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https://doi.org/10.5109/12875

出版情報：九州大学大学院農学研究院紀要. 53 (2), pp.569-574, 2008-10-28. Faculty of Agriculture, Kyushu University
バージョン：
権利関係：

J. Fac. Agr., Kyushu Univ., **53** (2), 569–574 (2008)

Consumers' Attitudes to Food Traceability System in China –Evidences from the Pork Market in Beijing

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(*Received June 26, 2008 and accepted July 16, 2008*)

This paper briefly introduces the history, structure and operation of food traceability system in China and then uses consumer survey data to observe consumers' attitudes to traceability system in pork market. The facts show that food traceability system (FTS) already intrigued policy makers' interests in China, but the development of FTS reaches just at initial stage in legislation and practice at both national and local level. Meanshile the survey data shows that most of consumers didn't know much about FTS. Though 92.8% considered FTS was very necessary, only 62.9% had confidence on FTS in faith. And majority of respondents hold the view that government should bear more extra cost of food brought by FTS.

Keywords: food traceability system; attitudes; pork market; China.

INTRODUCTION

Nowadays, traceability has become an important issue in the international food sector as a result of the higher profile of food safety problems and consumer concerns, especially in developed countries (Liu Xue *et al*., 2007; Smith and Furness, 2008). On the international agenda related food safety, particularly for global organizations such as the World Health Organization (WHO) and the Food and Agriculture Organization of the United Nations (FAO), it's gradually emerging as a hot topic. With considerable outbreaks of food born diseases and public trust in food quality fundamentally undermined, the ability to trace food produce back to its source or origin rapidly, accurately, and credibly has become a significant issue for governments. Furthermore, consumers worldwide are increasingly demanding food products that are produced within a system capable of correctly identifying the source of potential food safety risks. Meanwhile suppliers such as farms, firms and marketers also have a number of motives for establishing traceability systems (Golan *et al*., 2004; Nanseki and Yokoyama, 2008). Overall speaking, each stakeholder concerns about food safety, potential health hazards, and transparent information, consumers' demand for credence attributes, and improving supply chain management etc. have pushed food traceability turn popular. Accordingly food traceability has first received growing recognition by policy makers and firms in the food industry. For example, Australia has used a tail tag system for over 30 years to identify the most recent property of origin for cattle (MLA, 2004); The European Union adopted mandatory traceability actions in food industry since 1st January 2005 (European Union, 2002; Giraud *et al*., 2006); In the United States, although without mandate system–wide traceability, many profit–driven examples occurred in red meat and fresh products market (Sebastien and Sumner, 2008). Since 2001, the Japanese government has been promoting the development and use of food traceability systems, and the integration of traceability systems with agricultural risk management systems (Nanseki *et al.* 2007) in order to improve food safety amongst food operators such as producers (farmers), retailers, and manufacturers (Nanseki and Yokoyama, 2008).

Recently similar episodes also take place in China. Frequent food safety incidents generated by Sudan, clenbuterol and read–heart duck eggs increased the urgency of having a system in place to facilitate quick and accurate trace back of food throughout the production process, subsequently not only safeguard food quality, but also provide useful information in accessing and allocating legal responsibility for those who involved in the supply chain. Regarding on substantial advantages such as reducing marketing costs, ensuring product integrity, increasing consumer confidence, China is now developing and implementing food traceability programs throughout (Ministry of Commence of China, 2006). Among those programs, meat industry usually is preferred to be taken into consideration as trials. Chinese meat production grows rapidly in recent years with consumers' income increased. It now accounts for 71 percent of the total meat production in Asia. Moreover, 65% of Chinese meat consumption is pork, which is the most main animal protein resource for Chinese consumers. On average, annually per capita production is 39.6 kg and the total production is 51,972,000 t that

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accounts for 50.1% of the world production (National Bureau of Statistical of China, 2007), Standing on the viewpoint of the above numbers, roughly speaking the safety of pork is vital for most of Chinese consumers' daily livelihood. So it will be highly necessary for China to establish traceability systems in the pork market.

Food traceability has also received growing attention in the economic literature, for example, Souza–Monteiro and Caswell (2005) and Golan *et al.* (2004) discussed the effect of traceability on market failures in food sectors, Hobbs *et al.* (2005) estimate the willingness to pay for traceability system. Sebastien and Sumner (2008) explore the linkage between traceability and food safety in the context of allocating liability. But there are few researches focusing on the development of Chinese traceability system and consumers attitudes toward it. Our study was carried out in order to fill this gap.

This paper is organized as follows, we firstly introduces briefly the history of food traceability system in China and takes Beijing Olympic food traceability system (BOFTS) as an example to review the structure and operation of food traceability system in China, and then uses consumer survey data to observe consumers' perception of traceability system in pork market.

FOOD TRACEABILITY SYSTEM IN CHINA

For concerning about both domestic food safety and international trade, since 2000 China has been adopting lots of measures and programs to introduce, extend, encourage and even mandate traceability system in food supply chain.

In legislation, there are a few specific laws or regulations concerning food safety but little referring traceability before 2001. Bur in recent years, traceability of food system gradually evolved into necessary policy options. According to the law of People's Republic of China on agricultural products' safe quality issued in 2006, all agricultural enterprises must set up production recording that should be authentic and be kept for at least 2 years; otherwise, the transgressor will be penalized not more than 5000 RMB. In addition, individual producers are also encouraged to keep recording within their own production. Such actions are considered as the rudiments of food traceability system in China. To step forward, on June 26 of 2006, Ministry of Agriculture of China (MOA) promulgated the regulation on animal labeling and their feeding documents establishment in farms (No. 67 Act). In this act, the most key points are as follows: animals such as swine, cattle and sheep/goats in the farms must be gained unique identity code around the China, and it shall be labeled with a special tag embodying a unique code before moved from its region of origin. The accredited feeding enterprises must establish their feeding information documents to record inputs mainly used, such as feeds, feed additives and veterinary drugs as treatment. Traceability on animals or food–produced animals will be started in case of any of the following issues: (a) Some labeling are not in accord with livestock and products from themselves; (b) Livestock and their products have been infected or contaminated by some diseases and virus; (c) There is no quarantine certificate authorized by the accredited institution; (d) Some veterinary drugs and other venomousness as well as nocuousness substance have been used, which are forbidden in terms of related regulations; (e) when serious animal health events occurred; and (f) other situations in which traceability should be applied. All the preceding regulations are just limited in agricultural and food sectors. To be more extensively, recently General Administration of Quality Supervision & Inspection & Quarantine, Ministry of Commerce, State Administration for Industry and Commence jointly informed that mandatory electronic quality–tracing mark must be attached to key commodities which cover 9 categories and 69 varieties referring food, home appliance, and cosmetics etc. since Nov 29th of 2007. Otherwise these products won't be p to be sold in market.

In practice, as early as 1992 "Green Food" program was launched by MOA, Action Plan for Pollution–free Agricultural Products was formally carried out also by MOA in April 2001. These actions were partly aimed to instill some simple 'traceability' approaches. Up to now, while there doesn't exist formal ,uniform and standard food traceability system under operation in the whole market, more and more wholesale markets and agricultural products supplying bases primarily already conjunctly built diverse forms of specific food safety system through certain measures such as appointing and specifying suppliers, checking proofs and tickets, detail market recording etc. One survey in 1329 city markets and 1108 rural markets performed in 2006 by Ministry of Commence of China showed that 53.7% of city markets, 32% of supermarkets, 80.4% of wholesale markets of agricultural products, 70.7% of retail markets introduced the above initial measures to foster traceability (Ministry of Commence of China, 2006). More than half of frozen food will be able to be traced back to origin in 2008. In addition, China will roundly implement identification and tracking for chicken.

SOME EXPERIENCES OF FOOD TRACEABILITY SYSTEM IN BEIJING

The forthcoming Olympics game in Beijing is helping the push towards food traceability. In order to ensure food safety, Beijing is establishing and perfecting a specialized food safety traceability system for the 2008 Olympics, in order to monitor food quality from the origin of production to each stage of processing, packaging, transportation,distribution till ultimate consumption. The Beijing Administration for Industry and Commerce (BAIC) and Beijing Food Safety Supervision Office (BFSSO) already founded Beijing Food Safety Traceability System (henceforth BFSTS) based on Capital Food Safety Monitoring System (CFSMS) under the network environment of BAIC. BFSTS consists of one first–level platform and four individual sub–systems. The first–level platform is that Beijing Data Centre for

food safety traceability, which is responsible for information collection, analysis, evaluation, tracing, early–alarming. The four sub–systems includes fruit and vegetable, animal products, prepackaged food and Olympic food traceability sub–system. The system covers main food types such as fruit, vegetable, aquatic products, livestock &poultry products, eggs and prepackaged food etc, and processes of cultivation, feed, processing and logistics of Olympic food. All relating investment is totally funded by the government. The structure and function of BFSTS can be described as Fig. 1.

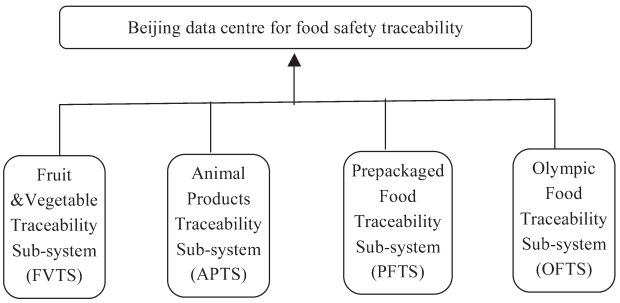

Fig. 1. The framework of BFSTS.
Notes: FVTS, APTS, PFTS respectively maintain management, inquire, statistic and analysis of information flow through production, logistic, processing and consumption for different food. By the way, OFTS integrates Global Positioning System (GPS), Geographical Information System (GIS), Radio Frequency Identification (RFID) and labeling technology to tracing Olympic food, especially immediately relating consumers' identity with raw materials of food that they consumed in the cafeterias of Olympic spots.

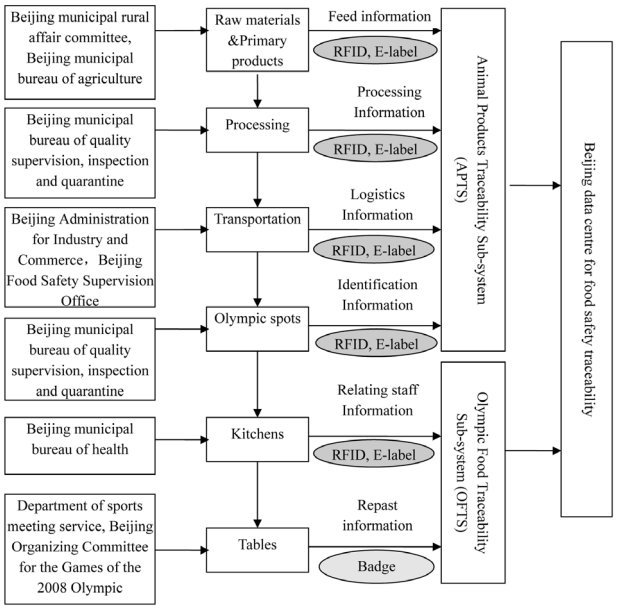

Fig. 2. The operation of BFSTS in the supply chain.
Note: For under construction, this traceability system is still undergoing continual development and polish. So its final version is not fixed yet.

BFSTS was initiated by BFSSO together with the cooperation from other government departments such as agriculture, commence, business administration, and sanitation. More details about the roles of different institutions in the operation of BFSTS will be illustrated in Fig. 2. In the BFSTS, all Olympic food should be embodied with uniform logistic codes, which support function of intelligent reading &writing and encoding correspondently by integrating IC card, RFID and electronic label. With the result of these measures, all of Olympic food can be traced from fork to farm. Furthermore, watchdog personnel are responsible for supervising and sample checking the dynamic change of food quality, key indicators such as pesticide & agricultural chemical residuals and bacteria numbers will be detected accurately in each stage. Subsequently, all these processes will be explained in OFTS by taking animal products as example (Fig. 2)

For more detail, we take Qianxihe food group[1] as an example to depict how BFSTS works from the company's perspective. Qianxihe has designed a rather successful pork traceability system during the practice of quality management. In the stage of feed, each piglet will be attached with a two–dimension electronic identification ear tag after its birth, then this ear tag will record information on pig's feedstuff, the use of antibiotic, feed additives and veterinary drugs, vaccination records, lineage, and other health data in the entire process of feed, simultaneously conveying all information to the central database. When these herds of pigs are transferred into slaughterhouse, the transportation information about numbers and types of vehicles, drivers and work time also will be timely sent to the central database. When slaughter, the staff will use RFID equipment to scan each pig' ear tag, and input information gathered from ear tag into the database of Qianxihe, meanwhile input workers' related information also into it, then all the information will be submitted into MOA's central database from Qianxihe information centre. In the end, central database will reload total information in the form of bar codes, and actualize terminal query for consumers. Up to now Qianxihe pork traceability system only supports tracing pork from birth to slaughter. In addition, Qianxihe pork traceability system will adopt GS1[2] for data type because MOA has not yet push uniform standard. According to the basic flow of pork production, the sketch of Qianxihe pork traceability system is shown as Fig. 3.

The entire system in Fig. 3 is based on the central database established by the cooperation of MOA and China Mobile Group[3], which vertically connects stages of

[1] Qianxihe food group was solely appointed by Beijing Organizing Committee for the Games of the 2008 Olympic to supply frozen pork and pork products for Olympic Games.

[2] GS1 is a leading global organization dedicated to the design and implementation of global standards and solutions to improve the efficiency and visibility of supply and demand chains globally and across sectors. The GS1 system of standards is the most widely used supply chain standards system in the world.

[3] China Mobile Group is the largest company in wireless communication industry in China.

Table 1. Current status of traceability in pork production in Qianxihe group

	Birth	on farm feeding &Production	Move Animals	Slaughter	cut and pack	sale
Location	Feed mill	hoggery	transport	Slaughter slot	wholesaler	retailer
Technology	2–D ear tag	Business records	Business records	RFID	Bar code	–
Breadth*	parental or grandparent's lineage	use of feed, veterinary drug, and vaccination	truck No., drivers' name, specific time, temperature and humidity in truck	date, time batch and place of slaughter	–	–
Depth*	traceable	traceable	traceable	traceable	traceable	untraceable
Precision*	individual piglet level	individual pig level and farm level	herd level	Group level	Single carcass level	–

Notes:– represents that the capability of traceability is restricted.

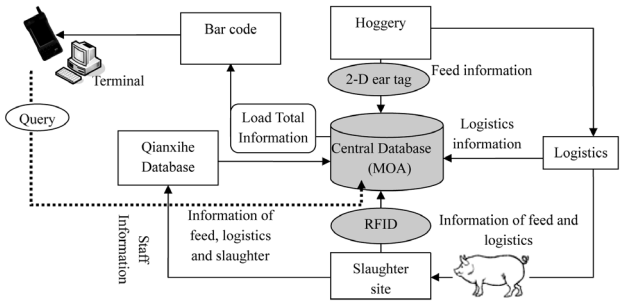

Fig. 3. The operation of Qianxihe pork traceability system.

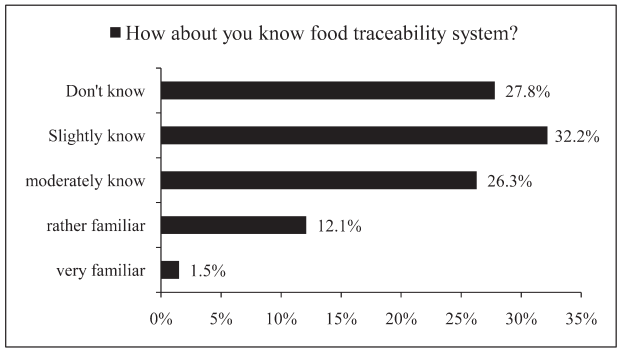

Fig. 4. The perception level of food traceability system.

feed, transportation and slaughter as the whole. The detail description of traceability was given in Table 1.

CONSUMER ATTITUDES TO FOOD TRACEABILITY SYSTEM IN PORK MARKET

Only when consumers can accept traceability system positively, then the system may work well. For the purpose to make sure how consumers think about traceability system, we carried out a consumer survey from December of 2007 to January of 2008 in the pork market of Beijing, all observations were selected randomly. In total 401 consumers were personally interviewed, we got 388 valid samples. The data shows that more than 2/3 of respondents heard or knew food traceability system, but few people had a quite good knowledge of what traceability is, only 1.5% very familiar, 12.1% rather familiar. More than half of them just know a little about it, still about 1/4 even don't know it at all. (See Fig. 4)

After respondents were informed with basic information of food traceability system (FTS), as showed in Fig. 5, 92.8% of respondents thought traceability system was very necessary, 89.4% said they would buy traceability pork, then 62.9% thought the system could strengthen their confidence on consuming food.

Regarding to the cost of the traceability system, more than 2/3 of respondents hold the view that government should pay at least 60% extra cost for products brought by food traceability system (See Fig. 6).

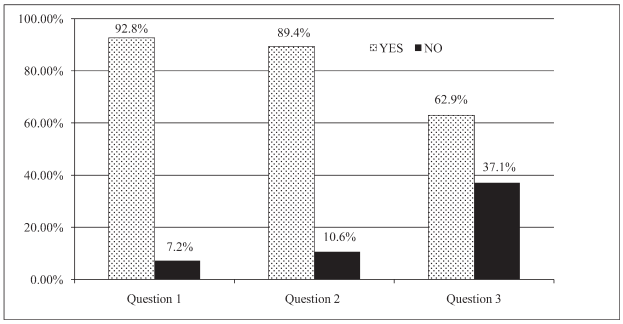

Fig. 5. Consumers' attitudes toward food traceability system. Note: question 1: Do you think it is necessary to apply traceability system in pork? Question 2: Would you buy pork with traceability marks? Question 3: Could it increase your confidence on consuming food?

For the reason to choose FTS, most of respondents reported just because they believed that it could increase their confidence on pork quality, surprisingly they didn't care about what's the information contents of FTS. For the reason why respondents didn't choose FTS, the main reasons included the follows, suspicious of authenticity of information in FTS (42.1%), Lack of knowledge about FTS (26.7%), and potential higher

Table 2. The reason for choosing food traceability system

The reason for you choose pork with traceability	numbers of answers	% of total responses
a. it can help me distinguish various pork based on production type	47	12.3%
b. it can increase my confidence on pork quality after knowing production process	294	77.2%
c. it can help me know more about producers and keep a steady shopping relationship with them	21	5.5%
d. expect to exchange information with producers through it	19	5.0%
e. others	0	0.0%
The reason for you don't choose pork with traceability	**numbers of answers**	**% of total responses**
a. higher price	63	23.7%
b. know little about it	71	26.7%
c. not necessary	19	7.1%
d. possible fake information	112	42.1%
e. others	1	0.4%

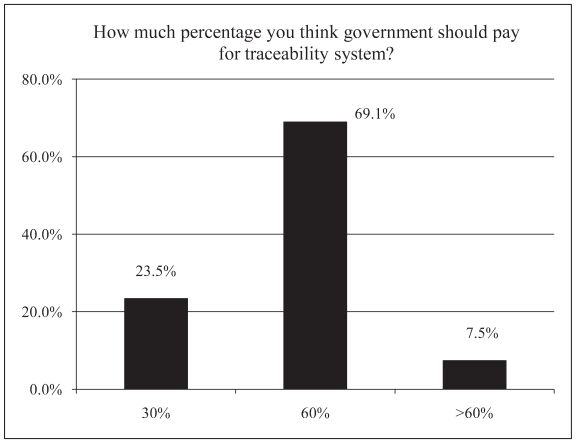

Fig. 6. Consumers' attitudes to share cost for food traceability system.

prices caused by the system (23.7%). More details can be found in Table 2.

CONCLUSIONS

Food traceability system (FTS) already intrigued policy makers' interests in China, but the development of FTS is just at initial stage in legislation and practice at both national and local level. For the present situation, the most difficulty in promoting FTS is that lack of mandatory uniform data standard, which determines the compatibility among different systems. Furthermore, many regions carry out their own FTS for specific products, so these systems just suit for local market, the application region of traceability is limited.

There is an obvious gap between consumer's perception, accept and belief of FTS. Most of consumers didn't know much about FTS; even have no idea of BOFTS in China. With a result of this fact, though 92.8% considered FTS was very necessary, only 62.9% had confidence on FTS in faith. Other consumers worried about authenticity and transparency of information in FTS. Moreover their demand for pork with traceability would be decreased by higher prices. From consumers' viewpoint, government should bear more extra cost of food brought by FTS. Otherwise, it would affect consumers' incentives then result in market failure in FTS.

Endnotes:

* The breadth, depth, and precision of a traceability system are carefully selected to help achieve the objectives of the system (USDA 2004). Breadth is the amount of information the traceability system records. There is a lot to know about the food we eat, and firms must decide which information is of value. A record-keeping system cataloging all of a food's attributes would be enormous and unnecessary. The depth of a traceability system is how far backward or forward the system tracks. Precision reflects the degree of assurance with which the tracing system can pinpoint a particular food product's movement.

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