Research Article
Study on Safety Management of Food Traceability Based on Food Supply Chain

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Abstract: With the frequent occurrence of food safety problems in recent years, it is urgent to solve safety management problem of food traceability. In this study, with an overview of the food supply chain, it explores the significant meaning of safety management of food traceability as well as the traceability types of supply chains, discussing the construction measures and procedures of safety management of food traceability as well as the technical designing demand on food traceability system.

Keywords: Construction measures, food traceability, supply chains

INTRODUCTION

In recent years, food safety issues have become increasingly prominent, both the international and domestic food safety and quality incidents occurred occasionally: Internationally speaking, in Europe, the dioxin pollution incidents ravaged, Japan had pathogenic Escherichia coli storm, while the mad cow disease swept across Europe, as well as USA, Canada, Japan and other countries, from 2003 to 2004, there were fifteen Asian countries and regions had the bird flu; since October 2005 until February 2006, both Africa, Asia and Europe as well as the other 30 countries had suffered from bird flu; as far as the domestic problems are concerned, polluted rice and the exported vegetables with the exceeded standard of chloramphenicol problems, etc. Under this background, each country made laws, regulations and the relevant standards to adopt measures to control and ensure food safety, such as GMP, ISO9001, as well as HACCP system.

Under the new competitive environment, with the background of food security situation is not optimistic, it is very urgent to ensure the safety of food, therefore, this study will explore from a new angle, namely, the perspective of food supply chain to explore food safety problems, combining the knowledge of food supply and food safety chain management knowledge organically, so as to form new methods to guarantee food safety.

MATERIALS AND METHODS

The overview of food supply chain: With the development of the theory of supply chain, the famous scholar Denouden Zuurhie with his staff firstly proposed the concept of food supply in 1996 (Ropkins and Beck, 2003). The earliest definition of supply chain is from the perspective of the subject to define the definition of the supply chain. It is believed that the supply chain should refer to the company arrangement, of which products or services are provided to the market. This is the early concept of the definition of supply chain.

Nowadays, the food supply chain is usually defined as: a kind of mesh chain, which is with a functional net chain as its structure, it covers everything from "vendors" to "customers", which is related to all business activities from the formation of the final product or service to its delivery (Domenech and Escriche, 2006). The future competition between the enterprises will evolve into the competition between supply chains. The basic structure of food supply chain is composed of four main parts: supply chain, production, processing and sales. Each link is related to their own sub-links respectively with its own organizations as its different carriers, including logistics, information flow, technology flow, standardization, safety flow and flow of the added value added, which are connected into the network structure. The structure of the model is shown in Fig. 1.

The significance of the safety management of food traceability: Tracing is also known as "traceability", which comes from the term "Traceability/Product Tracing", according to the standard of ISO 9000 Quality Management System-Base and Term, it can be defined as "the ability of tracing the history, the application as well as the location" (Henrik and Kostas, 2002). The essence of traceability is a system with information recording and tracking. In 1990's, food safety issues are occurred frequently, with the world putting more and more attention to food safety and quality management, France and other EU countries put forward the proposal at Intergovernmental Working
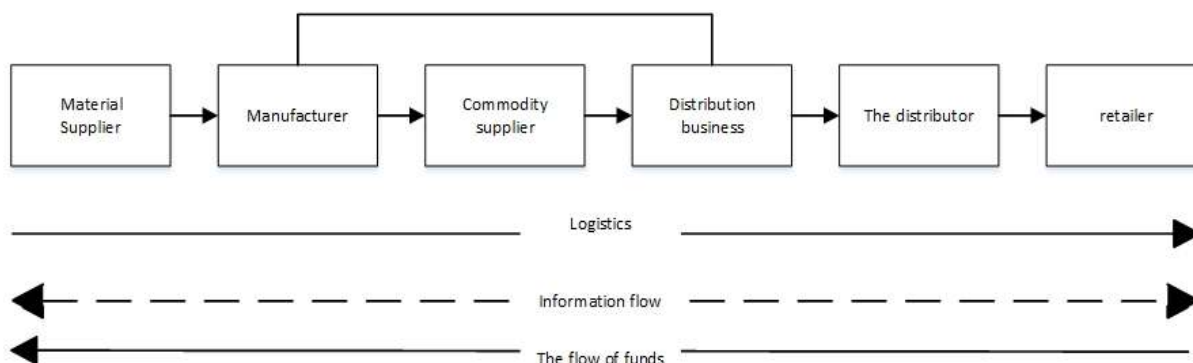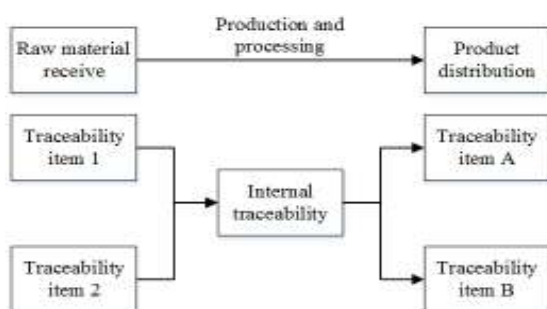
Fig. 1: Structure of the food supply chain

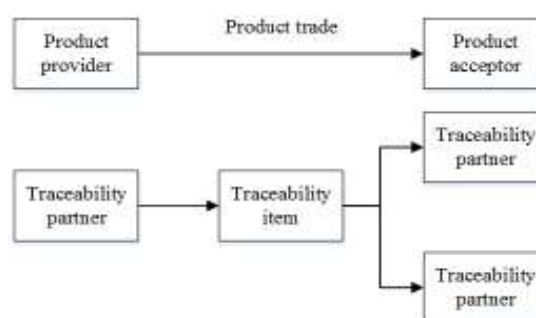Fig. 2: The internal traceability chart of food chain

Fig. 3: The external traceability chart of food chain

Group Meeting of the Codex Committee on Food Technology, proposing initiatively to establish a information recording system, which aims to strengthen the information transmission of food safety and control the harm of food borne disease as well as protect the benefits of consumers, namely, food traceability system, from then on, it raised hot upsurge of researching on food traceability (Stave, 2005). In European Union General Food Law (EC 178/2002), the definition of food traceability is the ability in all production, processing and sales stages of tracing and tracking the expected food or feeded food or substance, which essence is the traceability of the whole food chain.

Food traceability is an effective tool for food safety management, which can help to improve the efficiency of food safety management, easily recall the food that may have problems and effectively help consumers to distinguish false information; food traceability as a tool can be used throughout the food chain, which can be used in a certain stage of food chain; the forms of food traceability cannot completely the same. But the tracing distance must be able to accomplish "one step forward, one step back", namely, one step forward can trace back to the supplier, one step back can trace back to the client, as well as the processing process of the enterprise; food traceability design should give full consideration to the actual operation, as well as the feasibility and possibility of technology and economy.

Internal traceability: The enterprise's internal traceability is the foundation and key of the traceability of food chain (Regattieri *et al.*, 2007). The link of internal traceability is relatively complex, which involves a variety of raw material inputs as well as the outputs that may be more than one products, therefore, enterprises must make corresponding management and records and ensure the tracing accuracy with the definition and batches of the products. The enterprise's internal traceability must can achieve the standard "one step forward, one step back", namely, one step forward can trace back to the supplier, one step back can trace back to the client (Fig. 2).

External traceability: External traceability refers to the tracing item or source (a certain product of a certain batch) has been identified. It only involves the producing enterprises, such as the common link of distribution. For a certain kind of product, both sides need to identify the identification of the products, so as to keep the handover records, namely, the supplier must be able to trace back the receiver according to the identification of the products, while the receiver must be able to trace back to the supplier of the products, both parties should keep the handover records of the products (Fig. 3).

Measures for constructing the traceability system of food safety: According to the previous introduction

about the types of the food traceability system, in food supply chain, a complete traceability system should be established based on the following three steps of gradually.

The establishment of the internal traceability system: In order to realize the traceability of the whole food chain, the first thing for each food chain participants (enterprises) to do is to establish their own internal traceability systems, it requires each processing point in food supply chain should not only identify their own products, but also collect the identified food information as well as the raw materials that existed in the processing period, moreover, it should make all the identified information tagged in the products, so as to make a preparation for the use of the next processors or consumers. Because food chain is involved with the production of raw material and the production of food, logistics, sales and the other links, enterprises can only bear part or parts of the functions of the food chain. Therefore, the overall responsibility of food traceability chain should be borne by society, which can rely on laws and regulations to make restrictions, while the basic function of enterprise's traceability in food chain is guaranteed by enterprises, which is the basis of the food chain to be acted as a complete traceability system.

The establishment of the external traceability system: External traceability refers to the tracing between each node in the food supply chain, which needs to adopt a unified code, making the uniform standard, so as to ensure the integrity of the information. It can make the safety traceability system of each enterprise be compatible with each other, which ultimately form a unified national safety traceability system; it is started from the whole supply chain, it puts forward the relevant requirements on the links from the production of raw material to the table with the specific information in the supply chain, as well as with the relevant requirements from the participants, so as to set up a standard category, as well as the standardized information recording and transmitting methods; it pays more attention to the efficient communication of information between the enterprises or organizations in the food chain, which can describe what kind of production data is received and sent and how the data is transmitted.

RESULTS AND DISCUSSION

The realization of network management of traceability system: After the internal and external traceability systems are established, once there are some problems, it can trace back in accordance with the products which have been recorded from the raw materials to the finished products according to the listed information on the final consumption links, it can recall the unconsumed foods, revoke the market approvals,

cut off the source, eliminate hazards and reduce losses. But for consumers, with the increasing separation of production and consumption, the supply system is more and more complicated, it is more and more difficult for consumers to have access to the information of the product safety, at the same time, it is very difficult for consumers to understand the safety and quality from the final products. Therefore, last step of this system is to realize the network of the system, establishing a platform for inquiring the information of products, which can make consumers acquire the related information according to the unique identification tagged on the products when they purchased products. This platform mainly accepts various information from the terminal end of the enterprises, inspection organizations and certification agencies, making supervision, analysis and filtration on the information, so as to provide authoritative information for consumers, which can be regarded as a system connected with the government, consumers and enterprise.

The procedure and the technical design of food traceability system: In order to ensure the safety of the whole food chain, food chain must be traceable, which can trace back to its source, when problems occurred, it can find the reasons of problems, giving timely treatment. While in order to guarantee the traceability of food chain, it requires each enterprises that are related with each food chains must have internal traceability, dealing with the node management of the external traceability according to the principle of "one step forward, one step back". Traceability system design must comply with the principle of verifiable, justice and coordination, results and orientation, cost saving as well as practical principles, etc. However, the traceability system of each enterprise does not require the same. The essence of traceability system in food chain is information recording system which takes the technology of identification as the carrier. In order to complete the traceability of food chain, the technology must meet the principles of unique identification and recognition, data acquisition and recording, node management, information communication. At present, with the fast development of information technology such as records of automatic identification, bar code, FRID, magnetic card and the other automatic identification technologies, the development of these technologies has brought great convenience for food traceability, which can quickly promote the development of the system of food traceability.

CONCLUSION

Food has undergone a series of links and the processes from production to consumption, at the same time, it involves many participating organizations, any links or organizations had problems in food production or processing are likely to lead to the occurrence of food safety incidents. The traceability system of food

safety in the food supply chain can link up the information of the whole process so as to monitor the information, which is considered to be a feasible solution for full quality safety management "from farm to the table". The traceability system of food safety is the concrete realization of tracing the food safety, which has a significant meaning for the implementation of food safety management.

REFERENCES

Domenech, E. and I. Escriche, 2006. On the role of the reliability of critical control points in producing safe food. Proceeding of the European Safety and Reliability Conference ESREL 2006-Safety and Reliability for Managing Risk, 63: 1939-1947.

Henrik, V. and K. Kostas, 2002. Moral hazard, vertical integration and public monitoring in credence goods. Eur. Rev. Agric. Econ., 29: 271-279.

Regattieri, A., M. Gamberi and R. Manzini, 2007. Traceability of food products: General framework and experimental evidence. J. Food Eng., 81(2): 347-356.

Ropkins, K. and A.J. Beck, 2003. Using HACCP to control organic chemical hazards in food wholesale, distribution, storage and retail. Trends Food Sci. Tech., 14(9): 374-389.

Stave, C., 2005. Safety as a process. From risk perception to safety activity. Ph.D. Thesis, Doktorsavhandlingar vid Chalmers Tekniska Hogskola, Chalmers University of Technology, Göteborg, 2341(25): 1-83.