

Developing Nutritious Crops, Improving the Nutritional Quality of Farm Produce in China

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The report of the 19th National Congress of the Communist Party of China put forward the Healthy China strategy: “It is necessary to improve the national health policy and provide the people with a full range of full-cycle health services” (Xi, 2020). With the rapid development of China’s economy and the increase of grain production, people’s health conditions have improved significantly. However, a high occurrence of chronic diseases related to nutrition have become an emerging health problem of greater concern. In recent years, people’s demand for food has shifted from merely “filling the stomach” to “something that is delicious, safe and healthy”. As China has long paid more attention to quantity rather than quality in crop production, the nutrition quality of crops fails to adapt to the changes of people’s needs. Therefore, it is imperative to develop nutrition-oriented agriculture, establish medium and long-term “nutrition” goals for agricultural development, strengthen basic research, establish a standard system for the detection, identification, and evaluation of crop nutritional quality traits as soon as possible, promote variety improvement, and enhance the nutritional quality of agricultural products.

I. The Nutrition and Health of the People Should Be Guaranteed from the Source of Agricultural Products

With the rapid economic development and the continuous improvement of people’s living standards, the nutrition and health problems of Chinese residents have become increasingly prominent. The increase in chronic diseases and growing burden caused by malnutrition, imbalanced or excessive intake of nutrition are particularly serious in the southwest and northwest regions. The survey shows that the height and weight of adolescents in Guizhou Province are lower than those of the national average with relatively higher occurrence of iron-deficiency anemia and relatively higher proportion of vitamin A and vitamin D subclinical deficiencies; the number of patients with high blood pressure and diabetes among residents in the economically underdeveloped areas of western area of Guizhou has increased over the years; the occurrence of iron-deficiency anemia among adolescents in Xinjiang is as high as 20%, with vitamin A and vitamin D deficiency rates reaching as high as 27%–30%, and the overweight and obesity rates exceeding the national average level. Meanwhile, there are obvious

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regional differences in the dietary habits, nutritional needs, and health awareness of Chinese residents. For example, residents in economically underdeveloped areas of Guizhou have high intakes of animal fats and relatively low intakes of dairy products and aquatic products; residents in areas of ethnic minorities in Xinjiang prefer foods with high level of salt and oil, and have less intake of vegetables, resulting in a high occurrence of esophageal cancer and colorectal cancer. Residents in economically developed areas such as the Yangtze River Delta and the Pearl River Delta are more willing to pay more for nutritious food. They are more willing to purchase “green food” and “organic food”, and the import volume of agricultural products is increasing in such regions over years.

In recent years, the international community has started to explore ways to tackle nutrition problems from the source of food, taking “nutrition” as an important focus for agricultural development, and advocating the development of “nutrition-driven agriculture”, “nutrition-sensitive agriculture”, and “nutrition-enhanced agriculture” to achieve the sustainable development goals of the United Nations to “end hunger, achieve food security and improved nutrition and promote sustainable agriculture” (UN, 2020). The *Outline of the Healthy China 2030 Plan* proposed to formulate and implement a national nutrition plan, conduct in-depth research on the evaluation of food (agricultural products, food) nutritional function, and continue to meet the people’s needs in nutrition and health; the *National Nutrition Plan (2017–2030)* urged the integration of nutrition into all health policies to promote industries in food nutrition and health, and further enhance the production of nutritious and high-quality edible agricultural products; the *China Food and Nutrition Development Program (2014–2020)* also specified that the direction and goal of food and national nutrition development in the next 5 to 15 years is to “ensure the effective supply of food and promote the balanced development of nutrition” and “focus on promoting the transformation of development means of food and nutrition.”

Therefore, it is of great significance to investigate and analyze the issues and challenges in the supply of agricultural products in China, and to study and explore ideas and strategies to improve the nutritional quality

of agricultural products and meet the nutritional and health needs of the people.

II. “Priority on Quantity Rather than Quality” Hinders the Improvement of the Nutritional Quality of Agricultural Products

The grain production in China has achieved a steady growth for 10 consecutive years, laying a solid foundation for economic and social development. However, the less sophisticated production methods and imbalanced structures of grain production cannot meet the consumption and nutritional needs of residents. First, there is a structural problem of “imbalance between supply and use” in food production. For example, the wheat production was 108.8% of domestic consumption in 2015. Although the imbalance has been addressed in recent years, supply is still greater than demand; soybeans are greatly under supplied while more than 85% of oil-used soybeans are imported. Second, crop production cannot meet the processing requirements and some crop varieties cannot meet the requirements of “specialized supply” of raw materials for agricultural products. For example, the annual demand for special wheat in China is about 1 million tons, but the current annual output meets less than half of the demand with substandard quality; it is difficult to sell general wheat flour in Henan Province while the special flour is in short supply. Third, the high-quality agricultural products are in short supply, which further highlights the “deficiency in quality products”. High-quality, special-purpose agricultural products suffer from lack of production bases, low output, and unstable quality. For example, the limited high-quality protein corn cannot meet the demand of animal feed; and the brand high-quality rice with limited yield and high price is extremely popular on the market. Fourth, the development and promotion of more nutritious agricultural products is insufficient. For example, the comprehensive development of special cash crops, such as buckwheat and quinoa, is insufficient; and it is difficult to promote nutrition-enhanced products such as high-folic-acid corn.

The agricultural production in China has long sought to “feed” the population. As a result, crop breeding has prioritized increasing output as the

core target for agricultural policies, basic research, technology development, and standard formulation while overlooking nutritional quality. In addition, the lack of evaluation system of nutritional quality and the less sophisticated crop production and management methods of agricultural product have severely restricted the improvement of the nutritional quality of agricultural products.

First, improving the nutritional quality of crops has always been a global challenge, and the systematic research and development is still lacking in China. The large investment of crop breeding research in yield and traits has played an important role in expanding the scale of agricultural production and increasing yields in China. Nutritional quality is a complex trait determined by multiple genes. Due to weakness in basic research, China has not systematically carried out scientific research and technology aimed at “improving quantity, ecological quality and environmental friendliness, optimizing quality, enhancing nutritional quality and processing quality”. Basic scientific research on specific issues is underway, such as functional gene analysis related to nutrition, gene expression regulation, metabolic network construction, complex trait coupling, germplasm resource optimization, crop morphogenesis, and environmental interaction.

Second, the crop production technology system and standard system solely aimed at feeding the population have not been adjusted in time. Investigations show that new rice varieties cannot be purchased on a “higher price for better quality” basis due to the lack of evaluation technology and standards of nutrition; the nutritional quality of a large number of distinctive agricultural products is “unclear and vague”, which hinders the development of local advantageous industries. The quality of wheat production cannot meet the processing requirements of special flour; there is deficiency in maize germplasm resources suitable for machine harvest, green maize varieties with efficient nutrient and water utilization, and special and functional new varieties; peanut cultivation methods are unsophisticated due to a lack of standards and regulations while secondary food safety problems caused by plant diseases and insect pests are serious. In addition, lack of market mechanism also restrains the supply of high-quality agricultural products. For

example, the agricultural production in the northeast region is overly dependent on subsidies, the products are less market-oriented, and the sustainable supply of high-quality agricultural products is weak.

Third, a scientific, proper, and systematic standard system in nutrition quality of agricultural product has not yet been established. The lack of standards for the evaluation of nutritional value of agricultural products, processing nutrition control, nutrition testing and identification makes it difficult to effectively guide and lead scientific research and production, promote agricultural development and meet the nutritional needs of residents.

Fourth, the market-oriented mechanism of “quality-based pricing” has not yet been formulated. Due to insufficient scientific knowledge and the lack of guidance standards, new agricultural technology services are not yet mature, modern agricultural operation and service systems have yet to be improved, coupled with the instability of agricultural preferential policies, which largely hinders the improvement of nutritional quality of agricultural products in China.

III. Promoting Nutrient-oriented Crops Is an Important Pillar for Agricultural Development in the New Era

Developing nutrient-oriented crops, cultivating new high-quality nutritious varieties, improving market supply, and promoting the shift focus of agricultural products on “nutrition” can not only guarantee the nutrition supply to Chinese residents from the source, but also serves an important means to promote the quality and efficiency of agriculture, advance the supply-side structural reforms and promote agricultural, rural economic and social development.

To this end, the following suggestions are made:

1. Develop green agriculture with nutritional needs highlighted

Led by the national green agricultural development strategy, the medium and long-term “nutrition” goal of agricultural development should be established. It is recommended to formulate the scientific and technological development route of nutrition-driven crops, conduct systematic research on related scientific



issues aiming for breakthrough in core technologies, adjust the project organization form as well as the supporting policies and measures in areas including science research and development, education, and training, so as to guarantee the development of nutrition-oriented crops.

2. Strengthen basic research and establish a standard system

Establish a major research and development project for nutrition-oriented crops as soon as possible, carrying out multidisciplinary joint research on such topics as germplasm resource innovation, metabolic regulation, agricultural product processing, and nutrition for humans; advance research on the genetic and metabolic basis of nutritional traits of crops, and establish high-throughput analysis platform of plant metabolic components to provide support and services for the creation of nutritious agricultural products. Establish a technical center for crop nutritional quality testing and evaluation, and institute a technical system and standard system for the cultivation of high-quality nutritional crops, the development of high-quality nutritional agricultural products, and the testing and evaluation of nutritional quality of agricultural products based on innovative research; develop a nutritional labeling system for agricultural products, and formulate an integrated information database with traceable information of crop nutritional components, genetic resources and omics.

3. Research and develop core technologies and cultivate high-quality varieties

Encourage and advance the application of emerging technologies in crop breeding, tap genetic resources with high nutritional quality, and cultivate new varieties of high-quality nutritional crops, such

as nutrition-enhanced crops including high-folic-acid corn, nutritionally functional crops represented by high-resistant starch rice, crops that are in short supply such as high protein soybeans, and nutritionally balanced crops such as quinoa. Meanwhile, it is proposed to formulate certification and certification standards for high-quality nutritious crop varieties, market access standards, intake standards and dietary guidelines; improve the technological level of seed companies and provide better incentives for cultivating high-quality varieties, establish an internationally leading platform for nutritious crop breeding technologies, promote and demonstrate new varieties and new technologies of nutrient-oriented crops, guide the regional planning and specialized cultivation of high-quality nutritious crop varieties based on local conditions.

4. Promote market reforms and highlight education on science

On the basis of ensuring food security, reform the supply system and price system based on demand and market needs, advance the establishment of a market mechanism based on the principle of “higher price for better quality”; develop new models and industries such as “Internet-based agriculture”, “contract agriculture”, and “agricultural PPP”; integrate “nutrition” into various links such as breeding, cultivation, and processing, and strengthen the concept of nutrition and health in the entire technology, value and industry chain; resort to a variety of communication means and channels to facilitate the extensive, efficient and accurate promotion of the knowledge on high-quality nutritious agricultural products; actively practice the scientific “value on nutrition”, and effectively curb the “false health preservation” and “false education on science” through meticulous and orderly promotion and guidance.

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