Present Status and Prospects for Cereal Product Development in China

China is changing rapidly and so are its tastes. As a consumer society is emerging, new products are also appearing with increasing regularity, including processed cereal products. Rising average annual incomes, increased ownership of refrigerators and freezers, increased exposure to cuisines from around the globe, and a greater array of goods in supermarkets are all acting in combination to increase the variety of cereal products available in China.

Historically, cereal products in China have been restricted to dried noodles and rice. Flavored rice, pasta, and breakfast cereals have only become common in shops with the increase in Western influences. The arrival of fast-food restaurant chains and Western-style supermarkets, greater awareness of cereal products, and the emergence of a generation both willing and able to try new products has resulted in great strides being made in the market for cereal products in China.

Instant noodles now account for 10% of consumption of China’s wheat output and a significant portion of China’s oil palm imports. The total retail market for instant noodles and cereal products is expected to grow to ~25.7 million tonnes by 2011—an increase of ~34% over the size of the market in 2007. Plain rice is expected to remain the largest sector and is forecast to reach almost 74 billion yuan RMB (US$9 billion) in value by 2011. Noodles and breakfast cereals are expected to remain the most dynamic sectors, rising in value by an estimated 37 and 43%, respectively. All sectors are expected to continue to see positive growth throughout the forecast period.

At the same time, from 2002 to 2010 whole-grain food products increased by 100% globally. In 2002 there were only 321 kinds of whole-grain food products available in the global market; by 2010, the number had risen to 3,272. Whole-grain food products accounted for up to 40% of all cereal products in the United States and could account for more than 70% of high-end cereal products. The consumption of whole-grain foods in the United States increased by 20% from 2005 to 2008, and consumption of whole-grain foods first exceeded that of white bread in 2010 (1).

Development of whole-grain products has been listed as a priority in the industrial development project of the 12th National Five-Year Plan (2011–2015) of China. As a result, health-promoting, whole-grain products will be developed on a large scale in China. The development plan of the Chinese economic and social development project states that “excessive processing” of cereal and oil products, such as production of refined and white flour, which seeks to reproduce the mouthfeel and flavor of rice, should be prohibited to establish a foundation for developing whole-grain foods as part of the national policy (1).

Present Status of Cereal Foods in China

Development Status of Major Crops

**Rice.** Rice production in China is ranked number one in the world, reaching 192 million tonnes in 2008. There were 40 enterprises in China in 2008 with an annual rice production output higher than 100,000 tonnes, for a total output of ~9,415,000 tonnes. In 2008, sales income for the rice processing industry reached 153.3 billion yuan RMB. Total profits reached 2.53 billion yuan RMB, while the profit ratio reached 1.65%. There are still some problems in the Chinese rice industry, however. Rice industry production was only 46.2% of its capacity in 2008, which was <70% of international levels, ranking in the lowest levels globally. There were only 183 patents for 7,311 rice processing enterprises in 2008, and there is a significant lack of scientific information available in connection with proprietary intellectual property rights (2).

**Wheat.** Wheat is a major crop in China and is ranked number two in domestic production. The output of wheat production has been higher than 100 million tonnes/year in recent years. In 2007, there were ~3,100 wheat flour processing enterprises (the number of enterprises with daily processing capacities >50 tonnes could only be projected). Although there has been great progress in the Chinese wheat industry, which has been driven by market requirements, there are still some problems. There is a lack of high-quality wheat varieties for processing. For example, there are 300 wheat varieties grown in China, but there is lack of special varieties for use in bread and biscuit processing. Therefore, a large quantity of high-quality wheat varieties must be imported. There are also fewer special wheat-derived ingredients available domestically. Finally, the scale of most processing enterprises is small, and their production capacity is very low (9).

**Corn.** China ranks second in corn production globally. In 2009, 307 million hm² of corn was planted, and the output was ~160 million tonnes. Currently, ~15% of the corn produced is used in food processing, 74% is used in feed processing, and 11% is used in industrial raw material processing. The main problems associated with the corn industry in China include the limited number of large-scale enterprises; the greater number of small, diverse enterprises limits production capacity. Corn processing is challenging, and thus, more primary products that are processed less extensively are produced, while fewer extensively processed products are available (7).

**Soybeans.** In 2010, the output of soybean production in China reached 15 million tonnes, while soybean imports totaled 54.8 million tonnes. Consumption of soybeans reached ~65 million tonnes, including the 20.4 million tonnes used in crushing. Currently, crushing capacity is at ~80%. Medium- and small-scale enterprises may need to merge to stay in business, while large-
scale enterprises (e.g., Zhongliang, Zhongfang, and Dongling groups) will likely expand their crushing capacity. The importation of soybeans into China will continue to increase over the next five years, and the estimated average growth rate will be 5–10% annually (8).

Development Status of Minor Crops

**Buckwheat.** Currently, 100 million hm² of buckwheat is planted in China, and the output has reached 130 million tonnes/year. In recent years, the global requirements for buckwheat have shown an increasing trend, and buckwheat grown in China has a competitive advantage. Buckwheat exports from China reached 85,541,000 tonnes in 2007, a 2.1% increase compared with 2006. However, there are few research institutions and processing enterprises to study buckwheat processing in China, and thus, very few primary products, such as buckwheat flour, buckwheat wine, and buckwheat-derived ingredients, are available in the market for consumption. At the same time, the processing capacity is very limited, and it is hard to form large-scale processing enterprises. There are also no widely recognized brands available, and profitability is low. In addition, buckwheat product quality is unstable. Finally, buckwheat production and sales systems are not directly connected, which influences the success of both production and sales to a certain extent (4).

**Sorghum.** The area currently planted to sorghum in China is stable at ≈800,000 hm², and the total output is ≈300 million tonnes/year. Sorghum is produced in China primarily for human consumption and is a major food in parts of northern China. It is also an important raw material used in wine production and is used in feed, alcoholic beverages, sweeteners, and other staples (4).

**Millet.** The annual area planted to millet in China is ≈100 million hm²; the yield in a normal year is ≈330 million tonnes, which ranks second globally. The capability to intensively process millet in China is very limited. There are a few enterprises that use millet to produce wine or parched rice. Because no other applications require large-scale intensive processing, millet production is a long way from being ready to routinely place on the family table as a healthy food (4).

**Oats.** Currently, ≈300,000 hm² of oats is planted in China, and the output is ≈500,000–600,000 tonnes/year. There are three kinds of oat processing in China: 80% is traditional oat flour processing, 10–15% is oatmeal processing, and 5% is oat fractions (e.g., protein, β-glucan, fiber, oil, etc.) and other products (e.g., instant noodles and pastes) (4).

**Foxtail Millet.** Approximately 100 million hm² of foxtail millet is planted in China each year, and the total output is ≈210 million tonnes. Foxtail millet processing in China mainly involves the primary stage: 80–90% of foxtail millet is consumed as a raw material in the form of porridge and cooked rice, and small-scale processing is mainly focused on small enterprises and family workshops. The product category is mainly composed of convenience foods such as instant foxtail millet porridge, crust, instant powders, etc. (4).

**Kidney Beans.** Currently, ≈600,000 ha of kidney beans is planted in China; more than 800,000 tonnes is produced per year. Kidney bean production in China is tied in third place with the United States behind India and Brazil. After years of development, kidney beans are becoming the fastest developing industry in minor Chinese crops. Planting area, sales, and a large-scale circulation network have been established. However, further improvements in variety optimization and processing quality are needed (4).

**Mung Beans.** The area planted to mung beans in China is stable at ≈700,000 hm²; the total amount produced per year is ≈1 million tonnes. Both mung bean output and export rank number one globally. In recent years, intensive processing of mung beans has increased gradually, while the need for intensive processing has increased rapidly. At the same time, the demand for mung beans in other countries has also shown a gradually increasing trend (4).

**Red Beans.** The area planted to red beans is stable at 200,000–250,000 hm², and output is ≈300,000 tonnes/year. Red beans are used in foods as raw material or processed ingredients. Recently, red beans have increasingly been used in food processing and catering businesses, e.g., microparticles of red bean are used to produce red bean paste. Red bean filling is a favorite of Japanese consumers, and a red bean filling processing plant has been built by a Japanese enterprise in China. There are 40,000–50,000 tonnes of red bean filling sold in Japan each year. Some products enjoy brand recognition in the international market and have a competitive advantage. However, studies on various aspects of red bean production, such as planting basics, productive zones, growing conditions, product quality standards, processing and logistic equipment, seed culture, etc., are needed (4).

Development Status of Convenience Foods

**Instant Noodles.** Instant noodle production in China reached 26.5 billion yuan RMB by 2004. The number of production lines exceeds 3,000, but the operating rate is only 30%. In terms of total production, the output of Chinese instant noodles is ranked number one globally. Consumption per person ranks in ninth place globally, with a big difference compared to Korea and Japan (which is ranked first globally). Thus, the market potential is still very large, and plans are in place to improve integration and subsequent stages of development of instant noodles in China (6).

**Staple Convenience Foods.** Staple convenience foods in China consist primarily of instant noodles, cooked rice, and porridge; steamed stuffed buns; dumplings; breads; and rice flour-based foods with fillings. Staple convenience foods with frozen fillings, desserts, and prepared frozen foods have already become part of family meals and part of the three primary meals a day in cities and developing towns (6).

**Snack Foods.** Currently, the per capita consumption of snack foods in China is extremely low at only 16.6 g. Per capita consumption of potato chips in America is 2.6 kg, with annual sales of US$5.721 billion, which is 157 times that of China. Per capita consumption of snack foods in Japan is 3.85 kg, which is 232 times that of China. Thus, the snack food market potential in China is tremendous, and potential development space is expansive (6).

**Microwaveable Foods.** To date only a few types of microwaveable foods are available in China, e.g., quick frozen dumplings, shaomai, and precooked products that can be heated in a microwave. In addition, few enterprises specialize in producing microwaveable food products in China. Most frozen microwaveable foods on the market are simply labeled with “available for microwave heating” on their outer packaging. The great majority of manufacturers have not yet probed deeply into possible changes in food packaging in the microwaveable foods category (6).

Status and Limitations of Dietary Instructions for Chinese Residents

**Reduced Total Intake of Cereal Foods.** As indicated in the “Investigation Report on Chinese Residents’ Nutrition and Health Condition” (2002), during the past 10 years the portion of energy provided by grain foods has dropped to 47%, which is significantly lower than the recommended portion. Dietary fat intake has increased significantly from 19 to 28%, close to the upper
Development Status of Whole-Grain Foods in China

In recent years, consumption of cereals and tubers, with the exception of rice and wheat flour, has substantially decreased in Chinese diets. A survey conducted in 2002 indicated consumption frequency of high-fiber cereals and tubers showed a downward trend to 1.6 and 2.1 times per week, respectively. The intake of beans and bean products increased slightly but was well short of recommendations for a balanced diet. The consumption frequency of rice and wheat flour was 12.8 and 6.3 times per week, respectively, signaling a trend toward excessive consumption of rice and wheat products. Attempts should be made to turn this trend around as soon as possible, since it can have very adverse effects on maintenance of good health (3).

Excessive Intake of Baked and Fried Foods. In recent years, consumption of cereals and tubers, with the exception of rice and wheat flour, has substantially decreased in Chinese diets. A survey conducted in 2002 indicated consumption frequency of high-fiber cereals and tubers showed a downward trend to 1.6 and 2.1 times per week, respectively. The intake of beans and bean products increased slightly but was well short of recommendations for a balanced diet. The consumption frequency of rice and wheat flour was 12.8 and 6.3 times per week, respectively, signaling a trend toward excessive consumption of rice and wheat products. Attempts should be made to turn this trend around as soon as possible, since it can have very adverse effects on maintenance of good health (3).

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Excessive Use of Cereal Additives. Grain quality improvers, coloring agents, antiseptics, bulking agents, flavors, and fragrances are largely used to improve the sensory qualities of a product to meet consumer expectations. However, they can seriously damage consumer health. Increasing use of additives with no strong regulations has created consumer distrust of cereal foods. Meanwhile, the Chinese diet is slowly getting “sweeter” as dessert consumption has increased to meet consumer preferences for sweet flavors. About half of the current cereal products on the market are in the form of desserts, and more desserts are being developed. A high-sugar diet can lead to a rise in blood glucose and insulin levels and has been linked to fat synthesis and obesity (3).

More Extensive Processing of Grain Foods. Extensively processed grain products occupy the vast majority of the market supply. There isn’t much “whole grain” in many products, and quite a few do not deserve to be called “whole grain.” In addition, when fiber is added to products to increase their health benefits, extra fat and additives are also added to improve product flavor and texture, hindering their purchase by consumers looking for health benefits from these types of products (3).

Development Strategies and Prospects for Grain Foods in China

Whole-Grain Foods

National Education. The Ministry of Education should increase and improve scientific information on nutrition and health in primary and secondary teaching materials. Approved by the State Council, the Public Nutrition and Development Center, part of the National Development and Reform Commission, in 2011 held the 3rd Nutrition and Health Industry International Expo in Beijing. A special whole-grain food pavilion was open during the exhibition to link domestic and international companies with large supermarkets. Meanwhile, an International Forum on the Development of Whole Grain Foods, co-sponsored by the international Whole Grain Council (WGC) and Health Grain Foundation (HGF), was held. National Healthy Family Propaganda Actions and Science Popularization Activities are also being organized by six national institutions and industry organizations and will promote consumption of whole-grain foods in China (1).

Plans Advocated by Government and Industry Organizations. Prevention of “excessive processing” of grain and oil products is discussed in the National Economic and Social Development Plan (2011–2015); a plan that will pave the way for the development of whole-grain foods at the national policy level. The National Development and Reform Committee Public Nutrition and Development Center (PNDC) has issued a “Health Advocated Products” logo for whole-grain foods (Fig. 1) (1). The Nutrition Branch of the Chinese Cereals and Oils Association has organized activities on nutrition and foods (grains and oils) in the Chinese provinces to promote consumption of healthy foods. This program was launched from Beijing in 2010 and will continue to be pushed forward to other provinces (1).

Strengthening International Cooperation. PNDC, the Nutrition Branch of the Chinese Cereals and Oils Association, has established international partnerships with WGC and HGF. They have co-organized forums and will cooperate further in many areas in the future.

Fig. 1. Nutrition and Health Advocated Products logo (in English, "Nutrition and Health Advocated Products, Public Nutrition and Development Center") (1).

Fig. 2. Construction of a joint R&D platform for healthy whole-grain foods (1).
Construction of a National Joint R&D Platform for Whole-Grain Foods. The National Cereal Bureau has put forward a proposal to construct a joint R&D platform for healthy whole-grain foods. The platform would be composed of government organizations (e.g., Public Nutrition, Health Organization, and Education Ministry), research institutions (e.g., universities and academies), government administration agencies (e.g., Health Ministry and Chinese Illness Precaution Center), and industrial enterprises. They will perform research related to cereal product consumption and education, nutrition and health, quality improvement, processing technology, and product R&D and industrialization (Fig. 2). The goal of such a platform is to increase the consumption of healthy whole-grain foods by Chinese residents.

Grain-based Foods

Promising Grain-based Beverages. New grain-based beverages have emerged on the market in recent years. The industry believes that grain-based beverages are one of the development trends in future beverages. Incorporating grains into beverages using modern technology can help fully retain their nutrients. In addition, grain-based beverages have the advantages of improved taste, convenience, and easy assimilation. Grain-based beverages may be part of the solution to nutrition imbalances experienced by urban consumers caught in the fast pace of modern life. They hold the promise of enormous potential and business opportunities.

Commercial grain-based beverages are a convenient health food, enabling consumers to enjoy a nutritious and delicious meal on the go. New food products are making it easier to meet modern nutrition needs and blend well with fast-paced modern rhythms and popular trends.

The Chinese Food Industry Association has established the first domestic Cereal and Coarse Cereal Nutrition Food (Liquid) Industrialization Base in Xiamen. Simultaneously, the Chinese cereal-based beverage company Hui’er kang has set aside 10 million yuan RMB in special funds to take the lead in setting up a Cereal and Coarse Cereal Nutrition Food Research Fund. Ye Zhengming, CEO of Hui’er kang Group, has also revealed that the company will introduce post-doctoral positions and establish a green ecology food research institute within three years (5).

Mainstreaming Natural and Nutritional Convenience Foods. As the living standards of Chinese consumers improve and they search for products that will aid them in improving their health, more and more emphasis is being placed on nutritional properties when buying convenience foods. Hence, manufacturers must increase their R&D efforts to develop nutritious convenience foods to meet increasing consumer demands. To meet the specific needs of individual consumers, appropriate vitamins, minerals, etc. are being added to convenience foods to enhance their nutritional value. Manufacturers are developing convenience and snack foods that are low in calories and sugar and rich in iodine and dietary fiber, as well as natural fruit and vegetable beverages without added colorants and sugar. In addition, development of instant noodles should change to focus on nutrition; bowl-packaged noodles and fresh noodles will become a new growth point (1).

Developing Staple Convenience Foods. Given the quick pace of modern life and generally smaller family sizes, it is highly desirable that people spend less time preparing meals. Staple convenience foods could usher in a new round of development. Potential product trends include more delicate food processing, such as mung and ormosia rice porridge mixes, quick-cooking rice, self-rising flour, crispy coating mixes for fried chicken, and mixes for specialized products such as twisted dough-strips, etc. (1).

Guidelines for a Diverse Grain-based Diet. To incorporate traditional components of the Chinese diet into modern dietary requirements, great emphasis should be placed on developing diets that include multigrains, whole-grains, nutritious grains, and products containing combined ingredients, such as grains, beans, and tubers or grains, vegetables, and fruits.

The development of grain-based diets internationally has also diversified. Kentucky Fried Chicken (KFC) has initiated a new fast-food campaign that advocates staple food combinations of grains, vegetables, and fruits. Chinese enterprises have begun exploring multigrain diet options. Many food companies have developed nutritious meals and mixes in combination with various high-fiber cereal ingredients. In addition, “7+1” wheat flour fortification is gradually advancing.

Recently, international fast-food giant KFC claimed to break with traditional Western fast-food products. It is increasing the proportion of nonfried products it sells and is guiding consumers toward more balanced nutrition. It is also researching and developing products to meet Chinese consumer preferences. At the same time, the joint venture of General Mills and Nestle, Cereal Partners Worldwide, has begun adding fruits to grain-based foods to improve taste and reduce the use of salt and sugar.

Since ancient times Chinese diets have contained a combination of staple and supplementary foods, such as traditional Chinese baozi, jiaozi, and fried dumplings. The prevalence of cereal products in traditional Chinese diets can be used to help develop new nutritious cereal products that will become a popular part of a balanced diet (1).

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References


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