



Potato and Food Security in China

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The potential of potato to provide food security is one reason China has undergone remarkable growth in potato production over the last two decades and become the largest producer of potatoes in the world. In 2015, the Chinese Academy of Sciences recommended the strategy of developing and using potato as a staple food for domestic food security. Potato will become the fourth staple food in China, along with rice, wheat and corn.

Historically, potatoes have not been a large part of the Chinese diet. Therefore, efforts to increase potato production for food security and position potatoes as a staple food must include ways to increase consumption by Chinese consumers. In keeping with the preferences of Chinese consumers, a greater variety of appealing potato products have been developed, including potato steamed bread, potato noodles and flour. More than 200 potato products have been developed, such as frozen french-fried potato, potato chips, stackable potato chips, potato cakes, potato puffed snacks, potato liquor, potato beverages and others. This has accelerated the demand for raw potatoes. From 2007 to 2016, the annual consumption of fresh potato per year increased from 30 kg to 52 kg, increasing at a rate of 5.6% per year, and there is still room for future growth.

From 2007 to 2016, potato planting acreage increased from 4.5 million ha to 5.6 million ha, and there is a slow growth trend predicted for the future. Potato yield increased from 65 million tons to 97 million tons during this time. Current production levels are even more remarkable considering potato production was under 10 million tons in China as recently as 1986. Yield per unit area increased from 15 tons/ha to 17 tons/ha from 2007 to 2016. However, yield per unit area is less than the world average (20 tons/ha), and much lower than in

developed countries (40 tons/ha) such as Holland, France, the United States and New Zealand. Therefore, there is potential for greatly increased yields in China, which in turn would further contribute to the nation's food security.

Distribution of Potato Production Regions in China

Potato acreage is relatively concentrated in China, with 49% of the acreage in Northern China, where single cropping occurs. Thirty-nine percent is in Southwestern China where a mix of single cropping and double cropping occurs. Five percent is in Central China where mostly double cropping occurs. Finally, 7% of crop is grown in Southern China including Fujian, Guangdong, Guangxi, Hainan and Taiwan, where double cropping is increasing.

Reasons for Rapid Growth of Potato Production and Consumption in China

Multiple reasons account for the rapid increase in Chinese potato production. The short growth period and wide adaptability of potato makes it suitable for the diverse areas and climate types in China and allows potatoes to be planted year-round. Relevant parties have worked together to develop potato policies. In 2016, the Chinese government issued the “Guiding opinions on promoting the development of potato industry.” Subsequently, provinces and cities also introduced relevant policies designed to benefit potato production and demand.

Increased Food Security

For various reasons, potato has a greater potential to further increase its planted acreage and yields in China than rice, wheat or corn. Under existing conditions, we estimate it is possible in the short term to increase the average yield of potato from 17

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tons/ha to 22 tons/ha and increase the acreage from 5.6 million ha to 8.0 million ha, which is projected to increase the annual yield by ~79 million tons and help compensate for the inability of grain crops to meet national food security goals. The agronomic advantages of potatoes, including cold resistance, drought tolerance, geographic adaptability and high yields can save resources and relieve the pressure to increase grain production, which is an additional way potato can enhance food security in China.

Alleviation of Poverty

Another reason for the growth in potato production is the result of a concerted effort to reduce poverty. In China, impoverished areas are mainly concentrated in mountainous regions that tend to have harsher climates, high altitudes, and less developed transportation infrastructure. Potatoes can be grown in these areas and can provide needed calories and nutrition. According to statistics, among 592 impoverished counties, 549 grow potatoes. In all, more than 70% of the total potato planting acreage is distributed among poverty-stricken areas in China. Over the past ten years, the government has made concentrated efforts to alleviate poverty, in part by developing the potato industry in these regions. This not only should provide food for residents, but also present opportunities to increase the income of the numerous small family farms in poor areas. In these regions, potato has additional economic benefits compared to rice, wheat, corn and soybean.

Affordable and Nutritious

As discussed in this special issue of AJPR, potatoes provide complex carbohydrates to meet energy needs and they contain a wide array of vitamins, minerals and phytonutrients that appeal to Chinese consumers.

With the improvement of living standards in China, more people have become interested in the relationship between diet and health. For example, the nutritional value of different cereal crops, including buckwheat, beans, foxtail millet is now being recognized. Similarly, increased coverage in the media means people can more easily learn about the nutritional value of foods than they could a generation ago.

As living standards have improved in China, the number of patients with chronic diseases such as cardiovascular diseases, diabetes and obesity has increased. In the USA and Europe, potatoes are sometimes blamed as partial contributors to these diseases. However, in those countries, potatoes are often cooked with oil, butter or consumed with fried meat, which is different

from the Chinese consumption pattern. In China, consumers have a positive perception of the nutritional value of potatoes.

Future Needs for the Chinese Potato Industry

A limitation for potato production in China is that there are few potato varieties specifically developed for optimized performance in local conditions. Therefore, more effort is needed to improve the utilization of germplasm resources to select new cultivars for Chinese environments and to meet the needs of the Chinese potato industry.

Virus-free seed is an important need to maximize yield and quality, but it only accounts for about 30% of total seed planted and it is expensive in China. Infrastructure and technology improvements are needed to increase the availability and affordability of virus-free seed potatoes and reduce production costs. Production of pre-basic, basic and commercial seed should be improved, including the implementation of proper virus detection systems and quality controls.

Additional development of the Chinese potato processing industry is needed. It currently accounts for only 5–10% of potato production, whereas in the United States more than 70% of potatoes are used for processed products. In the future, new processed options are needed for fast, convenient foods, dehydrated products and other potato derivatives. More research and infrastructure is needed to improve the processing technology of potato as a staple food. Rice and wheat are the primary staple foods for Chinese consumers and are strongly preferred over potatoes, a habit that is difficult to change in a short time. More effort is needed to promote the nutritional value of potatoes to Chinese households.

Increased research and infrastructure development is needed for the transport and storage of potatoes, which are not easy to store or transport, in part because of high-water content. Fresh potato also sprouts easily, and its quality can deteriorate during long distance transportation. If transported frozen or as starch, the cost increases significantly.

Historically, government food support policies were mainly for rice, wheat and other cereals, but are less established for potatoes, which only recently have become widely grown in China. In the future, the government should provide similar support policies for potatoes as for cereals. Nevertheless, despite such challenges, the rapid increase in potato production in China, accompanied by a shift in consumer attitudes to incorporate potatoes into a diet that traditionally did not include potatoes, can be regarded as a success story that has enhanced food security in China.