



Design and Application of Agricultural Product Traceability Management Platform

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Abstract. Food traceability as an effective means to control food quality and safety has attracted increasing attention at home and abroad. In view of the construction requirements of the traceability system for different enterprises in China, in order to build a standardized Binzhou government traceability management platform, multiple traceability systems are integrated on the platform for unified management services, and the “Platform + System” application mode is constructed. Platform functions include retrospective tracing, system management, standard authentication, information service, traceability monitoring and other functions. The platform provides an effective way for the retrospective management construction of Binzhou’s regulatory authorities and realizes the demonstration application of the integrated platform.

Keywords: Traceability management · Platform model
Government regulation

1 Introduction

With the continuous improvement of people’s awareness of food safety, traceability system has become the popular direction of enterprise construction in recent years [6]. Through data collection and database management, it has an effective information record for every link of the whole circulation that includes product production, processing, testing, packaging, and transportation distribution [1]. The use of traceability system can reduce the risk of food quality, achieve the source of food, improve the recall efficiency of products and provide a strong guarantee for food safety [2–5].

Since the country proposed to implement the traceability system of agricultural products quality and safety, different regions and functional departments are carrying out quality traceability, then more and more local retrospective system and enterprise traceability system construction appears. Due to the different quantitative basis of a traceability system, traceability standards, traceability function and traceability technology are different. The system cannot be compatible with each other, which makes it difficult to share information. These problems have weakened their ability greatly to provide information sources for government regulation.

This paper puts forward a solution of the municipal agricultural products traceability management platform, which can not only meet the construction of enterprise traceability system but also facilitate the government to manage different areas and

different types of a traceability system. The construction of the platform can provide market dynamic, data analysis, market forecast, standard certification and other service modules for enterprises and government, and also provide more reliable support and guarantee for the quality and safety traceability of agricultural products.

2 Current Situation and Problems

2.1 The Construction of the Traceability System Is Repeated and Redundant

At present, agricultural products occupy a large market share in China, and the construction of quality and safety traceability system of agricultural products shows diversity. For example, the traceability system from various ministries such as the quality tracing network of planting products in Ministry of Agriculture, the national food safety traceability platform of NDRC and the ministry of Commerce's traceability system for meat and vegetables circulation; The Provincial Agricultural Committee platform such as the agricultural products quality and safety traceability management platform, the standard garden horticultural crops quality and safety traceability platform and the vegetable products quality and safety traceability platform in Jiangsu; The Agricultural committees of all levels and agricultural committees at county level (District) such as the agricultural products quality and safety supervision and management of geographic information platform and the meat and vegetables circulation platform and mobile supervision platform for quality and safety of agricultural products of Changzhou city [7].

These traceability systems are incompatible with each other and the overall operation efficiency of it is low, which causes the waste of information resources and easy to form "Information Island". It is not only difficult for consumers to search for traceability after the purchase of agricultural products, but also to increase the difficulty of supervision.

2.2 The Function Construction of the Platform Is Imperfect

With the development of market traceability system, consumers pay more attention to the information of agricultural products in the process of production and circulation. The increase of consumers' recognition degree of traceability products makes enterprises stricter in the control of information in the production process, and the requirements for the construction of the traceability system platform are more stringent [8]. At present, there is a large number of local retrospective platforms, but there is no emphasis on the function of management service in platform construction, and it also doesn't reflect the advantages and characteristics of retroactive platform integration.

2.3 The Construction Cost of the System Is High and the Government Cannot Participate Effectively

The promotion and application of the traceability management system of agricultural products is not only beneficial to the enterprises to improve the statistics and control of agricultural products production, processing, transportation and sales, to meet the information display of the key links of agricultural products, so that consumers can buy, but also for the relevant government departments to provide appropriate agricultural reference information data in order to allow the government to properly control the market economy and formulate corresponding economic policies. The construction, operation, and maintenance of agricultural product traceability system need a certain amount of manpower and material resources to support, so it is difficult for enterprises to obtain direct economic benefits from the retrospective product in the early stage of the construction of the retroactive system. Equipment upgrades, human input information, and other procedures increased costs, resulting in the use of enterprises to reduce the enthusiasm of the system. Equipment upgrades, human information input, and other procedures make the cost of enterprises increased, resulting in the use of the system to reduce enthusiasm. The construction of enterprise traceability system is not standard, and some enterprises give up the traceability system because of the high registration cost, which makes it difficult for the government to coordinate management.

2.4 The Low Level of Agricultural Organization Limits the Degree of Penetration of the Retroactive System

At present, the main models of agricultural production and management in China are mainly retail farmers, large farmers, cooperatives and other major situations, and large agricultural production enterprises are less distributed in China. So this leads to the low level of farmers' participation in agricultural production, the lacking of ability to operate computers and advanced equipment, the weak understanding of agricultural products traceability knowledge and information conversion ability, the low level scale of agricultural production, the inadequate guarantee of the quality of agricultural production supervision and the less information circulation between households and other issues. These problems seriously restrict the popularization and application of agricultural products quality and safety traceability in the agricultural production process.

3 Overall Design

3.1 The Significance of Constructing Platform

The construction of the quality and safety traceability management platform of agricultural products is based on the actual situation of the agricultural product retrospective management. We select the SOA analysis method which is process-oriented and integrated that combined with the "Platform + System" framework model to achieve [9]. The SOA architecture is a service-oriented architecture and a component

model that links the service component of the application through interfaces and convention protocols. This interface is defined in a neutral way, independent of programming languages, operating systems, and hardware devices. Through interfaces, information can interact in a universal and unified way. By confirming the key starting point and the effective information point of the retroactive platform, the model can realize the effective management and maintenance of all the local retrospective enterprises by the government regulators, the code expansion and the interface development, so that it can track the data with the provincial and national level docking effectively and explore a suitable management of regional traceability system platform development direction [10].

3.2 Integrated Service

The construction of agricultural products quality and safety traceability platform in Binzhou City is committed to building a traceability system based on the Binzhou government as the core and combine the characteristic industries in Binzhou to achieve integrated management services. The construction of traceability platform based on the construction of "Platform + System" ideas, data resources covering various agricultural subsystems, including fruit and vegetable traceability system, traceability system of grain and oil, agricultural and sideline products traceability system, traceability system of livestock and poultry, aquatic product traceability system, forest product traceability system of six subsystems, platform construction and combined with the characteristics of the local agricultural products the development, based on the construction of the full coverage of agricultural products traceability system, to achieve the promotion of characteristic agricultural products in the construction of a series of advantages, such as Zhanhua jujube, Sanhe Lake leek, Yangxin pear and other characteristics of traceability system. For example, fruit and vegetable traceability system including the characteristics of Binzhou jujube traceability system, leek traceability system, traceability system, traceability system of apple pear and so on, the traceability system of different enterprise users, such as the Zhanhua Institute of Zhanhua jujube traceability system, traceability system of cooperatives jujube.

On the one hand is to improve the level of traceability management platform, the construction of many provincial and municipal platform to the enterprise as the main object, displayed on the system is arranged between the various enterprises, the Binzhou back platform construction through the reasonable distribution, with industry-driven enterprise, outstanding industrial structure adjustment. Through all kinds of traceability system of demonstrative promotion, the construction of traceability system covering the entire industry, thus promoting the traceability of scale expansion of Binzhou City, so the city's traceability system added to the platform management, realize the true sense of the category of traceability management, ensure the safety of consumers.

3.3 System Architecture

The Enterprise traceability management system uses GS1 coding to design traceability chain coding system for agricultural products [11]. By means of scanning the barcode

on the product label, the system can obtain the data coding information of each node. The code encodes the participants, trade products, logistics orders, location, assets and service relationships of the system supply chain, thus solving the problem that information coding is not unique in the supply chain [12]. Besides, the coding has the global unity and scalability, which provides a reliable guarantee for data docking between platform and platform. The platform can not only meet the supervision department daily management and traceability of the application but also can realize five kinds of traceability system that include the computer query, SMS query, two-dimensional code query, telephone inquiry and touch screen query. It provides more efficient service to consumers and managers.

At the same time, The platform also controls the whole from four aspects: information acquisition, information processing, information service and information display. Information acquisition level is mainly to obtain the effective data of each block of each system, including data collection, key link data, production input and price benefit data, which provides data support for the overall analysis of the platform. The information processing level mainly through hand-held gun sweep code or two-dimensional code scanning to achieve the link between traceability code data transfer and the data back to the digital information interaction uses digital information technology to achieve quality and safety traceability management platform for information research and development. The information service layer provides the information service guarantee for the enterprise and the consumer through the development policy, the market dynamics, the analysis report, the agricultural guidance, the supply side information, the price quotation and so on. Consulting services and demand linkages enable producers and consumers to implement information interaction functions. The information display mainly through five query methods to facilitate consumers and regulators to query traceability related information. The four-layer frame diagram of the platform is shown as illustrated (Fig. 1).

3.4 The Design of System Function

The construction of the municipal traceability platform is different from the composition of the general enterprise traceability system. Enterprise traceability system is user-oriented enterprise, is through the analysis of enterprise internal supply chain, and establish traceability management system for the needs of the enterprise, the main function of the system is to realize the enterprise product traceability, the traceability system to improve the enterprise internal management and product quality and safety. Binzhou city agricultural product quality safety traceability platform for the operation of the object is Binzhou municipal government management, through the construction of a docking platform can realize the traceability system and platform, model to build “platform - multiple system”, and the traceability system of Binzhou City, also through the construction of government macro-control of the municipal traceability system administrator the origin of the platform. By analyzing the data of agriculture, forestry, animal husbandry and fishery in every county of Binzhou City, we can provide accurate data for the whole analysis and location of Binzhou agricultural products and provide data support for the next development policy and decision.

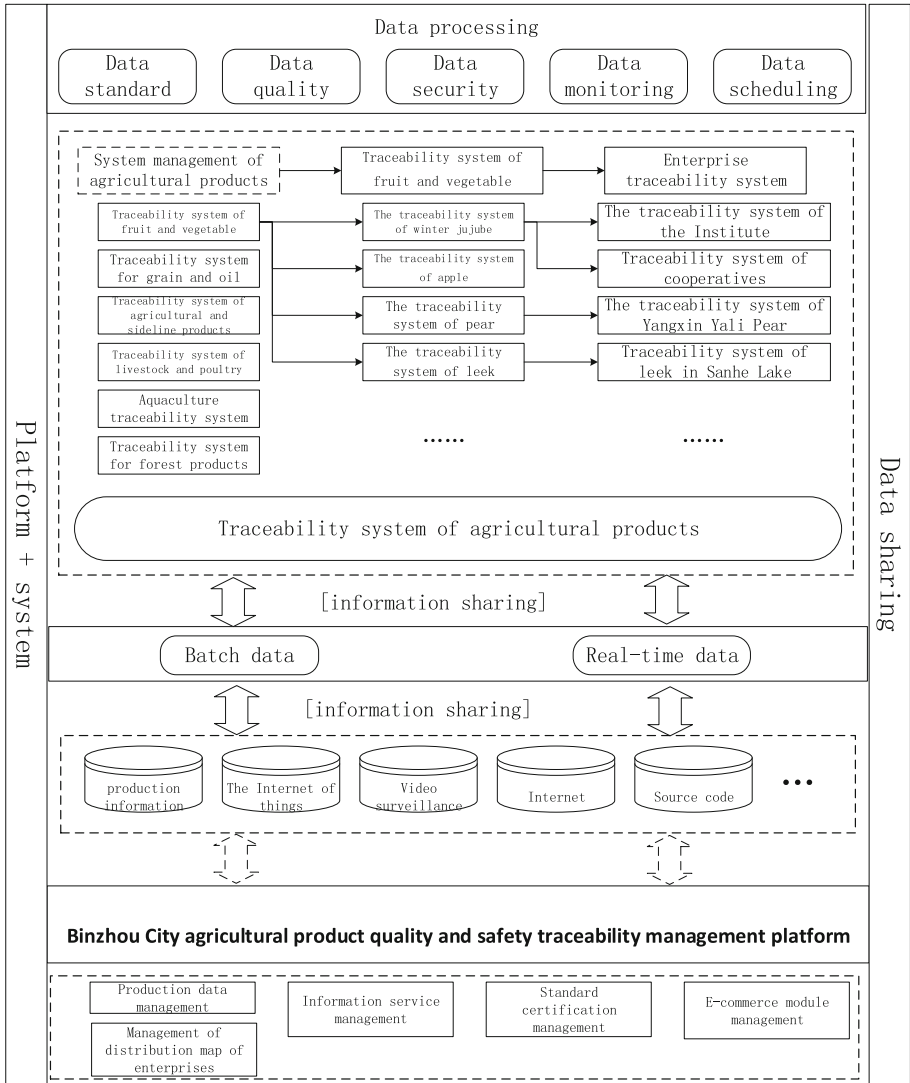


Fig. 1. Platform frame diagram

The management system of agricultural product quality and safety traceability includes agricultural product management subsystem, enterprise traceability management system, hardware traceability chain management system, information service management system, standard authentication management system, product distribution map system and production management data system. According to the classification standards of agricultural products by the Ministry of agriculture, the traceability system is divided into six types: fruits and vegetables, grain and oil, forestry, livestock, aquatic products and agricultural and sideline products.

Among them, the enterprise traceability management system is the retroactive management system embedded in the platform to provide platform and system information between the docking and software interface. The hardware traceability chain management system is based on RFID radio frequency electronic identification and barcode label technology as the core design and development, the function of the system to ensure that the industry chain links between the product batch uniqueness. Information service management system mainly for government regulators to add information through the platform, to provide industrial guidance for producers and consumers. The standard certification management system provides users with national, local and industrial standard information, and also provides qualification authentication links for enterprises to join the traceability platform. The product distribution map system is mainly based on geographic information technology, and it will join the platform enterprise to realize map layout and enterprise login interface. The production management data system is mainly to realize the data analysis of the agriculture, forestry, animal husbandry and fishery in the counties of the city, and provide the information basis for the macroscopic field of vision (Fig. 2).

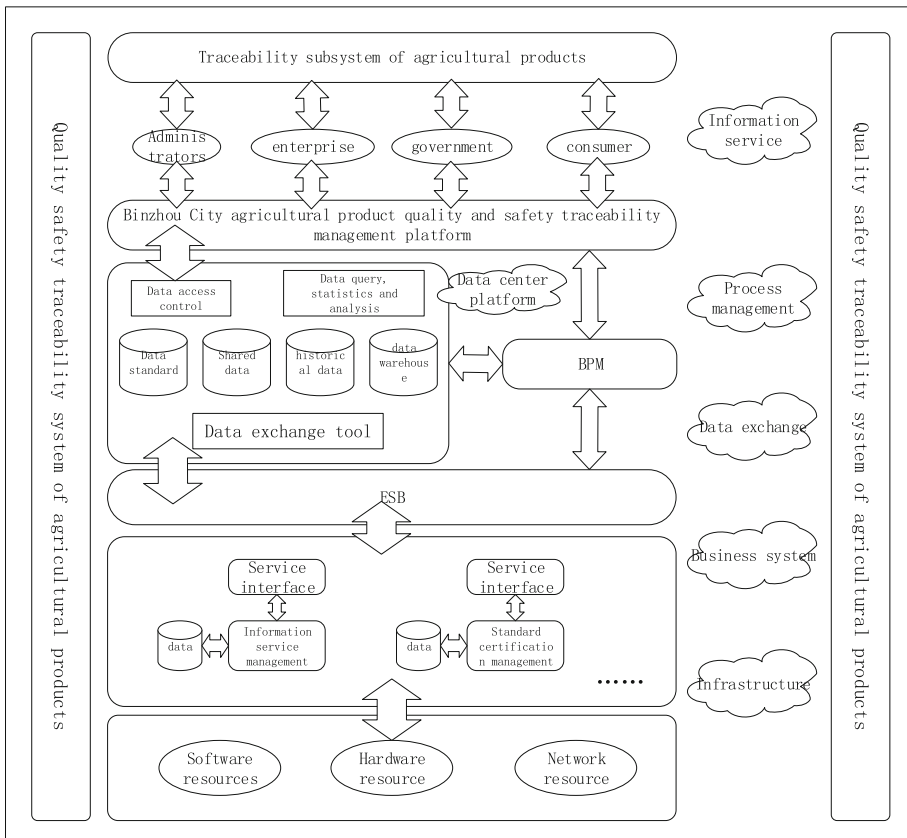


Fig. 2. Platform architecture

4 System Implementation

The system uses MyEclipse 10, MySQL, and Chrome browser as development tools based on the above platform traceability model. Based on Browser/Server (Browser/server) network structure model and SSH as the core web applications open source framework, we use the most general and best JAVA language as the foundation to develop the platform and the system to combine the whole industry chain process and the platform function of the enterprise agricultural product system. The producers and consumers can realize the comprehensive information about the market information and other relevant information through the platform. So that producers and consumers not only can achieve a comprehensive grasp of agricultural products traceability information but also through the platform to achieve a timely understanding of market information and other related information.

The construction of this project is based on the advantages of agricultural resources in Binzhou City, Focus on the development of local agricultural products with better characteristics through the construction of large-scale and intensive advantages. We will further expand the scale and output value, improve the visibility of regional products and build characteristics of agricultural products base. After the implementation of the project, while increasing the supply of high-quality agricultural products at the same time, it will have a positive impact in guiding farmers to learn science and technology, changing the traditional cultivation, farming methods, promoting agricultural restructuring, increasing farmers' income, improving the overall quality and competitiveness of agriculture and other aspect (Fig. 3).



Fig. 3. Platform interface

5 Conclusion

Takes Binzhou city agricultural products as an example:

- (1) Analyzes the modeling process of the requirements definition of the Binzhou City retrospective platform through SOA and realizes the establishment of a “Platform + System” retrospective platform management model and analyzes the shortcomings of the current retrospective platform. The optimization of the platform model was optimized, and the respective functions of producer-consumer regulators were effectively integrated, and the Binzhou City agricultural product quality safety traceability management platform was established.
- (2) The application of a number of companies in Binzhou City shows that the use of the platform can standardize the company’s production level, improve the company’s management capabilities, and optimize the product’s entire industrial chain process to meet consumers’ reliable understanding of the entire process of product information. And the government provides a platform for companies to build brands to increase product added value and increase revenue.

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