

RFID BASED TRACEABILITY SYSTEM FOR SHEEP BREEDING

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Abstract: As China's meat production is growing, the quality safety of meat food as an important human food sources has increasingly become a major issue which related to the national economy and people's livelihood. Using early warning technique, tracking and tracing techniques and so on in the key link of meat food production in order to fulfill quality control is an important method which can effectively guarantee the food quality and safety. The use of RFID techniques and handhelds can automatically collect information about sheep breeding. Meanwhile this information could be inquired conveniently through Internet. This study uses C/S (Client/Server) model structure, and builds the sheep breeding traceability system based on RFID.

Keywords: sheep breeding; radio frequency identification (RFID); traceability

1. INTRODUCTION

With the development of the economy and the improvement of people's standard of living, sheep breeding has been developing rapidly. Especially during lasted 10 years, sheep breeding has gained a big achievement, as well its share in gross national product (GNP) increases tremendously (MU Shu-qin, 2005). However, sheep breeding in China is still in its infancy at present, mutton production system has not been completely established, the information of breeding, raising, migration, epidemic prevention and treatment are incomplete. Because of above reasons, mutton production in China has met the challenge of safety, quality, efficiency and continuation.

In addition international marketplace constantly has built green and technical trade barrier on animal products from China for food safety (ZAN Lin-Sen, 2006), therefore animal breeding which was predominant before is in a very hot spot now. Meanwhile, because of trade globalization and Industrial production of livestock product, production and consumption of mutton have separated with each other. On the other hand, it is difficult to acquire safety information of consumption for consumers because of complicated supply system, so consumers can't easily realize the safety of consumption through termination products if production information can't be passed effectively. Traceability has become an important issue in the international food sector as result of the higher profile of food safety problems (Montanari and Coleman, 1995; Clarke, 1986; 1992; Pilz, 2000; Chanet and Eynard, 2000)

There is need, for both economic and quality assurance reasons, for an efficient and cost-effective method for identifying and tracking livestock product, and for the monitoring of the processing of those livestock (Eggen, 2004& Verbeke 2006). China has recognized an urgent need to increase mutton quality and realized the importance of fast tracing of beef products (Wang LF 2005).By using the sheep breeding traceability system; it is easily to transmit information and resolve the problem of quality control and information dissymetry. So this measure can meet the home market and international market requirement, it also provide technical guarantee for production standard and production behavior, meanwhile it may be as an essential livestock products' measure to break the trade barrier in international marketplace. This paper had done the research by use of advanced equipments and established traceability system based on the actual research. So not only inaccuracy for manual production was largely avoided, but also efficiency raised, production cost was saved and great economic achievement was gained.

2. THE SCHEME

2.1 Overview

The information records in the traditional sheep breeding and the identification of sheep depend on artificial means. Construction of sheep breeding management information system by using RFID tags and electronic hardware devices such as handhelds can record detailed and accurate breeding information timely and raise the traceability of breeding information. Sheep breeding management information system includes eight functional modules: Routine management, Feed storage, Disease prevention,

Veterinary drug management, Breeding management, Market management, System management.

2.2 Functional modules

(1) Routine management

Feeders feed sheep with forages in accordance with the feed formulation and record detailed information on specific sheep cot after getting forages from forages management department. When the sheep grow to a certain age, sheep need to be transferred to different sheep cot, and detailed records should be kept. In the process of feeding, feeders should conduct regular medical examinations to sheep, and fill out the sheep table. In the case of disqualification during medical examination, the sheep have to be washed out, and relevant record should be filled out.

(2) Feed storage

Forage management department contacts feed suppliers for procurement in determining the need to purchase feed varieties. Before forage entry warehouse, forage officers examine and verify forage, then determine to accept or not. Forage officers record forage entry information as soon as forage entry.

(3) Disease prevention

In the course of sheep farming, as soon as sheep show undesirable symptoms, the veterinary should be immediately notified, then detect the sheep and fill out detection tables. If epidemic situation was found, treatment should be taken immediately, and treatment measurement and drug usage should be kept. At the same time feeders will conduct regular desensitization and disinfection.

(4) Veterinary drug management

Veterinary Drug Management department contact suppliers for the procurement of veterinary drugs after determining which kind veterinary drugs should be procured. Before veterinary drugs entry, veterinary drugs officers should examine and verify veterinary drugs, then determine to accept or not. Veterinary drugs officers record veterinary drugs entry information as soon as veterinary drugs entry.

(5) Breeding management

when ewe are in estrum, breeding manager will test semen from ram, and fill out test report, then determine which rams should be chosen for breeding. During breeding, the breeding ewe, breeding ram, breeding method, the sequence and date information and so on must be recorded.

To improve the efficiency of breeding, embryo transplantation has also been brought into sheep breeding. In sheep embryo transplantation, the embryo's donator, embryo receptor, date of embryo transfer, and other information should be recorded in detail.

When ewes are parturient, feeders and breeding managers transfer the parturient ewes to the special cots which are used to lambing. Lamb number, lamb sex, lamb varieties, lambing date and lamb weight must be recorded off grade and aborted lambs would be washed out and sheep washout sheet should be filled out.

(6)Market management

Market managers must register and audit the information of all the suppliers and customers, unqualified entities would be rejected. Market managers should register order information, and identify pickup ways and pickup date. Meanwhile supplies of farm should be able to meet the order, if not, further consultations are required to take so that the final order would be determined. On delivery date, feeders submit the list of the sheep sale, market managers register records of the sheep sale, and write-off the corresponding orders and store.

(7) System management

The main function of system management module is the user's rights management and parameters set of plug-in equipment. Design thinking of user rights management system is: different enterprise employee has different rights in the system, so corporate information can be managed in safety.

3. SYSTEM IMPLEMENT

3.1 Development platform

This system uses Visual Studio2005 + SQL Server 2005 database as the development platform and c# as server-side programming language. C# language was chosen mainly because: C# (pronounced "See Sharp") is a simple, modern, object-oriented, and type-safe programming language. C# has its roots in the C family of languages and will be immediately familiar to C, C++, and Java programmers. C# full has the advantages provided by the common language runtime, and can be easily integrated and interactive with other applications (XIE Ju-fang, 2006).

3.2 Key Technology

(1) Readers, RFID technology and handhelds

The traditional sheep breeding process management adopts the artificial forms, so the information is serious loss, efficiency is not high, and it's difficult to trace the information. RFID is beginning to be widely used for tracking cattle from birth to the processing plant (Conill et al., 2002). It uses

tags affixed to assets to transmit accurate, real-time information to users' information systems (Gerdeman, 1995). Using reader can give individual sheep an only RFID identification; information is read by handheld for the purpose of routine management and then passed to the computer in the processing plant.



Fig.1 Desktop readers, RFID technology and handhelds

(2)Database access method

SQL Server 2005 provides a stable support and easy maintenance for the system. Database access technology adopts ADO.NET which is a rich data access technology, and one of the key features of the .NET Framework. ADO.NET still has a slew of advanced features and tricks that can be quite useful when you are dealing with data in a real-world application.

3.3 Characteristics of the system

(1)Maternal warning

The system can forecast maternal of the breeding sheep and give a date of childbirth which is based on different species of sheep, and do the appropriate warning.

(2)Sheep genealogical query

Traditional sheep genealogical is mainly managed by manual. It is difficult to manage the breeding sheep when the amount of information is extremely large. This system adopts recursive algorithm dynamic family tree, so the growth of genealogical information is also increased by time and the information is accurate.

(3)The traceability of the information

The system records the various segments of sheep breeding information which is started from birth and achieves the raising stage traceability of the information in order to provide this information for the sale of sheep, sheep slaughter, and so on, so the information is passed.

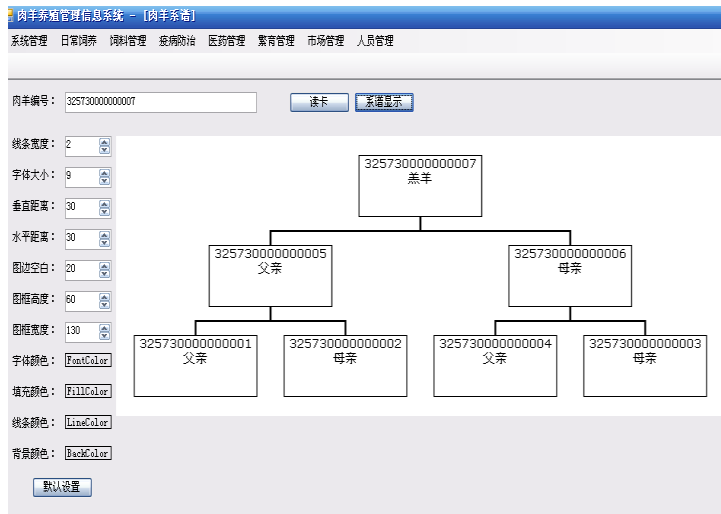


Fig.2 Sheep genealogical query

4. CONCLUSION

It is drawn all attention to inducing livestock product tracing system into food safety and quality control system. And the research of livestock product traceability system is underway in China. The information stored in livestock breed process could not be transferred effectively. It may cause information losses during the tracing processing. A well-designed traceability system may benefit many in the animal food industry (Dickinson and Bailey, 2002), and traceability could become a valued public good (Xie Jufang et al., 2004), especially for food safety. This paper does the preliminary research of the key technology (RFID, computer technology, database and so on) and designs a traceability system for sheep breeding. The introduction of traceability can enhance overall effectiveness and efficiency.

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