

Original Research Article

Research on risk identification and prevention and control strategies of China's domestic soybean industry chain

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Abstract: Soybean is an important strategic material to ensure the supply of edible oil and the development of animal husbandry in China. Based on the perspective of the whole industry chain, this paper analyzes the current situation of domestic soybean production, processing, consumption and trade, and identifies multiple risks in upstream planting, midstream processing, downstream demand and external environment. China's soybean industry chain is facing outstanding problems such as natural and production factor constraints, low processing level, and high import dependence. This paper proposes prevention and control measures from the aspects of stabilizing production supply, optimizing processing structure, stabilizing market fluctuations, and strengthening external risk management and control to enhance the resilience of the soybean industry chain and ensure national food security.

Keywords: domestic soybean; industrial chain; risk identification; food security

1. Introduction

Soybean is a key oil and protein crop in China with an irreplaceable role in food consumption, animal husbandry and food processing. Driven by consumption upgrading and large-scale breeding, domestic soybean demand maintains rigid growth, leading to a long-term supply-demand gap and high import dependence. Amid accelerating global grain trade restructuring, geopolitical conflicts, extreme weather and market volatility have intensified uncertainties in China's soybean industry chain. Clarifying its operation status, identifying potential risks in each link and establishing scientific prevention measures are of great significance to enhancing chain resilience.

2. Current situation of domestic soybean industry chain

2.1. Planting production status

In 2025, the national soybean planting area was 154 million mu, a decrease of 990,000 mu compared with the previous year, a decrease of 0.6%, and stabilized at more than 150 million mu for four consecutive years. Total production reached 20.91 million tons, an increase of 1.3% over the previous year; the yield per unit area was 135.9 kg/mu, an increase of 2.5 kg over the previous year, an increase of 1.9%. The production area is highly concentrated, and the three provinces in Northeast China and the eastern part of Inner Mongolia are the main production areas. The output accounts for more than 95% of the country, and the output of Heilongjiang Province accounts for more than 40%. Huang-Huai-Hai summer soybean area is the second largest production area, accounting for 20%-25% of the country's production.

2.2. Processing transformation status

In 2025, the total consumption of soybean in China will be 114.15 million tons, of which 94.2 million tons will be squeezed, accounting for 82.5%; edible and deep processing consumption of 13 million tons, accounting for 11.4%; planting and other consumption of 6.95 million tons, accounting for 6.1%. In domestic soybean processing, 72% is used for soybean products processing, 13% is used for soybean protein production, 10% is used for pressing, and the rest is used for seed and other purposes. The concentration of crushing links is high, foreign capital and large enterprises are dominant, the scale of local small and medium-sized enterprises is small, and the level of technical equipment is limited. The comprehensive utilization rate of deep processing and by-products is less than 70%. The development of high value-added

products such as soybean phospholipids and polysaccharides is insufficient, and the value-added space of the industrial chain is limited.

2.3. Current situation of trade circulation

In 2025, soybean imports reached 111.83 million tons, an increase of 6.5% year-on-year. Imports account for 84.2% of the total domestic supply, and the self-sufficiency rate is only 15.8%. Import sources are highly concentrated, with Brazil 82.33 million tons (73.6%), the United States 16.8 million tons (15.0%), and Argentina 7.89 million tons (7.1%), accounting for 95.7% of the total.

2.4. Supply and demand and market situation

In 2025, China's total soybean consumption will reach 114.15 million tons, an increase of 32.7% over 2015. In 2025, the output will be 20.91 million tons, which can only meet 15.8% of domestic consumption demand, and the gap between supply and demand will remain above 90 million tons for a long time. In 2025, the average price of domestic soybean spot market is 3595 yuan/ton, and the price of high-quality high-protein soybean (protein $\geq$ 43%) is significantly higher than that of ordinary soybean. The annual average price is 4400-4600 yuan/ton, and the price difference is 400-600 yuan/ton.

3. Risk identification and assessment of domestic soybean industry chain

3.1. Risks in upstream planting

The risks in the upstream planting link are mainly reflected in two aspects. First, natural risks. Regional climate fluctuations frequently cause droughts, floods, and low-temperature damage. Long-term continuous cropping in major producing areas leads to soil degradation, reduced soil fertility, and increased frequency of extreme weather events, which affect soybean growth and yield stability. Second, production factor risks. The update of high-quality and high-yield soybean varieties lags behind; the rising prices of agricultural materials such as fertilizers and pesticides have pushed up planting costs; and the inadequate supporting of agricultural machinery and irrigation facilities in some producing areas restricts the improvement of production efficiency.

3.2. Risks in the middle processing link

The risk of midstream processing is mainly reflected in two aspects. First, the level of industrial structure is low, the proportion of primary processing is high, and the development of deep processing and high value-added products is insufficient. The products are mainly primary products such as soybean meal and soybean oil, and the comprehensive utilization of by-products such as saponin and oligosaccharides is insufficient. The second is the risk of market competition. The crushing industry has overcapacity, the industry competition is intensified, the proportion of raw material procurement costs is high, and the profit space of enterprises is squeezed. Small and medium-sized enterprises have poor operating stability due to their small scale, weak technology and insufficient cost control ability.

3.3. Downstream consumption and demand side risk

The downstream consumption and demand-side risks are mainly reflected in three aspects. First, consumption demand fluctuations. Changes in the scale of the animal husbandry and breeding industry affect the demand for soybean meal; adjustments in the edible oil consumption structure alter the demand for soybean oil; and the consumption of soy products and other edible products is influenced by residents' habits and market supply. Second, alternative product risks. Oil crops such as palm oil and rapeseed oil replace soybeans in the edible field, while other protein raw materials squeeze the demand space for soybean meal. Third, channel risks. Adjustments in the pattern of circulation channels (supermarkets, catering, e-commerce) affect product circulation efficiency and sales stability, which easily leads to terminal inventory overstock, capital occupation, unreasonable channel layout, and amplified supply-demand mismatch risks.

3.4. Trade and external environmental risks

Trade and external environmental risks mainly appear in three aspects. First, geopolitical conflicts and import dependence risks. Amid ongoing global geopolitical tensions, policy changes in major soybean exporters disrupt production and export orders. Intensified economic and trade competition among major

powers complicates the trading environment, while volatile bilateral relations raise the risk of supply chain disruptions. China's soybean consumption relies heavily on imports with highly concentrated sources, and single supply channels strengthen the transmission of external shocks. Second, price and financial risks. Unstable international supply and demand trigger sharp soybean price fluctuations, while credit policy adjustments increase financing constraints and liquidity pressures for processors and traders. Third, trade policy risks. Tariff changes and trade controls in major exporters affect import costs and volumes, while rising non-tariff barriers and evolving international trade rules further increase trade uncertainty.

4. Risk prevention and control strategy of domestic soybean industry chain

4.1. Risk prevention and control of upstream planting

4.1.1. Improving the disaster resistance of soybean production

Improve the disaster monitoring and early warning system in the main producing areas, build a full-dimensional monitoring network covering meteorology, pests and diseases, and soil moisture, promote stress-resistant and stable planting patterns and green pest prevention and control technologies, promote soil improvement and soil fertility improvement projects, reduce the impact of extreme weather, pests and diseases, and soil degradation on soybean production, stabilize annual yield levels, and build a natural risk defense line at the production end.

4.1.2. Optimizing the supply guarantee of production factors

We will accelerate the breeding and application of high-quality, high-yield and stress-resistant soybean varieties, establish a linkage mechanism between variety approval and market access, standardize seed market management, and severely crack down on fake and inferior seeds. Stabilize the market prices of agricultural materials such as chemical fertilizers and pesticides, improve the reserve and regulation mechanism of agricultural materials, make up for the shortcomings of agricultural machinery equipment and farmland irrigation facilities, improve the level of production standardization and mechanization, and reduce the impact of production factor cost fluctuations on planting income.

4.2. Risk prevention and control of midstream processing links

4.2.1. Promote the transformation and upgrading of the processing industry structure

Accelerate the development and transformation of soybean deep processing technology, improve the comprehensive utilization efficiency of by-products such as saponin and oligosaccharides, expand the supply of high value-added products such as protein peptides and phospholipids, extend the industrial chain, enhance the overall value-added ability and core competitiveness of the industry, and solve the risk of high proportion of primary processing and short value chain.

4.2.2. Optimize the market competition pattern of processing industry

Guide the orderly adjustment of production capacity in the crushing industry, curb excessive homogenization competition, and promote the concentration of production capacity in advantageous areas and leading enterprises. Support enterprises to optimize the procurement model, strengthen cost control, improve the interest linkage mechanism of the industrial chain, increase support for technological transformation and financing of small and medium-sized enterprises, and enhance the operational stability and risk resistance of small and medium-sized processing entities.

4.3. Downstream consumption and demand-side risk prevention and control

4.3.1. Suppress the fluctuation of downstream consumer demand

Strengthen the dynamic monitoring and judgment of animal husbandry, edible oil and soybean products consumption market, establish a demand early warning mechanism, guide the large-scale and standardized development of the breeding industry, promote the diversified supply of soybean processing products, reduce the transmission impact of single demand fluctuation on the industrial chain, and stabilize the downstream market operation.

4.3.2. Reduce the market impact of alternative products

Optimize the quality and cost competitiveness of soybean products, build domestic soybean characteristic brands, expand characteristic and differentiated consumption scenarios, weaken the substitution effect of palm oil, rapeseed oil and other protein raw materials, stabilize the market share of soybean core consumption, and alleviate the squeeze of alternative products on the demand side.

4.3.3. Optimization of terminal circulation channel layout

To adapt to the multi-channel sales trend (supermarkets, catering, e-commerce), we should improve the production-marketing integration mechanism, build an online-offline integrated circulation platform, scientifically regulate terminal inventory, reduce risks of inventory backlogs and supply-demand mismatches, and enhance product circulation efficiency and sales stability.

4.4. Strengthening trade and external environmental risk prevention and control

4.4.1. Reducing the risk of soybean import dependence

Steadily improve domestic soybean production capacity, promote the diversified layout of import sources, disperse national concentration risks, enhance the independent and controllable ability of soybean supply chain, alleviate the external impact caused by high external dependence, deepen long-term agricultural cooperation with major soybean exporting countries, expand emerging supply channels along the "Belt and Road," reduce the impact of geopolitical conflicts and great power games on soybean supply chain, and ensure smooth trade channels.

4.4.2. Slow-release the impact of international market price fluctuations

First, improve the domestic and foreign soybean market price monitoring and early warning mechanism, improve the futures market risk management function, guide the industrial chain operators to use hedging and other hedging tools reasonably, stabilize abnormal price fluctuations, stabilize business expectations, and weaken the excessive transmission of international prices to the domestic market. The second is to improve the financial service system of soybean industry chain, innovate credit products and guarantee mode, alleviate the financing constraints of processing and trade enterprises, and standardize the trading behavior of futures market.

4.4.3. Response to changes in international trade policy

First, strengthen the tracking of international soybean trade policies, improve the response mechanism of tariff and non-tariff barriers, improve the early warning and prevention and control system of trade frictions, standardize import and export management, ensure the continuous and stable development of soybean trade, and prevent supply chain risks caused by trade policy adjustments. The second is to track changes in the international energy and transportation market, optimize logistics routes and transportation organization models, develop multimodal transport, and reduce transportation costs.

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