

## Research Article

### Study on Risk and Quality (Safety) Management Mechanism of Food Supply Chain

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**Abstract:** In this study, it takes the interpretation of Food supply chain as the starting point, with the analysis on the risk of Food supply chain as well as the analysis on quality and safety, combined with the analysis on the safety system of Food supply chain and the model of quality system of Food supply chain, so as to explore and discuss the risk of the supply chain as well as the quality control mechanism. The supply chain of Food is a long chain, the safety risk of Food mainly comes from the supply chain of the main operation process.

**Keywords:** Quality control, safety system, supply chain of food

#### INTRODUCTION

With the improvement of people's living standard, demands on high-quality and safe agricultural products have become general behavior orientation for consumers both at home and abroad, the problem of the safety of agricultural products has got more and more attention by all the countries in the world. Food supply chain is a long chain and the risk of Food safety is mainly sourcing from the operation process of each part of the supply chain, therefore, in order to strengthen the risk control of Food supply chain, first of all, we should strengthen the control over the safety risks of the subject of the supply chain as well as the construction of the supporting system.

Food supply chain is made up of two level supply chain, namely, Food farmers and Food processing enterprises (Fig. 1). Food farmers can be regarded as the source controller of the pork quality, who can decide the quality level of pork quality directly; while Food processing enterprises can regard the detection as the means, who can have the second line of control over the quality of pork. At the same time, the degree of detection can play a very important role in controlling the quality of pork. From the current situation of the quality and safety of pork, the large majority of pork quality and safety problems are hidden in the process of breeding and processing.

#### MATERIALS AND METHODS

**The detection of pork quality:** Because the distribution process is a little complicated, before and after the distribution, the pork quality will vary, the detection of the quality before delivery and distribution, even using the way of having simple sensory detection can reduce the risk of the unsafe pork into the market; the execution of disinfection plan: The disinfection of

cold storage, refrigerated vehicles can be necessary to ensure the distribution of pork process from being polluted, if there is no disinfection plan or the sterilization plan can not be carried on completely, it will bring security risk.

**The risk of food supply chain:** In the whole process of Food supply chain, it can not provide a kind of promise that can ensure the consumer to be damaged, this kind of damage is a threat to the health of the human body with toxic, harmful substances or factors.

**Identifying the risks of food supply chain:** Identifying the risks of Food supply chain means to make analysis on each link of the Food supply chain during the whole the process, each participation subject and environment should be considered as factors, so as to identify the possible influencing factors that can have effect on the Food supply chain, grasping the characteristics of each risk event, so as to identify the sources of risks as well as their relationship.

**The risk source of food supply chain:**

**Risk sources of food breeding:**

**The quality of Food:** The quality of Food can directly determine the pork consumption characteristics and the environmental adaptability, good quality of Food can help to improve the quality of pork and Food slaughter rate; feed and additive safety: the safety of purchasing feed and additives can directly affect the quality safety related to the pork quality and safety in relation to the harm to the human body and pollution to the environment; barn cleaning and disinfection management: whether the barn cleaning and disinfection management is in place will affect the Food's health. If barn cleaning and disinfection management is not in place, the Food can be easily infected with disease, which can result in the

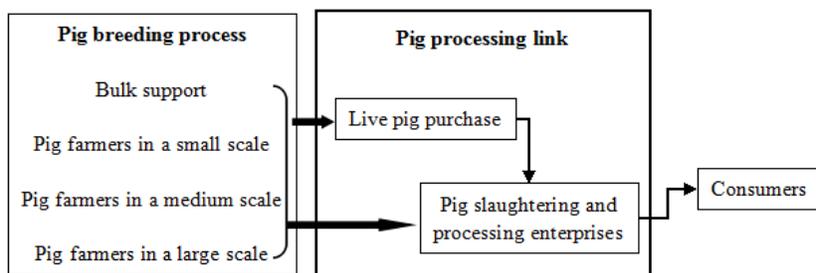


Fig. 1: "Food farmers+processing enterprise" two level food supply chain

declination of Food production and pork safety level (Chao *et al.*, 2009).

**Risk source of food transport links:**

**The inspection system of sick food:** During the process of transporting Foods, the process will have large areas of contact with air, at the same time, the density of Foods in the car bar makes it very easy to spread the disease. If there is no strict Food inspection system or the implementation of the system is not complete, it will spread the disease rapidly, which can cause huge losses; the execution of disinfection plan: the cleaning of the transporting vehicle and disinfection is useful in disease prevention and control infectious, if the execution of disinfection plan can not be carried out completely, it can cause the spread of the disease.

**Risk sources of slaughter and processing links:**

**Quarantine:** It is the most important link to control pork safety, which is an important means of controlling sick Foods and dead Foods into the market. If there is no inspection or quarantine before the slaughter and the inspection is not standardized, it will greatly increase the risk of pork quality and safety; the inspection of meat quality: after slaughter and processing, it requires to have the meat quality inspected, without inspection or the testing is under the standard, it will enable the unqualified pork into the market, which can result in potential safety problems (Balachandran and Radhakrishnan, 2005).

**Quality risk sources:** In the respect of the quality of breeding Food, the farmers pay little concern on the quality and safety of live; the source control of Foodlets and feedings, drinking water and other inputting materials existed many problems; the health and epidemic prevention level of farmers is not high, problems such as drug abuse or excessive use, as well as not having timely vaccination phenomenon existed. This kind of vertical cooperative relationship can give farmers the maximum autonomy, but the disadvantage is that it can make the price and the quality of the product uncertain.

**The safety system of food supply chain:** According to the type of Food quality and safety risk, it can be

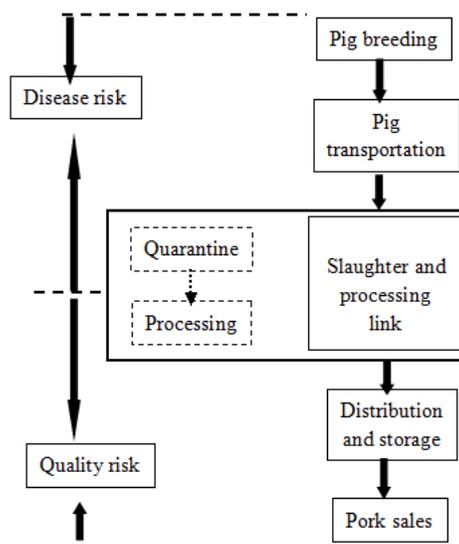


Fig. 2: The safety and risk system of food supply chain

divided into two categories of safety risk and the safety risk of pork quality. The former mainly existed in the Food breeding, Food transportation and slaughter and processing links, which can be mainly related to the problem of Food disease, such as: foot and mouth disease, blue ear disease; while the latter mainly existed in slaughtering, pork distribution storage and selling pork links, involving the pork quality and safety problems, including pesticide residues, residues of veterinary drugs, the degree of pork freshness (TVB-N), microbial content, as well as arsenic, lead and other residues (Katok and Wu, 2009). Among them, the slaughter and processing link can have the existence of Food disease risk as well as the risk of pork quality, the link of Food disease risk mainly comes from the source of live Foods and quarantine factors and pork quality risk mainly comes from slaughter and processing factors. The security risk system of the Food supply chain can be represented by Fig. 2, generally it involves two kinds of risks, which is the most complicated link.

**RESULTS AND DISCUSSION**

**Quality system model of food supply chain:** The Food supply chain quality system is composed by the single processing enterprise and farmers, the farmers

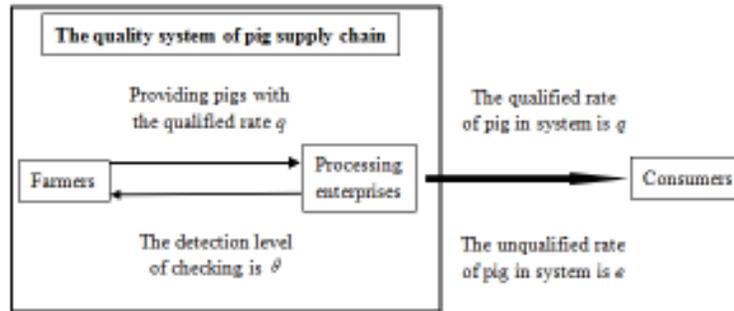


Fig. 3: The quality system of food supply chain

processing enterprises can provide Foods with the qualified rate as  $q$ , taking the implementation level of detection as the detection of  $\theta$  provided by the processing enterprises for farmers, then the Foods that are under the detection standard can be rejected (Hornibrook and Fearn, 2003). Therefore, the quality level of Food supply chain can be determined by the specific combination  $\{q, \theta\}$ , which can be shown in Fig. 3.

It can be known by Fig. 3. The quality system of Food's supply chain is determined by the combination  $\{q, \theta\}$ , which can ultimately provide unqualified pork products to consumers with the probability  $e$ , in the supply chain, the unqualified probability of the rejection is  $\mu$ .

Under the "loose" structure, the quality of Food  $q$  will increase with the decrease of the marginal cost of the quality of  $f$ , which will have the significant increases with the decrease of the marginal testing cost. This is because when the marginal cost is decreased, the capital using rate of the farmers is relatively improved, so as to ensure the enough funds to purchase more equipment and ensure the level of pork quality, therefore, the pork quality can be improved correspondingly. When the marginal cost of detection is reduced, the processing enterprises sampling rate will be increased, farmers under the pressure of testing, who will put into more funds to ensure the quality of live Foods, so the quality of live Foods can be increased (Reyniers and Tapiero, 1995). But in comparison, the effect of the marginal testing cost on the quality of Food is higher than that of the marginal cost. It can also prove that the research of this study, namely, under the "loose" supply chain structure, the detection level and the detection cost can play a decisive role in the overall quality level of the Food supply chain.

**The risks of each supply chain risk and quality control mechanism:** To reduce the risks of whole supply chain, the most critical thing is to control the slaughter process, pork sales as well as the safety of pork sales link, especially the safety risk of the sales link. In addition, the first two aspects of the risks are not low, which also need to carry out a certain security risk control. In order to control each internal security

risks of Food supply chain, it is necessary to carry out food safety management system, namely, the internal supply chain should be established, so as to ensure the necessary and systematic safety activities for the safety of pork.

## CONCLUSION

Currently, the related safety management system used in food supply chain can be including HACCP system, non-pollution agricultural products system, green food safety management system, organic food safety management system, good agricultural production procedure and so on. At the same time, these systems can provide operating basis for the internal control of each Food supply chain. It should be combined according to the characteristics of the selected several elements of the system, strengthening safety management activities for the whole process of production or service, giving the institutionalization and standardization, so as to become the requirements and procedure of the internal security work of the supply chain.

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