

Perspective

Big Food Vision and Food Security in China

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Abstract: Objective: The objective of this paper is to identify the key policy and strategic issues that need to be addressed to ensure national food security by using the big food vision. Design/methodology/approach: Based on China's specific national and agricultural characteristics, this paper discusses the current challenges and opportunities facing China's food security and identifies the key policy and strategic issues that should be addressed to ensure food security in China using the big food vision. Findings: Food supply in China has been significantly improved, and the food consumption has been significantly changed, but China still faces with multiple challenges, such as increasingly unbalanced diets, unsustainable use of land and water resources, mismatch between supply and demand, and increased volatility in international trade environment. To ensure China's food security, China should focus on the following four aspects: (i) strengthening the support of agricultural scientific and technological innovation; (ii) reforming policy and institutions; (iii) nudging consumer behavior change; and (iv) fully utilizing international trade and cooperation.

Keywords: food security; nutrition; big food vision; policy and strategy

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1. Introduction

The current global food and nutritional security are severe challenges, and there has been little progress in reducing various forms of malnutrition including hunger, micronutrient deficiency and overweight and obesity. It is estimated that in 2021, 702–828 million people (8.9–10.5%) have suffered hunger in 2021, and COVID-19 alone led to increase of 150 million; about 2.3 billion people are in moderate or severe food insecure state. Nearly 3.1 billion people cannot afford a healthy diet, an increase of 112 million over the previous year (Academy of Global Food Economics and Policy et al., 2023). Food insecurity is caused by a variety of reasons, including the continuing impact of the COVID-19 pandemic, the crisis in Ukraine, and climate change, among others. At the same time, the impact of reduced income and rising food prices have reduced the food purchasing and affordability of many, particularly low-income population. Thus, there is an urgent need for governments and multiple actors to take joint action to reverse the current trend to reduce or even end hunger and malnutrition.

Food security in China, a developing country with a population of more than 1.4 billion, will have a profound “knock-on effect” on the global food system. In recent years, the performance of food security in China has been recognized by the international community as a success. For example, in the 2022 global food security index, China ranks 25th in the world with a comprehensive score of 74.2, up nine places from 2021 (The Economist Intelligence Unit, 2022).

Facing “new period of turbulent change”, “tight balance of food”, “hard constraint of resources and environment” and “high demand of diversified food consumption” in the new development era, however, China is facing unprecedented risk in its food systems. In the face of multiple demands concerning food security, national nutrition, market efficiency, and systemic resilience, the task of ensuring food security in China continue to be a top priority for the government and the society. This article analyzes the current state of food security in China, summarizes the challenges faced by the country in both food supply and demand, and explores the pathways for ensuring food security from the perspectives of food production, consumption, and trade using the big food vision.

2. Challenges Facing Chinese Food Security

2.1. Food Supply

Under the impetus of policies from both the central and local governments, China has witnessed a remarkable enhancement in its comprehensive grain production capacity and the ability to supply major agricultural products. From 2004 to 2021, the supply capacity of agricultural products has been continuously strengthened in both quantity and quality (Han, 2023). With a mere 9% of the global arable land and access to only 6% of the world's freshwater resources, China has effectively tackled the formidable task of nourishing 18% of the global population, thus making a momentous contribution towards the eradication of hunger and the assurance of worldwide food security.

More specifically, the goal of “grain is basically self-sufficient and absolutely secure” has been achieved. According to data from the National Bureau of Statistics, China's total grain output increased from 305 million tons in 1978 to 687 million tons in 2022, with an average annual increase of 1.86%. The per capita food increased from 319kg in 1978 to 486kg in 2022, with an average annual increase of 0.96%. At the same time, China's agricultural supply has been continuously diversified. From 1982 to 2021, China's meat output increased by 5.6 times, and reached to nearly 90 million tons in 2021; milk production increased by 21.8 times, poultry egg production increased 11.1 times, and aquatic products increased by 11.5 times. In 2021, the output of Chinese poultry eggs and aquatic products reached 34.088 million tons and 64.637 million tons, respectively. From 1996 to 2021, vegetable production in China increased from 300 million tons to 780 million tons, an increase of 1.6 times; fruit output increased from 46.53 million tons to 300 million tons, an increase of 5.4 times; and edible oil increased from 22.11 million tons to 36.13 million tons, an increase of 63.4% (Han, 2023).

While China has made a series of achievements in the supply of important agricultural products, it is still faced with difficulties such as prominent structural imbalance between supply and demand, excessive external dependence of a variety of products with highly concentrated import sources, unstable supply market prices. In particular, domestic feed grain supply is chronically insufficient, and imports have increasingly become significant, especially feed grain mainly composed of corn and soybean falls short of demand. It is predicted that by 2035, the self-sufficiency rate of corn will drop to 82%, and the gap between soybean production and consumption will remain at about 9000 tons (Huang, 2021). The self-sufficiency rate of main crops is shown in Table 1. Corn, soybeans, pork and beef, dairy products, and edible vegetable oil are too dependent on the imports, and the sources are highly concentrated (Zhu et al., 2023). At the same time, scarcity of agricultural resources and environmental constraints has limited the growth of the supply capacity of agricultural products. The rapid progress of urbanization has increased production costs, and the lack of supporting capacity of agricultural science and technology has also led to low production efficiency of agricultural production. The deterioration of the international trade environment has led to the instability of the agricultural imports, and the supply of important agricultural products are at great risks.

Table 1. The self sufficiency rate of major farm crops.

Item	1991	2000	2010	2022
Wheat	88.4	84.5	99.1	99.3
Rice	100.9	99.3	103.7	98.9
Corn	116.5	132.9	103.1	96
Soybeans	110.9	54.7	21.7	18
Edible Vegetable Oil (Domestic oilseed pressing)	82.8	69.4	32.9	29
Sugar Crops	142.6	65.5	78.8	64.8
Pork	101.2	100	101	99.8
Poultry	101	98.1	100.9	100
Beef	120	100.9	101.8	101
Mutton	100.4	99.5	99.7	98.8
Poultry Eggs	100.4	100.3	100.4	100.4
Milk	100	100.3	100.2	100
Aquatic Products	102.8	103.8	108.6	109

2.2. Food Consumption

With the improvement of income, China has achieved quick progress in reducing hunger and malnutrition, and the dietary structure has undergone rapid changes. People are no longer satisfied with food consumption demand for “being able to eat” and “can be satisfied”, but pay more attention to “nutrition, high-quality, healthy, and safe” (Chen, 2019). Residents’ consumption of starchy staple foods such as rice and wheat has gradually decreased, the consumption of nutritious foods such as fruits, eggs, aquatic products and milk has gradually increased (AGFEP et al., 2021), and the consumption of animal foods such as red meat and poultry has increased steadily, and the consumption of refined grains and edible oils has increased significantly. The diets of Chinese population have become increasingly imbalanced, such as excessive consumption of refined cereals and meat, and insufficient consumption of vegetables, fruits and milk (AGFEP et al., 2022).

As a result, overweight and obesity, chronic diseases are increasingly prominent in China (He et al., 2019). In 2020, the rate of overweight and obesity aged 18 and over was 50.7%, chronic non-communicable diseases such as cardiovascular diseases, cancer, chronic respiratory diseases, and diabetes account for 88% of all deaths in China, and the prevalence of diabetes among adults is as high as 11.9% in 2020, nearly double that of 2002. In 2020, nearly one-third of the residents suffered from high blood pressure, and the prevalence rate of hypertension was nearly 10% higher than that in 2002. Vitamin A, calcium, iron, zinc and other important micronutrient deficiencies also affect the health of Chinese residents, especially children, pregnant women (AGFEP et al., 2023).

3. Food Security Under the Big Food Vision

The traditional concept of food security mainly focuses on the supply capacity of grains such as rice, wheat and corn. With the improvement of people’s living standards, the quantity and diversity of food consumption increase. The consumption level and structure of Chinese residents are changing from adequate food and clothing to well-off in an all-round way, from “grain and vegetables” to “grain, meat, vegetables and fruits” and from traditional family cooking to modern convenience (Xin, 2021). The food security concept based on “having enough to eat” should be gradually changed to the diversified food security concept of “eating well”, “eating healthily” and “eating at ease”. In the face of the imbalance between the structural supply and, it is difficult to meet the upgrading and diversified consumption demand, restrict the goal of nutrition and health, and the high degree of external dependence of agricultural products. China food should be more nutritionally diversified and safe under the overall goal of “basic self-sufficiency of grain and absolute security of food rations”. In 2015, the China’s annual central rural work conference proposed for the first time “establishing big agriculture and big food vision.” In 2017, Chinese President Xi Jinping further pointed out at the China’s annual central rural work conference, “It is necessary to develop food resources to cultivated land, grassland, forests, marine, plants, animals, microorganisms, and develop food resources in all aspects.” In 2022, he further explained in detail the big food vision, pointing out that “it is necessary to establish a big food vision, meet the needs of the people’s better life, grasp the changing trend of the people’s food structure, and ensure the effective supply of all kinds of food, such as meat, vegetables, fruits, and aquatic products, while ensuring food supply. Any of these factors are indispensable.” The big food vision reflects the transformation of China’s agricultural development goals from focusing on grain security to food security, nutritional health, dual carbon targets, and common prosperity.

The big food vision is closely in line with China’s national multiple development goals in the new development period, regarding meeting the diversified food consumption and better life of the people as the basic starting point, guiding the construction of food supply system guided by the demand for nutritious and healthy food, and expanding food resources in an all-round way (Fan & Zhang, 2023). The development concept of the big food vision requires to meet the diversification of diets and food supply, and to optimize the allocation of the whole landscape resources from a broader perspective, so we must pay attention to the sustainability of the whole food system, deal with the relationship between man and nature, and realize the common health of human beings and the earth. The development concept of the big food vision is a major strategic thinking to deal with the challenges of food supply and demand in the future and to ensure food security, and it is also the development of the concept of food security under the new situation.

4. Paths to Ensure Food Security Under the Big Food Vision

4.1. Strengthen Infrastructure Investment and Science and Technology Innovations

Facility agriculture should be developed to break through resource constraints. Facility agriculture is an integrated application of various technologies that use light and temperature resources to create a growing environment for crops, which will effectively use arable land resources and make it possible to grow crops in the Gobi, deserts, tidal flats, saline-alkali lands, etc. Facility agriculture has a high degree of intensification, high yield, and high efficiency, but unfortunately, the current development of facility agriculture in China is large but not strong, so it is difficult to meet the requirements of the development of the big food vision. In the future, facility agriculture should be regarded as an important source of food, and scientific development planning of facility agriculture should be made according to resource endowment, ecological conditions and industrial foundation, guide funds, technology and talents, improve the level of science and technology, develop special equipment, break through resource restrictions, optimize the layout of facility agriculture, and enhance comprehensive production capacity, and thereby satisfying the food consumption needs of residents.

The food potential in the future should be developed. Alternative protein is an important direction to deal with climate change, environmental degradation and achieve sustainable development. Plant-based meat can reduce the health risks caused by excessive meat consumption and can reduce greenhouse gas emissions and resource consumption. In the future, the country should strengthen the research, development, promotion, and application of future foods such as alternative protein, and actively tap the potential of future food. First of all, the country should increase the investment and technological innovation of the alternative protein industry, solve the current technology and cost problems, and develop diversified categories to fully meet the needs of consumers for taste and taste. Secondly, the government should strengthen supervision, formulate product standards, and ensure the quality of alternative protein products, which is particularly important to promote the development of the industry. Finally, public publicity should be strengthened to allow more consumers to scientifically choose alternative protein products.

The agriculture and food sector should be transformed to green and low-carbon production mode. At present, the over-intensive mode of agricultural production is not sustainable. The green and low-carbon mode of production should be promoted by establishing an incentive mechanism to encourage the main bodies of the food supply chain to adopt green and low-carbon technology, adopt technical measures such as climate change adaptability, water, fertilizer and medicine, increase investment in environmental pollution control, further improve agricultural ecological compensation policies, and reduce environmental pollution. At the same time, ecological resources should be protected by, by allowing cultivated land, grasslands, forests, rivers, and lakes to recuperate, and thereby providing high-quality and nutritious food for residents. The diversity of agricultural production helps to protect biodiversity and the ecological environment, and a good natural ecological environment can enhance the sustainability and resilience of the food supply system to enhance the ability to respond to various risk challenges.

The work of damage reduction in food production and transportation should be further promoted. At the present stage, key links should be strengthened along the whole food supply chains such as production, post-natal treatment and storage, and key varieties such as vegetables and fruits by strengthening infrastructure, cold chain, science and technology, and other measures in food production, circulation, food manufacturing and processing, and consumption, so as to reduce food loss in the whole industry chain. In the process of food production, seed saving, and damage reduction machinery and intelligent green and efficient harvesting machinery should be popularized and applied, by training farmers to operate agricultural machinery to reduce the loss of growing grain and harvesting in the field. In the links of food manufacturing, supply and transportation, reforming the food labeling system, making use of advanced technologies such as the internet of things and artificial intelligence must be carried out to promote the accurate matching of production and demand, improve the efficiency of the food system, and reduce food waste in the process of food supply and transportation.

4.2. Explore Innovative Policies and System Support

The development concept of the big food vision focuses on big food and wide resources, which goes far beyond the traditional staple grain and cultivated land. The current agricultural support policy is difficult to meet the needs of the development of the big food vision. In the future, it is necessary to expand the scope of food support policies, increase support efforts and optimize the support structure.

The first is to expand the range of food that receives the agricultural support. That is, the policy support for nutritional and healthy foods such as fruits, nuts, vegetables, aquatic products, milk, etc. should be added, the production potential of various foods is tapped, and the supply of

various specialty forest foods, grassland foods and marine foods is enriched. The second is to support the development and utilization of various food resources. Specifically, infrastructure investment and resource utilization research and development of resources such as forests, grasslands, and oceans should be increased, the investment of social capital investment is leveraged, the potential of various resources in food production, and coordinating the governance of landscapes, forests, lakes and sand systems. The third is to extend agricultural support policies from agricultural production to the entire food supply chain. The government should support not only agricultural production, but also agricultural and food-related enterprises in all sectors such as inputs, circulation, storage, processing, and trade, through tax breaks for small and medium-sized enterprises to improve their profitability, improve the income level of employees and their ability to pay for healthy food.

The direction of agricultural policy support should be optimized. The first is to increase policy support for nutritional health, increase subsidies to produce nutritious and healthy food, promote the supply of nutritious and healthy food, reduce or abolish policy support for unhealthy food, or even levy taxes. The second is to strengthen support for sustainable development. Specifically, we should establish an incentive mechanism to encourage the main body of the food supply chain to adopt green and low-carbon technology, further improve the agricultural ecological compensation policy, and continue to increase ecological protection policies such as subsidies and incentives for returning farmland to forests and grassland ecological protection. The third is to improve the risk management policy of food supply chain. That is, infrastructure construction such as high-standard farmland construction and agricultural product supply chain should be strengthened to reduce the costs of production, warehousing, transportation, processing and consumption; establish and improve the risk monitoring and emergency plan system of the whole food industry chain, provide subsidies and support for agricultural disaster insurance and reinsurance systems, improve the ability of early warning of natural disasters and emergency management of the food supply chain, and enhance the supply capacity of diversified food under multiple risks.

The mechanism of large-scale collaborative management should be innovated. The management departments and industries involved in the greater food approach are diversified, and the promotion of institutionalized and effective “cross-border” cooperation is an important guarantee for jointly promoting nutritional health and sustainable development. The first is to establish an inter-departmental coordination and cooperation mechanism, break through the administrative boundaries between different departments, and establish a coordination mechanism among the Ministry of Agriculture and Rural Affairs the National Health Commission, the Ministry of Ecology and Environment, the Ministry of Education, the Ministry of Finance and other departments, establish a steering committee on the greater food approach, and apply the concepts and indicators of nutrition and health and green and low-carbon development to the work of all departments. The second is to give full play to the role of the market mechanism in optimizing the allocation of resources, improve the determination of the rights of cultivated land, woodland, grassland and other resources and the market-oriented reform of factors, promote the standardization and institutionalization of the factor transfer market, stimulate the transaction of production factors among different subjects, effectively promote the appropriate scale of agricultural operation, strengthen non-agricultural employment, entrepreneurship and other supporting policies, and guide small-scale farmers to withdraw from agricultural management activities in an orderly manner.

4.3. Promote the Change of Consumer Behavior

In view of the current health and environmental difficulties caused by residents’ unbalanced diet, the big food vision should be used as an opportunity to improve residents’ food consumption and promote the transformation of the national dietary structure from “something to eat” to “diet is rich, balanced, healthy and sustainable”, and thus, promoting the National Nutrition Plan and the rational Diet Action in healthy China.

Promoting food education for all and cultivating the concept of sustainable and healthy diets should be a top priority by establishing food education programs in schools, providing professional nutritionists in communities(villages), and using information and communications technology for public awareness campaigns can be effective tools to bridge the “last mile” gap in nutrition knowledge and guide consumers in forming healthy dietary habits.

Creating a healthy and enabling food environment is critical in promoting sustainable and healthy dietary habits among consumers. Appropriate industry regulations can foster an industry that adheres to standardized labeling, certification, and general standards for the food industry. Additionally, behavioral interventions can guide and enable shifts in consumer choices toward healthy and sustainable food.

The concept of life of cherishing food and rational consumption should be respected. Guidance should be strengthened to promote the transformation and upgrading of the dietary structure

of residents, improve the problem of excess nutrition, and then reduce the waste of food from the consumer side; advocate preparing and ordering meals on demand, reduce extravagance and waste, and make rational use of leftovers; actively create a good atmosphere of saving and honoring, shameful waste, and refusing to compare, strengthen the propaganda of “saving and cherishing grain” through various channels, strengthen the propaganda of “strict economy and opposing waste,” and raise the residents’ awareness of saving food. create a shameful atmosphere of waste in the whole society.

Increasing policy coordination and incentives for a healthy and sustainable food industry is critical. A multi-sectoral collaboration framework should be created to improve the food business chain toward health and sustainability. Improved laws and regulations and clear guidance and oversight roles of government departments could help this system. Financial policies, tax subsidies, and other measures should encourage the production and consumption of sustainable and healthy foods to meet the nutritional needs of vulnerable groups. Providing training and encouraging sustainable procurement and central kitchens can help administrators understand and implement sustainable and healthy diets.

Implementing a national nutrition improvement plan through targeted interventions is essential. To implement precise interventions, policymakers should design targeted dietary intervention strategies that consider differences in regions, demographic groups, and consumption scenarios. Food assistance programs that meet the food needs of low-income urban populations should be considered.

4.4. Strengthen International Trade and International Cooperation

Due to the limited domestic resources, the output of Chinese agricultural products cannot completely satisfy the increase in food consumption demand for residents, and it is necessary to meet the growing food consumption needs of domestic residents by importing agricultural products. In the future, China should promote the high level of agricultural opening up with the concept of open sharing, make good use of international market resources, establish a stable diversified international food supply chain, strengthen international investment and technological cooperation, actively participate in global food security governance, address global climate change and other common challenges, and jointly promote Chinese and global food security.

Maintain moderate imports, optimize the trade layout, and dispersed trade risks. China is the largest importer of agricultural products. Most of the food demand exceeds the total world exports, and the imported varieties and sources are highly concentrated. In 2021, grain imports accounted for 13% of the world’s total exports, soybean imports accounted for 60%, pork and beef imports accounted for 22%, and mutton imports accounted for 28%. Therefore, in the face of a hundred-year-old change, COVID-19 major popularity, continuous international trade friction, the prevalence of global trade protectionism, and the risk of agricultural trade, China is required to formulate a diversified strategy of importing agricultural products, do a good job of importing agricultural products, optimize the trade layout of agricultural products, strengthen international cooperation with trading partner countries, use the global agricultural trade rules, and establish a stable cooperation and win-win trade relationship.

Cultivation and growth of China’s multinational agricultural enterprises must be scaled up to improve the construction of international food supply chain and enhance the ability of international supply guarantee. In China, agriculture-related enterprises represented by Sinochem and Cofco are gradually involved in the global industrial chain of processing, trade, and transportation of agricultural products. For example, Cofco has formed a new camp of “Seven Grain Merchants” with the four major international grain merchants, Fengyi International and Viterra. In the future, multinational agriculture-related enterprises should be supported to build a stable international supply chain and enhance their ability to invest abroad and seek food overseas.

Finally, we should actively participate in global food security governance, jointly address global challenges, and promote global food security. To achieve the United Nations sustainable development goal of less than 2.5 percent of global malnutrition, there is a need to increase productivity at the global level, especially in middle-and low-income countries. Therefore, bilateral agricultural cooperation with “Belt and Road Initiative” countries and developing countries should be strengthened through global multilateral and bilateral cooperation mechanisms. In addition, food production capacity should be increased, cooperation at the global and regional levels in disaster prevention and mitigation of the food system and emergency response should be strengthened to jointly address challenges such as climate change and extreme disasters. In addition, we should enhance China’s right of speech in global agricultural governance and enhance the international influence of China’s agriculture.

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