

# Current state and prospects for the development of the grain sector of china's agro-industrial complex

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**Abstract.** Grain production in China plays a crucial role in ensuring food security and sustainable economic growth. The country's agriculture, including the cultivation of major grain crops, is in a constant process of modernization. This article analyzes the natural and economic characteristics of four major regions of China — Eastern, Central, Western, and Northeastern — and their impact on the structure of agricultural production. The article discusses the main cultural features, issues, and prospects related to the development of the grain sector. Based on data on grain production and exports, the authors conclude that China's growing dependence on soybean imports persists despite efforts to increase domestic production volumes. In the future, the authors believe that special attention should be given to optimizing land resources, implementing precision farming technologies, and improving mechanization levels to enhance production efficiency.

## 1 Introduction

Grain production in China is of great importance for ensuring food security and stable economic growth. The grain sector faces numerous challenges, including limited land resources, climate change, and the increasing need to improve agricultural infrastructure. The purpose of this study is to analyze the current state and determine the prospects for the development of the grain sector of China's agro-industrial complex, taking into account regional characteristics and the potential for increasing productivity and sustainability in the agricultural sector based on new technologies.

## 2 Materials and Methods

The study examines the development of the grain sector of China's agro-industrial complex, focusing on regional differences in agricultural production, climatic and soil conditions, and their impact on the production of major

grain crops. Data from government reports and agricultural production statistics were used. The research covers four regions of China, each characterized by its own climatic and soil features that influence grain production. The analysis employed methods of descriptive statistics, logic, comparative and trend analysis, as well as graphical data representation.

## 3 Results and Discussion

In terms of land area, China is one of the world leaders, ranking third globally after Russia and Canada. However, significant differences in the natural and economic conditions of the four major regions of China (Eastern, Central, Western, and Northeastern) lead to variations in agricultural trends and challenges faced by the regions. Table 1 presents comparative data characterizing the agricultural development conditions in these four regions [1].

**Table 1** Comparative Analysis of Agricultural Development Conditions and Major Crops Grown in the Four Regions of China.

Region	Characteristics of Natural Conditions	Characteristics of Economic Conditions	Major Agricultural Crops Grown
Eastern	Warm and humid climate, fertile soils	Developed economy, high level of urbanization, advanced agricultural modernization, shortage of land resources [2].	Rice, wheat
Central	Moderate climate, sufficient rainfall, flat terrain	Balanced economy, good agricultural infrastructure, but uneven distribution of water resources and labor outflow.	Wheat, rice, corn
Western	Complex terrain, variable climate	Underdeveloped economy, weak agricultural infrastructure, reliance on government support.	Corn, wheat, fruits
Northeastern	Fertile soils, cold climate	High level of mechanization, stable grain production, but population outflow and strong impact of climate change.	Corn, soybeans

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The Eastern Region of China is located in the coastal zone with a warm and humid climate. In the valleys of the Yangtze River and the lower reaches of the Yellow River, fertile soils promote the cultivation of rice and wheat. This is the most economically developed region in the country, where modern technologies and mechanization are actively applied. However, urbanization and the growth of cities lead to increased demand for agricultural products and a reduction in arable land area [3].

The Central Region has a temperate climate, abundant rainfall, and a flat landscape, making it an important grain-producing area. The soils here are suitable for growing wheat, rice, and corn. The region's economy is balanced, but the development pace is slower compared to the Eastern region, and agriculture remains an important part of the economy. Major issues include the uneven distribution of water resources and labor outflow.

The Western Region of China includes mountain ranges and desert areas with harsh climatic conditions. A lack of water resources and poor soils limit agricultural production. Drought-resistant crops such as corn and wheat are grown here, along with the development of fruit growing and livestock farming. The region's economy is underdeveloped, and agricultural infrastructure is weak, requiring government support in transportation and irrigation [4].

The Northeastern Region is known for its fertile chernozem soils, which are suitable for growing corn and soybeans [5]. However, the cold climate, with long winters and a short growing season, requires precise organization of planting times. The region has a high level of mechanization, but industrial decline and population outflow create a labor shortage. Additionally, climate changes, such as droughts and early frosts, pose a threat to agriculture.

Table 2 demonstrates that the highest rice production is concentrated in the Central Region, while rice volumes remain stable in the Eastern and Western Regions, and the Northeastern Region stands out for

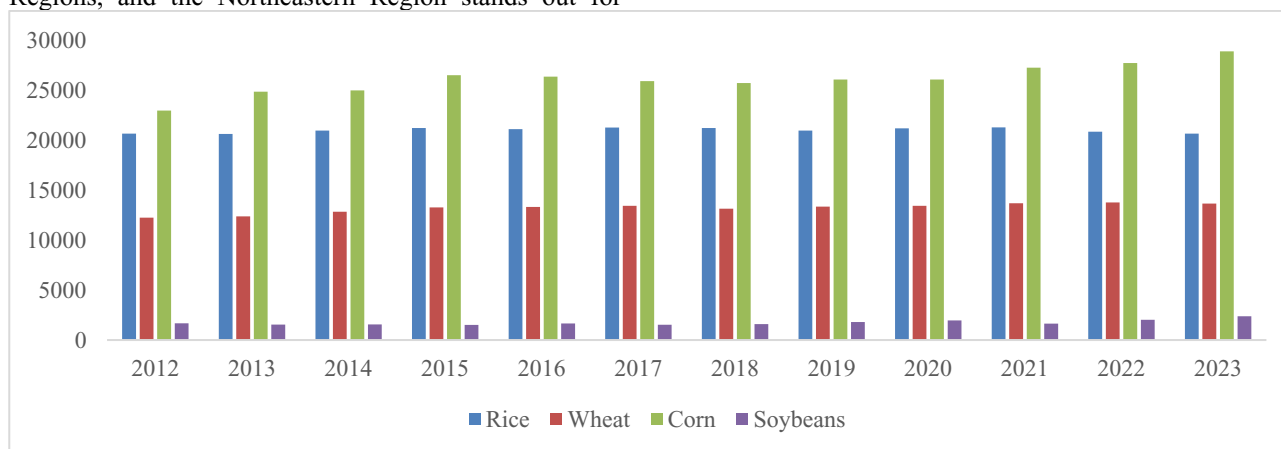
producing high-quality rice due to its fertile chernozem soils. The main wheat production is in the Eastern and Central Regions, particularly in Henan and Shandong provinces, while in the Western Region, wheat volumes are limited by unfavorable terrain and climate, and in the Northeastern Region, production is minimal due to small sowing areas. Corn production is most developed in the Northeastern Region due to favorable climatic conditions, though significant volumes are also produced in the Central and Western Regions, where corn is primarily used in livestock farming and industry. Soybeans are of great importance in global agriculture, ranking fourth after wheat, corn, and rice, and first among leguminous crops. The main soybean-producing region in China is the Northeast, with Heilongjiang province contributing the largest share, while production in other regions remains low, making China dependent on imports to meet its high domestic demand.

**Table 2** Production of Major Agricultural Crops in the Four Main Regions of China, 2023 (Million Tons)

	Rice	Wheat	Corn	Soybeans
Eastern Region	43.82	57	52.7	1.95
Central Region	87.07	59.59	46.5	3.21
Western Region	40.37	19.9	91.51	5.38
Northeastern Region	35.35	0.1	98.13	10.3

Source: compiled by the author based on data from [16]

The development of the grain sector in China's four major regions forms the basis for the placement of the country's main agricultural productions. Each region has its specific characteristics in grain, technical crops, and livestock production, contributing to the creation of a diverse agricultural structure [6]. The production of major grain crops in China is shown in Figure 1. In 2023, the priority crops were wheat, rice, and corn. Chinese agriculture met 95-98% of the total domestic food demand, with grain crops accounting for 85-90% of the total food demand.



**Fig. 1.** Production of Major Grain Crops in China (Million Tons), 2012-2023 Source: compiled by the author based on data from [16]

The data analysis from the figure allows us to conclude that from 2013 to 2023, the production of rice, wheat, corn, and soybeans in China generally shows an upward trend. The production of rice and wheat remains

relatively stable, with wheat production demonstrating gradual growth, reflecting the impact of technological improvements and increased mechanization. Corn production is characterized by significant volatility, but

in recent years, a noticeable growth trend has been observed. Since 2007, the government has been purchasing corn from farmers at a fixed price, ensuring stable income for producers. However, this policy was abolished in 2016, and the price of corn shifted to a market-based pricing system, leading to a reduction in farmers' incomes and decreased motivation to grow corn, causing fluctuations in its production volume.

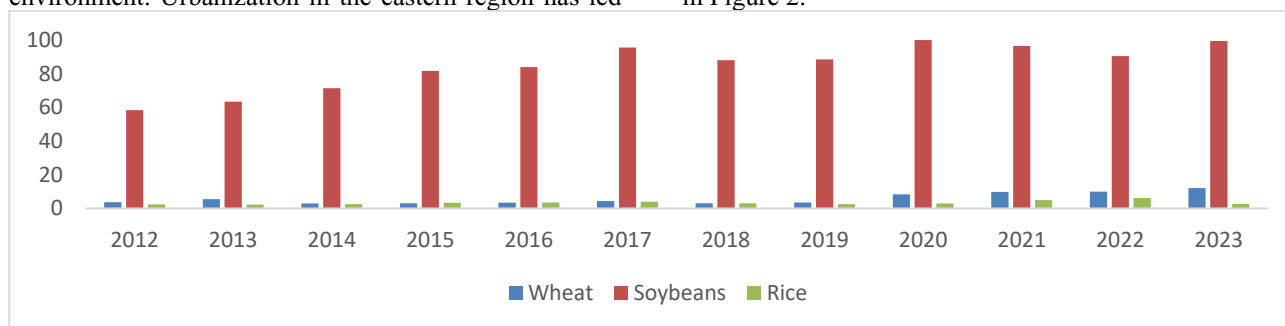
The competitive prices of soybeans in the United States, Brazil and Argentina make foreign soybeans very competitive in the Chinese domestic market, reducing the incentive to grow soybeans in China. However, in recent years, with government subsidies and technological support, the area of land planted with soybeans has expanded significantly in the northeast, and yields have increased.

Overall, despite stable production and a high degree of modernization of major food crops, China still faces many challenges in terms of resources, markets and the environment. Urbanization in the eastern region has led

to a shortage of arable land, and rice production is constrained by water resources. In the central and northeastern regions, climate change is affecting wheat and corn production, with the risk of extreme weather. In the western region, poor geographical conditions and inadequate infrastructure hinder agricultural production, and low soybean yields still face pressure from imports.

Over the past ten years, the production of major agricultural crops in China has developed steadily, providing an important foundation for the domestic food market [7]. However, with increasing domestic demand and changes in the global market, China needs not only to increase the efficiency of its own grain production but also to address issues related to the import and export of agricultural products [8]. This is especially true for soybeans, as domestic production does not fully meet the growing demand, leading to an increasing dependence on imports [9].

The import of major grain crops into China is shown in Figure 2.



**Fig. 2.** Major Grain Imports into China (Million Tons), 2012-2023 Source: compiled by the author based on data from [16]

From 2012 to 2023, the structure of grain imports into China underwent significant changes. The volume of wheat imports increased annually, from 3.7 million tons in 2012 to 12.09 million tons in 2023, representing a growth of nearly 227%. Soybean imports also continued to grow substantially, reaching 99.41 million tons in 2022, with a growth rate of 70% over the period. Rice imports fluctuated, but a sharp increase in import volumes was observed in 2021-2022. This was related to the impact of the pandemic when the Chinese government increased reserves to cope with potential food crises and supply chain disruptions.

Currently, China is heavily dependent on imports of soybeans, wheat, and rice. The main soybean suppliers are Brazil and the USA. Soybeans are used in China for oil production and animal feed, especially for pig farming, but domestic production does not meet demand. In wheat, China mainly depends on Australia and Canada, as domestic production does not cover the needs for high-quality wheat for the baking industry [10]. Although China is the largest producer of rice, the main rice exporters remain Vietnam, Thailand, and Myanmar, who supply high-quality rice to meet domestic demand.

China also exports certain quantities of grains such as rice, wheat, soybeans, and corn. The main export destination for wheat is North Korea. Corn is predominantly exported to North Korea and Russia. The main importers of Chinese soybeans are South Korea and Japan. However, the largest volumes of China's

exports are in rice. Although China is one of the world's largest grain producers, its grain exports remain relatively low. This is largely because of the country's massive domestic demand, driven by its large population and the need to ensure food security [11]. The pressure to feed such a large population means that much of China's grain production is kept within the country.

Moreover, limited arable land and high production costs reduce the global competitiveness of Chinese soybeans [12]. Countries with lower production costs dominate the global grain export market, which further hampers China's export efforts. To complicate matters, the Chinese government places restrictions on grain exports to secure domestic supply and stabilize prices, which naturally leads to lower export volumes.

Looking ahead, China's grain industry has reasons to be optimistic. With a solid foundation in production, ongoing technological advancements, and greater mechanization, the country is positioned to improve both the efficiency and quality of its grain production. This will not only sustain the domestic market but should also support long-term stability. One key to this future growth will be optimizing land use, especially with the help of precision agriculture technologies that promise higher yields with less land, fostering a more sustainable farming model [13]. Improved mechanization will definitely help lower production costs and boost efficiency, which is so important if China's agricultural sector is going to grow in the future [14]. But there's

more to it. China is working on diversifying what it grows. This isn't just about increasing the amount of food produced, but also about making sure it doesn't rely too much on one type of crop. This will make the whole agricultural sector a bit more resilient, especially when market conditions change. Part of the plan also includes building up grain reserves and improving storage systems, so the country can handle food shortages during tough times.

That said, it's not all smooth sailing. There are still some big obstacles. One of the most pressing issues is the lack of land, combined with the effects of climate change, which make it even harder to increase production. To deal with these problems, China will need to get better at using land more efficiently and work on developing crops that can handle the changing climate [15]. And even though there's been progress in increasing production, China still relies a lot on imports—especially for things like soybeans. To really tackle this issue, boosting domestic production of these essential crops is going to be key.

## 4 Conclusion

The research has shown that the differences in natural and economic conditions across the four major regions of China influence the structure of grain production. These regions have distinct agricultural trends driven by climatic conditions, infrastructure status, and access to water resources.

Based on the current state of the grain sector in China, the following recommendations have been developed to stimulate the development of the country's agribusiness sector for each region. For the Eastern region, it is important to maintain rice and wheat production, improve land resource management, and implement technologies to increase yields. The Central region must maintain a balance between rice, wheat, and corn production, focusing on infrastructure development and retaining the workforce. For the Western region, priorities should include government support, infrastructure development, and the introduction of climate-resistant grain varieties. In the Northeastern region, the key tasks are maintaining corn and soybean production, preventing population outflow, and adapting technologies to changing climatic conditions.

The study concluded that grain production in China shows stable growth despite existing challenges, such as limited land resources and the impact of climate change. Key steps to improving the situation include optimizing land use, introducing new climate-resistant crop varieties, and further developing agricultural mechanization. However, China remains dependent on soybean imports, which requires additional efforts to reduce this reliance. In the future, the development of precision agriculture technologies and infrastructure improvements will also play a key role in ensuring the country's food security.

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