

Preliminary Study on the Concept and Evaluation Index System of Grain Industry Security

Dongmei Li*

Department of Management
North China Institute of Science and Technology
Yanjiao, China
Lfdm76@163.com

Abstract—The grain industry security is a major strategic issue that is related to the development of national economy and national security, and the establishment of evaluation index system of grain industry security is the premise and foundation of the grain industry security evaluation. In this paper, the concept of food security is sorted out, and the concept of grain industry security is presented, meanwhile on the base of the construction of grain industry security system theory model, analysis the influence of potential threat, industry main body and macro safeguards on grain industry security, clarify the action mechanism of various factors and establish a index system of grain industry security evaluation.

Keywords—grain industry security; influence factor; index system

I. THE DEFINITION OF GRAIN INDUSTRY SECURITY CONCEPT

Improving the overall national food acquisition ability and eliminating macro food insecurity risk are the basis and premise of elimination of household and personal food insecurity. Therefore, the security of food production and circulation is the key to the problem of food security, and the grain industry carrier of assuming grain production and circulation should be a research area of food security issues.

After accession to WTO, the greatest impact in the field of agriculture is food industry. The core content of the Sino-US agricultural cooperation agreement that is a precondition for China's accession to WTO is food trade. The huge differences in grain production costs between China and other developed food exporting countries determines the china's disadvantaged position of exports and the international grain markets' impact on China's food industry is inevitable. Therefore, China's food industry not only should have a stable production capacity, ensure that the grain has the stable and effective supply, but also to foster and strengthened food industry's competitiveness, foster food industry's penetration on international food market, so as to avoid taking up too much market share by the United States and other countries exporting food, this is the need for food industry's own development, and even the need for food security.

Therefore, the definition of the concept of food security from the industry level, this paper puts forward the concept of grain industry security: in the integrated international and

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domestic market environment, a country's food industry is competitive in the participation international competition, can resist the risk factors from the outside and inside and maintain sustainability of grain production and smoothness of grain circulation, thereby form a stable, efficient food supply.

II. THE DESIGN OF FOOD INDUSTRY SAFETY EVALUATION INDEX SYSTEM

Evaluation of the food security of the FAO is a method of macro comparison, the operation is simple, meanwhile facilitates the comparison between international. The main basis of the indicators included in; food production, import and export volume, the amount of inventory; the total population and the age and gender distribution; consumer distribution [1].

At present, the Chinese scholars studying on the food security evaluation apply the meth-od of indicators used four or five factors [2-6], namely using four indicators such as: the fluctuation co-efficient of grain output, the rate of food self-sufficiency, the food reserve ratio and the per capita grain possession, with the indicator "food security of the poor" to assess food industry safety. Some scholars put forward more index in the study, such as food and dietary energy supply and demand balance, fluctuation index of demand for food and rate of food price increase, etc.[7]

Food industry security system is an organic system composed of several interrelated, interacting elements, is a complex system. For such a complex system, with a single index to reflect the degree of security is not enough, so establishments of a scientific, reasonable, complete structure, clear logic index system is very necessary. Before the construction of index system, we should establish the theory model of grain industry security system, that is the basis of establishing the evaluation index system.

A. The Theory Model of Food Industry Safety System

The internal and external risks that food industry is facing is inevitable, so we should observe the grain industry security problems, standing in the system rather than standing on the system—focus on the food industry's overall survival ability and the capacity of guaranteeing the stable, effective food supply. Abstract description of the concept of food security from the point of view of the system, grain industry security is grain industry' s state of being able to meet the established

goals under certain safeguards and risk. Based on complex relationships of the security system of the grain industry, we build the grain security system model:

$$FI = \{O, W, B, L\}$$

Operation model: $B:O * W \rightarrow L$

Among them, FI: the structure of grain industry safety system;

O: the main body of grain industry;

W: potential threat;

B: safeguards;

L: security state.

Description: when the food industry body O faces potential threat W, under the action of the safeguards B, pursuit maximization of security degree L.

Based on the above issues defined, the evaluation of food industry security including: grain industry body immunity (competitive) O, threat factors W of grain industry security, safeguards B of grain industry security. Elements structure is shown in Fig. 1.

We combine various elements with the following simple mathematical models, namely:

$$S = F(W, O, B)$$

$$\text{Among them, } \frac{\partial S}{\partial W} < 0, \frac{\partial S}{\partial O} > 0, \frac{\partial S}{\partial B} > 0$$

Building this model was designed to simplify grain industry safety system, easy to understand and analyze the interaction process between various factors affecting grain industry safety, thus, can reveal the mechanism of grain industry safety.

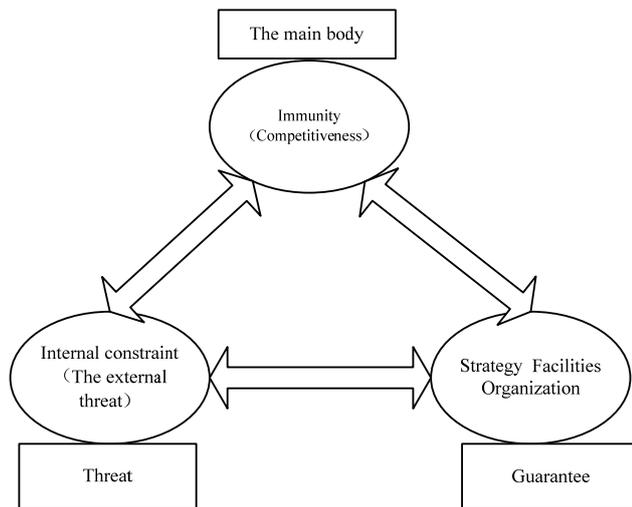


Fig. 1. Elements structure of safety systems for grain industry.

B. The Analyses of the Factors Affecting the Safety of Grain Industry

Many factors affect grain industry safety, and they are mainly summed up in three aspects: potential threat factors, factors affecting industrial competitiveness, factors influencing macro support capability.

1) *Potential threat factors*: The potential threat factors is the most direct one causing unsafe for grain industry, and it can be divided into internal environmental factors and external trade factors. The internal environmental factors can be divided into three categories, and the first category is agricultural resource constraints, including cultivated land resources and water resources; The second category is agricultural ecological environment and natural disasters; The third category is pressure from the growth of food consumption demand. External trade factors included the impact of low prices grain abroad and the influence of international grain market.

2) *Main body immunity (competitive) factors*: If potential threat factors are direct cause affecting safety of grain industry, then the industry immunity or competitiveness is the root cause. The results of the economy globalization is the competition without border, any industry has to face domestic and international competitive market and the potential market risk, if there is no strong immunity or competitiveness, industry can not resist the foreign risk, and also can't really go into the international market. For the domestic market, in the face of foreign low-cost and high quality grain impact, although grain quota management is the effective mean to protect safety of grain industry, but in the long run, uncompetitive industry even under protection can't last forever. Therefore, considering the safety of grain industry from the perspective of industrial immunity, industrial immunity or international competitiveness is the core of the problem. Factors affecting the international competitiveness of industry should be an important part of the index system for measuring the safety of grain industry.

From the degree of relevance to the correlation of cause analysis and the scope of influence, immunity factors can be divided into direct factors and indirect factors. The direct factors reflect the competitive strength of grain industry that appears as continuous improvement of grain production capacity and circulation capacity. The indirect factors reflect the competitive potential of grain industry that is shown as the financing status of grain industry, labor quality, level of science and technology, organization system and market condition.

3) *Factors affecting the macro support capability*: Because agriculture (especially food industry) is a weak industry with great social benefits and low economic benefits, under the condition of market economy, whether in product market competition or in the competition of economic resource allocation, it is often in a weak and disadvantageous position. So, the agriculture (especially food industry) needs special protection in the country's macro-control.

The protection of grain industry by the state can be analyzed from three aspects: protection strategy, protection facilities, and protection organization. The macro protection strategies include protection policies and laws; Protection facilities include two aspects: the construction of national strategic grain reserve facilities and the construction of agricultural infrastructure; Protection organization refers to agricultural administrative agencies that implement agricultural protection on behalf of the government.

C. Analysis on the Mechanism of Influencing Factors of Grain Industry Security

From the above analysis, we can see that the grain industry security system is when the protection object O faces threat of W, under the action of protection measure B, the pursuit of security level L is the greatest. The security of the protected main body-- grain industry depends on two aspects : on the one hand, is the pressure from potential threats from various aspects, on the other hand, is the control power brought by the national Macro-protection measures. Only when the security control power of grain industry is matched with the pressure it faces, the security of grain industry can be guaranteed. When the grain industry is threatened, it will not only depend on national Macro-protection measures to save its own, but also has its own immunity that comes from the competitive-ness of the grain industry in participating in international competition. The relationship between factors affecting grain industry security can be shown in Fig. 2.

D. Determination of Index System

Based on the above theoretical model, through the systematic analysis on factors affecting grain industry security, this paper constructs the evaluation index system shown in Fig. 3 according to the analytic hierarchy process. The target layer of this system is a comprehensive index that generally reflects the level of grain industry security. The criteria layer that reflects index composition of target layer is composed of potential threats, industrial competitiveness, macro support capability and other comprehensive indicators: potential threat indicators are used to reflect the factors and potential impacts that pose a threat to grain industry security; indexes of industrial competitiveness are used to reflect the resistance of grain industry to threats and the ability to maintain its own security; Indicators of macro support capability are used to reflect the ability of national macro-control to maintain the security state of grain industry. Index layer is used to reflect individual indicators of each part of the criterion layer, composed of menu and multi-index.

III. CONCLUSION

On the basis of construction of theoretical model of grain industry security system, this paper analyses potential threat elements, industrial subject elements and the impact of macro-safeguard measures on grain industry security, defines the action mechanism of each element and establishes an index system for evaluating grain industry security. The conclusions are as follows:

(1) The safety evaluation of grain industry is a comprehensive, systematic and complex problem involving many subjects. This paper puts forward a method of balanced analysis of threat and protection. The grain industry security system is decomposed by the main line of potential threat-industrial subject-macro safeguard measures.

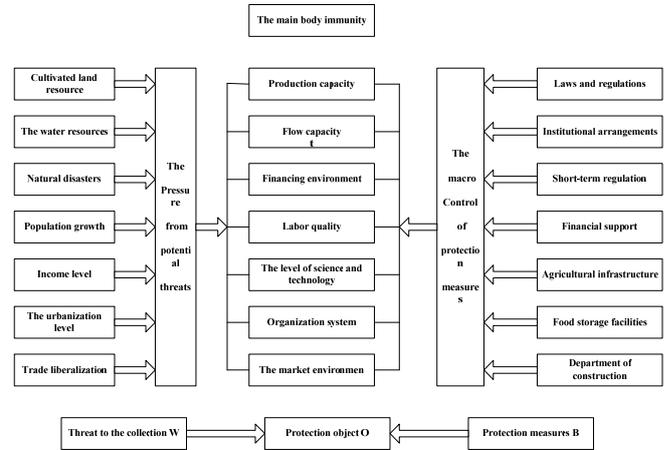


Fig. 2. Mechanism of influencing factors on grain industry security

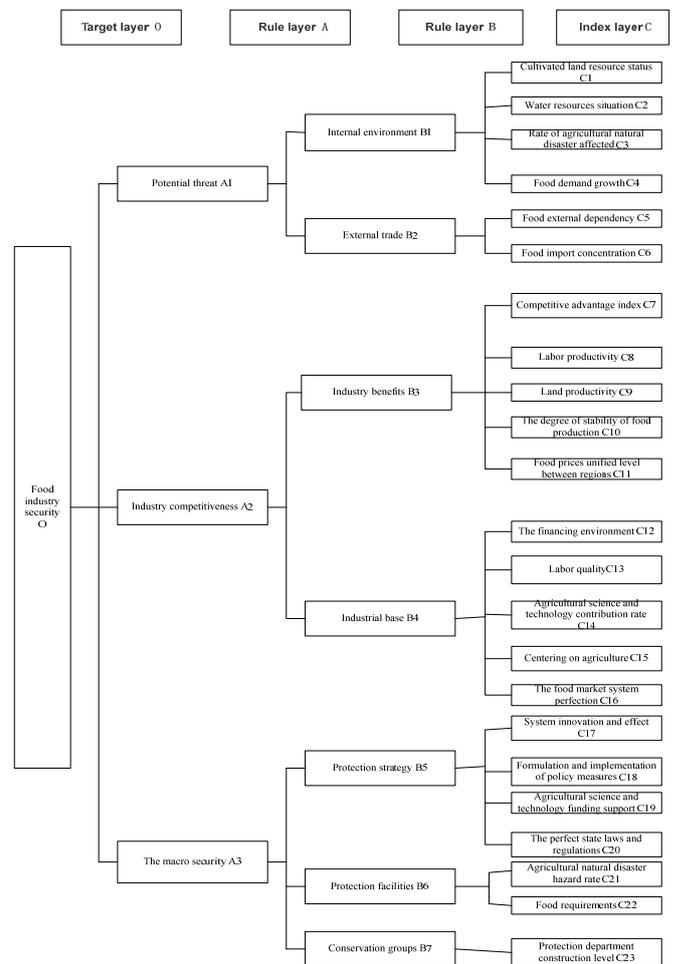


Fig. 3. Evaluation index system of grain industry security

(2) Each layer and each indicator that has its own characteristics and illustrates the problem from different aspects and directions can reflect comprehensively the security situation of grain industry from many aspects. The evaluation includes: potential threat (internal environment, external trade) used to reflect the factors and potential impacts that pose a threat to grain industry security; industrial competitiveness (industrial benefits, industrial foundation) used to reflect the resistance of grain industry to threats and the ability to maintain its own security; macro support capability (protection strategy, protection facilities, protection organization) used to reflect the ability of national macro-control to maintain the security state of grain industry and the reflection on the unsafe state of grain industry.

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