# Research on Agricultural Product Supply Chain Monitoring and Traceability Platform under the Internet of Things

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*Abstract:* This article studies the relevant issues of agricultural product supply chain monitoring and traceability platform under the Internet of Things. On the basis of analyzing the current situation of China's agricultural product supply chain, it is proposed to use Internet of Things technology to build a monitoring and traceability platform for agricultural product supply chain. The article first introduces the basic principles and characteristics of Internet of Things technology, then explores the security, traceability, and information asymmetry issues in agricultural product supply chains, and elaborates on the necessity of establishing monitoring and traceability platforms. On this basis, a design and implementation scheme for an agricultural product supply chain monitoring and traceability system based on the Internet of Things is proposed.

*Keywords:* Internet Of Things; Agricultural Product Supply Chain; Monitoring and Traceability Platform; Traceability

## Introduction

With the rapid development of rural economy in China, the level of agricultural industrialization is constantly improving, and the ways in which agricultural products enter the market are becoming increasingly complex. There are security issues, traceability issues, and information asymmetry in the agricultural product supply chain, which are even more serious in the context of frequent food safety incidents. How to improve the quality and safety of agricultural products, strengthen traceability, reduce information asymmetry, and protect the physical health of consumers is currently an urgent problem that needs to be solved. The Internet of Things technology has the characteristics of wide distribution of sensor nodes, comprehensive information collection, and efficient data processing, providing technical support for establishing a monitoring and traceability platform for agricultural product supply chain.

## 1. Introduction to Internet of Things technology

The Internet of Things is a network communication technology based on the Internet, sensors, communication, etc. It combines objects with sensor nodes to collect, transmit, and process data. Its features include diversity, real-time, automation, big data and cloud computing, security and privacy protection. In the application of agricultural product supply chain monitoring and traceability platforms, Internet of Things technology can play an important role in improving monitoring efficiency and reliability, ensuring the quality and safety of agricultural products.

## 2. The problems in the agricultural product supply chain

### 2.1 Security issues

The agricultural product supply chain involves multiple links, including production, processing, transportation, storage, and sales, and each link has potential safety hazards. For example, in the production process, the use of a large amount of pesticides and fertilizers has resulted in excessive pesticide residues in agricultural products. During transportation, if the temperature cannot be well controlled, it will cause the cold chain to break, thereby affecting the quality and safety of agricultural products. During the circulation process, there are a large number of counterfeit and inferior products, which pose certain food safety risks to consumers. Secondly, due to information asymmetry and incomplete exchange of information between supply and demand sides, consumers' judgments on the quality and safety of agricultural products are affected. Suppliers often tend to conceal the true situation of agricultural products in order to obtain higher profits, while consumers lack transparent information and are unable to make accurate choices.

## 2.2 Traceability issues

The traceability of agricultural products is an important issue in the agricultural supply chain, which brings great difficulties to consumers. Firstly, the agricultural product supply chain involves multiple links, including planting, picking, processing, transportation, and sales. In each stage, there will be many participants, such as farmers, planting groups, traders, processing plants, retailers, and so on. Due to the existence of a large amount of incomplete and scattered information in the supply chain, consumers find it difficult to comprehensively analyze its origin, processing, and other links. Secondly, there is opacity in the information flow in the agricultural product supply chain. Due to the lack of a unified information platform and standardized data recording methods, information from various stages often cannot be effectively transmitted and shared. This has resulted in important information such as agricultural product manufacturers, pesticides used, and fertilizers not being provided to consumers in a timely manner, and has also increased the difficulty for relevant departments to supervise food safety.

## 2.3 Information asymmetry issues

There are a large number of information asymmetry issues in the agricultural supply chain, among which the most prominent is the information asymmetry between producers and sellers. In agricultural production, the planting, picking, and processing of agricultural products are a complete process. Due to the participation of planting teams and processing plants in the production process, they have a better understanding of the production and processing of agricultural products. They have more critical information, such as the use of pesticides and fertilizers, monitoring data of growth environments, etc. These information often cannot be effectively transmitted to consumers and regulatory authorities, resulting in incomplete and inaccurate information. In the agricultural production process, the production process and quality inspection results of agricultural products are important factors affecting the quality of agricultural products. It leads to consumers questioning food safety and reputation, thereby reducing their purchasing desire and trust.

# 3. The necessity of monitoring and tracing platforms

## 3.1 Improving the safety of agricultural products

The monitoring and traceability platform can monitor important information such as pesticide and fertilizer usage, irrigation water quality, etc. in the agricultural production process. Real time monitoring of pesticide residues exceeding standards and water source pollution in agricultural production, and adjusting and correcting them to ensure the quality and safety of agricultural products. The monitoring and traceability platform can track the flow and processing of agricultural products.[1] Through batch tracing and traceability of agricultural products, we can understand the processing and transportation situation at each step, ensuring the safety of agricultural products throughout the entire supply chain. For example, when a batch of agricultural products are contaminated or damaged during transportation, problems can be detected in a timely manner to prevent unqualified products from entering the market and protect people's health.

## 3.2 Enhancing the traceability of agricultural products

The monitoring and traceability platform can record the entire production and processing process of agricultural products, including important information such as planting time, location, which pesticides and fertilizers were used. These pieces of information can be traced back to specific farms and farmers, and consumers can scan the traceability code on the product or query data on the platform to understand the production status of the product, in order to make informed purchasing decisions. The monitoring and traceability platform can track the circulation and processing of agricultural products. In the production process, by recording the batch number and transportation data of the product, it is possible to have a good understanding of the origin and flow direction of the product. This is of great significance for tracing food safety issues, handling recall incidents, etc. It can help relevant departments quickly and accurately identify the problem and take corresponding measures to handle it.

## 3.3 Reducing information asymmetry

This system can achieve real-time recording of data during the production process and achieve information sharing. Participants in each production process can monitor the production process of agricultural products in real time and enable each participating entity to obtain

the true condition of the products in real time. This can reduce information asymmetry and improve collaboration and communication efficiency between various links. Users only need to scan the traceability code on the product or search for relevant information on the platform to know some important information, such as production processes, quality test results, etc. Through this approach, consumers can reduce their concerns about incomplete and inaccurate information about agricultural products, thereby increasing their trust.

## 4. Design and implementation of a monitoring and traceability platform for agricultural product supply chain under the Internet of Things

### 4.1 Platform architecture design

The architecture design of the agricultural product supply chain monitoring and traceability platform is the foundation for implementing its functions. The system should adopt a distributed structure consisting of a front-end display layer, a data processing layer, and a back-end storage layer. The front-end display layer provides users with an interactive interface with the platform, which can query and track product information through the network or mobile software. This layer needs to provide a user-friendly interface and efficient interactive experience, so that users can easily query and trace agricultural product information[2]. The data processing layer is responsible for receiving, processing, and transmitting relevant data on agricultural products; This layer requires ensuring that data in each link can be smoothly transmitted to the backend storage layer on the basis of security and stability. At the same time, this layer also needs to clean, organize, and analyze the data so that subsequent information query and traceability functions can accurately display relevant information. The backend storage layer is the core of the entire platform, responsible for storing data related to agricultural products. To ensure the security and scalability of data, distributed databases or cloud storage can be used. The system should also have effective data retrieval and query functions, allowing users to quickly query and track product related information in a short period of time.

### 4.2 Data collection and transmission

Data collection and transmission are important components of the agricultural product supply chain monitoring and traceability platform. This step requires ensuring the accuracy, timeliness, and completeness of the data. Firstly, obtain corresponding data from various stages of agricultural product production, processing, transportation, and sales, and analyze them. To ensure the completeness and accuracy of data, various methods such as sensors, scanning devices, and manual input can be used[3]. Then, data transmission requires secure and reliable network communication methods to transmit the collected data to the data processing layer. To solve this problem, IoT technologies such as wireless sensor networks and cloud platforms can be used for long-distance data transmission. At the same time, to ensure data security, it is necessary to encrypt it and manage its permissions to avoid data leakage and tampering.

### 4.3 Data storage and processing

Data storage and processing are crucial components of the agricultural product supply chain monitoring and traceability platform. This stage requires efficient data storage and processing capabilities to support the implementation of subsequent information query and traceability functions. Firstly, to ensure the security and scalability of data, distributed databases or cloud storage can be used. Through this approach, distributed data storage and backup can be achieved, enhancing the reliability and stability of the system. Secondly, in the process of organizing and analyzing data, it is necessary to organize and analyze the data so that it can better display the required information in future information retrieval and tracking; On this basis, using methods such as big data processing and data mining, the raw data is processed and analyzed to extract valuable information.

### 4.4 Implementation of information query and traceability function

In the agricultural product supply chain, information retrieval and traceability are its core functions. In this system, users can understand the specific situation of each stage of agricultural product production, processing, transportation, sales, etc., in order to achieve the goal of traceability. Firstly, it is necessary to provide users with a flexible query interface based on their different requirements. On this basis, by querying keywords, time periods, and geographical locations, the desired products can be obtained. Secondly, the traceability function re-

quires the integration and display of data from various stages to form a complete agricultural product traceability chain. Users can obtain the historical records and detailed information of related processes of agricultural products by scanning the traceability code on the products or entering relevant information.

## 5. Conclusion

The article takes the Internet of Things as the background and focuses on the problems of security, traceability, and information asymmetry in China's agricultural product supply chain. The research object is to construct a monitoring and traceability platform for agricultural product supply chain based on the Internet of Things. The construction and operation of this platform can effectively improve the safety of agricultural products, enhance traceability, reduce information asymmetry, and thus protect the health rights and interests of consumers. On this basis, a design scheme for an agricultural product supply chain monitoring and traceability platform based on Internet of Things technology is proposed. The application of these technologies and methods provides strong support for the monitoring and traceability of agricultural product supply chains, with the hope of achieving significant results in practical applications.

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