Design and Implementation of Food Security Traceability System based on Internet of Things Technology

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Abstract. The production, circulation and consumption of grain have a direct bearing on the vital interests of the people and the state. Since ancient times, food security has been the foundation of economic development, social stability and national self-reliance. Therefore, food security and food security must be effectively guaranteed in order to promote the sustainable development of the national economy. According to the introduction of the industry, in China, there are still threats to food security factors. First of all, due to the low comparative benefit of grain planting, farmers are less and less motivated to grow grain, which directly limits the improvement of China's grain supply capacity. This paper mainly studies the design and implementation of food security traceability system based on Internet of things technology. This paper combines Internet of things technology to design food security traceability system for food security problems. The "household settlement card system" based on RFID technology enables farmers to swipe their credit CARDS to sell grain by issuing them to grain farmers free of charge. Farmers sell grain, subsidies management more convenient. Grain sales and subsidies can be directly deposited into the bank account associated with the settlement card of farmers, so as to avoid farmers carrying large amounts of cash and facilitate farmers.

Keywords: Internet of Things Technology, Food Security, Security Traceability System, Security Design

1. Introduction
With the rapid advance of reform and opening up and the sweeping tide of economic globalization, people's demand for agricultural products has changed from satiation to good eating, not only to eat well, but also to eat more healthily [1]. Sending samples puts forward higher requirements on the quality of agricultural products, the direct or indirect source of food [2]. The quality of agricultural products is not only related to people's physical health, but also related to people's trust in the agricultural economy and the government's supervision department [3]. This kind of credible capriciousness will even affect the adjustment of agricultural industrial structure, affect farmers' income and the sustainable development of agriculture. Therefore, the quality of agricultural products is a hot spot that the society has been paying attention to [4].

The rapid development of information technology has had a great impact on China's economic
development and social progress, and has become an important part of promoting economic development. Information technology has been applied in many industries, such as the application of information technology in the food industry. The application of information technology is of great significance to ensuring national food security and implementing macro-control [5]. In foreign countries, the application of information technology in the food industry is extensive, the domestic start is late, but the development results are remarkable. The application of information technology in grain industry can effectively reduce or control costs and improve production efficiency. In order to improve the effectiveness, diversification of means and forward-looking development of information application, the comprehensive ability of collecting, analyzing, archiving and applying information of enterprise business flow, logistics and capital flow and the accurate extraction of classified information derived therefrom should be constantly strengthened [6]. With the reform and opening up into the deep water zone, the grain circulation system put forward higher requirements, the grain circulation system reform is continuing to deepen. Although food storage and transportation supervision system in China is tremendous development in the recent decade, but there are still many problems. The rapid development of the Internet of things direction to the development of China's grain storage regulation brought new [7]. This article mainly relying on the Internet of things technology, in accordance with the principle of practical, advanced, big data using mobile Internet, Internet transmission, and other advanced information technology to design intelligent grain integrated system, implementation of grain depot daily management informationization, provide food industry informatization construction experience [8].

Safety traceability system is a mechanism to know the source and destination of products by collecting information of each link of the product supply chain [9]. This paper studies the food security traceability system based on the Internet of things technology. Through the traceability platform, farmers can use the traceability code of grain to query the purchased fertilizer information, so as to know the key node information of the whole process from production to sales of grain fertilizer. If any problem is found, they can complain through the platform [10]. The government supervision department can also handle farmers’ complaint information through the tracing platform. Since the supply chain of the problematic grain is fully informed, the supervision department can investigate and collect evidence on the circulation links for the purpose of preventing the problematic grain from continuing to flow into the market. Moreover, enterprises can also conduct self-inspection of their own product quality through the tide chasing platform, and can conduct targeted investigation on the use of farmers to get timely feedback [11].

2. Method

2.1 Concept of Traceability System
The concept of traceability system is initially used in logistics transportation. In this transportation process, the place of transportation, the transit place, the place of deposit, and the packaging information of the goods transported are recorded. Similarly, the process from the producer to the consumer is similar to this. Food is planted, picked, processed, packaged, transported and finally sold to the consumer. In the whole process of circulation, any link may have safety problems, which is related to the health of consumers. Factors influencing the stand or fall of planting process is very complex, geographical location, environmental factors, growers experience, and in the process of processing and transportation, processing technology, transportation, are crucial for the quality of the food, therefore, set up food quality and safety traceability system, will be collected all information entry, will be able to realize the whole process of transparent, real-time monitoring and management, ensure the safety of consumers. The definition of food traceability is to collect information from the whole process of food planting, picking, processing, packaging, transportation, and finally selling to consumers, establish information files and input them into the database, and finally use modern technology for centralized and unified management to realize the whole process of food traceability.
2.2 Food Security Traceability Process

The traceability process of food security is a two-way query to realize the whole process of food from planting, picking, processing, packaging, transportation and finally selling to consumers. The forward query process generally refers to the query tracing process of grain from planting, picking, processing, packaging, transportation and finally selling to consumers. The forward query is applicable to grain producers, with the purpose of inquiring whether the recording link is complete, or finding the root cause of the problem through this link in time when there is a problem, and dealing with it timely, so as to nip the problem in the bud, control the harm degree to the minimum extent, and protect the health of consumers. The reverse query mode of the user is our main user facing consumers. In general, Consumers want to buy our food products to query, can be reverse back through buying food traceability code query, if found the problem products, consumers can find the location of the problem according to the result of query back and head, can ask the relevant personnel to give certain economic compensation and the corresponding corrective avoid food security problems appear again. In the process of food quality and safety traceability, in order to ensure that the food obtained by consumers is truly safe, we must ensure that the specific information of each link is recorded accurately and in detail, to achieve a comprehensive monitoring of food product quality and safety.

3. Experiment

3.1 System Construction Goal

In this paper, the quality and safety traceability system is designed with food security as the background. Therefore, food security is taken as the research and analysis object, and information collection and data transmission are conducted on the information of grain planting plots, planting process, processing enterprises, and logistics and transportation. Design different user personnel to each part of the information collection and input and modify the rights.

3.1.1. Record of Basic Product Information. The recording of basic information is mainly for the input of relevant basic information in the system, including food product information, product manufacturer information, government department information, etc. The input data not only contains relevant text information, but also includes pictures and other information in different formats. Food product information mainly includes food type, name and simple description of food and other information, producer information mainly includes enterprise name, address, business license number and other information.

3.1.2. Records of the Production Area. System for grain producing area information to add, managers for a batch of food enter the location of the origin of information, soil conditions, soil pollution, pesticide residues, the aging condition of soil and related parameters such as air condition system can be according to the calculation on the origin, and will be rated excellent origin products have been endorsed as a top.

3.1.3. Processing Information Collection. Managers can add data for intermediate links in the food process, including packaging, testing, processing information, etc.

3.1.4. Input Basic Logistics Information. When the manufacturer wants to carry out grain distribution, the logistics company, order number information and vehicle information should be tracked and recorded in real time. The order information should have the order user name, grain name, quantity, destination and consignee's contact number. Vehicle information includes vehicle type, license plate number, driver information, etc. In the process of grain logistics, real-time location information and time information should also be updated in a timely manner.
3.1.5 Establishment of Grain Archives. When the grain information, processing, origin and logistics information are input, a grain file will be generated for the current batch of products, which records the information of each trace node in the batch of products and presents the information to the user in the form of tracing code query.

4. Discuss

4.1 Product Safety Management Function Analysis

![Figure 1. Product safety statistics](image)

As shown in Figure 1, intelligent warehouse management integration application of Internet of things devices, need a lot of manpower and material resources on the Internet of things the front-end data acquisition and transmission, the wide use of the Internet of space distribution, the characteristics of large amount of data, data acquisition terminal sensor, using the network protocol comes back to the processing module, the converted to digital information by the system software analysis and processing, such as temperature and humidity, gas concentration, temperature control standards, using wireless communication network to transmit data to the data server, the user can retrieve data on the server side, and the data analysis and processing. Through large-scale and distributed information acquisition and state identification, the front end of the sensor adopts multi-type, multi-angle and multi-scale information for online calculation for specific perception tasks, and shares resources with other units in the network for interaction and information transmission to ensure real-time data. This greatly improves the accuracy of warehouse management data and the saturation of analysis materials, all intelligent control and analysis, the comprehensive and deep power source and data, and the application of Internet of things technology lays a solid data foundation for the construction of intelligent granary.

4.2 Traceability Analysis of Agricultural Product Quality and Safety

| Table 1. Agricultural product quality and safety statistics |
|----------------------------------------------------------|
| Food safety                                               | 70.4%        |
| Air pollution problem                                     | 67.9%        |
| Housing problem                                           | 59.7%        |
| Medical problems                                          | 58.2%        |
| The employment problem                                    | 48.8%        |

As shown in table 1, with the help of Internet of things technology, a large amount of original data is collected through the integration of intelligent warehouse management. In order to achieve
intelligent analysis and control, big data analysis and mining technology are still needed. Play to the characteristics of big data technology to all instead of sampling data, the correlation of data mining, fully put to the data warehouse management can express business relations and trends, mining the cause of the problem, the trend of the development of the prediction, complete reconstructed the barn changes cause the business management in the process of data, data analysis to solve the grain of large amount of data to handle and accurate analysis result in difficulties for efficient management mat foundation.

5. Conclusion
In the process of agricultural development, food security traceability plays a crucial role in inspiring confidence in agricultural development. But in recent years, driven by interests, some grain was lost, which caused great losses to farmers. These security incidents have not only caused widespread concern in the society, but also government regulators are sparing no effort to crack down on criminals. With the use of automation equipment and the popularization of Internet of things technology, the modernization of agriculture has become an inevitable trend. In this context, this paper studies the design of food security traceability system based on RFID technology and EPC Internet of things, which is of great significance to the management and system improvement of the whole food supply chain.

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