China began its 10th “five-year plan” in 2001. As part of the country’s ongoing scientific approach to development, the plan included a number of initiatives aimed at improving the quality and distribution of food in China, most of which were highly successful. By 2005, when the country finished the plan, the gross output (product value) of the food industry had reached $287 billion, a 97.2% increase since 2000 and an average annual increase of 19.4%. The industrial added value of the food industry was $89 billion, which represented an 87.8% increase since 2000 and an average annual increase of 17.6% during the 10th five-year plan. Total food sales income had reached $282 billion, which represented a 101.3% increase since 2000 and an annual increase of 20.3% during the 10th five-year plan. Total pretax profits had climbed to $48 billion, a 91.9% since 2000 and an annual increase of 11.4% during the five-year period.

**Substantial Increases of Food Yields**

By the end of the 10th five-year period, the overall product structure of the food industry was much better aligned with consumer demand. The main yields increased significantly, with wheat flour yields rising to 39.22 million tons, a 42.2% increase, and edible plant oil rising to 16.12 million tons, a 92.6% increase, since 2000. By the end of the plan, the total yield of top-grade rice and standard first grade rice accounted for more than 92% of the total rice yield, which represented a 7% increase compared to 2000. The yield of top-second or above-grade refined wheat flour accounted for 75% of the total flour yield, which represented a 5% increase since 2000. The ratio of whole refined edible vegetable oil to the total amount of edible vegetable oil increased from 30% in 2000 to more than 60% in 2005.

As part of this growth, industry-specific areas were created to help focus on specific agricultural products. The idea was that by clustering these enterprises, the industries would experience increased growth and development. For example, a special, superior wheat processing zone was created in Huang-Huai-Hai. A corn and soybean processing zone was generated in northeast China and in eastern Inner-Mongolia and an advanced rape seed processing area was developed along the Yangtze River Basin.

The 10th five-year plan also made significant effort to develop China’s food science and processing equipment technology, with specific focus on the key technologies and processing equipment for rice, wheat, corn, and soybean. Some examples of the type of technical problems that have been overcome include processing with membrane separation, physical properties modification, cold-aseptic filling, and cold processing. Several new products with great market potential were developed as a result of these technologies, such as soybean protein isolate and modified corn starch. The newly developed, high-tech food processing equipment include a beer filling and packing production line capable of handling 48,000 bottles per hour, an instant noodle production line that can produce 180,000 packs per day, industrial robots, and a stretch-blow molding machine with double cylinder, multi-layer co-extrusion. In short, China has closed the gap between their food processing technology and equipment and that of the western world.

**Present Problems of the Food Industry in China**

There are rich food resources in China. The yields of cereal, rape seed, vegetables, fruits, meat, and aquatic products rank first in the world; however, the extent of value-added transformation and food processing from these products is relatively low. The ratio of domestically processed food to consumed food is currently only 30%, while such a ratio in developed countries such as the European Union, the United States, and Japan is as high as 90%. As far as production goes, the rate of the total output value of the Chinese food industry to the total output value of the agricultural industry is only 0.5:1, while such a rate in developed countries is as high as 2.0–3.7:1.

Another issue has to do with the lack of specialized processing facilities. Simple processing products have dominated in the domestic food industry. For example, the available corn processing products are mainly starch, alcohol, wine, and feed. There are not very many specialized products, such as polyols and modified starch. The main soybean processing products are also simple products, such as oil and meal, while there are very few specialized products, such as lecithin and isoflavone.

One more problem affecting the Chinese food industry is the high number of small scale businesses. For example, only 1% of the rice processing facilities can produce more than 400 tons per day. The capacity of most rape seed processing enterprises is less than 100,000 tons per year and the average daily crushing capacity of a Chinese sugar cane factory is only 2,500 tons. The fact that there are so many smaller facilities means that it is harder to implement change and new initiatives. To put this in perspective, one can compare the Chinese pork industry with that found in the western world. The percentage of the processing capacity represented by the top four largest businesses in the Chinese pork industry account for less than 10% of the industry, while in the United States, the top four largest businesses account for 50% of the industry. In the Netherlands, the top three enterprises account for 74% of the industry. These same trends hold true for the grain food industry as well.
Food safety has also received a lot of attention in China. There is a great distance between the current level of food safety and the consumers’ expectations. Security and safety accidents have happened, and the public sense of food sanitation and security has suffered.

One of the factors of food safety has to do with the stability, reliability, and security of the processing equipment. Right now the average unit’s energy consumption is high and its reliability is low. There is not enough research going into this industry and, consequently, the rate of independent innovation is relatively low. Numerous industrial food techniques and industries have not been developed, such as isolation and physical properties modification, nonthermal sterilization, multiple stage concentration and drying, continuous frozen drying equipment, and monomer frozen equipment at cryogenic temperature.

**The Objectives of the Food Processing Industry during the 11th Five-Year Plan**

The first goal of the food processing industry is to continuously and rapidly increase the scale and profit of the industry. The gross output is expected to increase from $287 billion in 2005 to $577 billion in 2010, representing an annual average increase of 15%. Total pretax profits are expected to increase from $48 billion in 2005 to $95 billion in 2010, with an annual average increase of 15%. The ratio of the output value of the food industry to that of agriculture will increase from 0.5:1 in 2005 to 0.8:1 in 2010.

Second, it is obvious that the level of specialized processing and comprehensive utilization needs to be improved. By 2010 it is expected that processed food will account for 40% or more of the consumer diet. The ratio of the output value of the food processing industry and the food manufacturing industry will be increased up to 70% or more. In this case, food processing is used to refer to cereal milling, feed processing, plant oil processing, sugar refining, slaughtering and meat processing, and the like, while food manufacturing refers to baked goods, candy, chocolate and preserved fruits, and instant and canned foods. The comprehensive utilization rate of cereal and edible vegetable oil by-products will be enhanced dramatically.

Third, the nutritional intake of the public is expected to improve significantly. The general public is expected to consume what is considered a “well-off” or “more affluent” food intake, representing higher levels of dietary nutrition. The daily average energy intake of a person will reach 2,300 calories, including 75 g protein and 70 g fat. Broken down by region, the daily average energy intake of an urban resident will reach 2,250 calories, including 75 g protein and 80 g fat; and that of a rural resident will reach 2,320 calories, including 75 g protein and 65 g fat.

Fourth, the food industry will continue to focus on sustainability. The energy consumption per unit of food output will decrease by 20%, water consumption per unit of industrial value added food will decrease by 30%, the comprehensive utilization rate of industrial solid waste will reach up to 80% or more, and the total emission of main pollutants will decrease by 10%.

**Development of the Cereal Processing Industry**

During the 10th five-year plan, the cereal processing industry achieved considerable growth. There were 8,700 large-scale cereal processing enterprises in 2005 representing $45 billion in industrial output. The cereal processing techniques and equipment were improved significantly and the creation of primary industrial distribution centers led to obvious advantages. For example, rice milling was centralized in the Hubei and Jiangxi provinces, in the central south of China, wheat processing was focused in the Henan and Shandong provinces, in central east China, and edible plant oil processing was concentrated in the Jiangsu and Shandong provinces, southeast China. Plans for the 11th five-year plan include the improvement or elimination of small scale, excess rough processing facilities, an increase in specialized processing products, and the overall streamlining and improvement of cereal processing techniques and equipment.

**Development of the Edible Plant Oil Processing Industry**

China is a big country with significant edible plant oil production and consumption. Total production of edible plant oil has reached 16.12 million tons, and there are plenty of varieties. Gradually, the technical gap between China and advanced countries has been shortened. However, there are obvious contradictions in the Chinese edible plant oil processing industry, such as excess production in some areas, low levels of comprehensive oil seed utilization, and unequal regional distribution. An example of this can be seen in the fact that more than 50% of the raw material used to create soybean oil comes from international sources. As far as regional distribution goes, 70% of the country’s processing capacity is located in the southeast coastal area of China.

Looking ahead, for the purposes of controlling the total amount of processed oils, the current edible oil processing resources need to be integrated; the industrial structure and regional distribution should be adjusted. Edible oils, such as peanut oil, soybean oil, rape seed oil, and cottonseed oil, need to be steadily developed. The development of some specialty edible oils, such
as camellia oil, safflower oil, olive oil, rice bran oil, and germ oil, also needs to be accelerated. The proportion of refined oil and specialty oil will be increased; the comprehensive utilization extent of oil seeds will be increased too. By-products such as oilseed protein and bioactive materials need to be developed. In addition, the country needs to promote further industrialization of traditional soybean products and development of new soybean processing industries.

By the end of 2010, edible oil production capacity will reach more than 25 million tons. The proportion of refined edible oil will increase up to 70%. The number of oil processing enterprises capable of producing more than 300 tons per day will increase from 20% to 45%. As a result, the consumption ratio of first class and second class oil in rural areas will be gradually increased.

Tao Feng earned his doctorate in cereal, oil, and plant protein sciences from Jiangnan University. He has a master’s degree in food science and engineering from Tianjin University of Science and Technology. His professional specialties are the isolation and purification of natural products; chromatography methods; food properties, such as the rheology of solid or semi-solid food and thermal properties of macromolecular foods; and antioxidation activity and scavenging radicals in natural products. Feng can be reached at ft422@sina.com.