tracing the quality of products can achieve the push service in the rural information platform. This can bring tremendous benefits for agriculture.

The agricultural industry is related to the development of rural economic and social stability. The issues about the quality of vegetables have aroused the concern in the public. In October 2010, the notice of "about meat and vegetables circulation tracing system construction pilot instruction opinion", from the ministry of commerce and finance claimed that put more effort to resolve the problem of tracing the resource of meat and vegetables can reduce the customers' anxiety to the quality of food. New technology in agricultural IOT such as data collection, RFID, ZigBee, and GPRS can be used to recognize the e-mark on the vegetables. Reader can record the information of vegetable in the links of producing and logistics. Through the internet and computer, the traceable network of quality of vegetable can be built so that explicit the responsibility of vegetable traceability system to improve the supervision and public service. This can produce larger social benefits and economic benefits.

EXPERIMENTAL SECTION

The Constitution of vegetable traceability system in agricultural IOT
The agricultural IOT can be applied in planting vegetables, environment monitoring, product processing, storage and distribution which can improve the management of traceability from the original to the ending. The constitution of vegetable traceability system can be shown in the following picture.

The management mode of information and traceability can be used in the links of planting, logistics and consumption. In the planting link, this can trace the information of seed treatment, cultivation management (irrigation, fertilization, medication), harvest packaging, production and production date etc; In the processing link, traceability system can trace back the information of vegetable products including name, product grade and quality inspection information, vegetable processing batches, processors, processing date, shelf-life and packaging materials etc; In the logistics link,

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traceability system can trace back the information of transportation which includes real-time monitoring vehicles, cold chain logistics etc; In the vegetable consumption link, consumers can scan through vegetables QR code on the product packaging, tracing the vegetable information in the links of planting, processing, transportation. This guarantees the quality of vegetable. In the link of vegetable supply .
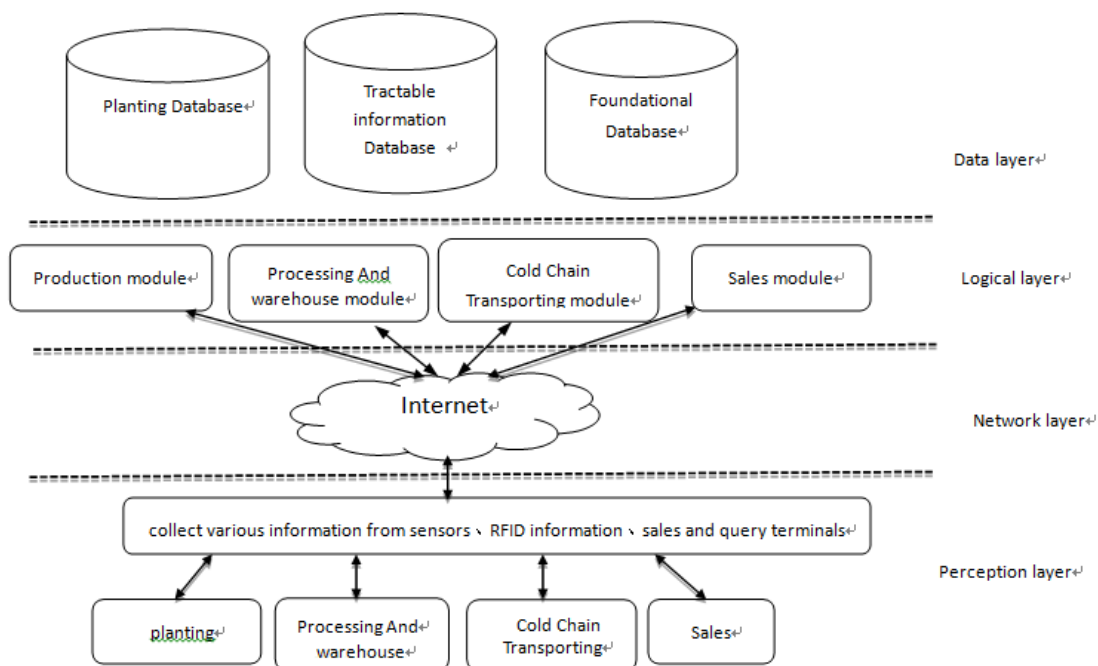

Fig1. The constitution of vegetable traceability system in Agricultural IOT

RESULTS AND DISCUSSION

Situation of construction of vegetable traceability system
Construction of intelligent vegetable greenhouse
Standardizing the construction of intelligent vegetable greenhouse can guarantee the security of green vegetables. Producing greenhouse vegetables has strict requirements to the temperature, humidity, illumination. Traditional Environmental Monitoring System mainly relies on the cable sensor network environment monitoring system. The data transmission relies on conductive medium which is poor mobility and not suitable for maintenance. In order to resolve these problems, Wang et al. designed the intelligent vegetable greenhouse which use the MSP430 single chip microcomputer as core . This greenhouse is systemic, stable and cheap. In addition, it has reserved wireless expansion port , which can effectively monitor the temperature , humidity and light in the greenhouse [1]. Zhou et a.l designed vegetable greenhouse monitoring system based on the Wireless Sensor Network. This system consists of sensor node, ZigBee wireless network technology and the composition of collection terminal, which is secure and stable in terms of data collection and transformation[2]. In Jin Zhou, a city of China, the agricultural departments have developed a platform to manage the M2M greenhouses. This platform can use sensor to transfer the parameters (temperature, humidity, light intensity, soil PH, CO_2 concentration, etc.) from greenhouse to the communication module, then to the M2M platform through GPRS network. If the parameters have reached the threshold value of warning , the alarm will be generated. Through the SMS alarm and remote control can manage the greenhouse effectively and scientifically[3].

Management of planting vegetable
Combining the modern agricultural IOT technology and environmental monitoring systems, the prospect of scientifically guiding vegetable farming and selling applications is quite rosy. Li et al. who designed a data recording and decision supporting system based on PDA to trace the quality and safety of cucumber, through which the system can achieve real-time recording and transmission of operational information on the farmlands [4]. Fang et al. who designed a Pocket PC (PPC) based farmland information rapid collecting and real-time processing system which can be combined with GPS and a wide range of sensors to solve the timely access to spatial and attribute information and analytical processing problems in the term of agriculture [5]. Wu et al, who designed the intelligent information collecting terminal which consists of the Android smartphone, SQLite database and remote server monitoring software. Via this terminal, data which includes texts, figures and videos could be inputted in the farmland to improve the

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accountability and reliability of the tracing-data. [6]. Mao et al. developed an IOT based vegetable factory monitoring system. Via the development of the IOT systems which encompasses wireless monitoring nodes which are distributed in the greenhouses and the key values which set by the experts according to their own experience and knowledge, the controlling system of the vegetable factory will perform reactions automatically to adjust the parameters of the agricultural production, when some data goes astray from the set value [7]. The Agriculture Bureau of Langfang City has developed a vegetable intelligent expertise platform, setting up the greenhouse distribution, greenhouse situation, pest warning, maturity forecasting, crop model library, management reports, expert analysis, expert interactive, practical operation management and some other items. Based on the Internet access an management, this platform reveals the vegetable planting, transporting and selling which covers all aspects of information management [8].

The link of processing and transportation
Integrated electronic label, bar code technology, sensors, communication network and computer network technology. The quality of farm products can be tracked, intelligent delivery by those technologies above. Lu etc developed the RFID health security electronic information system and set up the standard of planting, fabricating, packaging, transporting, they realized the track of farm products form farm to restaurant[9]. Wang etc integrated RF recognition and communication technology into vegetable track system, and they designed the vegetable track system based on internet of things. By the internet of things, they can realized the automatic data acquisition and automatic transmission[10]. Hsueh etc designed the real-time control and monitor system for those perishable products, they store those collected information and mark preservation period in RFID electronic label. Then, they use RFID reader to read the information in electronic label and send those information to computer system. When the food quality and storage environment become poor, the distribution center will remove those bad food in order to improve the transmission environment, those steps will follow the information on the RFID electronic label[11].

The link of consumption
As the establishment of mobile terminal, supermarket inquiry terminal and tracking website, consumers can receive feedback from software platform, send the demand information to production bases and track the quality of every batch of vegetable. Consumers can also receive the production information and videos to confirm the quality of the organic vegetables. Cheng and his team designed the Agricultural Production Quality and Safety Tracking Intelligent Terminal, which is based on B/S Agricultural Production Quality Tracking System and C/S Intelligent Terminal Quality and Safety Inquiry System. This terminal can construct a quality control platform for companies, provide service to consumers, and realize the tracking for agricultural production[12].

The Constitution of platform of vegetable traceability system
In 2004, Shou Guang implemented the vegetable security traceability information system consisting of three parts which are enterprise management, data platform of food quality and query terminals. This can guarantee the unique identify a packing unit vegetables in each process to realize the unify. Yan et al. built up the vegetables product safety traceability information system based on the QR code to manage the whole process from vegetable production to market . Therefore, the vegetable industry can be promoted [13,14]. Fu et al. utilize the technology of RFID, QR code, ASP.Net, component development technology to develop the vegetable traceability system which can provide the detailed information about vegetables and a operational platform to manage and control the quality of vegetables for enterprise[15,16] .

Problems of vegetable traceability system
More progresses need to be made in vegetable traceability system
At present, most of the farmers possess low degree of organization in China. Vegetables are mainly sold through farmer's market as well as the existence of numerous circulations, no packaging, and the uncontrollability of quality. Therefore, the traceability system construction, which involve before, during and after the production, needs to be improved.

The standardization of agricultural IOT technology needs to be further standardized
During the development of agricultural IOT technology, various new technologies emerge in the process of data sensing, acquisition, transmission, analysis, application. Due to different technical solutions, the standard of data perception layer and data model are not unified so that they not only cannot relate to each other but also cost higher for development. All of these would hinder the development of agricultural IOT technology. Therefore, organize an effective management department to design relevant policies and regulations, speed up the establishment, implementation and application of key standards is very necessary.

The equipment cost is waiting to be reduced
At present, the agricultural environment and devices of vegetable information collection, transmission and perception are relatively expensive. They are only used in some high value crops or large vegetable greenhouses instead of promoting in large-scale. How to change the farmers in terms of cost barriers will become the current primary issue. Therefore, on the premise that cost has not yet to reach popularity, the development of agricultural IOT will be difficult.

The power consumption of farmland wireless sensor network need to be resolved
Considering the long-cycle growth of vegetable and large number of sensor nodes, it is a crucial problem for large-scale farmland planting oriented wireless sensor network (WSN) to convert green light energy into electrical energy and lengthen the operation cycle of the network effectively.

The construction of technical personnel team remains to be further strengthened
Agricultural IOT is a multidisciplinary technology. As an emerging technology, it possesses high technical requirements. Technical extension workers need not only possess solid knowledge of agricultural extension, but also master the modern information technology. At present, the marketing personnel at the grass-roots level still need the further training of modern information technology so that agricultural IOT can be widely applied at the grassroots level .

Security needs to be further improved
Agricultural IOT wireless sensor technology is mainly consist of RFID and bar code, which are also a huge hidden security trouble. Easily illegal reading and modification of labels information, valid identity pretend and cheat, label illegal tracking and so on form vicious competition. Therefore, it is necessary to build a strong security technology system to ensure the safety, real-time and effective of data.

CONCLUSION

Along with the comprehensive work of safe traceability of the quality of agricultural products in our country, many cities have implement the traceability management platform. Diversified electronic tag has set up a platform for safe traceability of the quality of agricultural products and a logistics distribution system, realizing the tracking and tracing of safe traceability of the quality of agricultural products. The consumers will trust more on agricultural products which have traceability mark logo. Safe traceability of the quality of agricultural products using agricultural IOT as core technology and logistics distribution technology system can improve the enthusiasm of producers, circulators, and consumers, improving the credibility of each other. All of these will drive the formation and development of related industrial chain, form a virtuous circle, and create a wide prospect of market.

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