

Research on Traceability Platform of Fruit Production and Marketing Information based on PAMTP

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Abstract—This paper takes the fruit production and marketing information and its quality safety in some areas of Zhuji as the research object. Data processing and analysis and construction of the production and marketing information model are carried out through PAMTP. On this basis, with the help of technologies such as Hadoop, HBase, HTML, JAVA, etc., a fruit production and marketing information tracing platform is built, whose functions include source information, order feedback, personal center, etc., to trace the source of fruit supply, and make product picking transparent. It can not only eliminate consumers' concerns about the safety of fruit but also provide suppliers with reliable and high demand sales channels, thus solving the problem of traceability of fruit production and marketing information at present, avoiding the occurrence of poor sales, and achieving both supply and demand in the fruit market.

Index Terms—fruit production and marketing, Information on fruit production and marketing, Information traceability platform

I. INTRODUCTION

In recent years, a series of fruit quality safety incidents have revealed that there are still many risks of fruit quality safety and this safety problem is not optimistic in China. The abuse of chemical drugs such as "pesticides", "hormones" and "additives" has led consumers to panic about the quality and safety of fruits in China. Whether the fruit source is legitimate, whether it is safe to eat, and how to dispose of the problematic fruit have become a common concern for consumers when buying fruit. In addition, the excellent fruit rate is less than 10% of total output in China's fruit industry. Through our investigation of some farmers, we found that many fruits, such as oranges and grapefruits, have very good taste and sweetness, but they don't have a good look, leading to low competitiveness. However, a lot of brand fruits which have a good look in the market have numerous safety problems. This is contrary to the growing demand of consumers for the taste and quality of fruit, so further development of fruit market is constrained.

To sum up, in such a market environment, it is extremely necessary to build a platform that can trace the source of fruit, control quality problems, and at the same time provide a reliable and large volume sales channels to

meet the needs of consumers and promote the development of the market. Therefore, the platform uses the existing technical design to establish a more comprehensive and detailed traceability system for fruit production and marketing.

II. DOMESTIC AND FOREIGN FRUIT PRODUCTION AND MARKETING TRACEABILITY SYSTEM

A. Figures and Tables

European Union member states and some developing countries began to pay more attention to the research of food traceability system in the 1970s. From government to consumers[1], all of them, Committed to applying traceability measurement in food production and food supply chain and had carried out some extensive and in-depth research and application. They also had issued a series of relevant regulations and required Beef products and fresh fruits and vegetables sold can be traced to ensure food safety and hygiene. In terms of information management, the European Union has established national databases for livestock and Manage their information throughout their lives. Now a days, many countries in the European Union currently use the EAN.UCC system as a standard for food safety traceability [2].

In addition, the United States sets up a relatively perfect food quality and safety system by developing and developing technology related to food safety traceability, connecting multiple links from production to distribution, in South Korea they also do some research about tracing of agricultural products. Production information identification cards have been established for more than 1,000 agricultural products. About the international side has formulated the GIS global traceability standard[3] specification based on the global unified identification system, which is the most comprehensive traceability technology standard in the world.

B. Domestic research status

The research on Chinese vegetable traceability system began in 2001. In July, Shanghai issued *the interim measures on the safety supervision of edible agricultural products in Shanghai*, putting forward the traceability system for vegetables for the first time. Vegetable safety information platform was established in 2004. A similar system was established in Beijing in 2002, which required

records based on where the vegetables were produced, the date of production, the grower, the seller, etc., to be recalled in time if a problem was found. In 2004, a research project of the ministry of agriculture, *the pilot project of traceability system for vegetable products entering Beijing*, was approved. In 2007, Beijing began to establish the food (vegetable) safety traceability system for the Beijing Olympic Games [4,5].

The domestic agricultural product tracing system from emergence to present development research has got many considerable prospects. But, there also are many problems, such as, at present, most domestic agricultural product traceability system mainly refers to the production traceability of designated crops at the government level, which is limited to the official website and PC, therefore, the scope of information resources has some limitations. Different from some of the larger commodity manufacturers, much small-scale information of agricultural products still has some gaps. What's more, when consumers search, they need to input the traceability code or bar code, which is a tedious operation. As for Information content, The information is relatively simple, which only includes the basic origin, warranty period, specifications, etc., while the detailed information on product production and sales is not involved.

Based on the above analysis, we know the importance of fruit traceability. In order to solve the problem of tracing fruit production and marketing information at present, the traceability system of fruit quality should be established as soon as possible. Therefore, this paper proposes the traceability model of Production and marketing traceability platform (PAMTP for short) in the mode of service collaboration.

III. CONSTRUCTION OF INFORMATION TRACEABILITY MODEL OF FRUIT PRODUCTION AND MARKETING BASED ON PAMTP

A. A Brief Description Of PAMTP

This model is based on the RFID read-write equipment information acquisition system and China's existing partial food quality traceability system, however, the current food quality traceability system in China is mostly an internal traceability system developed on the basis of a single enterprise, it is difficult to share trace information, moreover, the content of traceability information is inconsistent, there are problems with simplicity and complexity. So the project team took advantage of the existing technical design, on this basis, a more comprehensive and detailed traceability system of Production and marketing traceability platform (PAMTP) is established, the core of this traceability system is the establishment of the traceability model of fruit production and marketing information.

B. Establishment Of PAMTP Information Model

- PAMTP data processing and analysis
Production data information acquisition is based on traditional manual record using wireless sensor technology. In the production environment monitoring and management, the farmland environment monitoring

equipment set up by the sensor network can automatically acquire the production environment parameters, such as temperature, humidity, ph and so on. The RFID reading and writing equipment can be saved in the electronic tags of fruits. The monitoring and management of the production environment can be completed through video monitoring of the production environment. In field operation record management, when operators fertilize, spray pesticides and irrigate fruits through the system, the system USES RFID reading and writing equipment to actively save to electronic label. At the same time, we can monitor the specific situation of fruit through video. In the pre-sales quality test management, the overall biochemical information of the product, such as sweetness, proportion of ingredients, proportion of chemical addition, is detected through batch sampling test, and records are kept by using reading and writing equipment. The above data information for the product is classified as production data, which can be stored in the same database by subject. Sales data information is published by real-time update of background database. In the monitoring and management of logistics distribution, 3S technology is used to locate the transport vehicles and use RFID to record the transport information. The system also integrates hardware equipment such as printer, intelligent traceability scale and scanning gun to help achieve the traceability information management of fruit.

- Model features

On the basis of the existing product information model, a one-to-one systematic tracking mode is adopted under the cooperative service, and a more comprehensive PAMTP information model is established by combining multiple data monitoring and positioning tracking technologies, as shown in the figure below:

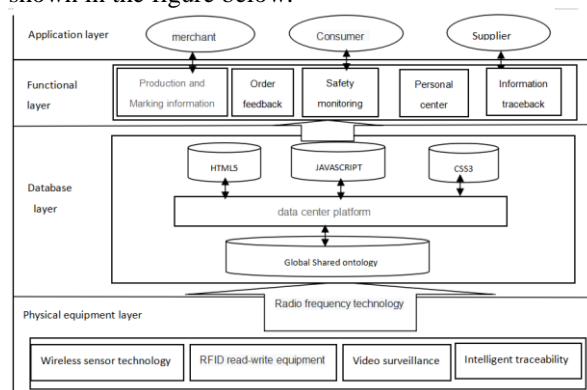


Figure 1. PAMTP information model

The model is divided into four levels in logical structure: physical device layer, database layer, function layer and application layer.

Physical equipment layer: real-time data monitoring of multiple monitoring sites, and

Data are aggregated to the database layer for processing through radio frequency transmission data.

Database layer: all kinds of data are stored in the database under the cooperative service of designated fruit. The data layer is the core layer of the model. There is a mapping between the local ontology and the global sharing

ontology, data is aggregated to data zte, and data support is provided in different functional modules.

Functional layer: this layer is the entrance of user access information, provides support for product information access, and can realize multi-module information access, mainly including the home page, production information, order feedback and personal center four modules.

Application layer: the application layer is a circular functional structure composed of consumers, service integrators and service providers, providing and receiving product information services.

The content of PAMTP information model is mainly divided into production information and sales information, which can comprehensively and transparently reflect all kinds of information of products, ensure the safety and traceability of product quality, improve the quality advantage of I products, increase the quantity of sales, and achieve win-win results of both buyers and sellers. As shown in the following table:

TABLE I . NAME AND DEFINITION OF EACH DOCUMENT SEGMENT OF PRODUCTION INFORMATION

Document segment name	Use
Locating	The geographical name and physical location of the product's origin
Environmental quality	Product area soil, humidity, sunlight and other biological growth environment
The physical appearance	External, observation, phenomena, including product appearance weight, color and shape
The essence of chemical	Sweetness, proportion of ingredients and proportion of chemical addition
Planting record	The planting process records include pollination time and times of dosage of medicine
freshness	The product's picking time record

TABLE II . NAME AND DEFINITION OF EACH DOCUMENT SEGMENT OF SALES INFORMATION

Document segment name	Use
Product shelves	Information about the products purchased on shelves
Business consulting	Consumer information to consult ask a question
Merchants orders	Customer order feedback from merchants
The order processing	Shipping and logistics information
Feedback	Consumer product use satisfaction evaluation feedback
Secondary after-sales	Return of goods, dissatisfied after - sales processing information

In addition, this model application platform is an e-commerce platform, which needs to increase the management and integration of user personal information, mainly including user personal information, registration and login, mode setting, etc. which generally includes 4 document segments. The specific situation is shown in the following table:

TABLE III. THE NAME AND DEFINITION OF EACH DOCUMENT SEGMENT OF USER INFORMATION

Document segment name	Use
Log in	Including user login registration account password information

Personal information	Including profile picture, member name and other information
Change the setting	Including account and security, harvest address, information reminder and other settings information
Pay attention to collection	Including user's attention, collection, shopping cart and other information

C. Functional architecture based on PAMTP

At present, the traceability platform established in China is an isolated safety traceability system established by major enterprises according to their own characteristics[6]. Part of the system adopts the HACCP system principle of international certification, which can be changed from the original post-test unqualified to the control of intermediate nodes, controlling the harm in all links and reducing the harm degree to the minimum. In this context, the platform comes into being for consumers to eat safe and well-sourced fruit. This platform using cloud computing as the main body is mainly in order to ensure the reliable support of the vast amount of data, in the fruit quality and safety traceability system, need to be geographically distributed in different parts of the plant unit, processing units and sales units and consumers of fruit quality and safety management information integration and sharing, using the J2EE technology to complete the fruit quality traceability information maintenance and management. This platform mainly includes four functional modules, home page, source information, order feedback and personal center. The functional structure of the platform is shown in the figure.

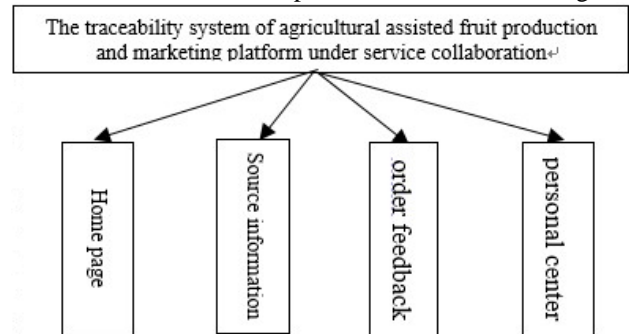


Figure 2. The functional structure of the platform

"Home" function module

In this module, the platform will push some boutique products to users, as well as briefly introduce the core services and jump to other pages and other functions.

"Production source information" function module

The "source information" module can provide users with detailed information about the product, including product introduction and the introduction of the place of origin (including sweetness, pesticide use, soil of the place of origin, etc.).

Order feedback function module

Through this module, the platform gives users relevant dealer information and the logistics information of the fruit purchased, and inquires some basic information of fruit transportation.

"Personal center" function module

In this module, the platform provides the function to modify the user's personal information (including receiving address, user nickname, etc.), and also records the user's purchase behavior, so that the user can query, analyze the purchase behavior, and calculate the user's preferences, in order to push relevant high-quality products.

The construction of this platform mainly USES HTML5, JAVASCRIPT, CSS3 technology, and HBase database. Compared with the application of traditional single technology, the multi-language combined architecture can accomplish more tasks, and the data processing of picture, audio, video is more advantageous.

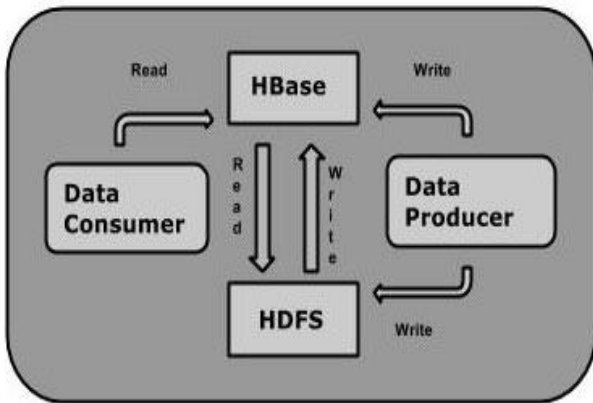


Figure 3. Data flow chart

IV. PROTOTYPE SHOW

A. "Personal center" Part

The platform adopts the user's real name system and requires users to fill in relevant information.

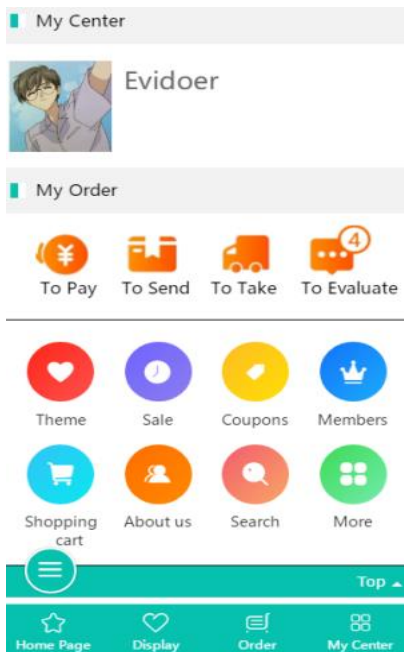


Figure 4. Personal center

B. "The main page" Part

The main page is the user's first impression of the platform.

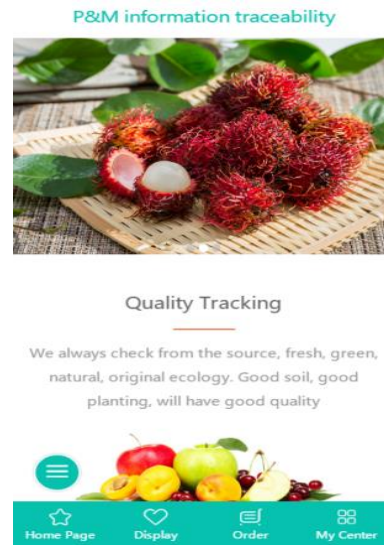


Figure 5. The main page

C. "Product display" Part

In this interface, users can choose the products what they want to buy.

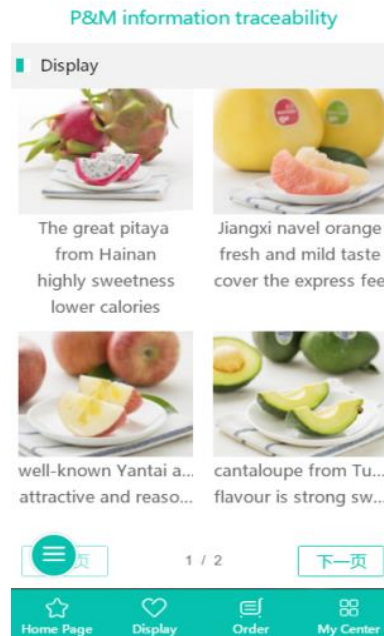


Figure 6. Product display

D. "Production and marketing information query" Part

In this function module, the user can know the planting information of a certain fruit.

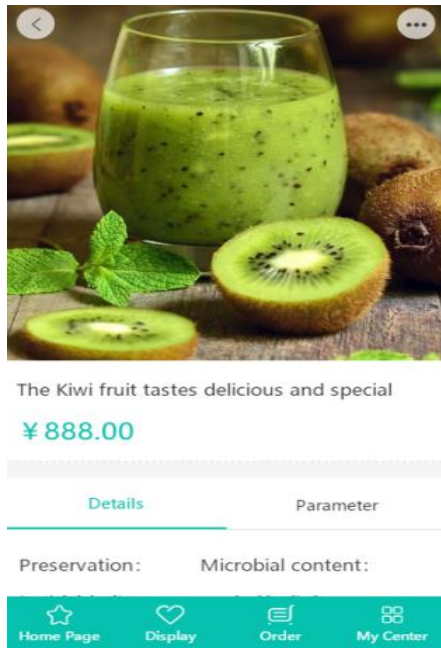


Figure 7. Production and marketing information query

V. CONCLUSION

In this paper, based on the collection and collation of a large number of relevant literature of traceability system, a PAMTP information model was established to reflect the production and marketing of fruits in response to consumers' concerns about the safety of fruit by analyzing the development status at home and abroad. Based on Hadoop, HBase, HTML, JAVA and other technologies, a security traceability system with massive data support was developed. This system mainly completed analysis of research status at home and abroad and discussed the concept of the related technologies, and established the traceability model of fruit production and marketing information which is mainly used to guarantee the quality and logistics safety of fruit products on the fruit sales platform to alleviate the safety problem of fruit, to guarantee the quality of fruit purchase for consumers, and to solve the sales problem of fruit suppliers at the same time. This study preliminarily completed the research and promotion of fruit production and marketing information under the service collaboration mode by using some current practical techniques. Due to limited r&d time and experience in team development techniques, as well as insufficient understanding of relevant knowledge system, the research system interface is not humanized, beautiful and the background management is not perfect. Relevant data should be updated in real time according to the actual situation and the project team should follow up in time.

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