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# Establishmentof Quality-SafetyTraceabilitySystemfor Navel Orange

Shihong Liua, b\*, Huoguo Zhenga, b, Haiyan Hua, b, Pengju Hea, b, Yongqiang Guoa, b

*aAgricultural Information Institute, Chinese Academy of Agricultural Sciences, Beijing, P.R.China 100081*

*b Key Laboratory of Agri-information Service Technology, Ministry of Agriculture, China, 100081*

**Abstract**

Traceability system has been an import means in food quality and safetymanagement. Governments in many countries are putting increasing emphasis onestablishment of food traceability systems. According to production, processing, storage and distribution of the featureagricultural products----navel orange in the central mountain area of China,this article proposes the technology line and the main result of the research of traceability forqualitysafetyof navel orange.

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*Keywords:* feature agricultural products; navelorange; trace of quality; traceability

## Introduction

Navel orange is a kind of feature agricultural products in the central mountain area of China. It mainly distributes in the Gannan area of Jiangxiprovince. Gannan navel orange is the most special product in Jiangxi citrus production and has been an import means in increasing income of peasants. But, the quality safety incidents of navel orange in recent years have dealt a blow to navel orange's reputation and cause great

\*Shihong Liu,Agricultural Information Institute, Chinese Academy of Agricultural Sciences, Beijing, P.R.China 1000[81.Email:lius@mail.caas.net.cn,](mailto:lius@mail.caas.net.cn) Tel:+86-01-82103075

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economic loss. For example, the “dyedorange “incident made the navel orange of the 70% of Hong Kong market share reduce to zero in 2004;the “Bactrocera” incident in Sichuan Gung Yuan area was a great blow to the south citrus production in 2008.Market rate was below production cost. The bid of a part production was only 20% of production cost. The peasants suffered heavily loss.Typical of agricultural products of Central Mountain Gannan navel orange as the research object, we explore the monitor points of full traceability of quality and safety of the typical ofagricultural products in our country, and the retrospective business processes, relative standards and key technologies applied to safety and quality of typical of agricultural products in our country.

Because of efficient risk control, food traceability systems receive muchattention by many countries. Food traceability systems mainly apply in animal husbandry in developed countries at present, and gradually cover into vegetablesǃfruit and so on.The United States issued the regulation for food safety, demanded all the companies which involve in food transportationǃfood distribution and food import establish and save the whole records about the food distribution indecember,2003(2). In 2008, the Canadian federal government reached an ambitious goal.The country has achieved tracing back 80 percent of agricultural products to its source, supporting the "Brand Canada strategy"(7).The Japanese Government has passed new legislations required meat processors to collect and save time in the slaughter of livestock per head DNA samples (9).

In the past decade, a series of traceability system for quality and safety of agricultural products came into being, quality and safety monitored traceable system for chicken safety and quality production (YunfengBai, ChanghuaLu, 2005), quality tracking and traceability information system for the entire process of beef production in quality and safety (ShusenZan,TongchaoZheng, 2005) , Origin Digital System for Factory Pork Production Safety (ChanghuaLu, JufangXie, 2006), the main grain and oil product quality and traceability system (ShihongLiu, HuoguoZheng, etc., 2008), are all highly representative of the research results.

## Methods And System Design

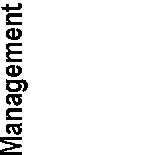
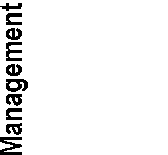
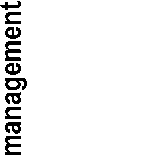
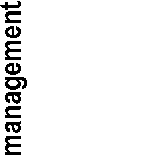
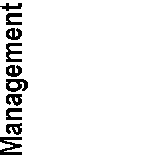
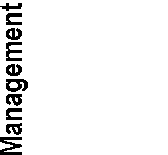
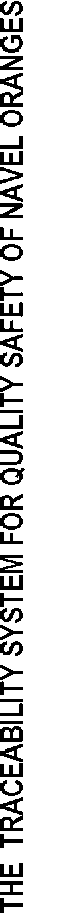
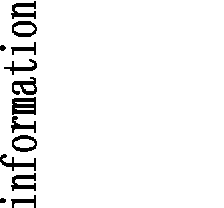
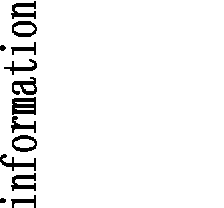
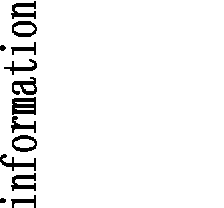
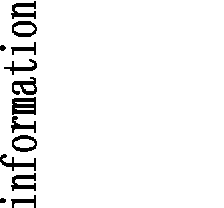
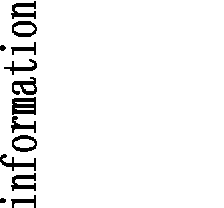
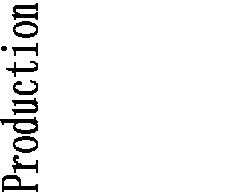
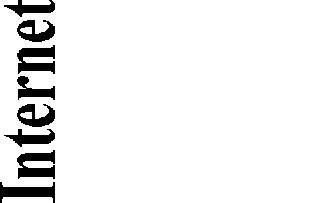
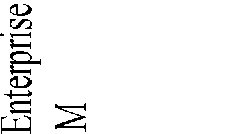
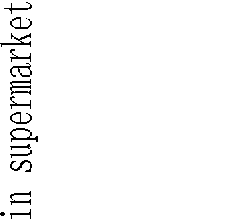
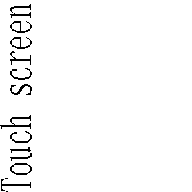
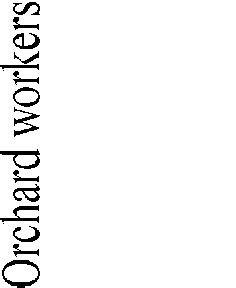
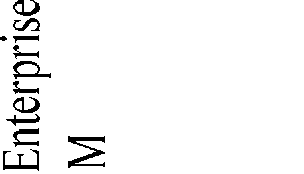
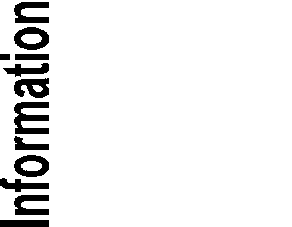
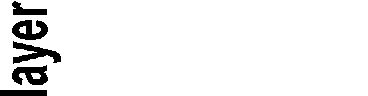
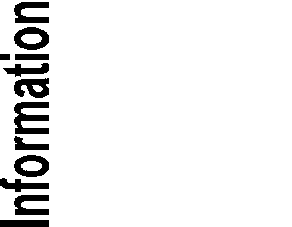
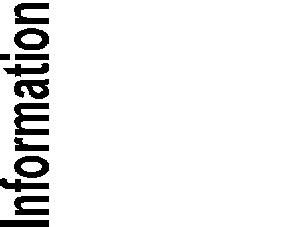
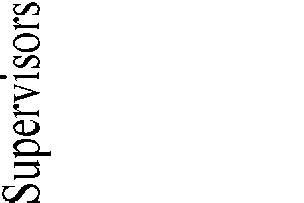
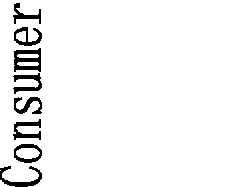
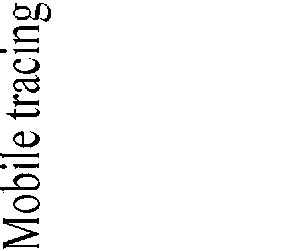
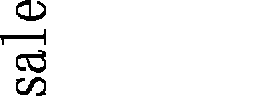
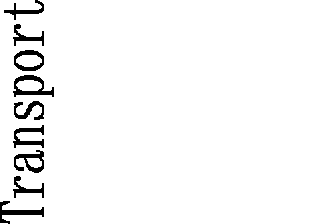
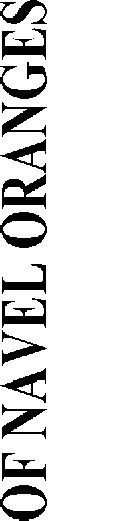
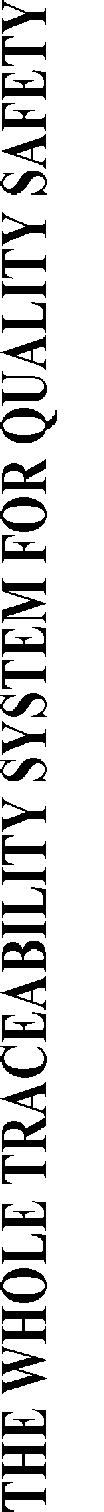
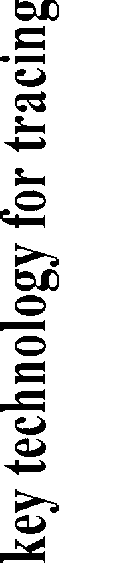
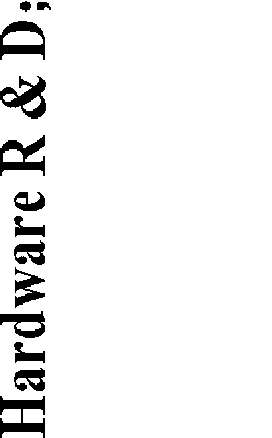
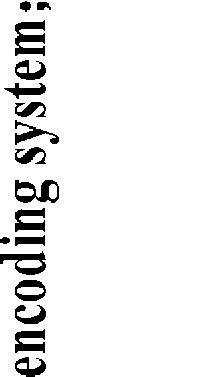
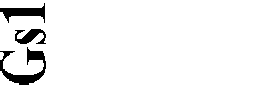
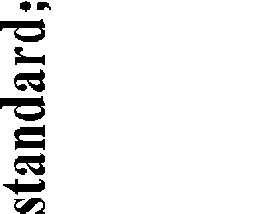
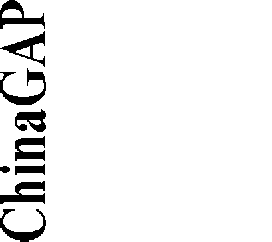
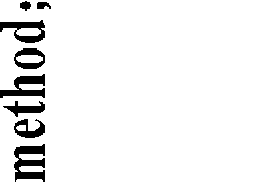
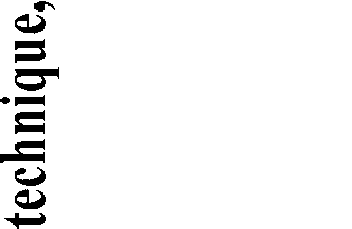
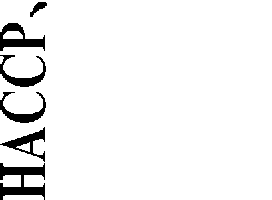
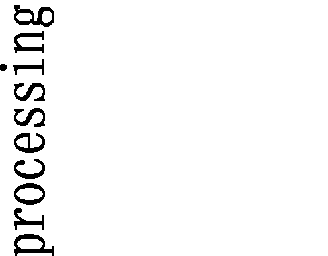
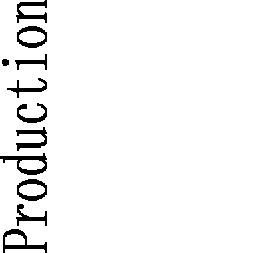
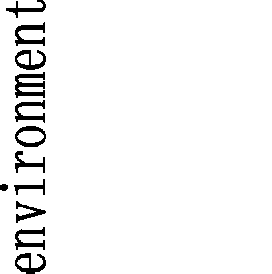
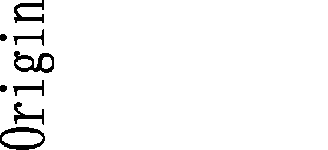
* 1. *Methods*

The use of modern informationtechnology, the entire process of traceable digital management, fast tracking and traceability of product quality and safety, traceability application support and rapid traceability across the network platform construction and other major breakthroughs in key technologies help to construct a number of software and hardware platform of independent intellectual property rights, and achieve demonstration and application in the mountains of central China to explore retrospective method for the quality of the typical of agricultural products suitable for China's national conditions.

* 1. *System Design*

Quality and safety of Orange tracking and tracing technology decompose the overall architecture from three levels of the information collection, information processingand information services. In the information collection layer, through sorting out process from planting to harvesting and the process of production of the navel orange product, we investigate their business processes, analysis hazards, explore and determine factors which affects the quality and safety of navel orange, and get product processing, quality inspection, logistics and marketing and other aspects of quality and safety information which basedon processing and production of enterprises, build traceability data center of navel orange, and provide data support to achieve the ultimate traceability. In the information processing layer, using HACCP(1)and other quality management methods and tools toanalyze and determine key factors of the quality and safety indicators of navel orange. Using the encoding information technology, information exchange, management and hardware R & D of digital





**Tracing back mobile terminal**

**Product traceability management**

**Site back**

**Touch Screen back**

**End Product Code Management**

**Orange back barcode printing**

**Transportation Information Management**

**Orange trace code generation**

**Packaging Information Management**

**Transportation Information Management**

**Packaging Information Management**

**Storage Information Management**

**Batch Management Package**

**Packaging Process Management**

**Processing information management**

**Processing Batch Management**

**Process management**

**Materials management**

**Picking process management**

**Picking Information Management**

**Production Process Management**

**Picking Batch Management**

**Use record input**

**Management inputs**

**Growers Information Management**

**Production records**

**Orchard management of environmental factors**

**Environmental indicators monitoring information**

**Orchard-based information management**

**Orange Standard Management**

**Basic information management orchard**

**Origin of Environmental Standards**

**Orchard codes**

**User basic management**

**Standards for Grades of Orange**

**User basic management**

**Orange physical and chemical standards**

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technology, we can complete traceable information portal of quality and safety of navel orange and research the technologies. In the information services layer, information services of quality and safety of orange could be provided to consumers, business managers and regulators through the network platform, supermarket touch screen, original mobile terminals and other methods. Overall system framework is shown in Figure 1. The traceability data centered original solution is shown in Figure 2.

Figure 1.System architecture diagram Figure 2: Data-center retrospective programs at the core

*2.3. System Function*

The traceability system for quality safety of navel oranges focuses on the whole process of information management which in the production and processing of navel orange, and provides services that consumers can get the safety information of navel orange from online platform. Functional modules shown in Figure 3:

Figure3. The functional modules oftraceability system for quality safety of navel orange

## Results

* 1. *System architecture diagram for traceability system*

Using HACCP techniques, combined with China GAP, cananalysis quality and safety of the navel orange chain trace. Itcan also raise the quality and safety of major hazard sources and analysis to determine the quality and safety indicators and critical control points in the various aspects oforange source trace chain. It can not only establish the traceability for quality and safety of navel orangeindicator system, but also determine the key indicators of quality and safety orange.Navel orange elements of HACCP Hazard are shown in Table 1.

Table 1. Navel orange HACCP Hazard Analysis Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Production Program | Safety hazards | Hazard is Significant or  not | Judgments on the basis of the third  column | Preventive measures | Whether the CCP |
| Parksite selection | Biological  hazards | N |  |  | N |
| Application  Management | Biological  hazards | Y | Fertilizer Storage | Separate fertilizer and  fruit |  |
| Transportation | Biological hazards | Y | The breeding of  pathogens during transport | Control of transport  conditions&the environment | N |
| Sale | Biological hazards | N |  |  | N |
| Chemical Hazards | N |  |  | N |
| Physical hazards | N |  |  | N |

* 1. *Orange trace chain quality and safety control and controlling aspects of metadata elements standards*

According the safety indicators and their critical control points which are introduced in the framework of navel orange safety system,we describe the navel orange back chain standardly. On this basis of description,metadata standards which in the navel orange back control and the navel orange control elementsmust be designed.

* 1. *Orange retrospective coding system for quality and safety*

Based on place of origin code, EAN / UCC standards, a quality tracking and tracing of Orange coding system, combined with internal production processes, has beenstudied and designed. This includes raw materials, origin code, the batch production at the core of all aspects of code orange, and final product quality and safety traceability code.Itprovides the basis support with forming a complete retrospective navel oranges.

* 1. *MobileTracing Terminal*

Adopting micro-electronic technology, we have developed Mobile traceability terminal hardware with ATmega128 microprocessor as the core and consisted by GPRS wireless communication module, LCD display, USB interface, random access memory, small keyboard, barcode scanning equipment and spare interface and so on . Meanwhile we have developed Data interactive software to communicate date with Mobile traceability terminal which is based on Windows Socket.

* 1. *The Traceability System For Quality Safety Of Navel Orange*

With navel oranges for object and with navel oranges’ traceability chain for main, we have established a multi-level and multi-role traceability system for quality safety of navel oranges by information coding, multiple platform sources, hardware development and other technology. System functions include basic information management, standard management, orchard information management, processing process management, storing, transportation, marketing management and traceability management and so on ,there not only realize the information management of quality and safety on production process, storage, and sales for enterprises, but also provide consumers and regulators with services by many kinds of ways such as network, supermarket touch screen, mobile traceability terminal and so on.

## Discussion

1. Navel oranges in the central mountainous areas of agricultural production have the most representative features, which directly affect the quality and safety of agricultural products quality and safety of the entire region as a whole. Therefore, studying the traceability system for quality safety of navel oranges will have far- reaching social benefits.
2. The methods of the research, the development and application of the results of product demonstrations, will have a positive impact on fruit production quality management. R & D quality, safety traceability system and establish tracking and tracing information chain, largely to facilitate to the users of the products which are (anti) to the back.
3. Fruit production traceability system is applied to producing information and collecting real-time quality monitoring information, which will be difficult and key points of the tracing process.

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