An Analysis of the Main Factors Influencing the Early Warning System for Food Security

Peijun XIE*

Ningbo Dahongying University, Ningbo 315175, China

Abstract Food security is the national strategic issue, which is linked with economic development and social stability. This paper systematically researches and analyzes the threat to food security and five aspects related to food security, such as the related policy, food production, food circulation, food storage, and food consumption, and separately discusses various factors which have effects on food security, in order to provide ideas for taking effective measures to guarantee food security.

Key words Food security, Influencing factors, Food production, Food consumption

1 Introduction

Food is a necessity for human survival and life, and food security is one of the world's three major economic security issues. Since the outbreak of the food crisis in the early 1970s, the food security issues have received widespread concern among all countries and international organizations [1]. China is the most populous country, and national food security is very important. Central Document No. 1 in 2014, *A Number of Opinions on Deepening Rural Reform to Speed up Promoting Agricultural Modernization*, proposed improving the national food security system, and paying close attention to the establishment of national food security strategy in the new situation. Food security was first raised to the national strategic level. National and regional food security has become a hot topic. In recent years, there are many scholars using various methods from different angles to study the food security issues. Wu Jichuan *et al.* [2] analyze the main factors that affect national food security from economy, politics, nature, science and technology, and propose a series of policy recommendations. From production and circulation, Liu Xing *et al.* [3] study various factors influencing food security in Northeast China, and put forward food security measures. Zhang Zongjun *et al.* [4] use Douglas function to analyze the factors influencing food security in Gansu Province, and propose enhancing the level of food security by strengthening modern agricultural technology and rational planning, and increasing production. Li Huihui [5] studies the current situation and problems concerning food production, reserves, distribution and consumption in Jilin Province, and makes recommendations for improvement based on specific circumstances. Based on the characteristics of Heilongjiang Province, Wang Guoqi [6] discusses the problems restricting food production, distribution and consumption, and comes up with the corresponding security policies. Ye Xia *et al.* [7] use questionnaire survey to analyze various factors that affect food security in Fujian Province, and put forward effective measures to ensure food security. From the existing literature, there are many qualitative analyses on the strategies, principles and current status related to food security, but it lacks quantitative evaluation; there is a shortage of systematic studies on determining food safety risk factors, difficult to reflect the food security level. The existing literature provides an important reference for this paper to determine the scope, object and ideas of study, and this paper analyzes various factors influencing food security to systematically and scientifically determine the relevant influencing factors.

2 The factors influencing food security

2.1 Related policies

2.1.1 Urbanization policy. Through the process of urbanization over the past 30 years, it can be found that China has experienced the transition from traditional urbanization to new urbanization. Traditional urbanization has a direct negative impact on arable land area and labor, thereby forming double pressure on food security. With the development of urbanization and in-depth understanding, the principles, models and path of new urbanization become gradually clear, and the core is to achieve rural and urban infrastructure integration and equalization of public services not at the expense of agriculture, food, ecology and environment. The urbanization construction has a profound impact on the construction land and food need structure, and the resulting environmental pollution, arable land shrinkage and water shortages are bound to become increasingly evident. Therefore, in the process of developing the policies related to urbanization, the local government must strictly implement the national land policies and regulations.

2.1.2 Agricultural subsidy policy. Agricultural subsidy policy is an important part of policies concerning agriculture, farmers and countryside, and an important measure to emphasize and encourage food production. It helps to reduce production costs of farmers, and improve farmers' enthusiasm for growing grain, aimed at

Received: April 14, 2015 Accepted: June 6, 2015
Supported by Ningbo Soft Science Research Project in 2014 (201401A1011090).
* Corresponding author. E-mail: xpjstar@aliyun.com

increasing farmers' income and grain production. Since 2004, the state has given a series of agricultural subsidies such as farm machinery subsidy, improved seed subsidy, natural disaster relief, agricultural resources and reserves subsidy, direct grain subsidy and agricultural environmentally friendly subsidy. The improved seed subsidy policy is aimed at encouraging farmers to use improved varieties, increasing food production, and promoting agricultural modernization. The direct grain subsidy policy can contribute to the stability of agricultural production, and directly increase farmers' income levels. The agricultural environmental protection subsidies will help to guide farmers to protect the agricultural ecological environment, ensure rationalization of pesticide use, and improve food quality and safety.

2.2 The factors influencing food production

2.2.1 Climatic conditions. Climatic condition is a key factor in agricultural production, and climate change will produce multi-level impact on food production. Climate change will directly affect the yield and quality of grain, thereby affecting the stability of food supply and threatening national and regional food security. Climate change will lead to changes in light, temperature, humidity and other weather factors, and these factors determine the suitability of the regional crop growth. The changing climatic conditions will have different degrees of impact on crop varieties and regional distribution. With global warming, there is a certain degree of geographical change for crop planting. In addition, the emergence of explosive and epidemic crop pests and diseases in history was closely related to climate change, and it was mostly due to the abnormal relationship between biological populations caused by climate change.

2.2.2 Agricultural science and technology. Practice proves that science and technology is a strong driving force to improve the efficiency of food production and promote the development of modern agriculture. Agricultural science and technology is a very critical aspect during the agricultural modernization process, and also an important technical support for ensuring food security. The increase in the amount of agricultural machinery and enhancement of function can help to improve the efficiency of agricultural production and promote food production. With the advance of the urbanization process in recent years, there is a trend of considerable rural labor forces migrating to cities and towns, resulting in a relative shortage of rural labor. Agricultural mechanization can effectively solve the problem of rural labor shortage, expand the agricultural production scale, realize rural division of labor, and help to optimize the allocation of resources.

2.3 The factors influencing food circulation Food circulation is a key bridge between food production and consumption, and a good food circulation mechanism not only ensures the smooth transition between food production and demand, but also ensures the food security. Since the reform and opening up, China has implemented a series of food circulation system reforms, to ensure that the market mechanism plays an important role in food resource optimization process. Food acquisition is the starting point of circulation, and it is a weak link of food circulation management; food processing is a link to increase food value; food marketing is the end of circulation, and all other links serve sale and consumption. Considering the uneven distribution of major grain producing areas and major sale areas, food circulation safety plays an important role in the food security system.

2.4 The factors influencing food storage Food storage mainly includes secure storage technologies and storage equipments and facilities. Secure storage technologies mainly include controlled atmosphere grain storage technology, low-temperature grain storage technology, pest control technology, and biological control technology. The controlled atmosphere grain storage technology is used to control the air within grain storage warehouse. It often adds carbon dioxide and nitrogen or reduces the oxygen content in the air to inhibit the proliferation of pests and reduce the rate of deterioration of food. The low-temperature grain storage technology adopts refrigeration technology or natural cooling to ensure that the grain is stored at a low temperature environment, in order to suppress the pest's metabolism, and prevent spoilage of food. Based on the growth law of pest populations, the pest control technology uses appropriate methods and measures to maintain pest populations at a harmless level. The biological control technology uses the natural predators of pests or their own pathogenic microorganisms to control pests, and it is safe and efficient. The storage equipments and facilities are used for automated cleaning, drying, loading and unloading, ventilation, fumigation and grain situation testing according to different grain storage functions, aiming to establish an ideal grain storage environment and ensure grain storage security.

2.5 The factors influencing food consumption

2.5.1 Food demand. With the continuous growth of the total population and demographic changes promoted by further development of urbanization and industrialization, China's food consumption demand has continued to increase in recent years, and the food gap is further widening, posing a serious threat to food security. According to statistical analysis, when the urbanization rate increases by 1%, the corresponding food consumption will increase by one million tons. The improvement of people's income levels and changes in consumption structure play a role in rapidly promoting consumer demand for industrial use of grain, increasing about 2.2% per year, which will bring some pressure on China's grain security.

2.5.2 Food waste. The food wasted every year is almost 6% of total production, and the control of food waste has become an important measure to ensure food security. In 2010, the State Council issued *Notice on Further Strengthening Saving Grain and Combating Waste*, which attached great importance to the problem of food waste. Food losses and waste mainly exist in storage, transportation, processing, consumption and other parts. Farmers' grain storage conditions are backward, the grain logistics system is inefficient, and the consumption habits are poor, which are the main reasons for food losses and waste. In recent years, the Chinese government emphasizes scientific food management, strength-

ens food storage and circulation facility construction, promotes healthy consumption concept, and vigorously promotes food-saving mechanism.

3 Conclusions

In this paper, we systematically study various links in national food security, and further explore the key factors influencing each link, in order to provide a reference for analyzing food security level and ensuring food security. The two factors that affect food production are climatic conditions and agricultural science and technology. Climatic conditions have a comprehensive impact on food security, while agricultural science and technology can effectively solve the problem of shortage of rural labor to expand production scale of agriculture. Food circulation involves many aspects, and good circulation mechanism can ensure the smooth transition between food production and demand, which is an important basis for food security. Food storage is to ensure food quality and food safety. Food consumption includes food demand and food waste, and the two factors bring greater pressure on food security. The analysis of main factors influencing food security paves the way for the study of the weighting factor, and provides theoretical support for the construction of food security early warning system.

References

[1] DAVIES S. Adaptable livelihoods,coping with food insecurity in the Malian Sahel[M]. London: MacMillan Press,1996.
[2] WU JC. Analysis on the factors affecting the food security in China in recent years[J]. Manager Journal,2014(1): 385. (in Chinese).
[3] LIU X, ZHENG GT. Analysis on the factors affecting the food security in Northeast China Region and the supporting measures[J]. Journal of Changchun Normal University (Humanities and Social Sciences),2013, 32(3): 11-15. (in Chinese).
[4] ZHANG ZJ, DOU XC. Factors affecting food security and relevant research in Gansu Province——Based on analysis of data in 1985-2008[J]. Hubei Agricultural Sciences,2012, 51(4): 852-854. (in Chinese).
[5] LI HH. Study on the early warning system for grain security in Jilin Province [D]. Changchun: Changchun University of Technology, 2014. (in Chinese).
[6] WANG GQ, QU CX. Analysis on the problems of grain security in Heilongjiang Province and its countermeasures[J]. Modernizing Agriculture, 2014(8): 18-20. (in Chinese).
[7] YE X, BAI LY, HUANG X, *et al*. Agricultural resources guarantee ability research of food safety in Fujian Province[J]. Chinese Countryside Well-off Technology,2014, 4(12): 110-114. (in Chinese).

(From page 76)

[3] National Bureau of Statistics of the People's Republic of China. On interpreting the increase of food[EB/OL]. http://www.stats.gov.cn/tjfx/sjjd/t20131129_402931553.htm, 2013-11-29. (in Chinese).
[4] ZHAO X. Study on grain direct subsidy policy and increasing farmers' income[J]. Public Finance Research, 2013(5): 51-54. (in Chinese).
[5] ZHAO YQ. Study on "the effect decreasing" of grain direct subsidy policy in China[J]. Review of Economic Research,2012(33):3-17. (in Chinese).
[6] FAN Q, HE W. Study on regional grain direct subsidy ways and the performance of production increase[J]. Macroeconomic Management, 2013(2):45-47. (in Chinese).
[7] WU LP, TIAN T. Study on China's food security under new stage from the perspectives of trade[J]. Agricultural Outlook, 2013(4):66-70. (in Chinese).
[8] KANG YQ. Study on benefit compensation system in major grain production area based on food security assurance[J]. Journal of Henan Normal University(Philosophy and Social Sciences Edition), 2013(4): 74-76. (in Chinese).
[9] ZENG J. Analysis on Chinese multi angle grain area division and food security situation[J]. Hubei Agricultural Sciences, 2012, 51(11):2397-2400. (in Chinese).
[10] LUO GQ. On implementation path of food security responsibility in major grain production areas and its countermeasures[J]. Economic Review, 2012(1):84-87. (in Chinese).
[11] ZENG J, JIANG XQ. Study on coordinated development between rural income and food security[J]. The World of Survey and Research, 2012(3): 42-45. (in Chinese).
[12] Research Group of "Guaranteeing Food Security and Improving the Income of Farmers". Trains of thoughts on guaranteeing grain security and increasing farmers' income[J]. Macroeconomics, 2002(38): 55-59. (in Chinese).
[13] LV XY, JI XQ. Rethinking on Chinese food security problem
[J]. Problems of Agricultural Economy,2013(9):15-24. (in Chinese).
[14] LUO B. Experience and reference from foreign food safety management [J]. Economist, 2012(9): 97-102. (in Chinese).
[15] ZHANG ML, LIU JS. The basic trend of modern western administrative reform and its enlightenment[J]. Chongqing Administration,2007(5):62-64. (in Chinese).
[16] MA XH, LAN HT. On enhancing the overall grain production capability of China and the construction of food security assurance[J]. Macroeconomic Management, 2008(11):31-34. (in Chinese).
[17] WAN BR. A strategic countermeasure on increase the farmer's income and ensure safety in food[J]. Problems of Agricultural Economy, 2004(4): 4-8. (in Chinese).
[18] MA WJ, FENG ZC. The policies and inspire of directed subsidy in foreign country[J]. Economic Review,2007(11):67-69. (in Chinese).
[19] LI Y, ZHAO WB. The effects of food import on China food security under open conditions and the countermeasures[J]. Practice in Foreign Economic Relations and Trade, 2013(8): 26-29. (in Chinese).
[20] HE AH, LIU TS, ZHANG YH. On reducing the loss of Chinese grain and its effects on food security[J]. China Price, 2013(6):79-82. (in Chinese).