

# Establishment of Food Safety Management Standard System from the Perspective of a Whole Industry Chain

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**Abstract.** This paper analyzes the differences in chain, community and environment based on three different levels (primordial nature, humanized nature and industrial ecology) from the perspective of a whole industry chain, and points out that food safety should be based on ecological safety to achieve zero pollution from field to table. On this basis, this paper proposes a 3D model of food safety management standard system by centering on management, link and food category, and establishes a food safety management standard system framework after fully considering the category, level and role of the standard in accordance with the basic principles of and requirements for the establishment of the standard system. Finally, it puts forward some and suggestions on the establishment of a food safety management standard system.

**Keywords:** food safety; 3D model of food safety management standard system; industry chain.

## 1. Introduction

Food safety management standards are the technical requirements and measures developed after risk assessment of chemical, biological, physical and other substances existing in or possibly existing in food, food related products and food additives that have adverse effects on human health. These standards specify the most basic requirements for food that will enter the market. They are technical regulations that shall be implemented in food production and operation, inspection, import and export, supervision and management, and are the important basis for food safety supervision and management. They play an indispensable and unique role in the food safety risk management system. Governments all over the world regard food safety management standards as one of the most important measures for food safety supervision and management as they play a very important role in ensuring food safety, preventing foodborne diseases and maintaining normal food trade.

## 2. Food Safety and Whole Industry Chain

### 2.1 Ecosystem Chain in the Context of Food Safety

To solve the problems in food safety fundamentally, we must follow the laws of natural ecology. Ecosystem is composed of two parts: abiotic inorganic environment and biological community. The inorganic environment is the foundation of ecosystem and contains basic substances such as sunlight, water, air, inorganic salts, and organic matter. It determines the complexity and richness of ecosystem. The biological community reacts on the inorganic environment and changes the appearance of the environment while adapting to the environment. The various basic substances closely link the biological community with the inorganic environment, making the ecosystem an organic whole with certain functions. The agricultural industry chain in the context of food safety is closely related to the food chain and biological chain. The safety of the biological chain in nature determines the safety of the human food chain, and the safety of food chain is the basis of the safety of industry chain.

The conventional production mode of the food industry is gradually replaced by modern large-scale production mode, which mainly considers three levels: primordial nature, humanized nature and industrial ecological environment. As shown in Fig. 1, among the three levels of chain, community and environment, the chain is based on the community, and the latter is based on the environment. There is an interactive transmission relationship among the three levels, complicating

the spread of pollution: i) the spread of pollution at the same level of “chain – community – environment”; and ii), the spread of pollution from a high level to a low level among the three levels of environment, community and chain, and then from the low level to the high level through the vertical circulation of “water – soil – organism – air”. Only by blocking the circular chain of “tridimensional pollution”, can we solve the problems in food safety fundamentally. The source can be pollution-free first by industry chain control of circular economy, and then the subsequent extension of the industry chain should also be pollution-free on the basis of green and safe raw materials, otherwise it is impossible to solve the problems in food safety by simply providing local pollution control.

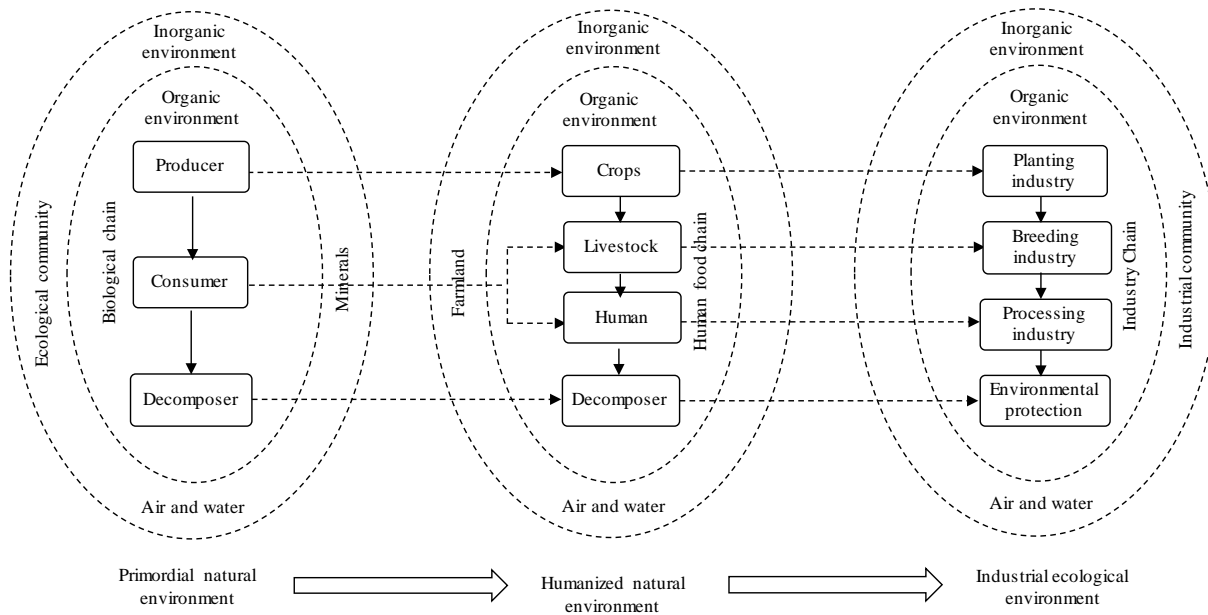


Figure 1. Ecosystem Chain in the Context of Food Safety

## 2.2 Whole Industry Chain of Food Safety

As far as an industry chain is concerned, a whole industry chain is a circular economic industry chain that links “planting industry, breeding industry, processing industry and service industry”. As far as the production process is concerned, the whole industry chain should link agricultural material supply, primary production, deep processing, and distribution together at the very beginning, and provide field-to-table systematic services to achieve the environmental protection throughout the whole process such as efficient utilization of resource and zero pollution emissions. Therefore, the organization of the whole industry chain should be adopted, as shown in Fig. 2, to break through the industry barriers of agricultural material industry, planting industry, breeding industry, processing industry, service industry or environmental protection industry, to link up the whole process of “agricultural material supply, primary production, deep processing, distribution and consumption”, and to achieve “zero pollution from field to table” through the systematic management of the whole industry chain and effective control of key links. The selection of origins should not only meet the technical requirements for eco-production, but also satisfy the economic requirements for sales and transportation. First, we must rely on pollution-free water, soil and air at the source to achieve the “source safety” of the first key step. Then, we should avoid chemical, biological and genetic pollution in the production process in the subsequent extension of the industry chain, so as to achieve real “green and environmental protection”, thus increasing the added value.

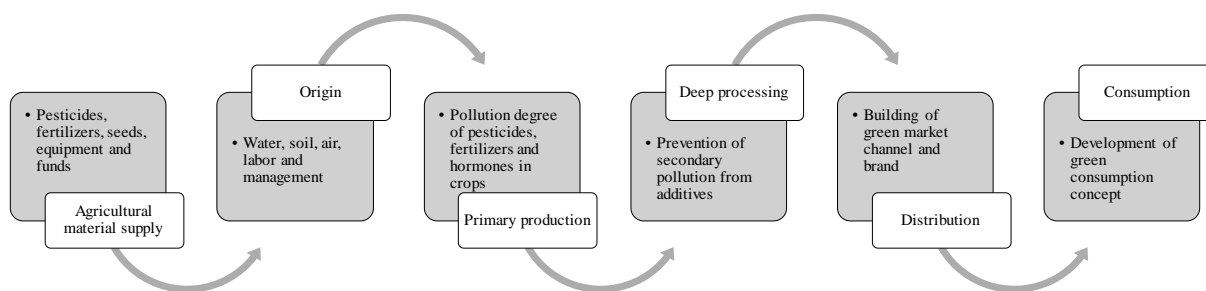


Figure 2. Whole Industry Chain in the Context of Food Safety

### 3. Establishment of Food Safety Management Standard System

#### 3.1 3D Model of Food Safety Management Standard System

Standard system is one of the bases for planning standard preparation and revision. It is the basis for promoting the scientific rationalization of the standard composition within a certain scope of standardization work and it is a comprehensive blueprint that includes existing, due and expected standards, and will be continuously updated and enriched with the development of science and technology. Food safety work shall focus on prevention, risk management, whole-process control, public involvement, and establishment of a scientific and strict supervision and management system. From the perspective of the whole industry chain, the food safety management standard system should be centered on three central themes, i.e. “people, matters, and things”, and be divided into three dimensions: (1) people – management: mainly including regulatory agencies, monitoring agencies, enterprises, consumers and third-party institutions; (2) matters – link: mainly including the production, processing, circulation, consumption and sales of food; and (3) things – food category: mainly including aquatic products, grain and oil & condiments, beverages and dairy products, infant formula and complementary foods, frozen drinks and quick-frozen foods, tea and alcohol, snack foods and others. Fig. 3 shows the 3D model of food safety management standard system.

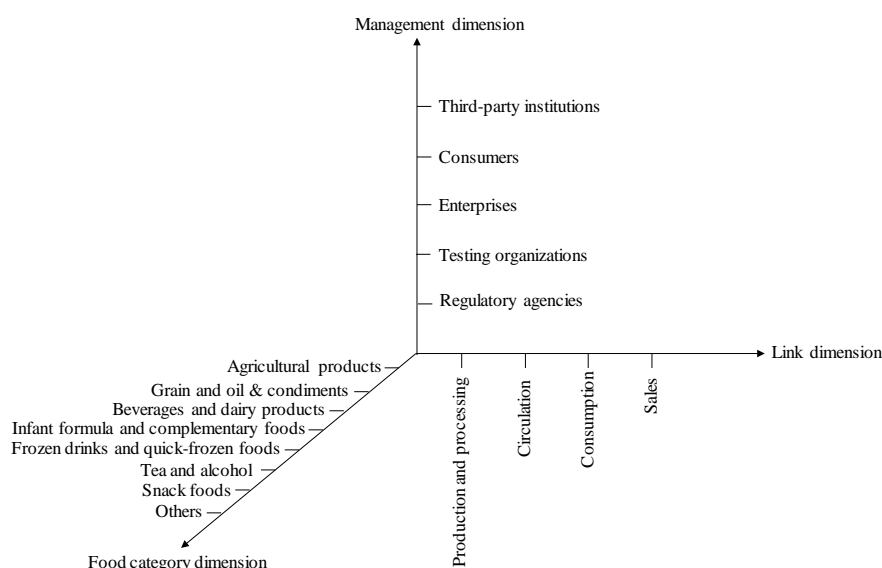


Figure 3. 3D Model of Food Safety Management Standard System

#### 3.2 Structure Diagram of Food Safety Management Standard System

A standard system framework is constructed by using the hierarchy method according to the national standard GB/T 13016-2018 Principles and Requirements for Constructing Standard System and the characteristics of the whole industry chain of food safety management. The standard system

framework is hierarchically divided into 3 levels from the three dimensions of food safety management (i.e. management, link, and food category), including 5 primary classifications, 18 secondary classifications, and 53 tertiary classifications. Fig. 4 shows the standard system framework.

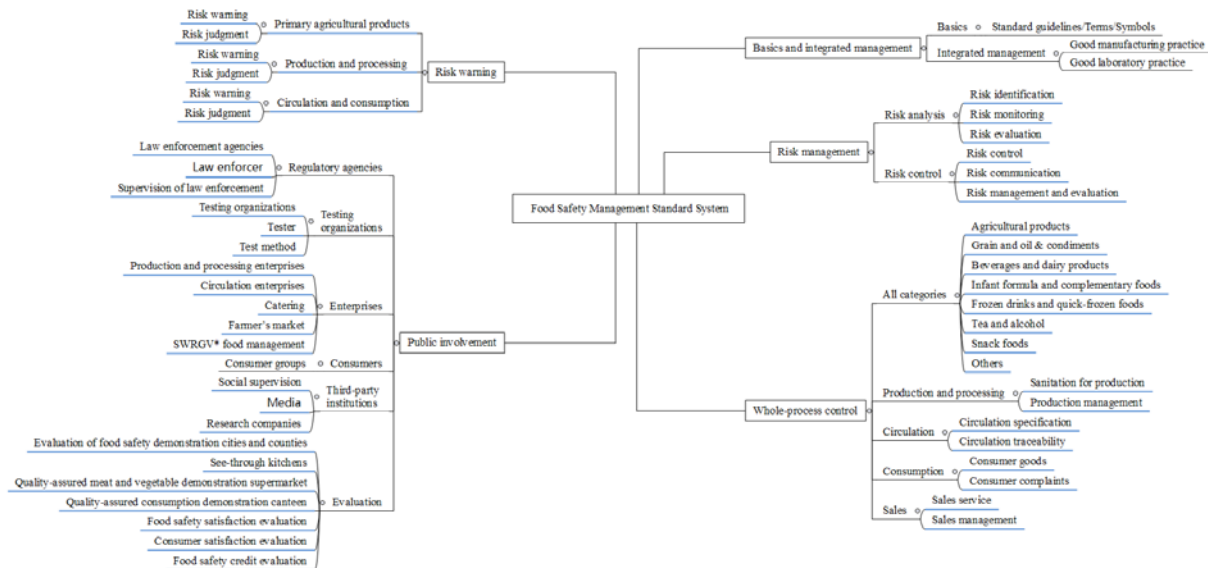


Figure 4. Food Safety Management Standard System

\*Note: “SWRGV” refer to small workshops, restaurants, grocery stores and vendors.

## 4. Conclusion

Relying on stringent food safety management standards and scientific and efficient standard system is an effective way to ensure food safety in China. We should actively integrate the prevailing food safety management standards, establish scientific and standardized procedures for standard preparation and revision, solve imbalances in standard granularity, repeated project approval, and lagging standard level from the source, and improve the coordination of the standard system. We should actively carry out standard cleanup to improve the overall technical level and applicability of the prevailing standard system. The reform of the standard management system and operation mechanism can have a profound impact on new standards in the future. The problems existing in the prevailing standard system, however, need to be solved through centralized cleanup. Also, we should attempt to comply with international food safety standards based on China’s national conditions, strengthen the publicity and supervision of food safety standards to promote their application and implementation, so as to implement strategic adjustment to the structure of China’s food products, thus providing reliable guarantees for food safety and ensuring public health and life safety.

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