DESIGN OF BEE PRODUCTS QUALITY MONITORING INFORMATION SERVICE PLATFORM

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Abstract: The bee products quality monitoring and tracing information service platform was researched and developed. This paper describes the design concept and critical technologies for the construction of the bee products quality monitoring and tracing information service platform. The system has functions of remote information collection, production-purchase-processing automatic coding, bar code generation and identification, product quality tracking and tracing, information release, origin evaluation, market prediction, and analysis based on Geographic Information System (GIS), providing information technology(IT) tools for bee products quality safety control and quality tracing in China.

Keywords: bee products, quality monitoring, information, traceability

1.   INTRODUCTION

Today, the modern management of apiculture has been clearly seen in many countries. For example, modern computer management technology has been adopted for bee products production and processing in Brazil, Colombia and Australia; GIS has been implemented in Brazil's leading apiculture.(K. Simoes, et al, 2005, F Foret, et al, 2005, K H Mcllvride,2005, B D Mahaman, et al, 2002, Qi Yamei,2007). Therefore, the apiculture will witness the trend of information technology applications, and modernization.

In China, the construction of information system platform from fork to farm and quality tracing for agricultural products has become an important project, including in develop agricultural products quality inspection system, market analysis and prediction system, digital agricultural products trading system, and distribution system; establish integrated agricultural products production and circulation information platform for safe production and efficient circulation of high-quality agricultural products; and create space information management analysis platform and agricultural products safety quality tracing system platform to realize holistic information management(Zhao Chunming, 2007, Liu Haifeng, etc,2007, Liu Dongmei,2006, Zhang Ting,ect,2007, Zhang Bing,ecty,2007, Shen Guanglei,ect,2007).

China's apiculture still features looseness, small scale, mobility of apiarists, it is difficult for monitoring and controlling of product quality(Zhao Jing, 2006,2002), so it is very necessary to track and control product quality through information technology.

2.　　DESIGN OF BEE PRODUCTS QUALITY MONITORING INFORMATION SERVICE PLATFORM

The investigation and analysis show that the production and processing of bee products have the following features: apiarists are isolated and dispersed though each of them has many beehives; apiarists often migrate and move their apiaries according to the florescence and season; apiarists are relatively undereducated and their production facilities are very simple. At present, organizations (like apiary association) and governments help apiarists improve production conditions, raise the awareness of bee products quality safety, and boost the development of apiculture. IT is indeed an effective approach for information communications, quality control and tracking.

The effective control, monitoring and tracing of bee products quality shall rely on the modern measures and IT. Therefore, we conduct the technical research on the bee products quality monitoring information service platform, and design relative technical framework and functions. According to the status quo of the apiculture(Chen Lihong, 2003), technical roadmap and standards should be first designed and determined. Let us take honey as example: the apiarist puts honey into the honey bucket, and the merchant attaches a bar code to indicate the origin and source after buying it; if the factory plans to mix the honey, another bar code is generated to indicate components before the processing; the final bar code and label of honey product will be generated before the sales. The system is designed to use PDA(personal digital assistant) as the data collection tool, so it should develop PDA-based bee products data collection system. To facilitate the

field data collection and use, it should simplify the information input, and allow the merchant to generate bar code in PDA, print and attach bar code through portable printer, enter information of apiarists and honey sources in computer system and submit it to the processing factory. However, it is a challenge for the extensive apiculture to track product quality, so the construction of bee products quality tracking platform should satisfy the features of apiculture (esp. the migration of apiary) from the perspectives of technology and operation.

By using existing communications network platform and technologies such as Java EE, GIS, Agent and Web Service, we design the framework of bee products circulation tacking information management platform, realize the digital bee products management, visualize the tracking and management on the whole bee products process from production to sales, including environmental quality assessment, production prediction, logistics and distribution management, circulation tracking and monitoring, and market analysis and prediction.

The platform can provide governments and administrative departments with bee products circulation information, serve as a tool for supervision management and quality inspection, and support the development of policy, regulation and decision. Furthermore, the platform can provide information and consulting services for enterprises, farmers and consumers, and facilitate the information communications for bee products trading and circulation. In fact, the platform will significantly enhance the holistic quality tracking and management of production-processing-circulation of bee products, and offer important IT measures for addressing issues of bee products quality control and export. The infrastructure of the platform is shown in Figure 1.

3. KEY TECHNOLOGY

3.1 Information collection

In view of scattered bee products producers, information collection device should contain PDA or handheld PC, portable barcode printer, and WindowCE OS for the system development. In view of mobility and swiftness, the collected simple data such as apiarist code, origin, products species, quantity and batch are used to generate bar code and conduct onsite printing.
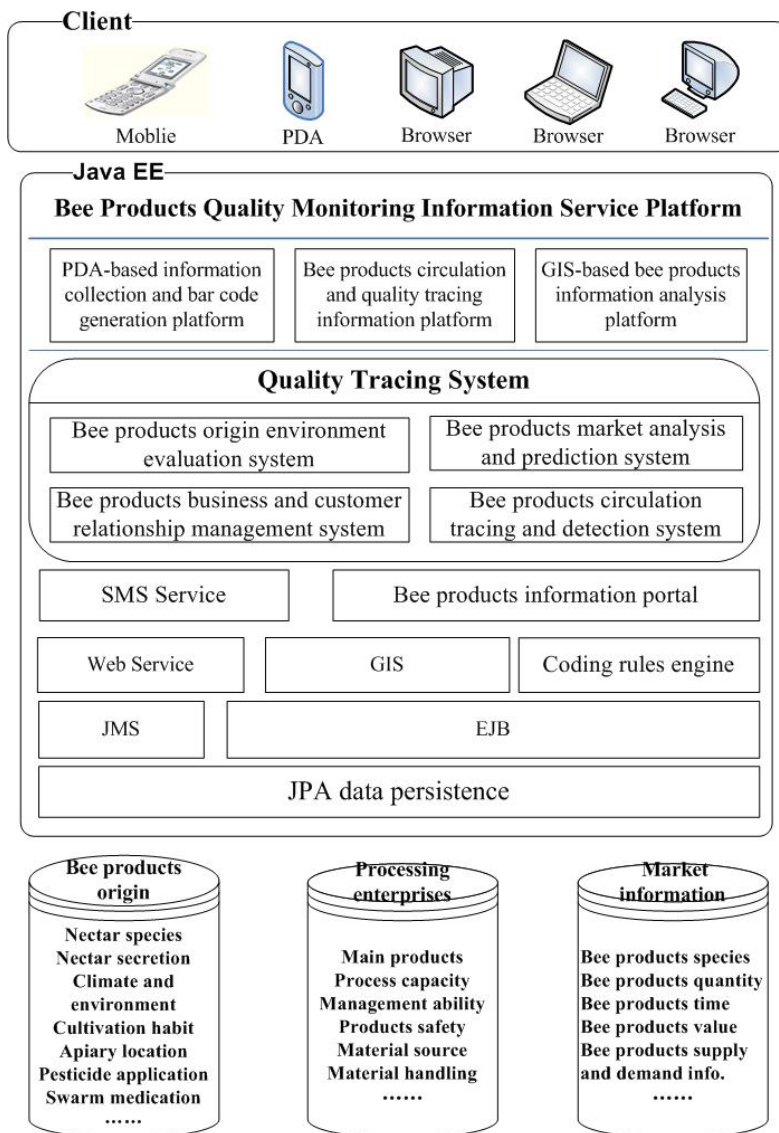
Fig.1: Architecture diagram

3.2   Database design

Besides bee products database and database management system, bee products data warehouse should also be established. The databases contain:

■   Bee products origin information database: includes data of space distribution, environment, apiarist, distribution of main crop and nectar plants.

■ Bee products processing enterprises database: include data of address, products, processing, management, product safety, materials source and handling of enterprises.

■ Bee products market information database: include data of species, quantity, time, quality, price, origin, source, supply and demand information, and trading information of bee products traded in China and other countries.

3.3   Tracing coding proposal

As global standard system EAN/UCC-128 international numbering system has commonality，universality, maintainability, expandability, low price and is widely used in food safety traceability system. In this research we employ EAN/UCC-128 as bee product mark. A mark unit includes honey which was encapsulated in the same pail and bar code is made of apiary code, product number, honey category and production date. Apiary code is made of seven-digit, which includes four postal codes and three apiary codes. Product number is made of four-digit, which includes 2 digits for year and 2 digits for product batch. Honey category is made of two-digit to show raw material. Production date is made of six-digit, such as 080326 shows that production date is march 26, 2008.

(7030)1566115001(10)0821(251)01(17)080326

Fig. 2：Traceability label of bee product quality

It is bee product's chain and basis that every production link has respective product feature code and trace code, so that inputting correct information and protect information safety appear especially important. We can easily read bar code information through optical scanner. When some link completes and transmits another link system would automatically produce and print new bar code. The normal bar code can only contain 13 digits and not describe product. Information traceability and transmitting mainly depend on database support so that quality training of apiculture stuff and system manager in charge of system client data inputting becomes very important. If we have enough money we should use 2-dimensional bar code which can save a great deal of information.

3.4   Tracing key link control

Mainly links of bee product quality safety tracing include apiary, purchaser, professor and retailer as four product quality reference point.

Apiary control mainly record and manage bee product original product information, gather data which includes place environment, sources of honey, water source situation, swarm condition and implements of production. Because swarm have distribution and movement characteristic we need gather information and inspect honey farmers' production conditions and supervisor mode through purchaser and beekeepers' association.

Purchasers and professors mainly realize bee product transit monitoring. They need input essential information in system client which includes bee product origin, test method, qualified situation, typeofproduction and packing information. Tracing code is used to control production information transformation. Retailer not only control basis information but also is responsible for consumer information inquiry. Consumer can inquire bee product interrelated producer and geographical origin information through product tracing label, mobile message, telephone and web site.

4.   DESIGN OF SYSTEM FUNCTION

4.1   Formulation of digital coding rules and barcode of bee products

The formation of bee products digital coding rules allows bee products to be coded during the whole production and circulation process, giving a full picture of production through bar code at each step. In addition, the engine of coding rules is created to provide coding service for practical application components in upper layer.

4.2   Evaluation of bee products origin environment

Based on bee products origin information database, an origin environment quality evaluation system is established to evaluate the origin environment and predict quality change. Through association analysis on environment data and bee products information data, it can use historic data to predict products quality and quantity.

4.3   Bee products circulation tracing and detection

The quality safety issues of bee products include: residual pesticide in nectar plants, residual veterinary drug during ill treatment, residual bio-toxic substance caused by contamination of heavy metal (such as iron, lead, etc) during production or by improper storage, and misuse of additive,

adulteration, and fake; internal quality issues such as immature production, mechanical impurities in production, etc.

To address those issues, it shall track and manage bee products circulation through product coding; query information about apiarist and enterprises as well as circulation route of bee products, and sum up circulation amount; establish SMS-based bee products inquiry system, and get the detail information from origin to current stage by inputting bee products codes to server via mobile terminals like mobile phone; create GIS-based bee products information management platform, and realize the spatial information management, query, analysis and visualization of nectar source, bee migration and product production; realize quality safety monitoring and control from material procurement, acceptance to product production; realize quality safety monitoring of package, storage, transport, processing and sales of bee products, and quality safety control of various analysis, inspection and test. As the quality safety monitoring and control covers the entire production process, it can make timely response, warning, modification, adjustment, and recovery when there is a fault in a step. Meanwhile, the qualify issue can be traced back in accordance to the false steps in the whole production process.

4.4   Market analysis and prediction of bee products

The analysis of bee products circulation tracing, detection, and market supply and demand can get the law of circulation of bee products on the market. Furthermore, it should analyze circulation progress, establish an analysis system and forecast the law of circulation of bee products. Compared with the true result, it can further predict the market trend of bee products and instruct the production according to the analysis.

4.5   Bee products e-Commerce platform

The functions of e-settlement, price collection, logistics control, inventory management, products auction, and online marketing are established on the basis of bee product information database and digital platform, integrating the inventory management, e-settlement, capital allocation, info collection, price release, etc.

4.6   Information management and publication

The establishment of bee products quality safety management information system and the release of latest quality safety standard will highlight the importance of safety among apiarists. The timely release and update of

apiculture news will guide the correct production for apiarists. The establishment of the bee products quality safety management information system can enhance the apiarist' awareness of quality safety, improve the bee product monitoring and management system, promote the apiculture productivity and manageability, raise the bee products inspection level and realize the industrialization to ensure the quality safety of bee products.

Meanwhile, the system can publish the latest development, vision, approach and consulting of technology information in the apiculture, thus to publicize technology knowledge of bee products, accelerate the transformation from technology to productivity, combine technology demand with technology supply, promote the application of technology in production, and consequently improve the quality safety of bee products.

5.   CONCLUSIONS

This paper deals with the key technologies used in the production, circulation and quality tracing of bee products. The research and design of relative network application platform and framework realize the feasible technological scheme and design thought for the resources sharing and joint decision making. The research of standard, specification and coding rules of bee products provides an information processing criterion for the standard production of bee products. The database of origin environment, quality monitoring, product inspection and circulation provides a tool for tracing the bee product quality. The portal offers an information exchange platform for the digitized control of apiculture pattern, production, sales, circulation and quality tracing, thus transferring the bee products from field to table.

ACKNOWLEDGEMENTS

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