China's Food Future

Consultation paper: how China's food-security strategy could reshape global agricultural commodity supply chains

GORDON AND BETTY MOORE FOUNDATION
SYSTEMIQ

Executive Summary

China is poised to reshape global agricultural commodity supply chains as it accelerates a push for food security.

01 Food security has become a strategic priority for Chinese leadership, central to economic stability and national security.

02 Early signals suggest Beijing is applying the same industrial playbook that is delivering global leadership in solar and EVs to food and agriculture – aligning policy, capital and technology.

03 By 2030, Chinese import demand will have peaked and begun to fall, especially for feed and animal protein. Demand for imported soya beans is projected to fall by 25%.

04 Long term, China's prioritisation of biomanufacturing and alternative protein technologies is set to transform domestic markets and reshape global food production.

05 Producers who adapt early – diversifying markets, upgrading productivity, raising deforestation and traceability standards – are best placed to succeed in this changing landscape.

2024: China is the world's largest food importer

Beef

75% of Argentina's beef exports

54% of Brazil's beef exports

41% of New Zealand's beef exports

Soya beans

89% of Argentina's soya bean exports

71% of Brazil's soya bean exports

53% of US soya bean exports

$124.5bn China's agricultural commodities import deficit

By 2030

25% reduction in China's soya bean imports

By 2040

14-16% of domestic beef and seafood markets captured by alternative proteins in China

By 2050

35-55% of domestic animal protein demand met by alternative proteins

This consultation paper synthesises the available evidence into a central hypothesis: that China has begun to apply to food and agriculture some of the same system-level tools it has previously used in sectors such as energy and transport. It considers what that could mean for domestic production, global trade flows and the future of protein supply. The purpose of this paper is to invite discussion on the assumptions, signals and scenarios presented and to use this to collectively shape more sustainable outcomes for all stakeholders involved.

Over the past four decades, China has undergone one of the most rapid and far-reaching economic transformations in modern history. Sustained industrial expansion and targeted growth of high-value sectors have lifted hundreds of millions of people out of poverty, with per capita incomes increasing by a factor of 25 since 1978.[1] Over the same period, China's population has grown by more than 450 million people.[2] This transformation has been underpinned by China's ability to coordinate policy, scale production and mobilise capital at unprecedented speed. That capacity accelerated after accession to the World Trade Organization in 2001.[3]

That same capacity has enabled China to establish global leadership in several strategic areas, particularly in green technologies. Today, China is the world's largest producer of renewable electricity and the dominant manufacturer of solar panels, wind turbines, and electric vehicles (EVs).[4] These sectors evolved through deliberate policy choices, long-term investment and a willingness to build supply and demand.

However, the economic and industrial model that enabled this success also generated new dependencies, most notably within China's food system. As incomes rose, diets shifted from traditional, predominantly plant-based foods towards highly processed and animal-based foods. Domestic agriculture has struggled to keep pace with the resulting demand for resource-intensive proteins.[5] This has left China increasingly reliant on imported agricultural commodities, running a large trade deficit of $124.5 billion today.[6]

The risk embedded in this dependence is amplified by concentrated supply chains. Brazil alone provides more than 60% of China's soya bean imports and around 40% of its beef, the United States supplies a further 30% of soya bean imports, and New Zealand accounts for 40% of dairy imports.[7] Recent years have demonstrated how quickly these vulnerabilities can materialise: climate volatility, water scarcity and extreme weather events are intensifying risks to global agricultural production, while geopolitical tensions and trade disruptions have underscored the fragility of highly concentrated import relationships.[8]

↑450m

people China population growth

25x

increase in China's per capita incomes

China is now finding these dependencies difficult to tolerate. For Chinese leadership, food security is no longer framed solely as a matter of nutritional sufficiency, but as central to economic stability and national security. This shift is visible across China's core planning architecture: the 14th Five-Year Plan (2021-2025)[9] was the first to place food security alongside energy and finance in a dedicated economic security section. The 15th Five-Year Plan (2026-2030)[10] builds on this, emphasising food security, agricultural modernisation, and diversified food supply systems. It signals growing interest in emerging technologies – including synthetic biology and new protein sources – while continuing to prioritise grain security, farmland productivity, and livestock and aquaculture modernisation as the foundation of China's food strategy.

In response, China has begun to apply the same system-level approach to food and agriculture that it once deployed in energy and transport. The strategic playbook operates through five mutually reinforcing mechanisms: strategic and coordinated vision, cascading from central government to provinces, state enterprises and financial institutions; a dense entrepreneurial environment of competing firms, university partnerships and regional clusters; financial support through state banks, subsidies and sustained R&D funding; policy and regulatory support; and induced demand, created through procurement requirements and usage standards to activate markets ahead of organic consumer uptake.

Early signals indicate that China has entered "Year 0" of food system transformation. New and emerging government policies centre food security, with a central pillar in reshaping protein supply through technological innovation, including alternative protein pathways. Domestic innovation clusters around alternative proteins, fermentation-derived ingredients and agricultural biotechnology are emerging.[11] State-aligned capital is flowing into infrastructure, and policy and regulations are signalling coordinated action, notably the approval of commercialised genetically engineered maize and soya varieties.[12] While demand-side mechanisms are still somewhat limited, this is consistent with the sequencing observed in prior transitions, where supply-side capacity was built and demand activation reinforced it.

By 2030 target-led optimisation could reduce China's soya bean imports by 23.5 million tonnes, or 25% relative to today. This volume is almost equivalent to all US soya bean exports to China in 2024 and comes alongside meaningful reductions in beef, poultry, dairy and egg imports.

Structural change becomes visible at the system level by 2040, turning China into a major animal protein exporter. Alternative proteins capture a meaningful share of the market as fermentation-derived and plant-based proteins reach price parity with their animal-based equivalents. At the same time, technologies like GM and GE crops and intensive controlled-environment livestock facilities are projected to improve production efficiencies and domestic output. As a result, China is projected to become a net exporter of several animal protein categories – poultry, dairy, eggs and aquatic products – a reversal that will introduce Chinese food exports as a competitive force in global markets.

By 2050 a new equilibrium emerges, with China leading a new bio-based industry. A third wave of innovation makes cultivated meats commercially viable, and alternative proteins are projected to meet 35-55% of demand across animal-protein categories in China. China's role in global protein markets has fundamentally shifted and their leadership in food innovation has once again made it the world's leading supplier of a defining 21st century technology, bringing biomanufacturing, infrastructure and alternative protein inputs to global markets.

The consequences of this transition will be felt across the global food system. China's agricultural imports were worth $237 billion in 2024. It is the primary destination for soya exports from Argentina, Brazil and the United States,[13] as well as beef from Argentina and Brazil.[14] For these economies, a sustained contraction in Chinese demand not only reduces volumes, but risks simultaneous falls in price and export revenue. This has cascading effects on farm incomes, land valuations, rural employment, and processing infrastructure.

Producer countries will be the first to feel the effects of China's transition. The changing demand could give Chinese policymakers the confidence to raise import standards and demand deforestation and conversion free (DCF) commodities, aligning with jurisdictions like the EU. Producers who embrace the change by upgrading productivity on existing land, raising DCF and traceability standards, and diversifying markets, will be most able to manage the transition and ensure future market access in the face of changing requirements.

For other actors, the implications are equally significant. The alternative protein industry outside China faces both opportunity and threat: China's industrial approach could dramatically reduce the cost of fermentation infrastructure globally but will also introduce direct competition in export markets for which existing producers and regulators must be prepared. For the aquaculture sector, the critical variable is whether China's expansion shifts toward feed-intensive species faster than alternative proteins can substitute for fishmeal and fish oil; if it does, the pressure on global forage fish stocks will be significant. For countries being courted as new suppliers in China's diversification strategy, the opportunity requires active management: dependency on a single large buyer replicates the vulnerability that existing exporters are now trying to resolve, and without domestic capacity and strong land governance, new suppliers risk accelerating rates of land use change in regions where, traditionally, this has not been a threat to nature.

Looking ahead

The coming 12 to 18 months are critical. The signals most worth tracking include: the adoption of explicit alternative protein and biomanufacturing targets in provinces; the emergence of designated industrial clusters and university-industry hubs; the scale and coordination of state-backed investment in fermentation and biomanufacturing infrastructure; changes to feed approval and seed regulation that lower deployment barriers; and any move toward demand-side activation through procurement standards or dietary guidelines.

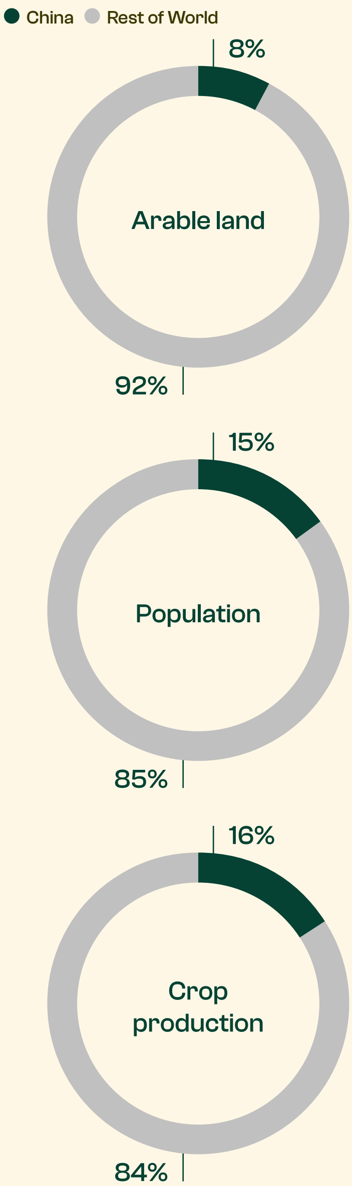
China has reshaped global supply chains before, when strategic priorities aligned with industrial capability. Action in this country has the potential to reshape global markets and the economics of entire industries. Understanding China's emerging food security strategy, and its approach to protein transformation, is therefore critical for governments, businesses, and investors seeking to navigate the next phase of global food systems change. The question is no longer whether it is applying that capability to food, but how fast, and whether others are preparing accordingly.

Contents

Context

China is one of the world's oldest and largest agricultural producers: it was here that staple crops such as rice and soya were first domesticated,[15] and today it remains a cornerstone producer of pork, rice and fish, accounting for more than 46%, 50%, and 30% of global output, respectively.[16] While this agricultural legacy reflects accumulated knowledge and sustained policy attention to food provision, the country still faces considerable challenges.

China's share of global agricultural land, population and agricultural production, %
Figure 1



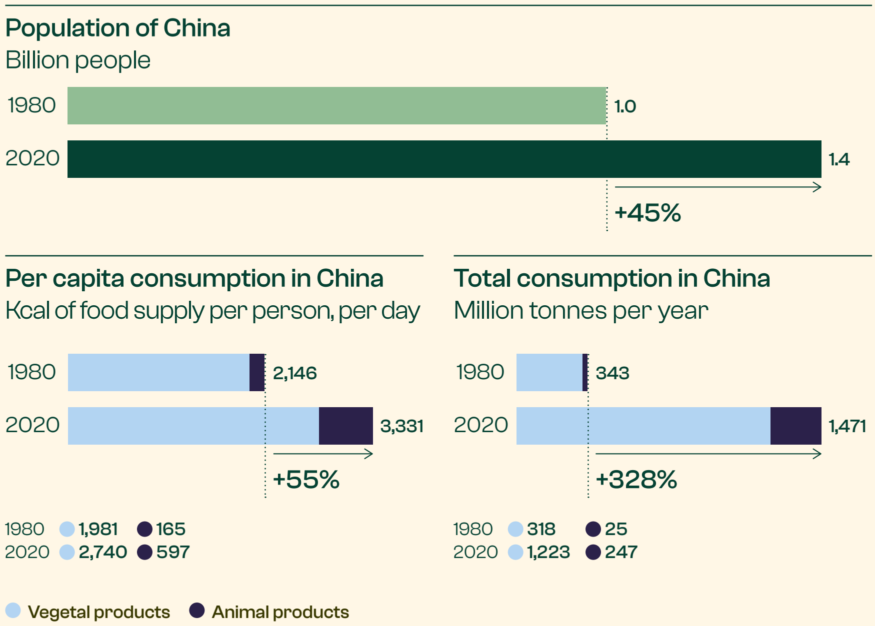
The nation operates within extremely tight resource constraints: it has just 8% of the world's arable land but 15% of the global population.[17] Per-capita freshwater availability is well below the global average,[18] and key agricultural regions face growing competition between food production, urban expansion and industry.[19] Since the 1990s, total agricultural area has remained broadly stable with little scope for expansion,[20] and faces growing risk of abandonment as rural populations move to cities for work and services.[21] Despite these constraints, China still accounts for 16% of the world's crop production by volume.[22] This reflects the scale and specialisation of its farming systems, even where yields remain below the world's best.

Over the past four decades, demand pressures in China have intensified. Two reinforcing drivers have shaped consumption.

Population growth added 450 million people between 1980 and 2020,[23] while rising incomes and rapid urbanisation shifted diets away from starchy roots and pulses towards animal protein, processed foods and convenience products.[24] Over this period, animal-based protein consumption increased tenfold,[25] and per-capita food consumption rose by more than 55%,[26] driven largely by meat,* dairy, fats and sugars.

These dietary shifts have amplified stress on China's food system. Animal-based foods are far more resource-intensive than the plant-based staples they replaced, requiring substantially more feed, land, and water. As a result, growth in consumption has translated into increases in demand for feed crops and water withdrawals, tightening the link between diets, environmental stress, and food security.

Growth in population, per capita consumption and total consumption in China from 1980 to 2020
Figure 2



* Meat here includes all animal tissue, both terrestrial and aquatic, consumed as food.

China has pursued productivity growth to narrow the gap between demand and domestic supply. Sustained policy attention and investment have delivered some meaningful gains, including an 80% increase in soya yields in the past 40 years.[27] However, yields for several key crop and animal systems remain below those achieved in peer countries.[28]

As domestic production struggled to keep pace, imports moved from a buffer to a backbone of China's food system. From 1984 to 2002, China was a net agricultural exporter* maintaining an average annual surplus of $2.7 billion.[29]

This position flipped in 2003, and by 2010 the deficit had reached $36.7 billion, driven largely by soya. Import dependence then accelerated through the 2010s, and by 2019 China had become the world's largest agricultural importer,[30] purchasing $77.5 billion more than it exported.[31] Today that deficit has grown further, to $124.5 billion, with China accounting for 60% of global soya bean imports and 24% of beef. These imports account for 84% of soya and 32% of beef consumed domestically.[32]

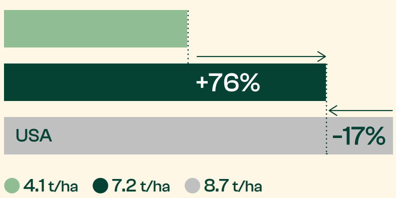
80%

increase in soya yields in 40 years

Comparison of Chinese yields over time and against illustrative peer producers, t/ha
Figure 3

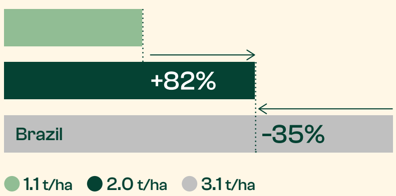
- China 1980
- China today
- Peer producer today

Rice



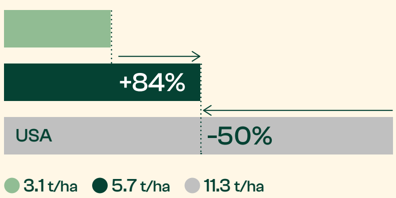
4.1 t/ha · 7.2 t/ha · 8.7 t/ha

Soya beans



1.1 t/ha · 2.0 t/ha · 3.1 t/ha

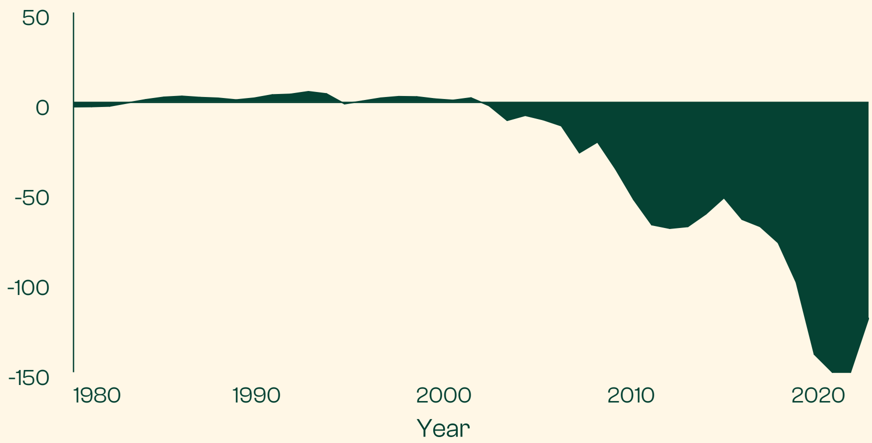
Maize



3.1 t/ha · 5.7 t/ha · 11.3 t/ha

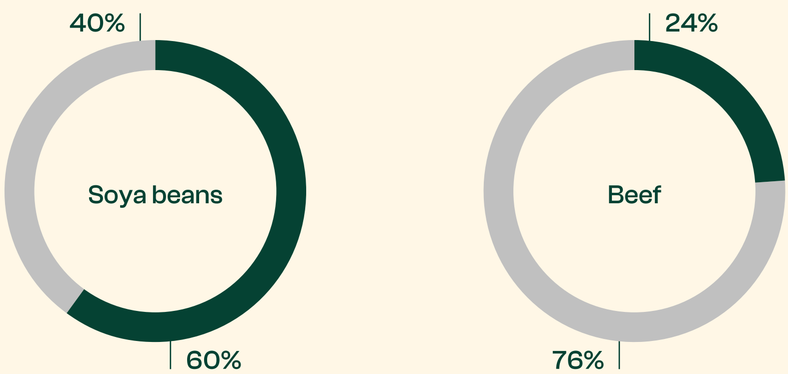
From 1980 to 2024, China went from being a modest net exporter of agricultural commodities to being the world's largest importer
Figure 4

China's net trade balance for crops and livestock products, 1980 to 2024
Billion USD



Chinese imports as a share of global trade in 2024

- China
- Rest of World



* Except for 1995, when China experienced a trade deficit of $0.8 billion

The risk from import dependence is amplified by the concentrated nature of these supply chains. Brazil alone supplies more than 60% of soya bean imports and around 40% of beef, the United States supplies another 30% of soya bean imports*, and New Zealand accounts for 40% of total dairy imports.[33] Supply concentration also extends to upstream inputs: China imports half of its fertiliser, around 8 million tonnes annually, primarily from Canada, Russia and Belarus.[34] While such concentration delivers efficiency under stable conditions, it leaves the system highly exposed to climate shocks, trade disputes and logistical failures.

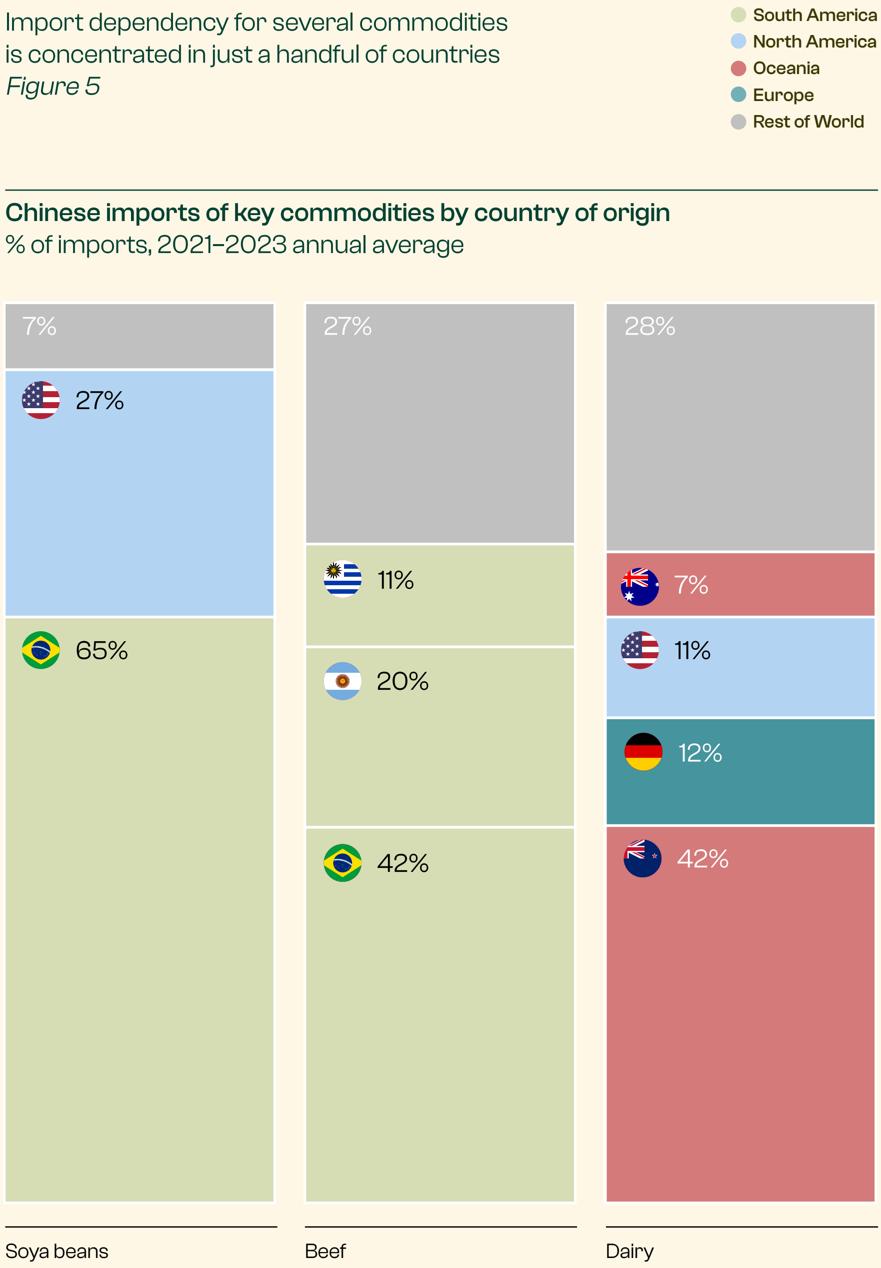
Recent years have demonstrated how quickly and severely these vulnerabilities can materialise. Between 2018 and 2021, African Swine Fever, a highly contagious viral disease of domestic and wild pigs, led to the death and culling of an estimated 140 million pigs – around 40% of China's pig herd. The resulting disruption was one of the largest protein supply shocks in modern history.[35] Losses were particularly acute in breeding herds, sharply contracting the sector's ability to recover.[36] Ongoing outbreaks of other zoonotic diseases, including avian influenza,[37] continue to place pressure on domestic production and threaten the global supply chains on which China is reliant.[38]

Climate volatility has further compounded these stresses. Severe flooding in 2023 and 2024 damaged around 2% of total cropland, particularly in the northeastern grain basket, and drought-affected regions suffered yield losses of 22-29%.[39] Rising temperatures add a further layer of risk as more frequent and intense heatwaves increase livestock mortality, reduce feed conversion efficiency and erode productivity.[40]

In addition to these physical risks, geopolitical disputes have destabilised established trade relationships. During the 2025 US-China trade dispute, reduced Chinese purchases translated into multi-billion-dollar losses for US soya bean producers, with farm groups estimating cumulative revenue impacts in the tens of billions of dollars as exports fell and trade diversified.[41] China pivoted toward Brazilian supply, at times accounting for 80% of imports, which in turn drove price spikes and prompted Chinese authorities to pause new Brazilian contracts.[42] These episodes underscore how reliance on narrow trade relationships can quickly become a strategic liability.

*Unless otherwise stated, trade statistics which speak of trade 'today' are annual averages from 2021-2023 inclusive, the most recent consistently available datapoints at the time of writing. As such, they do not reflect disruptions experienced between 2024 and 2026.

Import dependency for several commodities is concentrated in just a handful of countries
Figure 5



1.3m

population decline in 2022

100-150m

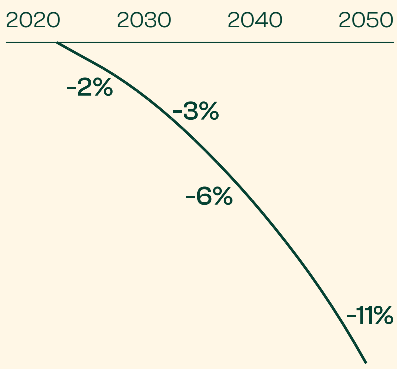
total population decline expected by 2050

Looking ahead, China's food demand is entering a new phase, but not one that automatically eases pressure. In 2022, the population declined for the first time in over six decades, falling by 1.3 million in a single year.[43] This trend is expected to continue into 2050, with the population shrinking to around 1.3 billion, a fall of 100-150 million people.[44] While this reverses one historic driver of demand growth, population decline alone will not translate into a rapid reduction of total food demand. The other factor that determines total demand is that of personal dietary choices. In the near-term, animal-based foods are likely to remain central to Chinese diets despite concerns around rising rates of obesity, diabetes and cardiovascular diseases.[45] Cultural preferences, income effects and urban food environments continue to support high consumption of meat and dairy, even as policymakers seek to moderate excess. As a result, total demand for animal-based protein is expected to plateau in 2030 before declining through to 2050 and beyond.

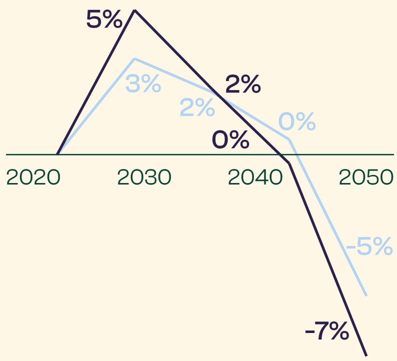
Crucially, despite the slowly falling demand, China's reliance on imported feed and protein inputs could remain largely unchanged. Without structural shifts in how protein is produced and supplied, the changing demand fails to resolve underlying vulnerabilities. Faced with these risks, early signals suggest that Chinese leadership is beginning to address these challenges in ways that will alter markets, supply chains and innovation pathways. Understanding this shift will be critical for China's partners as they prepare for future disruptions and assess emerging market opportunities.

Projected change in China's population, diet and total consumption between 2023 and 2050*
Figure 6

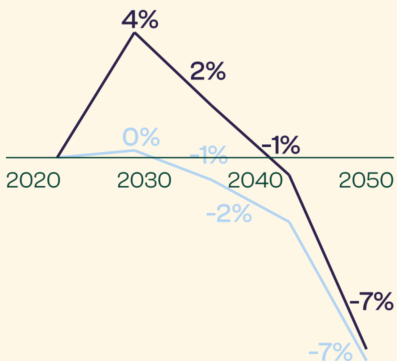
Population of China
Change with respect to 2023



Per capita consumption in China
Change with respect to 2023



Total consumption in China
Change with respect to 2023



● Animal products ● Vegetal products

* Projections here are in a business-as-usual scenario and without concerted efforts to change diets or technological evolution

Understanding change in China's food system

The shift

In response to these mounting pressures, Chinese leadership has elevated food security to a core strategic priority.[46] Over the past five years, food security has repeatedly been framed as a matter of national resilience, reflected in formal incorporation into Five-Year plans, long-term development strategies, and agricultural modernisation agendas.[47] The objective is not complete autarky but a higher degree of self-sufficiency. Policy language increasingly emphasises secure and controllable supply for staple foods, protein sources, and critical inputs such as animal feed.[48]

Protein is an area of particular importance for China's food strategy. It is the most resource-intensive component of the food system, the largest driver of import dependence, and the point at which diets, environmental pressure and geopolitical risk most visibly converge. As a result, efforts to strengthen food security in China increasingly focus on how protein is produced, supplied and substituted across both food and feed systems.

China's emerging strategy places great weight on resilience and continuity amidst a disruptive global order.[49] In practice, this means investing in technologies that reduce dependence on land, resource-intensive inputs, and imports, while supporting parallel production pathways, even when these options are not yet cost competitive. Against the backdrop of China's broader development agenda, this food system strategy is enabled by, and plays into, its green transition and adoption of clean energy, since technologies like biomanufacturing can be powered by the capabilities China has developed in renewable energy and batteries.

Key policy documents guiding the evolution of China's food system

15th Five-Year Plan
2026-2030[50]

China's national strategic blueprint, which now incorporates emerging technologies such as synthetic biology and new protein sources within a broader strategy to diversify China's food supply and strengthen conventional agricultural production.

Plan for Accelerating the Construction of China into an Agricultural Powerhouse
2024-2035[53]

"A world power must first strengthen its agriculture, and only when its agriculture is strong can a country be a world power".[54]

No. 1 Central Document
2026[51]

The Party's first agricultural policy statement of the 15th FYP period, explicitly naming biomanufacturing as a key technological priority for China's food system.

National Food Security Law
2023[55]

Aims to ensure security in staple grains for food use and instructs authorities to ensure the food supply remains firmly in the People's Republic of China's (PRC) own hands.

No. 1 Central Document
2025[52]

Food security remains a cornerstone, and the policy now places greater emphasis on reforming and modernising rural practices and achieving stable grain supply.

14th Five-Year Plan
2021-2025[56]

The first document to place food security in a dedicated economic security section, alongside energy and finance, and not in agriculture. Emphasises the need to "hold our rice bowls firmly in our own hands".[57]

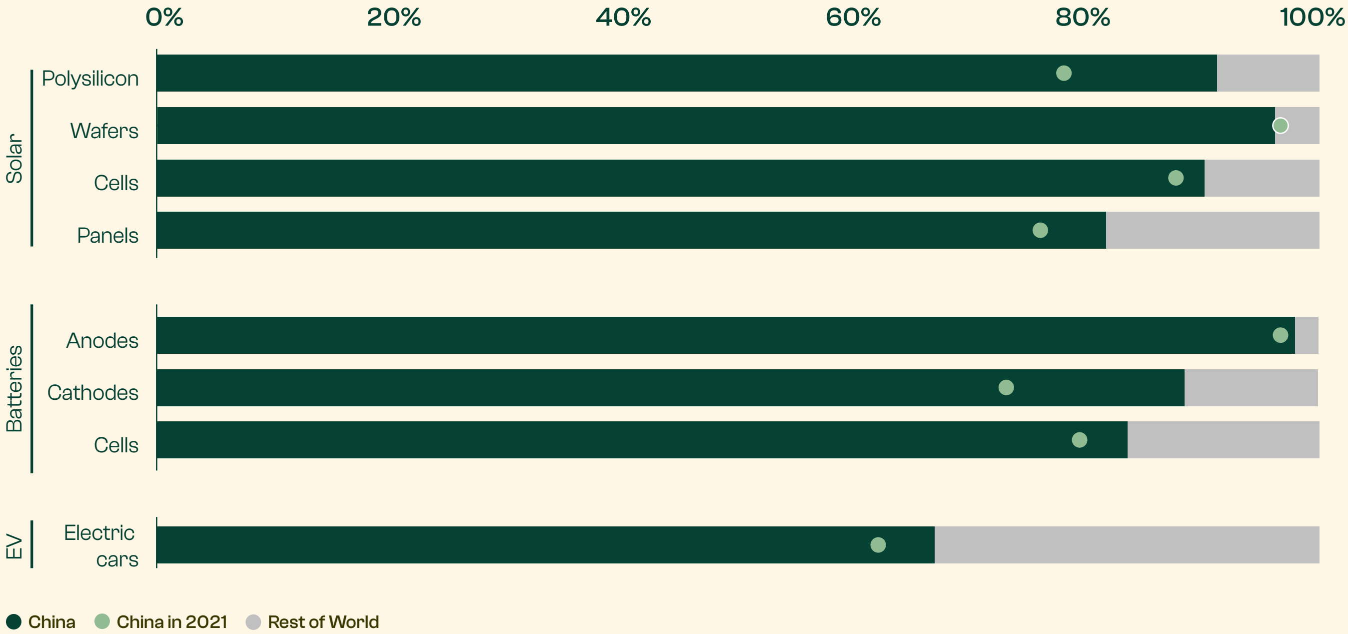
The precedent

Over the past decade, China has executed two of the most consequential industrial transformations of the 21st century. Since 2015, global solar capacity has expanded more than 30-fold, with solar now supplying 7% of global electricity,[58] and electric vehicle sales having increased 50-fold, reached 20% of new vehicle sales globally in 2024.[59] China sits at the centre of both transitions. By 2025, it accounted for approximately 80% of global solar manufacturing capacity and 70% of global EV production.[60] Its role as the world's largest manufacturer of these technologies extends deep into the value chain, where it is responsible for 80-95% of solar component manufacturing and 80-99% of battery component production.[61]

The speed of these transitions reflects the effectiveness of China's strategy and its ability to act decisively in response to global signals. In solar photovoltaics, external demand signals such as Germany's feed-in tariffs[62] and post-2008 stimulus conditions created a scaling opportunity. Chinese policymakers elevated solar within strategic industrial plans, mobilising export incentives and concessional finance to build capacity well ahead of domestic demand. As global deployment expanded, costs fell and scale compounded, transforming China from a marginal producer to the world's leading solar manufacturer in roughly 15 years. In EVs, this timeline fell to a decade.

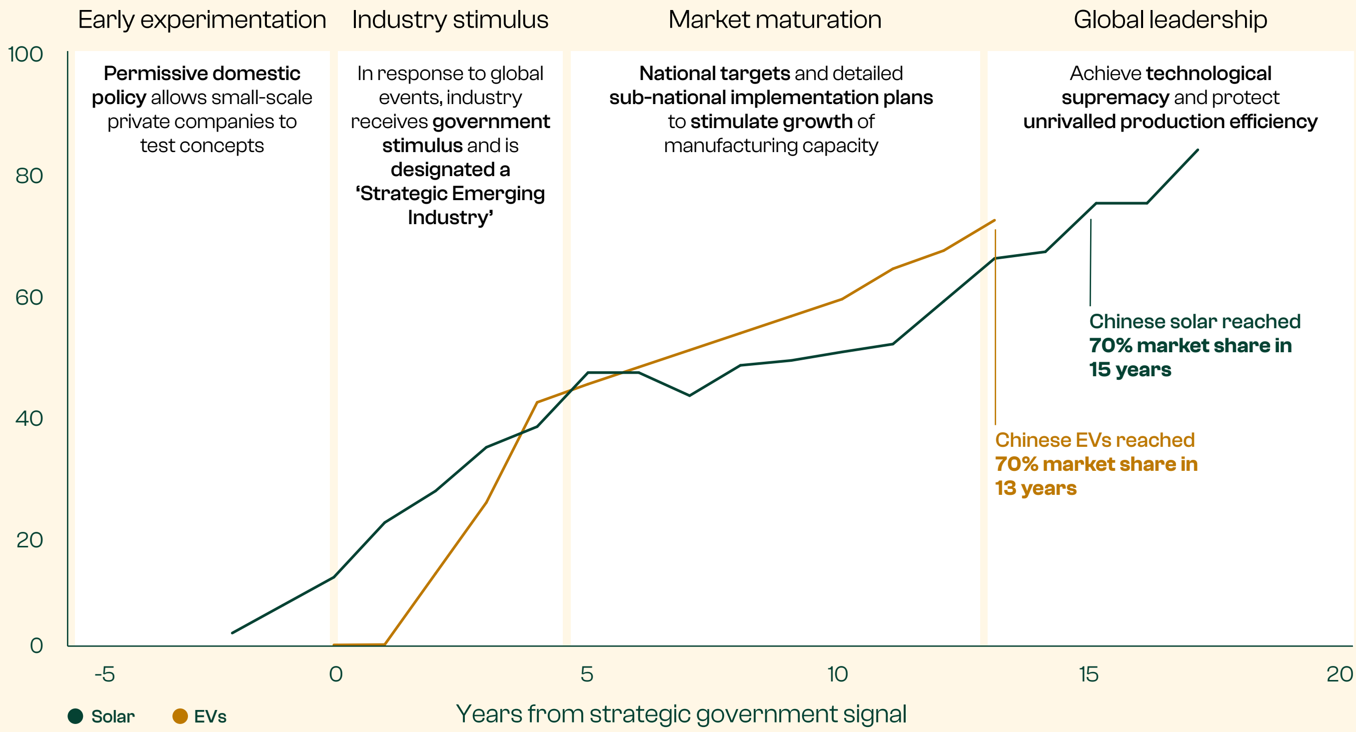
Chinese value chain capture in the solar and EV industries
Figure 7

Share of installed global solar and EV manufacturing capacity by stage of the value chain in China
%, 2023



China's growing market share in solar and EV production
Figure 8

Chinese production as a share of global market in respective industries
%



Note: Signal defined as sustained national-level policy backing, including inclusion in Five-Year Plans, sectoral guidance, and coordinated fiscal and regulatory support.
Source: IEA, Special Report on Solar PV Global Supply Chains 2022; IEA, Global Energy Review, 2025; ETC, Global Trade in the Energy Transition, 2025

China's experience in solar power and electric vehicles offers a useful precedent for understanding how large-scale system change occurs once a sector becomes strategically important. In both transitions, while incumbent systems continued to function, they could no longer be optimised in ways that resolved their underlying constraints and externalities. At the same time, alternative technologies already existed – these were technically viable yet commercially immature, fragmented and unable to scale rapidly through market forces alone. For both transitions, success hinged on alignment of targets, capital, regulation and manufacturing. The result was the rapid construction of parallel systems that went on to inspire change, overtake the incumbent systems and lead global markets.

Food systems differ fundamentally from energy and transport systems. They are governed by biological and physical constraints, are deeply embedded in culture, and are politically sensitive in ways that other systems are not. Substitution is more complex, and consumer choice is deeply influential, making demand-side interventions more difficult to implement. However, treating food's exceptionality as a reason to avoid comparison with other systems risks missing the patterns through which structural change occurs.

These differences shape how transitions unfold, but they do not preclude large-scale change. In energy and transport, the objective was achieving global technological leadership while reducing dependence on imported fossil fuels. Similarly, in food, China's objective is greater self-sufficiency and system resilience in the name of food security, while also building capabilities in emerging future food industries. What links these transitions is not the precise end goal, but the playbook used to pursue it.

The playbook

Studying these transitions reveals a pattern in China's approach to large-scale system change, one which can also be applied to other sectors. Crucially, implementation is neither linear nor frictionless. National strategies set direction, but outcomes emerge through experimentation at the provincial, municipal and firm levels.

This requires some redundancy, leading to uneven execution and high rates of failure; firms enter and exit rapidly, public capital is not always allocated efficiently, and capacity is built alongside emerging demand. This churn is a core feature of how China achieves scale. By tolerating duplication and failure, the system accelerates learning and reveals which technologies and models can survive at scale.

Strategic and coordinated vision

This is the critical first element and it is from this that everything else flows. Plans and targets that cascade from central government to provinces, state-owned enterprises and financial institutions. Unlike indicative targets in many economies, in China these directly shape investment decisions and administrative action.

Financial support

Access to low-cost capital from state-banks, combined with targeted subsidies and sustained R&D funding reduce early-stage risk and lower the cost of failure.

Policy and regulatory support

Rapid policy adjustment, regional pilots and proactive infrastructure build-out create an enabling environment for private sector participation.

Induced demand

Rather than waiting for consumer demand to materialise, the state ensures early uptake through procurement, standards and/or usage requirements.

Entrepreneurial environment

Dense supplier ecosystems, close industry-university partnerships and intense domestic competition drive rapid iteration and cost reduction. As weaker players exit, leading firms can scale and engage in value chain consolidation.

* See the Annex for a more detailed description.

Evidence of playbook deployment in China's food system

Early signals suggest the playbook is now being applied to food.

While China has long spoken of food security and reducing reliance on imports, it is the coordinated action across multiple elements of the playbook that we see falling into place now that make us believe this time is different. Taken together, these signals indicate that China has entered 'Year 0' of food system transformation.

Strategic and coordinated vision

Over the past five years, food security has been elevated within China's core planning architecture. Five-Year Plans set the country's binding national development priorities for the coming five years, cascading targets and investment commitments down to provinces, state enterprises and financial institutions. The No. 1 Central Document, issued annually at the start of each year, indicates the Party's single highest policy priority for that period and has focused on agriculture and rural development every year since 2004.

The 15th Five-Year Plan (2026-2030)[63], released in March 2026, signals a continued emphasis on food security through increased domestic productivity, diversified food sources and agricultural technology development. Emerging technologies, including synthetic biology and novel proteins, appear as part of this strategy. Similarly, the No. 1 Central Document, the first major policy document issued each year by China's central authorities, signals a shift from defensive food security to offensive agricultural modernisation, prioritising technological self-sufficiency and import diversification as the foundation for China's food strategy over the 15th FYP period. This built on the 14th Five-Year Plan (2021-2025)[64] and the Outline for Accelerating the Construction of an Agricultural Powerhouse (2024-2025),[65] which framed food supply as a matter of national security, emphasising self-sufficiency, secure and controllable supply chains and resilience. Protein and animal feed feature prominently in these documents, reflecting their central role in driving import dependence and resource pressure.

These priorities are reinforced across a broader policy ecosystem, including, but not limited to, the Digital Agricultural and Rural Development Plan (2019-2025),[66] Guidelines for Digital Construction of Agricultural Modernisation Demonstration Zones (2022),[67] the National Food Security Law (2023),[68] the National Smart Agriculture Implementation Plan (2024-2028), the No. 1 Central Document (2025),[69] Made in China (2025),[70] and Healthy China 2030.[71]

These documents have positioned food security beyond agricultural policy and into the realm of economic and strategic planning.

Entrepreneurial environment

Perhaps the strongest early signal is the emergence of domestic innovation around protein and feed. A growing number of domestic firms are active across alternative proteins, fermentation-derived ingredients, feed additives and agricultural biotechnology,[72] with many supported by universities, public research institutes and state-backed incubators.[73] Activity is increasingly clustering geographically, particularly in regions with strong industrial biotechnology bases. The concentration of firms in the Yangtze River Delta, Beijing-Tianjin-Hebei region, and Guangdong[74] – areas that also host established pharmaceutical, enzyme, and amino acid production – suggests a shift from isolated pilots toward a coordinated industrial ecosystem. This geographic clustering mirrors patterns observed in solar manufacturing and EV production during their pre-scale phases, when existing supply chains and technical expertise were repurposed for new applications.

Financial support

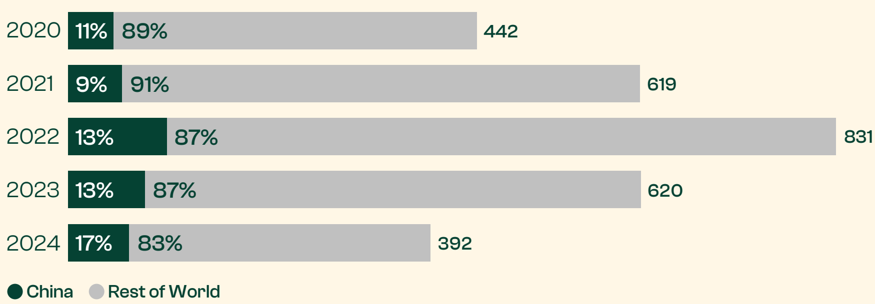
While still nascent and expected to grow again following the recent release of the 15th Five-Year Plan, state-aligned financing has increasingly targeted agricultural modernisation, where, for the first time, food security is mentioned as an economic strategy. Capital for seed development, feed efficiency and biomanufacturing capacity have increased, even where near-term commercial returns remain uncertain.[75] Large-scale investment in fermentation and biomanufacturing capacity have accelerated since 2020, supported by national and provincial initiatives that position synthetic biology and alternative proteins as strategic emerging industries.[76] For example, the State Development & Investment Corporation (SDIC) launched the Tianjin Biomanufacturing Innovation Academy with substantial committed capital focused on scaling fermentation infrastructure for both food and industrial applications, while Beijing's municipal government co-funded an $11 million sustainable protein R&D centre in January 2025, combining public and private capital to accelerate cultivated meat and precision fermentation technologies.[77] Dedicated funding streams under national agricultural science and technology programmes, alongside concessional lending from policy banks, mirror earlier patterns in solar and EVs, where preferential financing enabled firms to build capacity just ahead of growing demand.

There has been an increase in the share of patents being filed in China for future food technologies, indicating their growing interest in the space

Figure 9

Cultivated meat and fermentation patents by publication year

Share of total, % and total number of patents



Policy and regulatory support

Regulatory frameworks are being adjusted to accommodate new production systems. In late 2024, China approved the commercialisation of genetically engineered maize and soya varieties after years of controlled trials, signalling greater openness to crop biotechnology as a tool for yield improvement and import substitution.[78] As in solar manufacturing a decade earlier, multiple options are being explored and developed in parallel, signalling a tolerance for redundancy in exchange for speed and optionality. State capital is simultaneously funding a cultivated meat and precision fermentation hub in Beijing[79] and a planned alternative protein manufacturing cluster in Guangdong[80].

Induced demand

Notably, demand-side mechanisms remain somewhat limited. In prior transitions, China introduced demand mechanisms soon after manufacturing capacity had expanded and costs declined. A similar sequencing appears to be unfolding in food. Supply-side investment and experimentation are advancing, but large-scale demand activation remains limited. Demand in food systems is shaped primarily by consumer preferences and influenced by a combination of cultural and social factors; it cannot be directed solely through mandates.

Encouragingly, while the 15th Five-Year Plan[81] does not contain specific mandates for, say, public institutions to purchase alternative proteins, it does provide an enabling framework for them to do so in the future. Policies promoting "green consumption" and the "national nutrition plan" could later be used to create induced demand and accelerate adoption. Several levers are available, from public nutrition programmes and dietary guidelines to institutional procurement standards and formulation requirements for processed foods and feeds. Nevertheless, the current absence of strong induced demand suggests that China's food transition remains in the first phase of the playbook.

Case study

How industrial clusters are turning vision into action

Evidence of playbook deployment

In past transitions, the growth of regional industry clusters provided an early signal of imminent strategic industry growth. Clusters help to accelerate transitions by concentrating knowledge, infrastructure, capital, labour, and technology in one place, and enable the repurposing of existing capabilities from adjacent industries rather than building from scratch. Almost every major strategic transition in China since the 1990s can trace its origins to three clusters: Beijing-Tianjin-Hebei (BTH), the Yangtze River Delta (YRD), and Guangdong's Greater Bay Area (GBA), forming what experts call a "tri-core structure". [82] It is here that China's solar PV and electric vehicle industries were born, and these regions have more recently become major forces in biopharmaceuticals. Today, biomanufacturing and alternative proteins are also activating here.

Each cluster plays a distinct role: BTH is China's R&D brain, home to the world's top science city,[83] with R&D intensity 1.6 times the national average[84] and a concentration of universities and state research institutes that drive China's innovation pathway. YRD is the manufacturing machine, contributing 25% of China's national GDP from just 4% of its land area[85] and home to the dense chemical, pharmaceutical, and enzyme production infrastructure which is now being recycled for fermentation-based proteins. GBA is the commercial centre: Shenzhen is home to a vast electronics manufacturing base and the world's most concentrated hardware supply chain, and can move technologies to export faster than anywhere else in the country.

The solar PV and EV transitions provide clear precedents for this pattern. In solar, BTH universities generated the foundational science, solar cell manufacturing concentrated in the YRD, where chemical and glass industries provided the necessary raw material inputs,[86] and GBA took the downstream position, with the Pearl River Delta's electronics base absorbing inverter production and assembly.[87] The EV transition followed the same sequence: BTH drove motor control and lithium battery research, while the YRD, with 424 key EV enterprises and the capacity to source all components within a four-hour drive,[88] became the manufacturing core. The GBA sold and exported the final product, with BYD exporting globally from its home base.[89] In both transitions, BTH generated the science, YRD scaled the industry, and Guangdong commercialised the output, allowing China to reach global industrial leadership.

More recently, China has transformed their biopharmaceutical industries, developing infrastructure, knowledge and capabilities — fermentation facilities, enzyme production lines, precision bioprocessing — that can be repurposed for their growing biomanufacturing and alternative proteins industries. The BTH region now boasts 14 innovation platforms and 7 national advanced bio-innovation manufacturing clusters,[90] chief among them the SDIC Biomanufacturing Innovation Academy in Tianjin.[91] Revenue in YRD's synthetic biology "Golden Corridor" grew 213% from 2022-2024.[92] Changzhou's dedicated Synthetic Biology Industry Innovation Park launched in 2023 with 60+ companies,[93] and Shanghai's municipal government published a formal action plan to establish 10+ leading biomanufacturing firms by 2025.[94] Jiangsu, the YRD's largest manufacturing city, is home to over 4,000 biomedical enterprises with annual output exceeding $70 billion,[95] and the city is well positioned to manufacture alternative proteins at scale. In GBA, biomanufacturing has been designated a priority emerging industry with five dedicated clusters each targeted at $14.2 billion in output,[96] and the Chinese Academy of Sciences' Shenzhen institute has built dedicated synthetic biology infrastructure.[97] Together, these signals and the regional clusters suggest China is on the cusp of another industry transformation.

Potential levers for change

Applying the playbook outlined above, a subset of strategies emerged as near- to medium-term priorities with a high likelihood of adoption. Together, they point towards a food strategy that improves livestock production to reduce demand for imported feed crops, expands domestic crop production and develops biomanufacturing capabilities.

Strategies for food system transformation in China
Table 1

Strategies	Description	Target/Impact	Transition Type*
Soya bean meal reduction	Nationally mandated restructuring of livestock feed formulas to lower soya bean meal inclusion, cutting dependence without sacrificing meat output	Share of soya bean meal in feed to fall from 14.5% in 2022 to <10% by 2030[98]. Ministry projects >7% reduction in feed consumption per kg of animal output in large-scale farms by 2030	Conventional
High standard farmland (HSF) construction	State-led infrastructure programme to upgrade core arable land with irrigation, drainage, soil improvement, mechanisation access and digital management	Increase rate of HSF from 56% in 2024 to 75% by 2030[99]	Conventional
Poultry and aquaculture expansion**	A pivot toward species with higher feed efficiency and lower land intensity,	Increase production from 26 Mt and 53 Mt to 30 Mt and 65 Mt per year respectively by 2030[100]	Conventional
Adoption of genetically modified (GM)/gene edited (GE) crops	Controlled commercialisation of GM/GE maize and soya varieties to raise yields, improve resilience and stabilise domestic supply	Yield improvements of 6-13% projected.[101]	Technological
Controlled environment, vertical livestock farm expansion	Development of multistorey, highly automated, controlled environment livestock facilities, particularly for pigs, to maximise output per unit of land and strengthen biosecurity. While these systems are highly efficient, there are serious concerns around pollution and animal welfare[102]	Feed conversion ratio improvement of 11%[103]	Technological
Alternative proteins (plant-based, bio-fermented, and precision)	Future food alternatives, including plant-based, biomass and precision fermented ingredients, and cultivated meats,*** for food and feed replacement[104]	No specific target	Technological
Bioreactors and processing equipment	Develop expertise and capabilities in building the infrastructure needed for a range of bioindustries including, but not limited to, that needed for alternative proteins[105]	No specific target	Technological

* The strategies adopted to meet these objectives are either conventional or technological. Conventional strategies rely on the extension and intensification of existing practices, and progress is likely to be steady and incremental as targets are met. Technological strategies involve emerging technologies and production pathways, where China's past transitions show the potential for much faster, non-linear adoption.

** Aquaculture here indicates the farmed production of finfish, crustaceans and bivalves, and excludes seaweed and wild-caught fish.

*** Alternative proteins for human food mimic the look, taste and texture of conventional, animal-based proteins. Plant-based proteins use ingredients like soya, wheat gluten, peas, lentils and nuts to create meat and dairy alternatives. Biomass fermented proteins are made from microorganisms (fungi, bacteria, yeast) grown to produce protein-rich biomass. Precision fermented ingredients use microbes to create specific ingredients like albumin or casein. Cultivated meats are products made from animal cells grown directly in bioreactors.

Together, these strategies have the potential to alter China's role in global food systems. What was once the world's fastest growing import market may gradually stabilise, and even contract. At the same time, China's growing biomanufacturing capacity could position it as a more self-sufficient consumer and future exporter of alternative protein technologies.

Case study

Soya bean meal reduction at Muyuan Foods

Muyuan Foods is the largest single hog-farming enterprise, not only in China but in the world. It alone captures nearly 6% of the global market,[106] and provides a relevant case study for how actions from leading companies in China are aligned with government priorities. According to FAIRR, Muyuan started to test low-protein diets as early as 2000, based on evidence that conventional feed formulas oversupplied protein. In 2023, they were able to reduce soya bean meal inclusion to 5.7%, compared to an estimated industry average of 13%, saving 31kg of soya beans and $2 per pig in reduced feed and associated costs.[107]

In its recent Hong Kong IPO prospectus Muyuan Foods re-emphasised this as a strategy that the company will continue to pursue, explicitly identifying the optimisation of soya bean meal feed formulation as part of its climate transition and cost-reduction pathway.[108]

This example demonstrates that soya bean meal reduction is not theoretical or purely policy-driven. It is already being implemented at industrial scale, delivering both cost savings and reduced soya bean intensity per unit of output.

5.7%

Muyuan's soya bean inclusion in 2023

13%

Industry average soya bean inclusion in 2023

Impacts

What might be the likely outcome of this transformation? To explore this question, we undertook a modelling exercise to assess quantitatively a range of scenarios. These are not predictions, but instead are projections of what could happen if China achieves targets and technological transformation at the speed and scale it has achieved in other industries before. The experience of solar and EVs shows us this is possible, and the consequences are such that actors should plan accordingly. To understand how the impacts of this shift are felt around the world, let us imagine what the baseline scenario might look like for different stakeholders.

2030: the optimisation phase

In 2030, daily food consumption in China looks much like it does today. Despite this, the combined effect of steps taken in production systems to reduce import dependencies has resulted in soya bean imports falling by 25%.

Diets remain protein-rich, and consumption of meat, dairy and aquatic foods remains largely unchanged. On the other hand, Chinese production has continued to focus on efficiency and productivity for improved food security. Feed reformulation has reduced soya inclusion rates, avoidable food loss and waste has fallen by 50%, and investment has increased productivity on arable farms. Together, this has increased the amount of edible protein delivered per unit of land, water and feed.

China's poultry and aquaculture industries have seen significant expansion. While this has reduced reliance on imports for these products, the growth in aquaculture has increased demand for fishmeal and fish oil feed inputs. Where additional feed demand is met through improved recovery of fish-processing by-products, fishing pressure remains stable; where it exceeds by-product supply, it may be putting additional pressure on global fisheries.

Alternative proteins remain niche and have yet to significantly change consumer habits or reduce animal-protein consumption. Most alternative proteins are still more expensive than their animal-based equivalents, so consumer uptake remains limited. Despite this, consistent signalling from Chinese leadership means that the industry has continued to grow and innovate. With increasing scale and experience, costs are falling and retailers, food manufacturers and the food service sector are all experimenting with alternative protein ingredients. Price parity is reached first for fermentation-derived ingredients just before the end of the decade. Plant-based milks and dairy products are the notable exception in this scenario, accounting for 19% of their respective market.

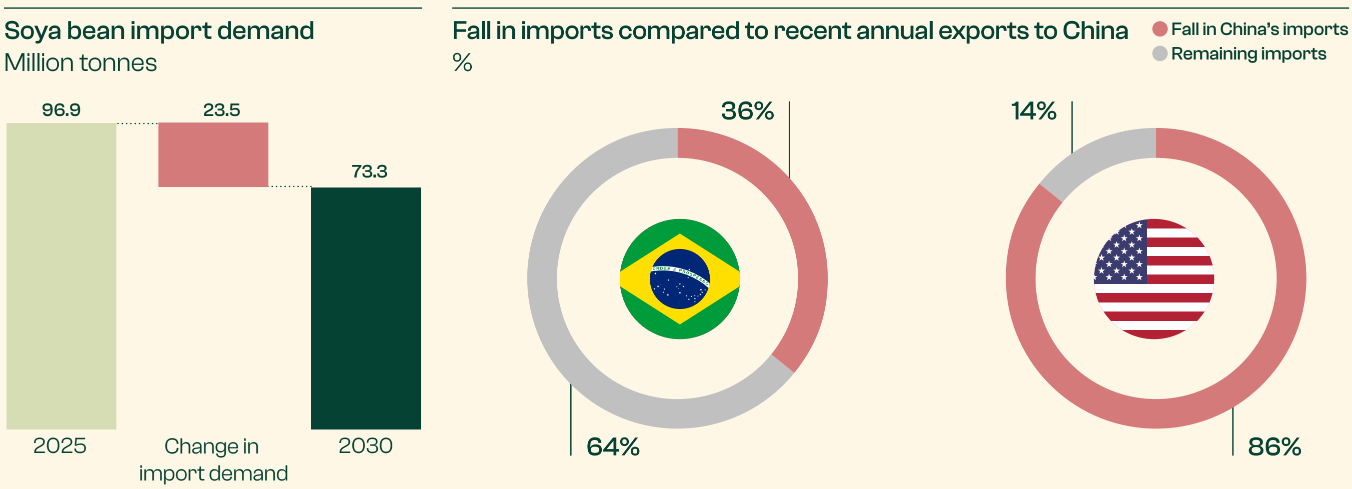
Trade effects

As the gap between consumption and domestic supply begins to narrow, demand for imported feed crops and animal products begins to fall. Under the baseline, soya imports decline by 23.5 million tonnes by 2030, a fall of 25% relative to 2025, primarily driven by lower soya bean meal inclusion in feed. This is equivalent to almost all US soya exports to China in 2024, or a third of Brazilian exports in that same year,[109] and is worth $12 billion. Smaller, but still meaningful, reductions occur across beef, poultry and dairy imports, while maize demand rises as domestic feed reformulations adjust.

China has also sought to build new trade relationships, piloting deals with new soya producers including Ethiopia[110] and others in sub-Saharan Africa. A small but growing share of imports is supplied by these emerging producers, helping to protect China from the potential for volatile market conditions. This optionality has given Chinese policymakers the space to raise the standards required of imported commodities.

25%
reduction in China's soya bean imports compared to 2025

Comparison of projected fall in soya bean demand against current imports from Brazil and the US
Figure 10



2040: structural change begins

By 2040 more fundamental changes begin to reshape the system more visibly.

New production pathways have scaled from pilot to commercial deployment. Alternative proteins, primarily fermentation-derived ingredients and plant-based proteins, have disrupted the most expensive animal protein categories first, with beef and high-value seafood alternatives reaching price parity earliest. Together, across all technologies, alternative proteins now account for approximately 14% of beef consumption and 16% of seafood consumption.

For conventional agriculture, GM and GE crop adoption continues to improve yields for maize and soya. Livestock production continues to consolidate into more intensive and controlled systems, notably vertical, high-biosecurity facilities for pig and poultry. These systems raise output per unit of land and reduce disease risk, but increase demand for energy, waste management and operational control.

Alongside the increase in domestic production, China's reliance on imported feed crops has continued to decline. Total soya imports have now fallen by 30% compared to 2025 levels. Maize has replaced much of that soya; fermenting the maize can increase its protein content and availability, making it a suitable substitute. It is also a key input for the growing alternative protein industry as a high-sugar crop. As such, despite increased domestic production and reduced overall feed demand, the need for imported maize has remained stable.

Most significantly, the combined effect of these changes means that China is now a major animal-protein exporter. While imports of speciality products which may be difficult to produce in China, like cheese or cold-water seafood species, will likely persist, domestic production of poultry, dairy, eggs and farmed aquatic products* now exceeds demand in certain product categories. Existing producers around the world will now have to contend with Chinese food exports on the market. As Figure 11 shows, China will continue to import beef and, despite being the world's biggest producer, pork.

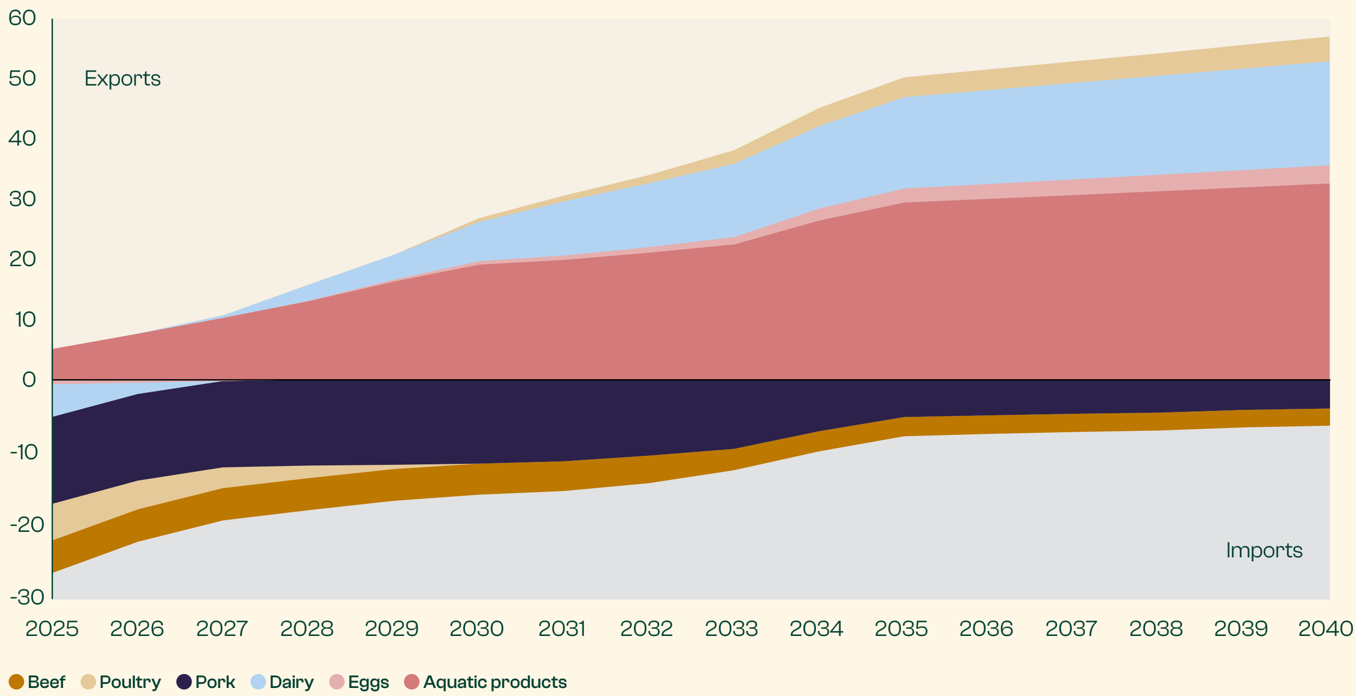
30%
reduction in China's soya bean imports compared to 2025

14%
of beef markets captured by alternative proteins

16%
of seafood markets captured by alternative proteins

Production expansion and falling demand mean that by 2040 China is a major animal-protein exporter
Figure 11

Supply-demand dynamic for animal-based products in China
Million tonnes



* Aquatic products here refers meat from both farmed and wild-caught aquatic species.

2050: new equilibrium

By 2050, the food system has settled into a new configuration. A third wave of alternative protein innovation in the 2040s has made cultivated meats commercially viable, unlocking large segments of the animal protein market. While meat, seafood and dairy remain important elements of the Chinese diet, 35%-55% of demand is met with alternative proteins across different product categories.

Trade remains central, but China's role in global markets has fundamentally shifted. China now exports nearly 45 million tonnes of farmed fish and crustaceans, over 20 million tonnes of milk equivalent and roughly 15 million tonnes each of pork and poultry. To supply these industries, China imports 65 million tonnes of soya every year, a 32% decrease since 2025. Imports of maize, however, have doubled since 2025 to nearly 50 million tonnes a year, driven by its role as a feed crop and a key feedstock for microbial and cultivated protein production. While this is significant growth, given maize yields over twice as much as soya per hectare of land,[111] the increase in maize consumption nevertheless results in the combined footprint of China's soya and maize imports falling by over 7 million hectares. Other sources of sugar will also be necessary, so alternative protein producers adopt potatoes and sugar cane, and are testing cellulosic inputs such as grasses or agricultural residues. Ultimately, whether through feed improvements or replacing animal-based products with alternative proteins, China's future food system has successfully chased efficiencies and is now capable of making more with less.

China's investment in biomanufacturing has positioned it as a global leader of another of the 21st century's defining technologies. As in solar and EVs, China captured critical points of the value chain; it is the world's leading producer of amino acids and other inputs, as well as the dominant supplier of alternative protein infrastructure, supplying producers around the world. These technologies are in demand in both established and emerging markets, with the potential to make the global protein supply more stable, diverse, and less dependent on land-intensive livestock systems.

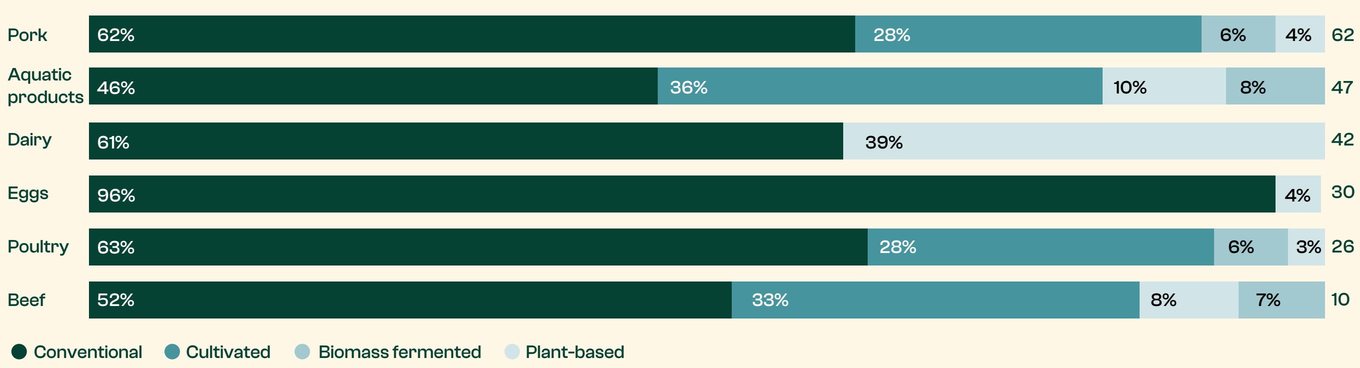
32%
reduction in China's soya bean imports compared to 2025

7m
hectare decrease in footprint of China's soya and maize imports compared to 2025

45m
tonnes of farmed fish and crustaceans exported

By 2050, alternative proteins are projected to capture a large share of the animal protein market
Figure 12

Breakdown of animal protein consumption by source in 2050
%, total demand in million tonnes



Implications

China's food system transition will be felt most strongly in the markets where Chinese demand has become structurally embedded.

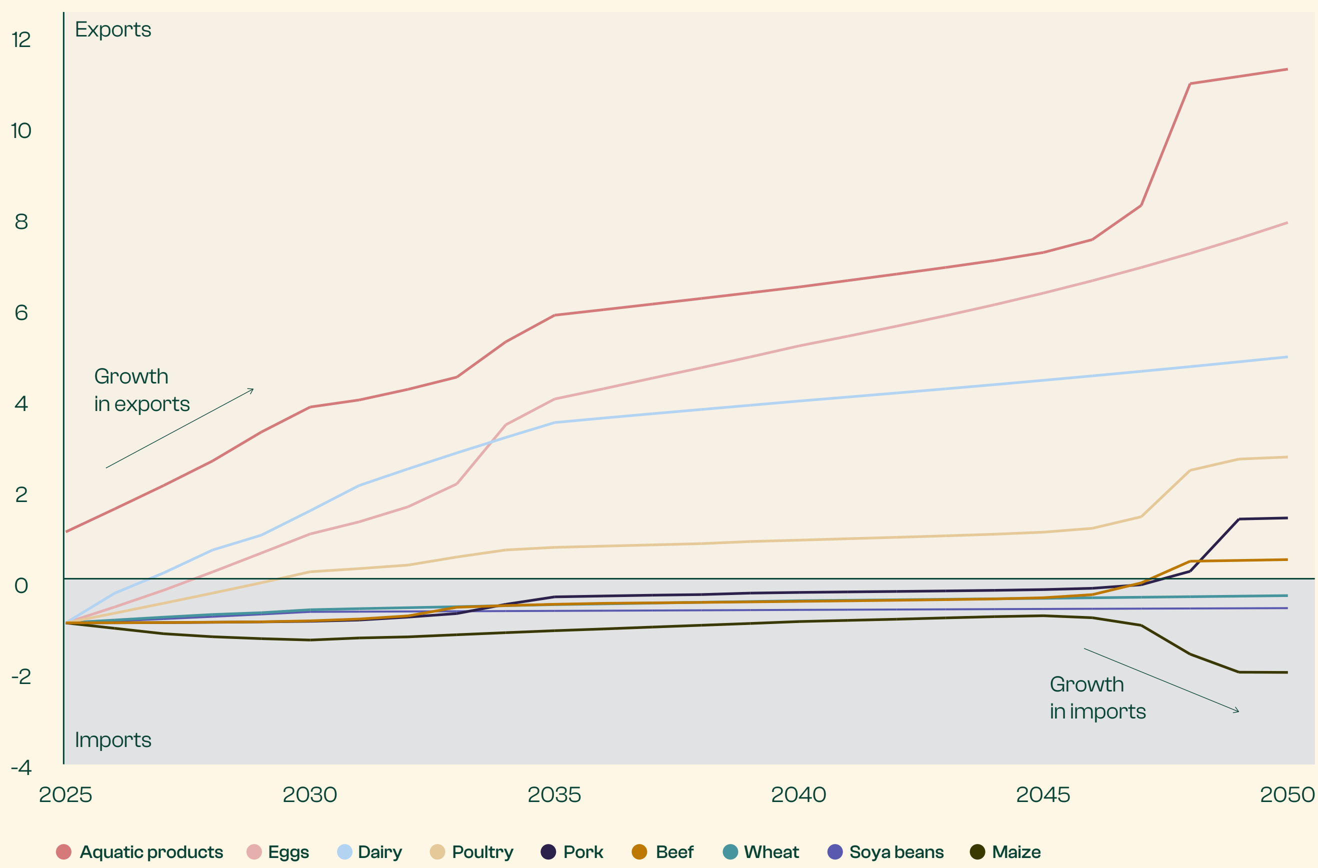
China's agricultural imports were worth a total of $237 billion in 2024.[112] In the three years from 2021 to 2023, China was the primary destination for the vast majority (89%) of soya exports from Argentina, 71% of Brazil's soya exports, and 53% of the US's soya exports.[113]

A similar pattern can be observed in beef exports, where demand from China made up 75% of Argentina's exports, 54% of Brazil's and 41% of New Zealand's.[114] For these economies, changes in Chinese sourcing patterns, standards or demand have major implications for fiscal planning and rural employment.

Anticipating these shifts can reduce adjustment shocks, safeguard forests and natural ecosystems, strengthen global food security, and enhance the resilience of a system on which billions of people depend.

Over the next three decades, China is projected to reduce its reliance on imports for a range of modelled commodities, turning it into an exporter of meat and dairy products by 2050
Figure 13

Change in net trade balance for specific commodities, indexed to 2025
2025=1



Implications for stakeholders in existing producer countries

Over the next two decades Chinese demand will fall. Countries whose agricultural economies currently depend on this demand must consider how to respond to these changes. One such country is Brazil, and in consultation with local stakeholders we have been discussing how the impacts of this shift may be felt there.

How will falling demand affect the value of your agricultural assets?

Because there are few alternative buyers large enough to absorb the shift of contracting Chinese volumes, global supply could exceed demand and prices for affected commodities could fall. Companies, investors and states reliant on the assumption of stable demand and prices face a compounding risk: falling volumes and falling prices simultaneously. Farm incomes and land valuations, processing infrastructure, and logistics networks are all exposed. Policymakers and financial institutions should audit their exposure and stress-test their asset base against the baseline scenario, while ministries of trade should build on efforts to diversify their export markets and hedge against falling Chinese demand.

Is continued agricultural expansion creating stranded assets?

Similarly, investing in agricultural expansion means building capacity that may never generate the returns used to justify it. The question goes beyond whether expansion is profitable today, but really whether the land being converted now will still be a productive, bankable asset in a rapidly changing market. At the same time, continued land use change disrupts water cycles, increases pollution, and erodes the ecosystem services that underpin productivity on existing farmland. Over time, this undermines the very asset base expansion was intended to build on, leaving producers exposed both economically and environmentally. For policymakers, this reinforces the importance of investing in productivity gains, resilience and diversification on existing farmland rather than expansion to create more. Policy and regulation should be oriented towards improving yields on existing farmland, strengthening land-use governance, and enforcing environmental safeguards.

Are you diversifying export markets before Chinese demand falls rather than after?

The time to diversify is when Chinese demand is still large enough to fund the transition, not after it has contracted. Producer countries who are dependent on China as a destination for soya, beef and dairy need to build alternative market relationships now. New markets require physical infrastructure, processing capacity, distribution networks and regulatory alignment, but the cost of building this while volumes are high is substantially lower than attempting to do so under conditions of falling prices and eroding margins.

Can your supply chain meet the standards that future market access will require?

China's recent strengthening of food safety supervision across imported supply chains, including expanded traceability, inspection and risk management requirements, signals a direction of travel toward tighter control over quality and provenance of food imports. This mirrors tightening standards in the EU and other regulated markets, where access increasingly depends on documented compliance with origin, land-use and sustainability criteria.[115] As these standards continue to evolve, exporters need supply chains that can demonstrate compliance and will need to invest accordingly.

Are governments preparing rural communities for structural adjustment?

The communities most exposed to a contraction in Chinese demand are often the least able to adapt. The adjustment, if it comes as a shock rather than a managed transition, will carry serious risks for rural employment and social stability – particularly for smallholder farmers, rural processing workers and regional economies built around a single commodity. Policymakers should be investing now in the productivity improvements, income diversification and social safety nets that would allow farming communities to navigate the structural change of this transition in a manner that does not leave the most vulnerable behind.

Implications for other actors

This section provides a shorter treatment of implications for three additional stakeholders. Each section poses key questions intended to guide thinking.

The alternative protein industry

China's industrial approach to alternative proteins has the potential to accelerate cost reductions globally, putting price parity within reach faster than the industry currently anticipates. This poses both an opportunity and a challenge for existing producers, such as those in Europe and the US.

Are you prepared for Chinese biomanufacturing to drive down the cost of production equipment?

If China follows the solar and EV model, bioreactors and fermentation systems could soon become significantly cheaper.[116] This is a win for the industry overall but may erode the advantage of early movers who built at higher costs

Are you prepared for Chinese alternative protein products to enter export markets?

This means direct competition with established producers.

Are your regulatory frameworks keeping pace with the speed of innovation?

Novel food approvals and labelling requirements will shape the pace of consumer adoption.

Aquaculture and marine resources

Aquaculture plays a central role in China's food security strategy, but the implications for marine resources are highly dependent on species mix and production systems. Today, China's aquaculture output is dominated by freshwater finfish, primarily carp species, alongside large volumes of bivalves and seaweed mariculture, which require no feed inputs and exert minimal pressure on wild fish stocks. This species mix is fundamentally different from the high-trophic, feed-intensive systems that characterise aquaculture in Europe and North America, and any assessment of the implications for marine resources must start from that distinction.

Is aquaculture expansion primarily achieved through species that increase pressure on wild fisheries, or in filter-feeding and low-trophic species that do not?

The risk is not aquaculture per se but a specific pathway in which growth in fed marine finfish and shrimp outpaces progress in feed substitution and by-product utilisation, thereby increasing pressure on forage fish stocks worldwide.

Is progress in feed substitution (alternative proteins, algal oils, improved recovery of fish-processing by-products) keeping pace with production growth?

This will determine whether expanded aquaculture is a net positive or negative for marine ecosystem health.

Are nearshore environmental limits being respected, and is investment in offshore and recirculating systems scaling fast enough to relieve coastal pressure?

Tighter environmental enforcement is already creating incentives to shift production systems, but the transition requires capital and governance.

Are marine resource governance frameworks adequate to manage the cumulative pressure of expanded aquaculture alongside existing capture fisheries?

Global commons require coordinated management, and the current framework has significant gaps, particularly for forage fisheries, which underpin the entire marine food web.

New supplier countries

China is actively diversifying its sourcing footprint.[117] This creates opportunities for investment and access but also introduces risks that deserve attention.

Is increased production capacity being built with diversified markets in mind, or primarily for Chinese demand?

Dependency on a single large buyer replicates the vulnerability that existing exporters are now trying to resolve.

Is the value being captured locally?

Without strong domestic processing and value-addition, new producer countries risk becoming raw commodity exporters, missing the downstream economic opportunity.

Are land rights and local food security being protected?

Agricultural investments that displace smallholders, stress land governance frameworks, or redirect domestic food supply toward export markets create social and political risks that can undermine the project itself.

Is environmental and political governance adequate to manage the risks of rapid agricultural expansion?

Countries without established monitoring and enforcement capacity face the risk of incentivising land use change in ecosystems that historically have not faced this pressure, with consequences for carbon, biodiversity and water that are difficult to repair. Similarly, the quality of contracts, land lease terms and technology transfer agreements will determine whether these partnerships deliver lasting value or primarily serve external strategic interests.

All actors should recognise this transition as structural. If import contraction, industrial reshoring and rising standards materialise together, the adjustment will be felt simultaneously through asset values, trade flows and competitive positioning across the food system.

The evolving picture

With the release of the 15th Five-Year Plan and several major policy forums scheduled early in this year, the coming 12 to 18 months are likely to clarify how quickly China's food system transition accelerates. Experience in energy and transport suggests that this is the phase when intent will become coordinated action. We identify the following signals that will indicate whether that inflection point has arrived:

Signals in planning and targets

Close attention should be paid to how the sector responds to the 15th Five-Year Plan and associated provincial plans. Explicit targets for alternative protein capacity, seed innovation or biomanufacturing would indicate a shift from experimentation to scale. Specific mentions of decadal targets for alternative proteins, potentially to achieve health or climate targets, or biomanufacturing and the inclusion of aquaculture feed composition standards in national regulation would suggest a significant transition to follow.

Signals from industry clustering

Further evidence of geographic clustering, such as designated industrial zones, university-industry hubs, or coordinated provincial programmes, would suggest that the entrepreneurial ecosystem is moving from pilot to commercial scale.

Signals in regulation and standards

Changes to food safety, feed approval, seed regulation or procurement standards can rapidly reshape markets. Inclusion of alternative proteins, novel feeds or new production systems within regulatory frameworks would lower barriers to deployment and accelerate adoption. Policies that differentiate or incentivise domestically produced alternative feeds would accelerate industrial scale, as would a formal biosecurity/disease resilience mandate tied to climate adaptation plans.

Signals in induced demand

Demand-side engagement is currently a little-used element of the playbook in China, but action here is likely to happen as health and environmental concerns move up the policy agenda. Induced demand may target consumers or purveyors through mandates, quotas, or incentives regarding alternative protein, feed composition, or diversified trade sourcing.

Signals in capital allocation

Announcements related to concessional finance, state-backed funds, research and development funding, or large-scale infrastructure investment (particularly of fermentation capacity, seed systems, or controlled-environment production) would mirror early-stage patterns in solar and EVs. The scale and coordination of these investments matter more than individual projects.

Together, these signals will help determine whether China's food system transition remains gradual or enters a phase of accelerated change.

As in previous transitions, the most important indicators are the alignment between strategy, industrial activity, capital and regulation.

Conclusion

Over the past four decades, China integrated into global agricultural markets as an engine of demand. Rising incomes and dietary transformations made it the dominant buyer of feed crops, and a central force in shaping demand flows.

That system is now under strain. Land and water limits, climate volatility, disease risk and geopolitical exposure have repositioned food security as a matter of strategic resilience. The emerging response is to improve efficiency within existing systems while diversifying and building new technological pathways that reduce dependence on imported food and feed.

This shift is likely to unfold in phases throughout the next few decades. In the near-term, China will likely focus on optimisation through feed reformulation, yield gain, and species shifts that reduce import reliance.

By the 2040s, structural diversification will become plausible as alternative proteins and biomanufacturing move to scale. By mid-century, China's role in global food systems could be fundamentally different.

The critical consideration for the rest of the world is whether China continues to drive global demand growth. If and when that role diminishes, the effects will ripple across commodity markets, land use, industrial strategy, and the geography of food production. The significance of this shift is such that even if stakeholders believe the likelihood of change happening on the scale outlined here is slim, the chance that it does come to pass cannot be ignored and must be planned for.

Producer countries are increasingly charting their own paths toward production systems that are both economically resilient and environmentally durable. Decision makers at every level are best placed to assess what combination of regulation, policy and enforcement will allow sustainable production to thrive over the long term.

In practice, this means finding ways to grow output without expanding the agricultural frontier. In Brazil, pathways being explored include prioritising yield gains and pasture restoration on existing farmland, strengthening traceability to farm level for soya and cattle, and aligning rural credit, insurance and infrastructure investment with sustainability goals. Investment in land rehabilitation and rural community resilience -- preparing for more local and circular markets -- is also central to this transition. Where these shifts are made, they protect market access as standards evolve globally, reduce exposure to stranded asset risk, and secure land, livelihoods and habitats for the long term..

China has reshaped global supply chains in the past, when strategic priorities aligned with industrial capability. The next evolution of global food systems may be shaped by how China chooses to secure its protein future.

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Annex

Our Approach

This analysis involved both desk-based research and iterative consultation. Initial analysis was informed by engagement with an external panel of experts and a broader network of food system, technology, and policy experts. The expert panel brought together experts on China, food systems and geopolitical relations between China and the rest of the world, from both within and outside of China. Additionally, we sought supplementary input on specific elements of the work, for example to help us better understand the landscape of the alternative protein industry in China. Emerging findings were then shared through bilateral discussions and at a dedicated food systems symposium, where perspectives from industry leaders and practitioners helped refine our assessment and sharpen conclusions.

Extended strategy description

Conventional strategies:

The first group consists of interventions that extend and intensify existing approaches. These measures are already in planning documents and regulatory frameworks, and their impact will accrue gradually as targets are met.

Soya bean meal reduction
A nationally mandated restructuring of livestock feed formulas to lower soya bean meal inclusion, cutting dependence on imported soya beans and reducing exposure to geopolitical risk, all without sacrificing meat output.[118]

High-standard farmland construction
A state-led infrastructure programme to upgrade China's core arable land with irrigation, drainage, soil improvement, access to mechanisation and digital management. The goal is to lock in stable grain yields under climate stress, consolidate fragmented plots and improve production capacity on the limited available land.[119]

Food loss and waste reduction
A legally enforced, whole-supply-chain effort to reduce losses from harvest through to consumption, framed as a non-negotiable food-security reserve. By cutting waste rather than expanding production, China effectively "creates food" without using additional land, water or inputs.[120]

Poultry and aquaculture expansion
A deliberate pivot toward species with higher feed efficiency and lower land intensity, supported by investment in offshore aquaculture, recirculating systems and modern poultry operations. This transition helps diversify protein supply and modernise the animal-protein value chain.[121]

New tech strategies:

The second group involves technologies that alter the structure of production itself. While many remain at early commercial stages, signs that the playbook is already being deployed suggest these solutions could transform rapidly over the next 10 to 15 years, emerging as integral components of China's food system.

Adoption of genetically modified (GM) or gene edited (GE) crops
Controlled commercialisation of GM and GE maize and soya varieties to raise yields, improve stress resistance, and stabilise domestic supply on constrained farmland. This marks a strategic shift from regulatory caution to seed sovereignty, explicitly aimed at reducing import dependence while keeping deployment tightly managed.[122]

Controlled environment, vertical livestock farm expansion
Development of multistorey, highly automated, controlled environment livestock facilities, particularly for pigs, to maximise output per unit of land and strengthen biosecurity. These systems allow production to continue in land-scarce regions but raise serious concerns around animal welfare.[123]

Alternative proteins
Alternative proteins can be produced using a variety of techniques. Our analysis suggests that three distinct technologies are being prioritised by Chinese leadership today, these are:

- **Plant-based:**[124] Derived from crops such as soya, peas, rice and wheat, these are processed to produce ingredients or foods, typically mimicking meat or dairy products, that can substitute for animal-based protein in human diets.
- **Biomass fermented protein:**[125] Produced by cultivating microorganisms, such as bacteria, fungi or yeast at scale and harvesting the microbial biomass itself as a protein source. These systems convert sugars or other feedstocks into edible protein with minimal land use, decoupling protein production from traditional agriculture and enabling production in controlled, industrial settings.
- **Precision fermented proteins:**[126] Production of specific proteins (for example whey, albumin or functional ingredients) by genetically engineered microorganisms that are programmed to express target proteins during fermentation. Unlike biomass fermentation, the microbial cells are not consumed; instead, the desired protein is extracted and purified

Bioreactors and processing equipment
Strategic investment in bioreactors, fermentation systems and downstream processing equipment as enabling infrastructure for future food, biotech and biomanufacturing industries. The priority is control over critical industrial hardware that underpins competitiveness, resilience and technological sovereignty.[127]

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The playbook in detail

China's playbook is built around five mutually reinforcing success factors:

Strategic and coordinated vision

Five-Year Plans translate national priorities into binding targets that cascade from central government to provinces, state-owned enterprises and financial institutions. Unlike indicative targets in many economies, these plans directly shape investment decisions and administrative action. Once a sector has been designated strategically important and incorporated into national frameworks, it signals a declaration of intent.

Financial support

Access to low-cost capital from state-banks, combined with targeted subsidies and sustained R&D funding, reduces early-stage risk and lowers the cost of failure. This allows firms to invest at scale before commercial viability is fully proven, accelerating learning curves and enabling the rapid build-out of capacity.

Policy and regulatory support

Clear political signalling reduces uncertainty about long-term direction, while China's ability to amend regulation rapidly in response to global developments allows policy to evolve alongside technology. Proactive infrastructure build-out, often ahead of demand, creates the physical and institutional landscape for new industries to scale. This combination of rapid policy adjustment in response to global events and initiative-taking infrastructure build-out creates an enabling environment conducive to private sector participation.

Induced demand

Mandates, quotas and fleet or deployment targets actively create markets for emerging technologies. Rather than waiting for consumer demand to materialise, the state ensures early uptake through procurement, standards and/or usage requirements, providing firms with the certainty needed to invest in these novel technologies, helping to accelerate learning and further drive down costs.

Entrepreneurial environment

Dense supplier ecosystems, close industry-university partnerships and intense domestic competition drive rapid iteration and cost reduction. Once a sector is prioritised, barriers to entry are lowered and competition is encouraged, accelerating consolidation around the most efficient firms. As weaker players exit, leading firms can scale and engage in value-chain consolidation.

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Results tables

Below are the outcomes of the three primary modelled scenarios. In all three scenarios, aquatic products, which encompasses the 'meat' from farmed and wild-caught aquatic species, are the only export commodity from the outset. As such, while the net change for other commodities illustrates the projected change in China's imports, for aquatic products it instead illustrates the projected change in exports.

Baseline scenario

The baseline scenario is the one outlined and discussed throughout the report.

		Change with respect to 2025								
		Demand			Domestic production			Net (change in Imports/ exports)		
Modelled commodities	Units	2030	2040	2050	2030	2040	2050	2030	2040	2050
Beef	Million tonnes	+0.0	-1.9	-5.9	+0.2	+0.2	+0.3	-0.2	-2.1	-6.2
Poultry	Million tonnes	+0.3	-2.5	-10.9	+6.0	+6.6	+7.3	-5.6	-9.1	-18.2
Pork	Million tonnes	+1.3	-6.1	-25.3	+1.7	+1.9	+2.1	-0.4	-8.0	-27.4
Dairy	Million tonnes	-9.6	-20.1	-24.3	+1.4	+1.6	+1.8	-11.0	-21.7	-26.1
Eggs	Million tonnes	-0.1	-2.5	-3.9	+1.1	+1.2	+1.3	-1.2	-3.6	-5.2
Maize	Million tonnes	+23.8	+26.8	+57.5	+15.2	+27.5	+32.7	+8.6	-0.7	+24.8
Wheat	Million tonnes	+2.6	+2.9	+3.1	+6.3	+9.2	+10.9	-3.7	-6.3	-7.8
Soya beans	Million tonnes	-22.1	-25.2	-28.3	+1.4	+2.6	+3.2	-23.5	-27.7	-31.4
Aquatic products	Million tonnes	+7.3	-3.9	-25.8	+11.5	+12.8	+14.2	+14.0	+27.5	+52.0

Low ambition, slow transition scenario

The 'low ambition, slow transition' scenario broadly sees targets missed and a slow transition to the end-state, while at the same time the impacts of climate change are most negative.

		Change with respect to 2025								
		Demand			Domestic production			Net (change in Imports/ exports)		
Modelled commodities	Units	2030	2040	2050	2030	2040	2050	2030	2040	2050
Beef	Million tonnes	+0.3	-0.3	-0.9	+0.1	+0.2	+0.2	+0.2	-0.4	-1.1
Poultry	Million tonnes	+0.8	-0.2	-1.2	+2.3	+4.7	+4.7	-1.5	-4.9	-6.0
Pork	Million tonnes	+2.3	+0.1	-1.4	+0.7	+1.3	+1.3	+1.7	-1.2	-2.8
Dairy	Million tonnes	-3.5	-11.1	-17.8	+0.6	+1.2	+1.2	-4.1	-12.2	-18.9
Eggs	Million tonnes	+0.5	-1.1	-2.6	+0.4	+0.8	+0.8	+0.0	-2.0	-3.4
Maize	Million tonnes	+8.3	+16.5	+16.2	-1.1	-0.2	-8.2	+9.4	+16.7	+24.4
Wheat	Million tonnes	+0.8	+1.5	+1.5	+2.8	+5.7	+5.4	-1.9	-4.2	-3.9
Soya beans	Million tonnes	-7.1	-15.7	-15.8	+0.6	+1.4	+1.4	-7.7	-17.2	-17.3
Aquatic products	Million tonnes	+3.2	+1.8	-4.4	+4.5	+9.2	+9.2	+5.3	+15.3	+21.5

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High ambition, fast transition scenario

The 'high ambition, fast transition' scenario broadly sees targets exceeded and an accelerated transition to the end-state, while at the same time the impacts of climate change are most positive.

		Change with respect to 2025								
		Demand			Domestic production			Net (change in Imports/ exports)		
Modelled commodities	Units	2030	2040	2050	2030	2040	2050	2030	2040	2050
Beef	Million tonnes	-0.4	-2.8	-8.7	+0.3	+0.3	+0.4	-0.7	-3.1	-9.1
Poultry	Million tonnes	-0.3	-5.2	-17.8	+6.8	+8.4	+10.3	-7.2	-13.6	-28.1
Pork	Million tonnes	+0.4	-12.3	-41.5	+1.9	+2.4	+2.9	-1.6	-14.6	-44.3
Dairy	Million tonnes	-20.7	-24.9	-29.2	+1.6	+2.0	+2.4	-22.4	-26.9	-31.7
Eggs	Million tonnes	-0.4	-3.4	-5.1	+1.2	+1.5	+1.8	-1.6	-4.9	-6.9
Maize	Million tonnes	+29.0	+37.8	+84.2	+22.3	+38.5	+42.5	+6.7	-0.7	+41.6
Wheat	Million tonnes	+3.6	+4.2	+4.9	+9.2	+12.5	+12.6	-5.6	-8.3	-7.7
Soya beans	Million tonnes	-28.6	-36.7	-46.9	+1.9	+3.3	+3.5	-30.5	-39.9	-50.4
Aquatic products	Million tonnes	+7.7	-4.8	-32.4	+13.3	+16.3	+20.0	+16.8	+34.7	+69.1

Sources

1 Food and Agriculture Organization of the United Nations. (2026). FAOSTAT: Population and Employment data [Data set]. FAO. Retrieved February 27, 2026, from https://www.fao.org/faostat/en/#data/OA

2 Food and Agriculture Organization of the United Nations. (2026). FAOSTAT: Population and Employment data [Data set]. FAO. Retrieved February 27, 2026, from https://www.fao.org/faostat/en/#data/OA

3 Council on Foreign Relations. (2025, February 6). What happened when China joined the WTO? CFR Education. https://education.cfr.org/learn/reading/what-happened-when-china-joined-wto

4 International Energy Agency. (n.d.). China. IEA. https://www.iea.org/countries/china

5 ChinaPower Project. (n.d.). How severe are China's food security challenges? Center for Strategic and International Studies. https://chinapower.csis.org/china-food-security/

6 Food and Agriculture Organization of the United Nations. (n.d.). FAOSTAT: Crops and livestock products trade data. Retrieved 1 February 2026, from https://www.fao.org/faostat/en/#data/TP

7 Food and Agriculture Organization of the United Nations. (n.d.). FAOSTAT detailed trade matrix [Statistical dataset]. FAOSTAT. https://www.fao.org/faostat/en/#data/TM

8 ChinaPower Project. (n.d.). How severe are China's food security challenges? Center for Strategic and International Studies. https://chinapower.csis.org/china-food-security/

9 Murphy, B. (Translator). (2021). Outline of the People's Republic of China 14th Five-Year Plan for national economic and social development and long-range objectives for 2035 (T0284_14th_Five_Year_Plan_EN.pdf). Center for Security and Emerging Technology, Georgetown University. https://cset.georgetown.edu/wp-content/uploads/t0284_14th_Five_Year_Plan_EN.pdf

10 (2026, March 13).Outline of the 15th Five-Year Plan for National Economic and Social Development of the People's Republic of China. Xinhua News Agency. https://www.news.cn/politics/20260313/ 085af5de5a4b4268aa7d87d90817df2f/c.html

11 Mridul, A. (2025, January 24). China opens $11M sustainable protein centre with support from local govt. Green Queen. https://www.greenqueen.com.hk/china-lab-grown-meat-sustainable-food-protein-centre-technology/

12 Reuters. (2024, December 31). China approves more GM crops to boost yields, ensure food security. Reuters. Retrieved February 27, 2026, from https://www.reuters.com/markets/commodities/china-approves-more-gm-crops-boost-yields-ensure-food-security-2024-12-31/

13 Food and Agriculture Organization of the United Nations. (n.d.). FAOSTAT: Crops and livestock products trade data. Retrieved 1 February 2026, from https://www.fao.org/faostat/en/#data/TP

14 Food and Agriculture Organization of the United Nations. (n.d.). FAOSTAT detailed trade matrix [Statistical dataset]. FAOSTAT. https://www.fao.org/faostat/en/#data/TM

15 Jack, S. (n.d.). Soy story: The history of the soybean. Eating China. https://www.eatingchina.com/articles/soystory.htm

Liu, L., Lee, G.-A., Jiang, L., & Zhang, J. (2007). The earliest rice domestication in China. Antiquity Project Gallery. Antiquity Journal. https://www.antiquity.ac.uk/projgall/liu313

16 U.S. Department of Agriculture, Foreign Agricultural Service. (2021, December 22). 2021 China's fishery report (Report No. CH2021-0176). https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=2021+China%27s+Fishery+Report_Beijing_China+-+People%27s+Republic+of_12-17-2021

Tridge. (2024, December 23). China to account for 46% of world pork production in 2024. Tridge. https://www.tridge.com/news/china-to-account-for-46-of-world-pork-produc-jvdfmx

U.S. Department of Agriculture, Foreign Agricultural Service. (n.d.). Rice – Top producing countries (Production data). https://www.fas.usda.gov/data/production/commodity/0422110

17 terraHORSCH. (2023). Land of contrasts: China. HORSCH Maschinen GmbH. https://terra.horsch.com/en/issue-26-2023/around-the-world/land-of-contrasts-china

Sources

18 Kama, R., Song, J., Liu, Y., Hamani, A. K. M., Zhao, S., & Li, Z. (2023). Water availability and status of wastewater treatment and agriculture reuse in China: A review. Agronomy, 13(5), 1187.

19 Hu, G., Li, X., Liu, X., Wang, S., Zhang, X., Shi, X., Bai, X., & Hubacek, K. (2025). Mitigating the ripple effects of urbanization on farmland productivity and ecological security through inclusive urbanization strategies. npj Urban Sustainability, 5, Article 12. https://doi.org/10.1038/s42949-025-00199-8

20 The World Bank. (n.d.). Arable land (hectares) – China (AG.LND.ARBL.HA). World Bank Open Data. https://data.worldbank.org/indicator/AG.LND.ARBL.HA?locations=CN

21 Body, P. (2024, October 24). Growing closer: China's rural-urban divide and its effects. CKGSB Knowledge, Cheung Kong Graduate School of Business. https://english.ckgsb.edu.cn/knowledge/article/growing-closer-chinas-rural-urban-divide-and-its-effects/

22 Food and Agriculture Organization of the United Nations. (n.d.). FAOSTAT: Crops and livestock products. Retrieved 17 February 2026, from https://www.fao.org/faostat/en/#data/QCL

23 Food and Agriculture Organization of the United Nations. (2026). FAOSTAT: Population and Employment data [Data set]. FAO. Retrieved February 27, 2026, from https://www.fao.org/faostat/en/#data/OA

24 Food and Agriculture Organization of the United Nations. (n.d.). Food balance sheets (FAO Knowledge Repository, CD7162EN). FAO. https://openknowledge.fao.org/handle/20.500.14283/cd7162en

25 Food and Agriculture Organization of the United Nations. (n.d.). Food balance sheets (FAO Knowledge Repository, CD7162EN). FAO. https://openknowledge.fao.org/handle/20.500.14283/cd7162en

26 Food and Agriculture Organization of the United Nations (FAO), Food Balance Sheets, FAO, n.d.

27 Food and Agriculture Organization of the United Nations. (n.d.). FAOSTAT: Crops and livestock products trade data. Retrieved 6 February 2026, from https://www.fao.org/faostat/en/#data/TP

28 Gale, F. (2014, April 29). China's corn yields continue to lag behind U.S. yields. U.S. Department of Agriculture, Economic Research Service. https://www.ers.usda.gov/data-products/charts-of-note/chart-detail?chartId=77402&

29 Food and Agriculture Organization of the United Nations. (n.d.). FAOSTAT: Crops and livestock products trade data. Retrieved 1 February 2026, from https://www.fao.org/faostat/en/#data/TP

30 U.S. Department of Agriculture, Foreign Agricultural Service. (2020, September 29). China: Evolving demand in the world's largest agricultural import market. https://www.fas.usda.gov/data/china-evolving-demand-world-s-largest-agricultural-import-market

31 Food and Agriculture Organization of the United Nations. (n.d.). FAOSTAT: Crops and livestock products trade data. Retrieved 6 February 2026, from https://www.fao.org/faostat/en/#data/TP

32 Food and Agriculture Organization of the United Nations. (n.d.). FAOSTAT detailed trade matrix [Statistical dataset]. FAOSTAT. https://www.fao.org/faostat/en/#data/TM

Food and Agriculture Organization of the United Nations (FAO), Food Balance Sheets, FAO, n.d.

33 Food and Agriculture Organization of the United Nations. (n.d.). FAOSTAT: Crops and livestock products trade data. Retrieved 6 February 2026, from https://www.fao.org/faostat/en/#data/TP

34 Cheng, K., et al. (2024). The nexus of geopolitics, decarbonization, and food security gives rise to distinct challenges across fertilizer supply chains. Cell Reports Sustainability. https://www.sciencedirect.com/science/article/pii/S2590332224006031

35 Meilin Ma, H. Holly Wang, Yizhou Hua, Fei Qin, Jing Yang, African swine fever in China: Impacts, responses, and policy implications, Food Policy, Volume 102, 2021, 102065, ISSN 0306-9192, https://doi.org/10.1016/j.foodpol.2021.102065.

36 Wang, T., Sun, Y., & Qiu, H.-J. (2018). African swine fever: An unprecedented disaster and challenge to China. Infectious Diseases of Poverty, 7, Article 111. https://doi.org/10.1186/s40249-018-0495-3 (PMCID: PMC6203974)

37 Soucheray, S. (2025, October 14). Two new H9N2 avian flu cases reported in China. Center for Infectious Disease Research and Policy (CIDRAP). https://www.cidrap.umn.edu/avian-influenza-bird-flu/two-new-h9n2-avian-flu-cases-reported-china

38 Ortiz-Millán, G. (2025). One Health in a globalized world: Challenges and responses to zoonotic threats. Global Bioethics, 36(1), 2550805. https://doi.org/10.1080/11287462.2025.2550805

39 Bi, W., Weng, B., Yan, D., Zhang, D., Liu, C., Shi, X., Jing, L., Yan, S., & Wang, H. (2023). Response of summer e growth to drought-flood abrupt alternation. Frontiers in Earth Science, 11. https://doi.org/10.3389/feart.2023.1086769

40 AccuWeather. (2023). Farm animals, crops suffer from extreme weather affecting China. AccuWeather. https://www.accuweather.com/en/climate/farm-animals-crops-suffer-from-extreme-weather-affecting-china/1536139

41 Gerlt, S., PhD. (2026, January 27). Soybean losses continue despite assistance. American Soybean Association. https://soygrowers.com/news-releases/soybean-losses-continue-despite-assistance/

42 Chen, X., & Cash, J. (2026, January 14). China's trade ends 2025 with record trillion-dollar surplus despite Trump tariffs. Reuters. https://www.reuters.com/world/china/chinas-trade-ends-2025-with-record-trillion-dollar-surplus-despite-trump-tariffs-2026-01-14/

Sources

43 Food and Agriculture Organization of the United Nations. (2026). FAOSTAT: Population and Employment data [Data set]. FAO. Retrieved February 27, 2026, from https://www.fao.org/faostat/en/#data/OA

44 Food and Agriculture Organization of the United Nations. (2026). FAOSTAT: Population and Employment data [Data set]. FAO. Retrieved February 27, 2026, from https://www.fao.org/faostat/en/#data/OA

45 Yi, L., Wu, J., Li, Z., & Wang, J. (2025). The rapid rise of ultra-processed foods brings up human health concerns. Journal of Future Foods. Advance online publication. https://doi.org/10.1016/j.jfutfo.2025.08.013

46 Cao, E, & Jackson, L. (2025, April 7). China's 10-year initiative aims for a more secure food supply by 2035. Reuters. https://www.reuters.com/world/china/chinas-10-year-initiative-aims-more-secure-food-supply-by-2035-2025-04-07/

47 Roy, A. (2022, September 23). China's food security strategy in the new era: Policies and challenges. ORCASIA. https://orcasia.org/article/132/chinas-food-security-strategy-in-the-new-era?

48 Li, C. (2022, July 8). China must have control over its own food supply. The National Committee of the Chinese People's Political Consultative Conference. https://en.cppcc.gov.cn/2022-07/08/c_788500.htm

49 Reuters. (2025, April 7). China's 10-year initiative aims for a more secure food supply by 2035. Reuters. https://www.reuters.com/world/china/chinas-10-year-initiative-aims-more-secure-food-supply-by-2035-2025-04-07/

50 (2026, March 13).Outline of the 15th Five-Year Plan for National Economic and Social Development of the People's Republic of China. Xinhua News Agency. https://www.news.cn/politics/20260313/ 085af5de5a4b4268aa7d87d90817df2f/c.html

51 Central Committee of the Communist Party of China & State Council of the People's Republic of China. (2026, February 3). Opinions of the CPC Central Committee and the State Council on anchoring agricultural and rural modernization and solidly advancing the comprehensive revitalization of rural areas. Xinhua News Agency.

52 Central Committee of the Communist Party of China & State Council of the People's Republic of China. (2026, February 3). Opinions of the CPC Central Committee and the State Council on anchoring agricultural and rural modernization and solidly advancing the comprehensive revitalization of rural. Xinhua News Agency.

53 Central Committee of the Communist Party of China & State Council of the People's Republic of China. (2025, February 23). Opinions of the CPC Central Committee and the State Council on further deepening rural reform and solidly promoting the comprehensive revitalization of rural areas. https://www.gov.cn/zhengce/202502/content_7005158.htm

54 Central Committee of the Communist Party of China & State Council of the People's Republic of China. (2025, February 23). Opinions of the CPC Central Committee and the State Council on further deepening rural reform and solidly promoting the comprehensive revitalization of rural areas. https://www.gov.cn/zhengce/202502/content_7005158.htm

55 Standing Committee of the National People's Congress of the People's Republic of China. (2023). Food security law of the People's Republic of China. Adopted June 28, 2023, effective July 1, 2024.

56 National People's Congress of the People's Republic of China. (2021, March 13). The 14th Five-Year Plan for national economic and social development of the People's Republic of China and the long-range objectives through the year 2035. Xinhua News Agency. https://www.gov.cn/xinwen/2021-03/13/content_5592681.htm

57 National People's Congress of the People's Republic of China. (2021, March 13). The 14th Five-Year Plan for national economic and social development of the People's Republic of China and the long-range objectives through the year 2035. Xinhua News Agency. https://www.gov.cn/xinwen/2021-03/13/content_5592681.htm

58 International Energy Agency. (2025). Global Energy Review 2025. IEA. https://www.iea.org/reports/global-energy-review-2025

59 International Energy Agency. (n.d.). Global EV data explorer [Data tool]. IEA. https://www.iea.org/data-and-statistics/data-tools/global-ev-data-explorer

60 International Energy Agency. (n.d.). China. IEA. https://www.iea.org/countries/china

61 Energy Transitions Commission. (2025, June 11). Global trade in the energy transition: Principles for clean energy supply chains and carbon pricing. https://www.energy-transitions.org/publications/global-trade-in-the-energy-transition/

62 World Future Council. (n.d.). The German feed-in tariff. FuturePolicy.org. https://www.futurepolicy.org/climate-stability/renewable-energies/the-german-feed-in-tariff/

63 (2026, March 13).Outline of the 15th Five-Year Plan for National Economic and Social Development of the People's Republic of China. Xinhua News Agency. https://www.news.cn/politics/20260313/ 085af5de5a4b4268aa7d87d90817df2f/c.html

64 Murphy, B. (Translator). (2021). Outline of the People's Republic of China 14th Five-Year Plan for national economic and social development and long-range objectives for 2035 (T0284_14th_Five_Year_Plan_EN.pdf). Center for Security and Emerging Technology, Georgetown University. https://cset.georgetown.edu/wp-content/uploads/t0284_14th_Five_Year_Plan_EN.pdf

65 Central Committee of the Communist Party of China & State Council. (2025, April 7). Plan for accelerating the construction of China into an agricultural powerhouse (2024–2035) (Trans. by Etcetera Language Group, Inc.; Ed. by Ben Murphy). Center for Security and Emerging Technology, Georgetown University. https://cset.georgetown.edu/wp-content/uploads/t0636_china_agricultural_powerhouse_plan_EN.pdf

Sources

66 Central Cyberspace Affairs Commission & Ministry of Agriculture and Rural Affairs. (2019, December 25). Development Plan for Digital Agriculture and Rural Areas (2019–2025). e-Agriculture, Food and Agriculture Organization of the United Nations. https://assets.e-agriculture.fao.org/public/news/ca7693en.pdf

67 Wang, S., Yang, Y., Yin, H., Zhao, J., Wang, T., Yang, X., Ren, J., & Yin, C. (2025). Towards digital transformation of agriculture for sustainable development in China: Experience and lessons learned. Sustainability, 17(8), Article 3756. https://doi.org/10.3390/su17083756

68 U.S. Department of Agriculture, Foreign Agricultural Service. (2024, February 14). National Food Security Law published (Report No. CH2024-0022). https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=National+Food+Security+Law+Published_Beijing_China+-+People%27s+Republic+of_CH2024-0022.pdf

69 U.S. Department of Agriculture, Foreign Agricultural Service. (2025, March 17). Number One Document provides Beijing's thoughts and highlights food security and rural reform (Report No. CH2025-0048). https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Number+One+Document+Provides+Beijing%27s+Thoughts+and+Highlights+Food+Security+and+Rural+ Reform_Beijing_China+-+People%27s+Republic+of_CH2025-0048.pdf

70 Kennedy, S. (2015, June 1). Made in China 2025. Center for Strategic and International Studies. https://www.csis.org/analysis/made-china-2025

71 World Health Organization. (n.d.). Healthy China 2030 (from vision to action). https://www.who.int/teams/health-promotion/enhanced-wellbeing/ninth-global-conference/healthy-china

72 The Good Food Institute Asia Pacific. (n.d.). APAC alternative protein ecosystem database. https://gfi-apac.org/industry/alternative-protein-ecosystem-database/

73 Wan Lin. (2024, September 24). Ecosystem building in China's new protein sector: Dao Foods expands its multi-region initiative for greater impact. Dao Foods. https://www.daofoods.com/news/ecosystem-building-in-chinas-new-protein-sector-dao-foods-expands-its-multi-region-initiative-for-greater-impact/

74 The Good Food Institute Asia Pacific. (n.d.). APAC alternative protein ecosystem database. https://gfi-apac.org/industry/alternative-protein-ecosystem-database

75 Donnellon-May, G. (2025, September 11). China's high-tech food security push. ChinaObservers in Central and Eastern Europe (CHOICE). https://chinaobservers.eu/chinas-high-tech-food-security-push/

76 Donnellon-May, G. (2025, September 11). China's high-tech food security push. ChinaObservers in Central and Eastern Europe (CHOICE). https://chinaobservers.eu/chinas-high-tech-food-security-push/

77 Mridul, A. (2025, January 24). China opens $11M sustainable protein centre with support from local govt. Green Queen. https://www.greenqueen.com.hk/china-lab-grown-meat-sustainable-food-protein-centre-technology/

78 Reuters. (2024, December 31). China approves more GM crops to boost yields, ensure food security. Reuters. Retrieved February 27, 2026, from https://www.reuters.com/markets/commodities/china-approves-more-gm-crops-boost-yields-ensure-food-security-2024-12-31/

79 Mridul, A. (2025, January 24). China opens $11M sustainable protein centre with support from local govt. Green Queen. https://www.greenqueen.com.hk/china-lab-grown-meat-sustainable-food-protein-centre-technology/

80 Mridul, A. (2025, December 12). 10 things we learned about China's alternative protein ecosystem in 2025. Green Queen. https://www.greenqueen.com.hk/china-alternative-proteins-lab-grown-vegan-meat-microbial-trends/

81 Source: (2026, March 13).Outline of the 15th Five-Year Plan for National Economic and Social Development of the People's Republic of China. Xinhua News Agency. https://www.news.cn/politics/20260313/085af5de5a4b4268aa7d87d90817df2f/c.html

82 He, X., et al. (2024). Spatiotemporal evolution characteristics and influencing factors of digital industry in China. Scientific Reports. https://www.nature.com/articles/s41598-024-77690-2

83 CGTN. (2024, December 22). How China drives high-quality development through technological innovation. https://news.cgtn.com/news/2025-12-22/How-China-drives-high-quality-development-through-tech-innovation-1JjihOzBpvi/p.html

84 China Daily HK. (2024). Yangtze River Delta at forefront of innovation drive. https://www.chinadailyhk.com/hk/article/621779

85 China Daily HK. (2024). Yangtze River Delta at forefront of innovation drive. https://www.chinadailyhk.com/hk/article/621779

86 Clean energy innovation in China (OIES Paper CE14). https://www.oxfordenergy.org/wpcms/wp-content/uploads/2024/07/CE14-Clean-energy-innovation-in-China-Final.pdf

87 Clean energy innovation in China (OIES Paper CE14). https://www.oxfordenergy.org/wpcms/wp-content/uploads/2024/07/CE14-Clean-energy-innovation-in-China-Final.pdf

88 China Briefing. (2024, September 10). China's industry clusters: A comprehensive overview. Dezan Shira & Associates. https://www.china-briefing.com/news/chinas-industry-clusters-comprehensive-overview/

89 China Briefing. (2024, September 10). China's industry clusters: A comprehensive overview. Dezan Shira & Associates. https://www.china-briefing.com/news/chinas-industry-clusters-comprehensive-overview/

90 CGTN. (2024, December 22). How China drives high-quality development through technological innovation. https://news.cgtn.com/news/2025-12-22/How-China-drives-high-quality-development-through-tech-innovation-1JjihOzBpvi/p.html

Sources

91 Mercator Institute for China Studies (MERICS). (2025, April). Lab leader, market ascender: China's rise in biotechnology. https://merics.org/en/report/lab-leader-market-ascender-chinas-rise-biotechnology

92 China Briefing. (2025, October 14). China's biopharma industry clusters. https://www.china-briefing.com/news/chinas-biopharma-industry-clusters-mapping-opportunities-and-regional-strengths/

93 Cambridge Network / Excellence First. (2025). Synthetic biology in China's Yangtze River Delta. https://www.cambridgenetwork.co.uk/news/synthetic-biology-chinas-yangtze-river-delta-opportunities-insights-uk-china-collaboration

94 Shanghai Municipal Government. (2024). Action plan of Shanghai municipality on accelerating the sourcing of synthetic biological innovation and building a high-end biomanufacturing industry cluster (2023–2025). https://english.shanghai.gov.cn/en-Bulletin/20241225/f94bab6637d147ec8ecb8d02973d6349.html

95 China Briefing. (2025, October 14). China's biopharma industry clusters. https://www.china-briefing.com/news/chinas-biopharma-industry-clusters-mapping-opportunities-and-regional-strengths/

96 CGTN. (2024, December 22). How China drives high-quality development through technological innovation. https://news.cgtn.com/news/2025-12-22/How-China-drives-high-quality-development-through-tech-innovation-1JjihOzBpvi/p.html

97 Xinhua. (2025, June 30). China's tech sector taps bioproduction to fuel expansion. https://english.news.cn/20250630/10013bdbbc59421e859eab9453942aa4/c.html

98 Cao, E., & Thukral, N. (2025, June 18). China's big feed shift to curb soybean imports, strain small farmers. Reuters. https://www.reuters.com/markets/commodities/chinas-big-feed-shift-curb-soybean-imports-strain-small-farmers-2025-06-18/

99 General Office of the Communist Party of China Central Committee & General Office of the State Council. (2025, March 30). China unveils plan to turn permanent basic farmland into high-standard farmland. The State Council of the People's Republic of China. https://english.www.gov.cn/Homepage/5d076471c6d0129ab8832ab6/202503/30/content_WS67e92c73c6d0868f4e8f153d.html

100 Ministry of Agriculture and Rural Affairs of the People's Republic of China. (2021, December 14). "14th Five-Year National Animal Husbandry and Veterinary Industry Development Plan" (2021–2025). Government of the People's Republic of China. https://www.gov.cn/zhengce/zhengceku/2021-12/22/content_5663947.htm

101 Cao, E., & Chu, M. M. (2024, December 31). China approves more GM crops to boost yields, ensure food security. Reuters. https://www.reuters.com/markets/commodities/china-approves-more-gm-crops-boost-yields-ensure-food-security-2024-12-31/

102 Wakabayashi, D., & Fu, C. (2023, February 8). China's bid to improve food production? Giant towers of pigs. The New York Times. https://www.nytimes.com/2023/02/08/business/china-pork-farms.html

103 Agriculture and Horticulture Development Board. (n.d.). Factors affecting feed conversion ratio (FCR) in pigs. AHDB. https://ahdb.org.uk/knowledge-library/factors-affecting-feed-conversion-ratio-fcr-in-pigs

104 National People's Congress of the People's Republic of China. (2021). Outline of the People's Republic of China 14th Five-Year Plan for national economic and social development and long-range objectives for 2035. https://cset.georgetown.edu/wp-content/uploads/t0284_14th_Five_Year_Plan_EN.pdf

105 National People's Congress of the People's Republic of China. (2021). Outline of the People's Republic of China 14th Five-Year Plan for national economic and social development and long-range objectives for 2035. https://cset.georgetown.edu/wp-content/uploads/t0284_14th_Five_Year_Plan_EN.pdf

106 Asia Corporate News Network. (2026, February 2). Muyuan Foods IPO: Hog giant's profit growth outpaces top 10 global meat firms, eyes global expansion. ACN Newswire. https://www.acnnewswire.com/press-release/english/104949/muyuan-foods-ipo:-hog-giant's-profit-growth-outpaces-top-10-global-meat-firms,-eyes-global-expansion

107 Pu, W. (2024, October 16). Could China's soy policy changes drive a sustainable agricultural transformation? FAIRR. https://www.fairr.org/news-events/insights/could-chinas-soy-policy-changes-drive-a-sustainable-agricultural

108 Muyuan Foods Co., Ltd. (2026, January 29). Prospectus / Global offering details [PDF]. HKEXnews. https://www1.hkexnews.hk/listedco/listconews/sehk/2026/0129/2026012900024_c.pdf

109 Center for Commercial Agriculture. (2025, November 17). U.S.–China Soybean Deal: Comparing Past Export Levels and Global Market Impacts. https://farmdocdaily.illinois.edu/2025/11/us-china-soybean-deal-comparing-past-export-levels-and-global-market-impacts.html

110 Addis Insight. (2025, July 8). China diversifies soybean sources: Ethiopia joins approved importers list. https://addisinsight.net/2025/07/08/china-diversifies-soybean-sources-ethiopia-joins-approved-importers-list/

111 Food and Agriculture Organization of the United Nations. (n.d.). FAOSTAT: Crops and livestock products. Retrieved 7 March 2026, from https://www.fao.org/faostat/en/#data/QCL

112 Food and Agriculture Organization of the United Nations. (n.d.). FAOSTAT detailed trade matrix [Statistical dataset]. FAOSTAT. https://www.fao.org/faostat/en/#data/TM

113 Food and Agriculture Organization of the United Nations. (n.d.). FAOSTAT detailed trade matrix [Statistical dataset]. FAOSTAT. https://www.fao.org/faostat/en/#data/TM

114 Food and Agriculture Organization of the United Nations. (n.d.). FAOSTAT detailed trade matrix [Statistical dataset]. FAOSTAT. https://www.fao.org/faostat/en/#data/TM

Sources

115 General Office of the Communist Party of China Central Committee, & General Office of the State Council. (2025, March 19). Guideline on strengthening food safety supervision across the entire supply chain. The State Council of the People's Republic of China. https://english.www.gov.cn/policies/latestreleases/202503/19/content_WS67dac61ec6d0868f4e8f0f9d.html

116 Synthesis Capital. (2023). Precision fermentation: Pathways to cost parity. https://synthesis.capital/insights/precision-fermentation-pathways-to-cost-parity

117 Embassy of the People's Republic of China in Nigeria. (2024, December 20). China-Africa agricultural cooperation: Boosting value addition in Africa. Retrieved from https://ng.china-embassy.gov.cn/eng/zngx/cne/202412/t20241220_11511884.htm

118 Cao, E., & Thukral, N. (2025, June 18). China's big feed shift to curb soybean imports, strain small farmers. Reuters. https://www.reuters.com/markets/commodities/chinas-big-feed-shift-curb-soybean-imports-strain-small-farmers-2025-06-18/

119 Ren, F., Xia, Z., Huang, Y., Chi, J., Gai, H., & Wang, Y. (2025). The impact of high standard farmland construction on China's agricultural resilience. Scientific Reports, 15, Article 38626. https://doi.org/10.1038/s41598-025-22519-9

120 U.S. Department of Agriculture, Foreign Agricultural Service. (2025, January 8). China releases food conservation and food waste reduction action plan (Voluntary Report CH2025-0003). https://www.fas.usda.gov/data/china-china-releases-food-conservation-and-food-waste-reduction-action-plan

121 Crona, B., & Troell, M. (2020). An analysis of China's changing seafood production and consumption and its implications to 2030. One Earth, 3(6), 734–747. https://doi.org/10.1016/j.oneear.2020.10.021 https://www.sciencedirect.com/science/article/pii/S259033222030302X

122 Cao, E., & Chu, M. M. (2024, December 31). China approves more GM crops to boost yields, ensure food security. Reuters. https://www.reuters.com/markets/commodities/china-approves-more-gm-crops-boost-yields-ensure-food-security-2024-12-31/

123 Wakabayashi, D., & Fu, C. (2023, February 8). China's bid to improve food production? Giant towers of pigs. The New York Times. https://www.nytimes.com/2023/02/08/business/china-pork-farms.html

124 The Good Food Institute. (n.d.). Plant-based meat. https://gfi.org/plant-based/

125 The Good Food Institute. (n.d.). What is fermentation for alternative proteins? https://gfi.org/fermentation/

126 The Good Food Institute. (n.d.). What is fermentation for alternative proteins? https://gfi.org/fermentation/

127 Mridul, A. (2025, December 12). 10 things we learned about China's alternative protein ecosystem in 2025. Green Queen. https://www.greenqueen.com.hk/china-alternative-proteins-lab-grown-vegan-meat-microbial-trends/

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