

# Study on Supply-Demand Dynamics and Prospects of Maize and Soybean in China

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**Abstract.** Maize and soybean are important grain and oil crops in China. Being the first grain crop in China, maize is important feed and raw materials for industrial uses, while soybean constitutes the major raw materials for animal protein feed. Hence, both are essential and strategic agricultural products related to people's livelihood worldwide. This paper mainly analyzed the changes in production, consumption, trade and price of maize and soybean in China, and applied the CAMES model to predict the trends in maize and soybean production, consumption, trade and price in the next decade (2024-2033) based on certain hypotheses of economic and social conditions and agricultural production conditions. According to the study, supply and demand of maize in China will witness regional balance in the foreseeable future, when maize imports will constantly decrease and the maize self-sufficiency rate will exceed 97%. In the meantime, imported soybeans will still be the major source for domestic feed use, with Brazil and the United States as the major importers. Despite the high imports, the self-sufficiency rate of soybean in China will keep rising and soybean imports will decrease due to the decline in feed processing and the increase in domestic soybean production capacity. In addition, this study also introduced the domestic and international uncertainties facing the supply and demand of maize and soybean in China in the future.

**Keywords:** Maize and soybean; Production; Consumption; Trade; Price

## 1. Introduction

Food security is the foundation of economic development, social stability and national independence, as well as a major strategic issue of international significance.[1-2] The Central Committee of the Party and the State Council have always emphasized this issue. Since the founding of New China, the Chinese government has always been prioritizing agriculture in the development of the national economy and making every effort to promote grain production, and has basically solved the food problem for the people. [3-4] Significant progress has been made in agriculture and food production since the Reform and Opening Up.[5] In 2023, the acreage sown in grain crops reached 1.785 billion mu (mu, a traditional Chinese area unit) (equal to 119 million hectares), and the total grain output in China hit 695 million tons, having stabilized at 650 million tons above for 9 consecutive years. [6] The government has set different self-sufficiency goals for different agricultural products. In terms of animal-derived foods, the self-sufficiency rate of which is high now and may face downward pressure in the future, the government has proposed an explicit goal, i.e. around 95% for pork, about 85% for beef and mutton, above 70% for milk source and basically 100% for poultry meet and eggs.[7]

The rise in the self-sufficiency rate of livestock products brings about the expanding feed grain demand as well as the declining self-sufficiency of soybean and maize. Therefore, importance shall be attached to the balance between the imports of animal-derived foods and the imports of feed grain. Since the use of maize has changed and it is now mainly applied as feed, the goals of maize and soybean self-sufficiency shall be reviewed.[8]

Maize is the first grain crop in China, the important feed and raw materials for industrial uses, as well as the important raw materials for medicine and new energy in China in recent years. Maize has been the fastest-growing grain crop in production in the past decade, with its growing area, per unit area yield and total output developing at a much higher rate than that of other crops. Hence, it plays a significant role in China's national economy.[9-14] As one of the important plant protein resources and plant-based oil crops, soybean shows significant influence on edible oil and feed and is therefore an important oil crop and grain crop. [15-16] In the meantime, soybean is also the agricultural product exposed to the most prominent supply-demand contradiction. Its import dependence has remained above 80%, and, more seriously, 95% have been imported from American countries such as Brazil and the United States, further intensifying the risk.[17] In the context of the increasingly intense international relations, it is essential to guarantee China's import channels of maize and soybean and safeguard food security. Therefore, we urgently need to strengthen the simulation, prediction and analysis of the supply-demand pattern centering on the current supply-demand situation and future trends of maize and soybean in China.

## **2. Study on Current Supply and Demand of Maize and Soybean in China**

### **2.1 Increase in Output**

In 2023, the government adjusted and optimized the maize planting structure. In addition to the stable planting area, as driven by deepening reform, technology development and technology integration, maize output has been boosted by the rising yield per unit area. As to the planting area, in view of the good returns and smooth sales of maize in the previous year, farmers were enthusiastic about maize planting in 2023. The national planting area reached 663.28 million mu (44.22 million hectares), having expanded by 2.7% compared to the previous year. Regarding the per unit area yield, despite the low temperature and moist soil in some places in the northeast producing region during the spring sowing, the unit weight of maize was higher than that in previous years due to fast-rising temperature in the later stage, appropriate soil moisture content in most areas and good heat conditions. In addition, as boosted by the popularization of improved varieties and increasing agricultural machinery, the per unit area yield has seen a stable rise. The average per unit area yield was 435.5 kg/mu (6,532 kg/hectare), showing an increase by 1.5% year on year; and the output was 289 million tons, having grown by 4.2% (Figure 1).

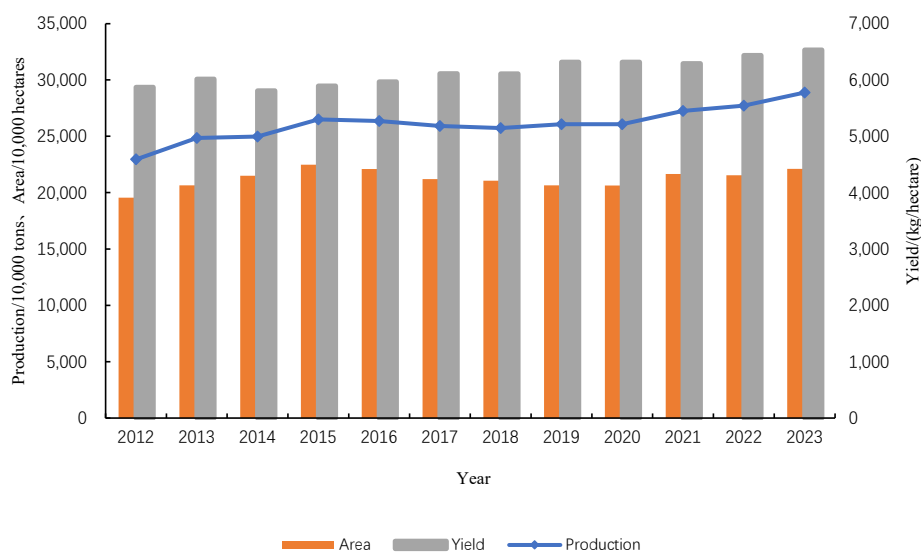


Figure 1 Corn planting area, yield and total output from 2012 to 2023  
(Data source: National Bureau of Statistics)

In 2023, the No. 1 central document for the year expressly proposed to “expand the production of soybean as oil crops”. Relevant departments introduced a series of policies to stimulate production, and pointed out “expanding the production of soybean as oil crops and improving per unit area yield and quality”. In this background, the output, planting area and per unit area yield of soybean hit an all-time high. The soybean output in China reached 20.84 million tons, showing an year-on-year increase of 2.8%, having exceeded 20 million tons for two consecutive years (Figure 2). To expand the planting area, the government further increased the subsidies for soybean producers in 2023, widened the gap between maize and soybean subsidies and strengthened the financial credit support. Moreover, the government also promoted the strip-based compound planting of soybean and maize, guided new agricultural operators to plant soybean and rewarded the major soybean-producing counties. Depending on these efforts, the national soybean planting area had increased by 3.451 million mu or 2.2% to 157 million mu (10.47 million hectares), having exceeded 150 million mu (10 million hectares) for two consecutive years. The year of 2023 was the first year of the large-area soybean yield improvement action. Centering on the “improved variety, method, opportunity, mechanism and farmland”, China made continuous efforts to overcome the weaknesses that restricted the improvement of the per unit area yield of soybean, and had achieved significant results. Though some areas in the Northeast and North China suffered from floods during the growth of soybeans, most producing areas in China met good light, temperature and water conditions, and the whole meteorological condition favored the growth and production of soybean. In 2023, the average per unit area yield of soybean was 132.7 kg/mu, 0.5% uptick year on year. The soybean protein granules in the market were bigger compared to previous years and the protein content was also higher on average.

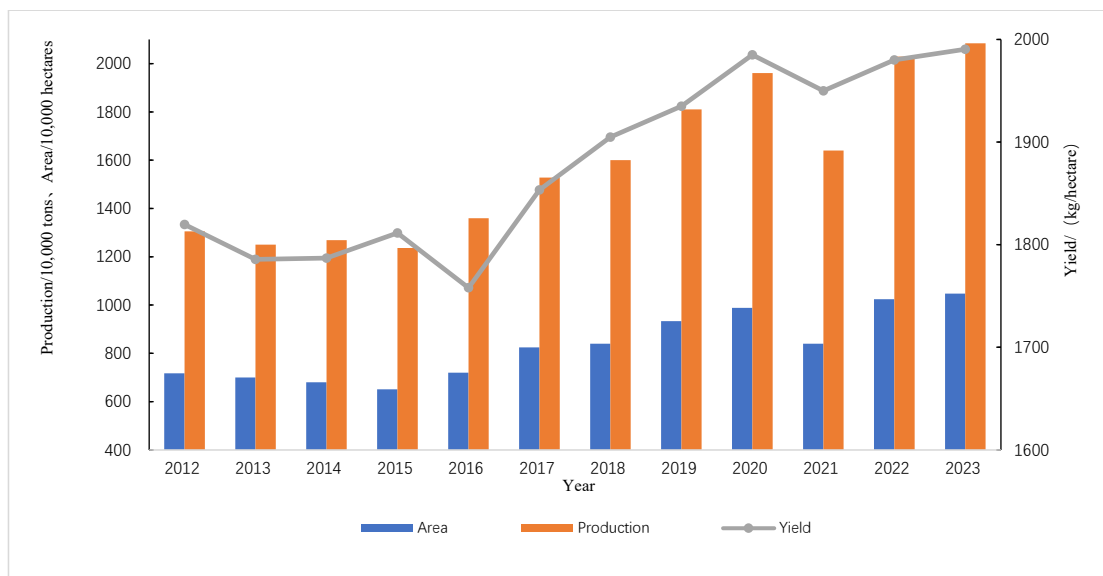


Figure 2 Soybean planting area, yield and total output from 2012 to 2023  
(Data source: National Bureau of Statistics)

## 2.2 Rise in Consumption

Maize in China is mainly applied to feed and industrial consumption, but less frequently used as food and seed. In 2023, feed consumption and deep-processing consumption of maize had been stable-to-rising, driving the steady growth of maize consumption. Consumption of the year amounted to 296 million tons, having increased by 2.9% compared to the previous year. The steady development of the breeding industry also bolstered the feed consumption of maize. According to the National Bureau of Statistics, the pork, beef, mutton and poultry meat output in 2023 had climbed by 4.5% to 96.41 million tons, and egg and milk output also grew to varying degrees. In this context, the feed consumption of maize was 193 million tons, showing a 4.3% increase year on year. With the slower increase in the production capacity of maize deep processing and the operating rates fluctuating from low to high, the industrial consumption of maize was 81.2 million tons, 0.2% up compared to the previous year. Maize was also increasingly favored by urban consumers as coarse food, so its food consumption trended flat to up and amounted to 9.9 million tons. As driven by the expanding sown area and the popularization of the rational close planting technology, seed consumption of maize also showed an uptick by 2.0% and reached 2.03 million tons. The losses also decreased by 9.77 million tons based on the development of storage and transportation skills.

In 2023, national soybean consumption had increased by 2.21 million tons, or 2.0%, to 111 million tons. Among the whole consumption, 84.7% of soybeans were mainly used for oil extraction, 11.9% for food and 3.3% for seed consumption, extrusion processing, losses and other uses. In 2023, as the amount of pigs on hand remained above a normal value, feed consumption increased and further stimulated the demand for protein meal. However, seeing the constant decline in returns from pig breeding, the Ministry of Agriculture and Rural Affairs started reducing and replacing soybean meal as feed and vigorously promoted the use of low-protein diet, having fully explored the protein-feed resources in China and continuously reduced the consumption of feed grain such as soybean meal. The soybeans used for oil extraction amounted to 93.8 million tons, 2.2% higher than the previous year. As to food consumption, China is the largest producer and consumer of bean products, characterized by a large consumer base and rigid consumption growth. However, considering the low price of other agricultural products and increasing alternatives in 2023, consumption of bean products recovered more slowly than expected. Consumption of soybeans in the whole year reached 13.2 million tons, having risen by 1.5% compared to the previous year. Seed consumption of soybean in this year was 860 thousand tons, 2.4% higher than 2022. The extrusion processing consumption and losses of soybean amounted to 2.9 million tons, being flat compared to the previous year.

### 2.3 Growth in Imports

As influenced by the expected increase in maize output and stronger US dollars, the international price of maize in 2023 presented a significant fall. In addition, the high demand for imports and the temporary increase in import quota further boosted the imports. In 2023, imports of maize had surged by 31.6% to 27.13 million tons, and exports of maize were 7.5 thousand tons, suggesting that the net imports of maize were 27.12 million tons, showing a 31.5% growth year on year. Before 2023, imports were mainly from the United States and Ukraine. However, the new import channels had been explored in 2023. In particular, the maize imports from Brazil had sharply grown, and accounted for 47.2% of total imports. In the meantime, the imports from the United States and Ukraine had respectively dropped by 45.8% and 5.2% to 26.3% and 20.3% (Figure 3).

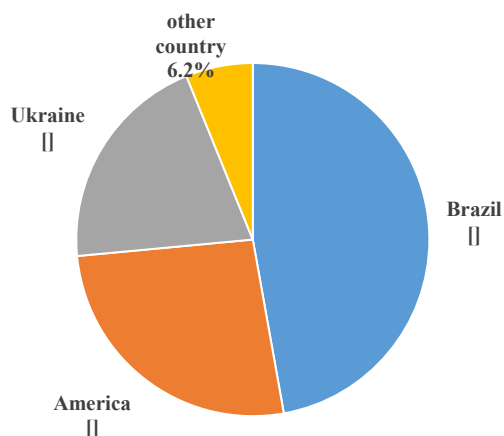


Figure 3 Sources of China's corn imports

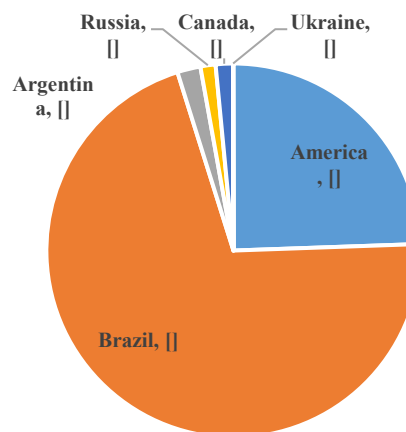


Figure 4 Sources of China's soybean imports

(Data source: General Administration of Customs)

Due to the increasing demand for oil extraction of soybean in China and the high price of soybean meal, China's soybean imports had revived in 2023, but failed to reach its record high of 100 million tons. According to the General Administration of Customs, China's soybean imports in 2023 were 99.41 million tons, having grown by 10.19 million tons, up 11.4% (Figure 4), while the import value reached 59.76 billion US dollars, up 4.8% year on year. In the meantime, the imports of genetically modified soybean were 97.71 million tons, accounting for 98.3%. Regarding the source of imports, China mainly imported soybeans from Brazil (69.95 million tons), the United States (24.17 million tons), Argentina (1.99 million tons), Canada (1.47 million tons), Russia (1.29 million tons) and Ukraine (49 thousand tons) in 2023. Among them, the imports from Brazil accounted for 70.4% of total imports, compared to 61% in the previous year, and the imports from the United States dropped from 31.2% to 24.3%.

### 2.4 Decline in Price

In 2023, the average wholesale prices of maize in the producing areas and sales areas were RMB 2.71 and 2.89 per kg, which stabilized and fell by 1.2% respectively compared to the previous year. After the Chinese New Year, the operating rates of maize deep-processing enterprises maintained high. Some producers increased their inventories, and trading enterprises became enthusiastic about stockpiling. Hence, sales were promoted and market price was stable.

In 2023, both the prices of soybean in the producing areas and sales areas gradually declined. The soybean price in Heilongjiang producing area was RMB 5.16/kg for the whole year, 14.6% lower year on year. The monthly price of soybean in producing areas had dropped by more than 10% compared to the same month of the previous year. The soybean price in Shandong sales area was

RMB 5.82/kg for the whole year, having plummeted by 10%. The monthly price of soybean in sales areas had declined by over 6% compared to the same month of the previous year.

### **3. Study on Future Trends of Maize and Soybean Production, Consumption and Imports in China in the Next Decade**

#### **3.1 Introduction to the Predictive Model**

This study applies the China Agricultural Monitoring and Early-warning System (CAMES) developed by the Agricultural Information Institute of CAAS. [18] Combining technologies such as data mining, artificial intelligence, statistical analysis and neural network and using knowledge of multiple disciplines including economics, agronomy, meteorology and computer science, CAMES achieves the integration of the biological mechanism and the economic mechanism based on the principles of correlation, unity and balance. With multiple functions such as monitoring, analysis, simulation, early warning and prospects, it is a large cluster system covering multi-variety and multi-market models.[19] Based on certain hypotheses of economic and social conditions (domestic and international economic development and population changes, urbanization level in China, urban and rural residents' income and consumption, the exchange rate of RMB, international crude oil price, etc.) and agricultural production conditions (employment in the primary industry, cultivated land resources, water resources, technological advancement, policy changes, etc.), CAMES presents prospects for production, consumption, trade and price of 20 kinds (varieties) of major agricultural products in China. The projections also consider the influence of the change in population structure and the enhanced health awareness on residents' dietary structure and consumption structure, the conversion between animal products and feed grains, the complementary or substitutive relations among agricultural products and the impacts of the agricultural policies of international organizations, regions, the world and other countries on China's agricultural product market through monetary policy, international trade, exchange rates, prices and other channels. These hypotheses are exogenous variables of the model, which are essential to the projections.

The model's hypotheses for the next decade are as follows: The global economy will maintain a low or medium growth rate in the medium and long term, with an annual growth rate of 2.6%. The Chinese economy will continue to recover and develop steadily, with an annual GDP growth of 4.8%. While the growth of world population will slow down, China's population will maintain a long-term downward trend, decreasing by 1.3‰ each year on average. China's urbanization rate will continue to rise, and the urbanization rate of the Chinese population and the urbanization rate of registered residents will climb to 72.5% and 56.7% respectively. The income of Chinese residents will maintain a rapid growth, with the increase in rural residents' income faster than that in urban residents' income. The per capital disposable income of urban and rural residents will grow at an annual rate of 4.8% and 7.3% on average. The Chinese residents' consumption price will fluctuate slightly, up 2.0% to 2.4%. The international crude oil price will fluctuate at highs in the short term, but will stabilize and decline in the long run. The average exchange rate between USD and RMB (middle price) is 1: 6.4-7.0, and the appreciation of RMB can be predicted. The employed population in the primary industry in China will slip by around 4% per year on average, while the quality of labor force will continue to improve. In the meantime, China will adhere to the red line of cultivated land to guarantee the quantity and quality increase of cultivated land. The area of water-saving irrigation in China will constantly expand, and water use in agriculture will be more refined. The contribution rate of scientific and technological progress in China's agriculture will attain 69%, while the comprehensive mechanization rate in crop cultivation and harvest will exceed 80%. The agricultural policy in China will also continue to support the construction of China into an agricultural power.[20]

#### **3.2 Prospects for Production**

For maize, the No. 1 central document for 2024 proposed "stabilizing the sowing acreage of the crop". Considering that maize shows production advantages in the main producing regions and the land

circulation cost is expected to decline in the market system, farmers may be more enthusiastic about maize growing. The planting area is expected to gain by 1.0% compared to the previous year to 670 million mu (44.67 million hectares) in 2024, and will be 663.66 million mu (44.24 million hectares) by 2033, with an annual growth rate of 0.2%. The No. 1 central document for 2024 also pointed out “implementing the program of grain yield improvement and integrating and promoting improved farmland, variety, mechanism and method.” Depending on the constant improvement of agricultural infrastructure, the per unit area yield will reach 441 kg/mu (6,617 kg/hectare) in 2024, 1.3% up year on year, and will be 486 kg/mu (7,290 kg/hectare) by 2033, showing an annual growth rate of 1.3%. With the increase in the planting area and per unit area yield, maize output will gradually swell, which will reach 296 million tons by 2024, 2.93% higher than that in the previous year, and 323 million tons by 2033, showing an annual growth rate of 1.4% (Figure 5).

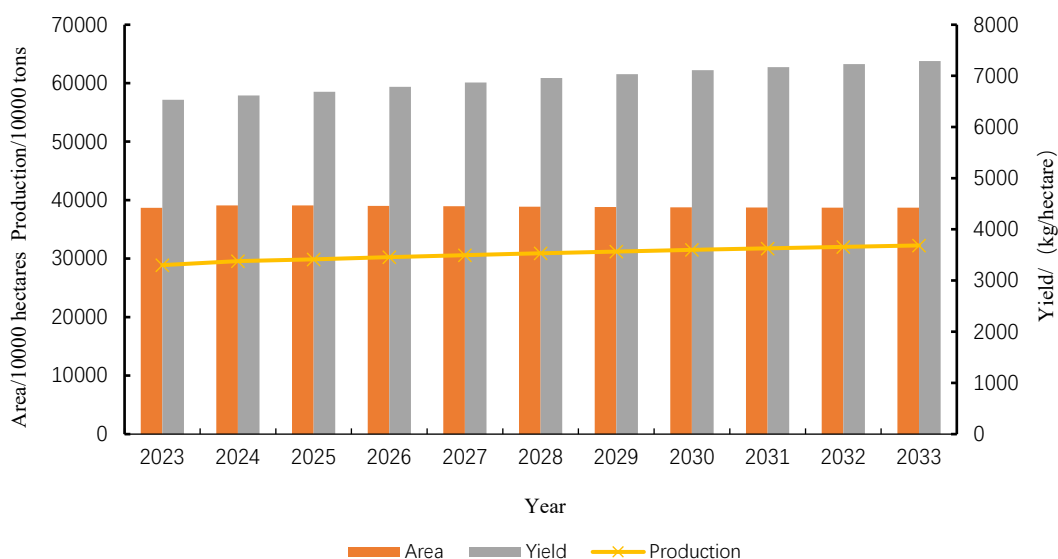


Figure 5 Corn planting area, yield and total output from 2023 to 2033

(Data source: 2024-2033 data from the prediction of the CAMES model developed by the Agricultural Information Institute of CAAS)

As to soybean, the No. 1 central document for 2024 indicated “consolidating the achievements in the expansion of soybean plantation and supporting the development of high-oil high-yield varieties”. It is predicted that the sown area of soybean in 2024 will be 156.44 million mu (10.43 million hectares), basically fair to that in the previous year. In the later stage of the outlook period, the producing area of soybean will trend flat to up, seeing the implementation of the government’s program of soybean and oil production capacity improvement. The sown area is expected to reach 184.47 million mu (12.3 million hectares) by 2033, with an annual growth rate of 2.4%. The year of 2024 is the second year of the initiative of large-scale increase in soybean yield, when the focus will be still placed on the “improved variety, method, opportunity, mechanism and farmland”, socialized services for agricultural production and other key links. In 2024, the per unit area yield of soybean is expected to be 138 kg/mu (2,070 kg/hectare), up 4.0% year on year. During the outlook period, seeing the popularization of high-yield high-oil varieties, integration and promotion of high-yield high-efficiency technologies and the improvement of agricultural mechanization, China’s per unit area yield of soybean will usher in a sharp growth. It is predicted that the yield will be 193 kg/mu (2,901 kg/hectare) by 2033, showing an annual growth rate of 3.9%. The total soybean output in 2024 is estimated to be 21.59 million tons, 750 thousand tons or 3.6% increase compared to the previous year, and will reach 35.68 million tons by 2033, achieving an annual growth rate of 6.4% (Figure 6).

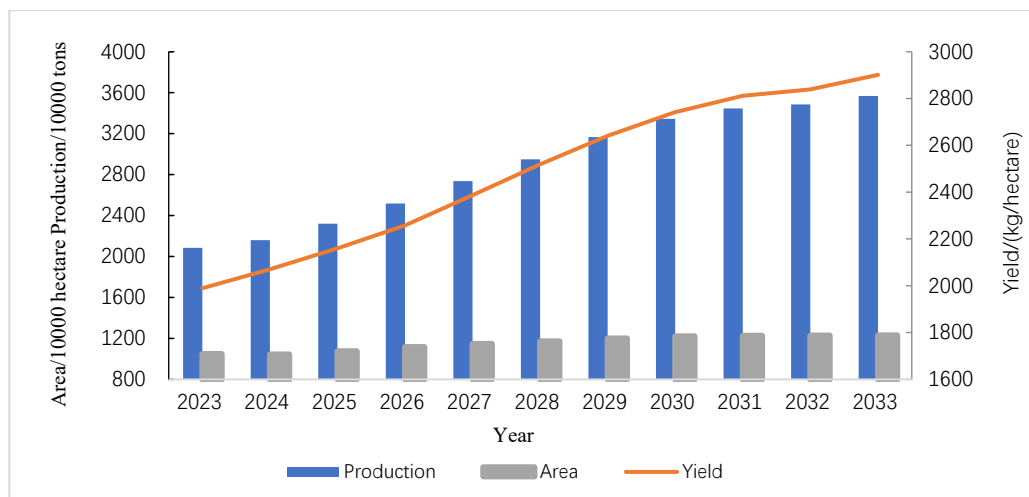


Figure 6 Soybean planting area, yield and total output from 2023 to 2033

(Data source: 2024-2033 data from the prediction of the CAMES model developed by the Agricultural Information Institute of CAAS)

### 3.3 Prospects for Consumption

Total maize consumption will be stable-to-rising, which is estimated to climb by 0.5% to 297 million tons in 2024 and grow to 321 million tons by 2033, with an annual growth rate of 1.1%. Regarding the feed consumption of maize, the amount of pigs on hand in 2024 will decrease, resulting in the slight decline in the consumption of pig feed for the whole year. However, output of poultry meat, beef and mutton will maintain a stable rise, and the wheat and rice feed used as substitution will reduce. Hence, it is anticipated that the feed consumption of maize in 2024 will be 192 million tons, slightly lower than that in the previous year, and reach 196 million tons by 2033, showing an annual growth rate of 0.75%. As to the industrial consumption of maize, with the improvement in deep processing enterprises' returns, the average operating rates in 2024 are expected to rise in 2024, which will drive the continuous growth in the industrial consumption of maize. It is projected that the deep processing consumption of maize in 2024 will reach 83.63 million tons, 3.0% up the previous year. In the medium and long run, the concentration ratio of the maize deep processing industry will further improve, and the pattern will be optimized. As affected by the recovery and growth of downstream demand and consumption upgrade, the market demand for the personalized, scene-based and differentiated maize products will expand, and the high-end functional food additives products will prevail in the market. In this context, the overall deep processing consumption of maize will witness a steady growth, which is predicted to be 101 million tons by 2033, achieving an annual growth rate of 2.3%. In terms of food consumption, urban residents' concept of healthy consumption will be enhanced as living standards improve. Hence, the consumption of coarse grains will steadily rise. The food consumption of maize will trend flat to up, but the total amount will still be small. It is anticipated that the food consumption of maize will be 10.1 million tons in 2024, 2.0% up compared to the previous year, and reach 12.37 million tons in 2033, showing an annual growth rate of 2.4%. For seed consumption, the seed used in per unit area will be stable-to-declining with the popularization and application of advanced technologies such as precision seeding. Therefore, seed consumption of maize will shed by 0.2% year on year to 2.03 million tons in 2024, and further drop to around 2 million tons in 2033 (Figure 7).



Figure 7: Corn Consumption and Consumption Structure in China from 2023 to 2033  
(Data source: 2024-2033 data from the prediction of the CAMES model developed by the Agricultural Information Institute of CAAS)

Total soybean consumption will trend flat to down, which is estimated to be 111 million tons in 2024, 0.1% down year on year, and be 113 million tons in 2033, suggesting an annual growth rate of 0.3%. The soybean consumption for oil extraction will be affected by the decreasing population and aging of the population structure. Since residents' pork consumption will be stable-to-decreasing and the initiative of reducing and replacing soybean meal as feed is implemented, the soybean meal use as feed in pig breeding will constantly decline. However, the large-scale livestock and poultry breeding and aquaculture and the processing of soybean protein products of high added value will boost the demand for soybean meal, thus restricting the reduction of soybean meal consumption. It is estimated that the soybean consumption for oil extraction will be 93.19 million tons in 2024, 0.7% lower than that in the previous year. As affected by the rewards and subsidies for domestic soybean processing, the soybean consumption for oil extraction will grow in the future, and will be 91.3 million tons in 2033, showing an annual decrease rate of 1.2%, which stands in sharp contrast to the growth rate of 2.5% in the previous decade. In terms of food consumption, with the increasingly enhanced health awareness of residents, the concept of "reducing oil consumption and increasing soybean consumption" will be widely accepted. Hence, the proportion of soybean products in food consumption will continue to rise, and may support the stable growth of the soybean product consumption. The food consumption and food processing consumption of soybean in 2024 is expected to climb by 2.5% year on year to 13.53 million tons, and will reach 16.99 million tons in 2033, with an annual growth rate of 2.6%. In addition, with the increasing sown area, the soybean consumption as seeds will constantly increase, but the technological improvement in seeding and the improved soybean varieties have increased the seeding efficiency per unit area. It is anticipated that the seed consumption of soybean will be 870 thousand tons in 2024 and 970 thousand tons in 2033. Regarding the losses and other consumption, depending on the constant technological improvement in storage, processing and other links, other consumption such as extrusion processing consumption and losses will be stable-to-rising, which is estimated to be 3.02 million tons in 2024 and 4.03 million tons in 2033 (Figure 8).

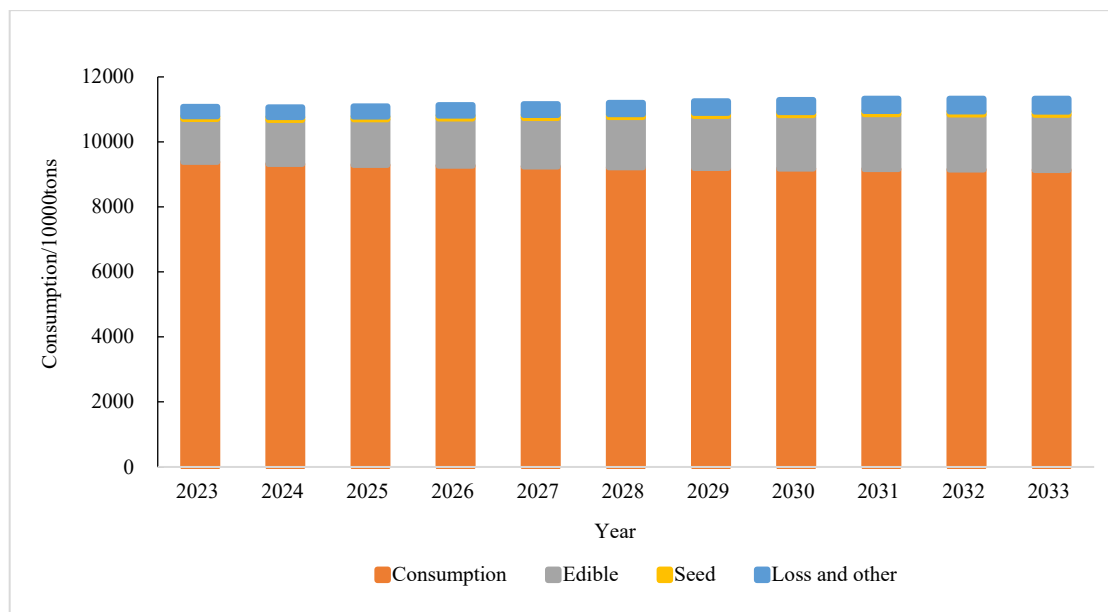


Figure 8 Corn Consumption and Consumption Structure in China from 2023 to 2033

(Data source: 2024-2033 data from the prediction of the CAMES model developed by the Agricultural Information Institute of CAAS)

### 3.4 Prospects for Trade

Maize imports will present a downward trend, and the structure of importers will be further optimized. In 2024, maize imports will plunge by 37.3% compared to the previous year to 17 million tons. During the outlook period, maize production and demand will become more balanced in China, indicating the continuous decline in imports. By 2033, maize imports will be 6.8 million tons, with the self-sufficiency rate of maize exceeding 97%. In terms of exports, along with the optimization of the maize planting structure, the special, high-quality and characteristic maize production will further upgrade China's competitiveness in maize exports. In particular, China's maize exports still see some potential in its neighboring countries and regions.

Soybean imports will fall from highs. During the outlook period, imported soybean will still constitute the major source of feed consumption of soybean in China, and Brazil and the United States will still be the major importers. The total imports will remain high. However, considering the decreasing feed processing consumption of soybean in China, increasing soybean production capacity and improving self-sufficiency rate of soybean, imports will decline. It is projected that soybean imports will be 91.72 million tons in 2024, 7.7% lower than the previous year, and be 78.69 million tons in 2033, with an annual decrease rate of 1.9%. In 2033, the self-sufficiency of soybean will exceed 30%. Japan, South Korean, Southeast Asia and some other countries and regions will raise their demand for high-protein soybean in China, which will boost the exports of China's soybean.

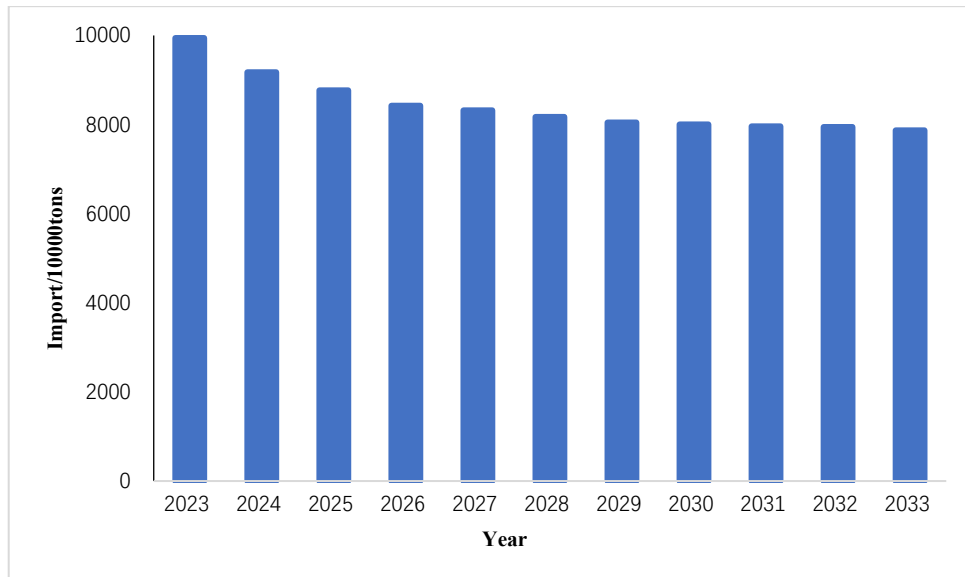


Figure 9 China's soybean import volume from 2023 to 2033

(Data source: 2024-2033 data from the prediction of the CAMES model developed by the Agricultural Information Institute of CAAS)

### 3.5 Prospects for Price

Maize price is predicted to be stable in 2024. In the short term, maize price will be exposed to the influence of both bullish and bearish factors. On one hand, with the declining maize price in the early stage, the operating rates of deep processing enterprises will rise. As total consumption will trend flat to up, the gap between maize production and demand will remain. On the other hand, overall supply of maize in China will be abundant, while the sales in the Northeast area will slow down. In the medium and long run, the cost of labor, land and the means of production incurred in maize production will inevitably increase, which will push up the market price of maize.

In 2024, soybean price is anticipated to fluctuate downward. In the short term, due to the high output of soybean in China, increase in soybean imports and abundant soybean for storage and alternation, demanding subjects are sensitive to price and they can purchase when they need. Also, since domestic soybean output is expected to continue to increase, the rise in soybean price will be inhibited. However, considering the high cost of soybean planting and farmers' enthusiasm about it, domestic soybean price will not see an evident decline. In the long term, the increasing demand for soybean products and high-quality protein in China will bolster the demand for high-quality soybean. Therefore, it is predicted that soybean price will be stable-to-rising.

## 4. Uncertainties

### 4.1 Climate Factors

Maize production is greatly affected by climate conditions. Changes in temperature, light and precipitation may cause drought, flood, typhoon, wind hail, low temperature, early frost and other disasters, which may exert direct influence on the sowing, growth, harvest, storage and transportation of maize and soybean. The market prices of maize and soybean are also considerably affected by climate conditions. In particular, the futures prices are greatly impacted by climate changes from sowing to harvesting period. As predicted by the National Climate Center, affected by El Nino, many regions in China will see relatively intensive rainfall, which may increase the risk of rainstorm and flood in some areas and cause both drought and flood in the main crop producing areas. As some parts of the world may suffer more extreme weather, the global agricultural production will be seriously influenced. In view of the frequent occurrence of extreme weather, the main producers of

maize and soybean worldwide and the main producing regions in China will face high natural risks, which will further impact the maize and soybean supply and price at home and abroad.

## 4.2 International Factors

With the slowdown of global economic growth and the changing macro-economic environment, the international situation is complex and stringent. The world economy will undergo reform and reconstruction since the game among powers will escalate. In addition, the prevailing protectionism and unilateralism will impede economic globalization, and politics will be an important factor hindering the development of international economic and trade relations. Since the industry chain of maize is relatively long and shows close relations with economic development, the uncertainties of the macroeconomic environment will exert certain influence on the development of maize deep processing and animal husbandry. As a major agricultural product in international trade and a focus of international capital, soybean is vulnerable to the influence of monetary policies, changes in exchange rates, logistics conditions, geopolitics and other factors. In the future, the international environment and the changes in exchange rates will affect China's international competitiveness in maize and imports of maize. Since China is the largest soybean importer of the world, its import channels will also face certain uncertainties.

## 4.3 Other Risks

Stable and continuous policies will contribute to the development of the maize and soybean industry in China. However, the actual results of policies are also uncertain for their development. Since feed demand constitutes the main part of maize and soybean consumption, the adjustments of feed formula will show a significant impact on consumption. With the improving technologies in animal husbandry and feed formula, the feed conversion ratio may be further lowered, thus reducing feed consumption and further affecting maize and soybean consumption. In addition, the popularization and application of some new technologies may also include the feed demand for maize and soybean. For example, the low-protein daily ration technology may increase the ratio of energy feed such as maize in the formula and lower the ratio of soybean meal. In 2023, 37 varieties of genetically modified maize and 14 varieties of genetically modified soybean had been reviewed and approved, and the first batch of production permits for genetically modified maize and soybean seeds had been issued, demonstrating the accelerated commercialization of genetically modified products. During the outlook period, low-carbon economy will be a necessary choice for the sake of the sustainable development of the world economy. In this context, the rising demand for renewable energy worldwide may increase the maize and soybean consumption in biodiesel. Moreover, the innovation and popularization of new maize and soybean varieties, research and development of transgenic technology, major animal diseases, public health emergencies and some other factors may also change the supply-demand pattern and price trends of maize and soybean at home and abroad.

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