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China's Drive for Food Sovereignty:

Navigating Opportunities and Risks in Sino-Dutch Agrifood Collaboration

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Executive Summary

For China, food security is a cornerstone of national security and regime legitimacy. While long focused on staple grain self-sufficiency, China's approach has evolved into a broader "Great Food View" strategy, encompassing a wider range of products like horticulture (vegetables) and livestock (meat) to meet the demands of a changing diet and ensure resilience. This drive for food sovereignty is not an isolationist pursuit: it necessitates international collaboration to access technology and innovation. As a global leader in agri-food, this presents a significant opportunity for the Netherlands. However, collaboration is fraught with risks, including a complex and dynamic policy environment, geopolitical tensions, and concerns over intellectual property. This report examines the potential for mutually beneficial Sino-Dutch agri-food partnerships by analysing China's policy landscape, the actual needs of its agricultural sectors, and the risks perceived by the Chinese enterprises involved.

The report aims to answer the following questions: 1) What are the focal points and ambitions of the Chinese state on agri-food development, both globally and domestically? 2) What are the needs/demands in China's horticulture and livestock sectors in light of these ambitions, and how and to what extent could Dutch actors contribute to meeting these needs? 3) What are the most prominent challenges and risks perceived by Chinese companies involved in CN-NL agri-food interactions and partnerships, and what recommendations can be given to mitigate these risks and facilitate further collaborations? The research was commissioned by the China Knowledge Network of the Government of the Netherlands. The conclusions and recommendations formulated in this report are solely those of the authors.

The report finds that China's strategy is a sophisticated balancing act between domestic production and global engagement. China has moved from domestic focus to "moderate imports" and supply diversification. It is now the world's largest importer of agricultural commodities. While rice and wheat remain protected, imports of soy, meat and specialty products have grown. The Belt and Road Initiative has diversified sourcing, reducing dependency risks. Chinese companies like COFCO and ChemChina (Syngenta) now operate as global players. Domestically, the state pursues interconnected safeguards: 1) protecting a shrinking natural resource base through arable land "red lines" and high-standard farmland projects. With 20% of the world's population but only 8% of its arable land, China faces acute constraints. The state has established a red line of 120 million hectares of arable land and invested heavily in "high-

standard farmland." Regulations on agri-chemical use have been tightened; 2) promoting technological innovation through national initiatives like the National Smart Agriculture Action Plan; and restructuring agriculture through state support for agri-enterprises. Agri-tech innovation is recognized as an important tool for overcoming resource constraints.

Crucially, the implementation of national policy varies significantly across region and types of entity, creating different operational logics and risks in agri-projects. Taking greenhouse projects as an example, we illustrate how, in the economically advanced eastern regions, agricultural projects are often "land-driven," with companies investing in greenhouses to secure land-use quotas with a view to more profitable urban development. In the western regions, a "subsidy-driven" logic prevails, with projects tied to (local) state goals like poverty alleviation. State-owned enterprises tend to participate more in project planning and general contracting, while private companies are more involved in the implementation and operation of agricultural projects.
These institutional and regional models expose collaborations to five principal risks:

Policy implementation gaps and contradictory objectives: Contradictions between different policy objectives and uneven local implementation create an unpredictable operating environment. This risk is most pronounced in the western region, where enterprises must navigate these national-level contradictions while aligning with local poverty alleviation mandates, creating compliance issues for enterprises.

Geopolitics pushes agri-food cooperation towards cautious cooperation: Tensions push cooperation towards cautious, transactional buyer-seller relationships. That would limit deeper innovation and knowledge exchange and escalates concerns over intellectual property rights (IPR) and data security. These findings highlight the need to account for geopolitics as an external factor shaping agricultural development and corporate behaviour.

Ineffective local policy implementation: Policy shifts can undermine project governance and long-term planning. In eastern regions, where land-driven models tie enterprises to (declining) real estate markets, policy inconsistency can cause an immediate liquidity crisis. In the west, where enterprises depend on stable subsidy flows, shifts in local implementation can threaten the viability of entire projects.

Low Operational Capability: Projects are often conceived as short-term political showcases, leading to a "subsidies stop, industry stalls" outcome, with a critical lack of focus on long-term, market-driven business models and talent development. This risk is particularly acute in the western region, where the subsidy-driven logic explicitly ties project survival to continued policy support. The "goal alliance" between government and enterprises can incentivize rapid construction to secure funding while neglecting post-construction operational planning. In the east, the risk manifests differently: land-driven enterprises may possess strong financial capacity but lack agricultural expertise, leading to operational failures despite impressive infrastructure.

Misaligned Expectations: A critical failure point, therefore, lies in the misclassification of a project type (e.g., state-led vs. private, land-driven vs. subsidy-driven), and in engaging with an inappropriate partner entity in both the eastern and western regions. Such misunderstandings lead to misaligned expectations among stakeholders regarding project goals, financing arrangements, and operational models.

Distinct needs and opportunities are identified in two key sectors:

Horticulture: China has massive greenhouse capacity, but it suffers from a "hardware-software" gap. Advanced facilities are often underutilized due to a lack of skilled growers and localized operational knowledge. The need has shifted from importing equipment to co-developing integrated, climate-adapted solutions, management systems, and training. Key challenges include a "hardware-software mismatch" (high-tech systems operating at 20% capacity due to a lack of skilled growers), climate diversity requiring localized designs, and a shortage of professional managers. Dutch suppliers' revenue expectations for China have fallen sharply since 2018 as the market shifts toward localization.

Livestock: Meat consumption has grown nearly six-fold since 1978 in China. The domestic sector has industrialized rapidly but faces structural constraints: breakthroughs in breeding require data sharing, yet domestic companies compete fiercely and distrust collaboration. Pork price cycles and overcapacity have driven many enterprises out of business. African Swine Fever led to extreme isolation protocols and operational inefficiencies. While demand for innovation in breeding and disease control is high, progress is hindered by institutional barriers, particularly a lack of trust and data-sharing among domestic companies. There is a strong demand from small and medium-sized enterprises (SMEs) for equitable, long-term partnerships focused on areas like circular feed systems and refined management, moving beyond simple transactional trade.

To navigate the risks, the report offers targeted recommendations:

For the Dutch Government:

Engage sub-nationally: Strengthen "Province-to-Province" partnerships between Dutch Greenports and key Chinese provinces.

De-risk collaboration: Launch a public-private fund and a "China Agri-food Risk Toolkit" to support pilot projects with clear IPR and data frameworks.

Ensure continuity: Establish a mechanism to track long-term collaborations, preventing any disruption caused by personnel changes.

For Dutch Companies:

Become a systemic partner: Shift roles from supplier to "system integrator," offering integrated solutions that include energy optimization, training and long-term operational support.

Pursue "localization with protection": Forge joint ventures with clear IPR frameworks, ensuring two-way talent and knowledge flow.

Navigate local governance: Invest in understanding the distinct political-economic models of projects in eastern versus western China and build relationships with both private champions and local agricultural bureaus.

Focus on SMEs: Broaden the scope of partnerships to include innovative Chinese SMEs, which are often key engines of growth.

Our overall conclusion is that Sino-Dutch agri-food cooperation remains promising but must evolve. The opportunity lies in moving from hardware sales to capability-building partnerships that deliver integrated, localized solutions. We observed and articulated that self-reliance, or self-sufficiency does not equal an isolationist approach. Instead, the attempt to become more self-reliant (or, sovereign) requires partnerships. For the Netherlands, success in this market depends on a strategy that combines technological excellence with deep institutional understanding and a commitment to long-term, equitable collaboration.

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1. Introduction

1.1 Research rationale and questions

The Dutch and Chinese states and their knowledge institutions and enterprises have a long history of collaboration in the agri-food sector. Collaborations and partnerships have been highly dynamic over the years, resulting from push and pull factors in both countries, as well as from geopolitics and geoeconomics.

Chinese state-owned and private companies are increasingly active in the global agri-food regime. This global engagement is, to a certain extent, related to the Chinese state's interest in bolstering self-reliance with respect to food security and safety. In recent years, the Chinese state has sought to increase self-reliance by diversifying supply chains and increasing its domestic production. The domestic sector has witnessed significant scale enlargement and intensification (i.e., industrialization) in recent years, in which the state has played an important role. Ongoing attempts to increase domestic production have involved, amongst other means, efforts to further develop the agri-food sector and to encourage innovation through research and development.

Is there a role to play for Dutch companies and knowledge institutions in the Chinese state's effort to become more self-reliant? In order to explore new avenues for collaboration and partnerships between China and the Netherlands, it is important to analyse: a) current and projected agrifood policies of the Chinese state promulgated with a view to strengthening self-reliance and food sovereignty; b) the aspirations, plans and needs of Chinese non-state actors, e.g. enterprises and semi-public institutions; c) opportunities and risks as perceived and experienced by Chinese companies in Sino-Dutch collaboration in the agrifood sector in light of this policy agenda; and d) the challenges and experiences of earlier partnerships between Chinese and Dutch actors (so as to highlight lessons learned).

However, collaboration is not without risks and challenges. For Dutch actors, engaging in the Chinese agrifood sector entails navigating a complex and dynamic policy environment in which the Chinese state increasingly prioritizes strategic autonomy and technological independence, manifested in and aligned with national development goals. Dutch companies may face challenges related to intellectual property protection and unequal access to markets. For

Chinese companies, collaboration with Dutch partners may involve risks too, for instance regarding regulatory uncertainties, as well as friction between local implementation and central state directives. These challenges are compounded by geopolitical tensions and the securitisation of agrifood chains, which can disrupt long-standing partnerships and create unpredictable operating conditions. Addressing these risks requires an assessment of the political economy in which Sino-Dutch agrifood collaborations is embedded.

In order to test these presumptions and to obtain a comprehensive understanding of where the opportunities and challenges are, we adopt a multi-scalar and multi-actor approach (methods are detailed further below). Prioritising depth over breadth, we focus on two agri-food sectors: horticulture and livestock, and narrow the scope to two regions in China: the Western Region (Shaanxi, Gansu, Ningxia, Yunnan, Guizhou) and the East (Delta) Region (Zhejiang, Shanghai, Jiangsu). The considerations for our selection are the following: First, the horticulture and livestock sectors are of strategic importance to the Chinese state, as articulated in recently published agrifood policies, such as China's Great Food View (大食物观 *da shiwu guan*) (2024). The Netherlands is internationally considered a technological lead in these two sectors, and partnerships could support technological upgrading and innovation in China's domestic agricultural sector. Notably, the Chinese state recently coined the concept of "new quality productive forces," which refers to technological upgrading and innovation. Second, the two regions are representative of different modes of agricultural development in China. For instance, Shanghai and Jiangsu are representative of the eastern open hinterland for agro-tech innovation, while Yunnan is the largest agricultural powerhouse for agrifood trade. Gansu has a long-standing experience in agro-tech innovation. Furthermore, the two regions have emerging or extensive cooperative projects with Dutch enterprises and research institutions. Later sections (4.2 and 4.3) will explain how regional differences primarily stem from divergent approaches to agricultural governance by local governments in eastern and western China. Lastly, given the diverse development models conducted in local governments and enterprises pushing agri-food projects in these two regions, an analysis of these two regions can help illuminate potential avenues for Sino-Dutch partnerships in the agrifood sector.

The questions that guide our analysis are the following:

Question 1: What are the focal points and ambitions of the Chinese state on agri-food development, both globally and domestically?

Question 2: What are the needs/demands in China's horticulture and livestock sectors in light of these ambitions, and how and to what extent can Dutch actors contribute to meeting these needs?

Question 3: What are the most prominent challenges and risks perceived by Chinese companies involved in CN-NL agrifood interactions and partnerships, and what recommendations can be offered to mitigate these risks and facilitate further collaborations?

1.2 Approach, methods and data

This report is divided into three parts. Through an analysis of policy documents issued by the central government and a literature review, the first part (section 2 and 3) discusses shifts in China's food policy and outlines the framework of China's food governance. As a crucial source of regime legitimacy, the rural issues addressed by these policiesreflect not only the Chinese government's objectives and needs for agricultural development, but also its broader political ambitions—including promoting social stability and organizational innovation. We contend that understanding these policy shifts is essential to understanding the Chinese government's mandates with regard to the agri-food industry and its governance objectives.

The second part (section 4) delves into China's domestic agricultural governance and the collaborative models between state and corporate actors that drive policy implementation. Through case studies and interview-based analysis, it examines the distinct institutional logics and associated risks shaping agri-business operations across eastern and western China.

The third part (section 5), examines current developments, needs, opportunities and risks of China's food industry, based on a review of recent industrial reports, policy documents analysis, and semi-structured interviews (details are provided later). We focus on the horticulture and livestock sectors. This part also analyses experiences and challenges of recent and ongoing Sino-Dutch collaborations and partnerships, based on interviews with Chinese and Dutch agri-food stakeholders (primarily non-state actors). The concluding section presents policy recommendations.

An appendix details the structures of the interviews conducted for this project. We conducted semi-structured interviews and incorporated open-ended questions for selected participants. We anonymized interviewees except for a few scholars whose work is publicly known. To reveal regional industry characteristics, we marked down interviewees' work locations.

2. Securing sufficient and safe food

2.1 Setting the scene

In February 2025, the Chinese state published its latest No. 1 Central Document, which is the first policy statement issued each year. The statement indicates the policy priorities of the moment.[1] Food security has always featured prominently in No. 1 Central Documents. The Central Document of 2025 centred on consolidating the foundations of China's agriculture and rural revitalization, with a focus on "new quality productive forces (新质生产力 *xinzhi shengchanli*)" in agriculture to ensure food security.[2] Specifically, it states that with "reform, opening-up, and scientific and technological innovation as driving forces, the country will safeguard its *grain* security and ensure that no large-scale lapse or relapse into poverty occurs" (emphasis added [3]).

Food security has been a concern throughout China's history, which features periodic famine and food crises. The Chinese leadership is acutely aware that a failure to secure food could destabilize the PRC (Dong et al., 2024: 5, 13). Accordingly, food security is essential to China's national security, and the authorities responsible for land governance can be held accountable.

However, the Chinese state has traditionally applied a relatively narrow definition of food security. Historically it has centred on self-sufficiency in terms of the cereals wheat, rice, maize and soy, with the first two being the most important staples of the Chinese diet (Gaudreau 2019; Zhan, 2022). The importance of these staples is exemplified by the concept or metaphor of the "Iron Rice Bowl" (Zhang, 2019). In its first White paper on food security[i] from 1996, the Chinese state set out a 95% self-sufficiency target for grain (Tortajada and Zhang 2021: 3).

In recent years the Chinese leadership has stressed the importance of other agricultural commodities for food security, in particular meat and edible oil (Tortajada and Zhang 2021: 3). This shift reflects changes in domestic demand. With the transformation of the Chinese diet, demand for food items such as fruits and vegetables (horticulture) as well as for meat, dairy, and fish has increased. With more dairy and meat consumption, animal proteins have become much more prominent in the diet (i.e., a "meatification" of the diet) (Jacobsen and Hansen, 2020). Between 1978 and 2013, China's meat consumption per capita increased almost six-fold

[1] https://english.www.gov.cn/policies/latestreleases/202502/23/content_WS67bb002bc6d0868f4e8efe69.html
[2] Also see: https://www.ctol.digital/news/china-advances-smart-farming-land-reforms-2025-policy/
[3] See: https://english.news.cn/20250223/d0b9cb61000f4cfe97fd56e382e7f036/c.html

(Jakobsen and Hansen, 2020: 97). Nevertheless, meat consumption per capita in China is still lower than in Europe or the United States, according to the Organization for Economic Co-operation and Development (OECD) and the Food and Agriculture Organization of the United Nations (FAO, 2025).

The Chinese government has introduced the "Great Food View" concept[4], aimed at broadening its definition of "food" to include a wider range of sources—s, potatoes, beans, fruits and vegetables, livestock, aquatic products, edible fungi, and novel proteins—to better meet diversified nutrition needs.

The dietary transformation can partially be attributed to a growth in income. At the same time, food safety concerns have increased among the population, in part triggered by several food safety scandals, among which the melamine scandal of 2008 is probably the best known.

2.2 Responses to new demands

Nonetheless, self-sufficiency in grain has remained top priority. To this end, the Chinese state is implementing various measures, including subsidies for specific cereals, investment in storage and logistics, and a "national food reserves strategy."[5] Some of these measures are not new: for example, the leadership has traditionally maintained food reserves (public stocks), mainly of domestically produced grains. This is linked to support for producers by offering minimum prices; when market prices drop below a certain minimum, the state stocks up grains.[6] Reserves now also include soy, edible oils (such as canola), and (frozen) pork. These are not only stocked up when market prices drop: reserves can also increase with overproduction (pig meat) or large volumes of imports.[7] Complementing these strategies, the "Rice Bag" and "Vegetable Basket" policies[8] aim to ensure a stable supply and affordable prices of staple grains and vegetables. The responsibility to maintain this stability is delegated to provincial and city level authorities.

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[4] See the Great Food View policy launched by the State Council in 2024: https://www.gov.cn/zhengce/content/202409/content_6974838.htm

[5] https://www.ctol.digital/news/china-advances-smart-farming-land-reforms-2025-policy/

[6] The USDA estimates that in 2018/19 China will hold almost 70% of global rice stocks, 67% of global maize stocks and 52% of global wheat stocks (USDA, 2019). The majority of China's reserves are thought to be owned by the government (public stocks), with the remainder held by the industry or farmers (private stocks).

[7] See: https://episode3.net/grain/why-is-china-hoarding-grains-and-other-commodities/#:~:text=At%20the%20heart%20of%20this,it%20than%20any%20other%20nation.

[8] From 1988 to 2011, to address the supply of non-staple foodstuffs in urban areas, the Ministry of Agriculture proposed the 'vegetable basket' initiative, with its subordinate agricultural departments at all levels responsible for implementation. Building upon the vegetable basket policy, the Ministry subsequently introduced the 'rice basket' initiative. This refers to a systematic plan implemented by China to safeguard food security, encompassing the entire process from grain cultivation, procurement, transportation and sales

The stockpiling policies, which have been reinforced after COVID-19,[9] have been subject to criticism in the past for their high cost and inefficiency,[10] resulting in losses. According to the OECD, China spent over $10 billion on public stockpiling in 2022.[11] Nevertheless, investment in stockpiling has increased to assure the availability of key food items, particularly as a safeguard against crop failures due to droughts or heavy rains, price spikes or trade disputes.[12] With reserves covering a significant percentage of the total global stock, foreign analysts have expressed concerns about the influence of stockpiling on global prices. A particular concern is how world market prices would change if China reconsidered its stockpiling policies *(*e.g. Deuss and Adenäuer 2020, p.8 on the Chinese maize stock which accounts for 70% of the world's total stock).[13]

This policy framework has directly shaped China's grain production landscape, resulting in an output increase of almost 50% between 2003 and 2013 (Tortajada and Zhang 2021, 3). Despite these efforts, the grain self-sufficiency target set out in the 2006 first White Paper on Food Security has not been met. Notably, the efforts to increase production have also led to a persistent surplus of low-quality grains (Tortajada and Zahng, 2021; Du et al., 2024). The OECD and FAO (2025: 54) expect that, by 2034, Chinese demand for wheat, maize, and rice will rise and account for 17%, 24%, and 25% of global demand, respectively. At the same time, China is expected to account for 16% of global wheat production, 22% of global maize production, and 25% of global rice production in the same year (OECD and FAO, 2025: 58). Thus, domestic production does not and will not fully meet future domestic demand for grains.

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to market price regulation. At the 1995 National People's Congress and Chinese People's Political Consultative Conference sessions, the provincial governors' accountability system for the Rice Bag Project and the mayors' accountability system for the Vegetable Basket Project were jointly incorporated into the Government Work Report. In 2010, the central government issued Document No. 1, focusing on institutional and mechanism development for the Vegetable Basket Project. In 2011, the National Development and Reform Commission, in collaboration with the Ministry of Agriculture, launched the National Vegetable Industry Development Plan (2011-2020), outlining the long-term development layout, priorities and policy measures for the vegetable sector. In January 2017, the General Office of the State Council issued the Assessment Measures for the Mayors' Responsibility System for the 'Vegetable Basket' Project.

[9] See: https://www.econstor.eu/handle/10419/279476

[10] See the policy report from China Power (CSIS): https://chinapower.csis.org/china-food-security/

[11] OECD (2023), *Agricultural Policy Monitoring and Evaluation 2023: Adapting Agriculture to Climate Change*, OECD Publishing, Paris, https://doi.org/10.1787/b14de474-en.

[12] See: https://www.cnbc.com/2025/03/05/china-raises-2025-budget-for-grain-stockpiling-targets-higher-domesticoutput.html#:~:text=Beijing%20raised%20its%202025%20budget,according%20to%20an%20official%20report.

[13] https://www.ers.usda.gov/amber-waves/2019/march/the-release-of-china-s-rice-stocks-could-impact-global-feed-markets

2.3 Challenges to domestic production

Shortage of quality land

As described above, the Chinese state has continued to focus on the domestic production of grains as well as other products. Domestic production falls short of demand for several reasons, including limited land for agricultural production, with rural land increasingly being reserved for infrastructure and real estate. The oft-reported figures are that China is home to around 20% of the world's population with only 8% of the world's arable land at its disposal for agricultural production (Dong et al., 2024; Wu et al., 2024; Zhan 2022). This arable land has shrunk in recent years. Soil fertility is declining due to pollution, the extensive use of fertilizers and exhaustion, while other dynamics, such as water scarcity, have become more severe in recent years due to climate change (Dong et al. 2024).

Low resource efficiency

It is therefore imperative for the Chinese state to optimize the use of land and water resources. This is reflected in the policy orientation towards "new-quality productive forces", emphasising innovation-driven, high-efficiency and green growth in primary sectors. Resource use efficiency has to be optimized through precision input management, improved soil health, and water-saving technologies to sustain yield growth without proportional increases in land, water and energy use, or emissions (FAO, 2021; OECD-FAO, 2024).

2.4 Concluding section 2

In summary, this section has shown how China treats food security as a national security priority and a source of political legitimacy. Food security has been broadened from a narrow focus on staple grains to a wider "Great Food View," covering diverse food sources to enhance resilience. The state combines production targets with strong governance tools, including reserve systems and local accountability ("Rice Bag" and "Vegetable Basket" responsibilities). The domestic constraints are limited arable land, soil degradation, water scarcity, and low resource-use efficiency, which make full self-sufficiency difficult. In the following section we examine steps undertaken by the Chinese state in the realm of food security and agricultural production, as well as activities by private and semi-private actors. We analyse China's growing role in global agriculture first and subsequently address the domestic level.

3. Securing sufficient and safe food

As reported by Chinese media, the No1 Central Document of 2025 (the Chinese government's first annual policy paper, traditionally focusing on agriculture and rural development) states that with "reform, opening-up, and scientific and technological innovation as driving forces, the country will safeguard its *grain* security and ensure that no large-scale lapse or relapse into poverty occurs" (emphasis added[14]). In the 2026 Central Document No. 1, new provisions have been incorporated into the framework for enhancing food safety, such as "expanding production space for rapeseed, peanuts, camellia-tea seeds, and other crops to diversify oilseed supply" and "promoting diversification of agricultural product imports." This section describes how the Chinese government intends to achieve its food security objectives. It outlines three interconnected safeguards—international engagement, resource conservation, and technological innovation—that together form a comprehensive strategy. The section demonstrates that China's approach does not solely focus on domestic self-sufficiency, but rather on a sophisticated balancing act between domestic production and global ambition, between preserving natural resources and intensifying output, and between current needs and future capabilities.

3.1 Opening up and going out

Whereas, until the late 1990s, the Chinese state focused primarily on domestic agricultural development to safeguard food security, in recent years initiatives have been more outward looking, in part driven by the imperative of food security. Zhan (2022) describes it as a paradigm shift, demonstrated by a gradual shift over time towards engagement in the international food system. The Chinese state's second White Paper on Food Security of 2019 (in Zhan, 2022) makes this change in perspective explicit: food security shall be attained by (increased) domestic productions and "moderate imports". In this second White Paper, "the 95% target for grain" was replaced by the statement that the production capacity of grain should be above 600 million tons. This section analyses the paradigm shift in China's approach to food security, moving from a primary focus on domestic self-sufficiency to a sophisticated strategy of moderate import with proactive global engagement.

[14] See: https://english.news.cn/20250223/d0b9cb61000f4cfe97fd56e382e7f036/c.html

3.1.1 Moderate imports

The state's growing demand for "diverse grains and proteins" as well as higher safety and quality standards has led to an increase in imports of agricultural commodities typically not produced (sufficiently) in China. Realizing that self-sufficiency is an unrealistic objective, the Chinese economy has gradually become more reliant on imported grains. However, the popularity of imported grains also results from the fact that their prices are relatively low and thus favourable for processing companies (Du et al. 2024, p. 6-7). The OECD and FAO (2025: 59) expect China to account for 39% of global import of "other coarse grains," but "only" 6% of global rice imports, and 2% of wheat imports.

Reliance on imports is not new, however. Notably, already in 2004 China had moved from being a net food exporter to becoming a net importer (Du et al. 2024), and in 2011 it became the world's largest agricultural and food importer (Tortajada and Zhang 2021, p.3; Du et al, 2024). In 2022, China imported approximately 98.3 billion USD in agricultural products (ref. 43 in CSIS, p. 8). China is the world's largest single-country importer of pork, accounting for roughly 15–25% of global pork imports. Major suppliers are the EU (Spain, Denmark, the Netherlands), Brazil, Canada, and the United States.

The Chinese state's attitude towards a reliance on imports varies: for crops of strategic importance, such as wheat and rice, the state strives for self-sufficiency and prioritizes domestic production. China's imports of livestock products—particularly chilled and frozen pork and pork offal—have shown a declining trend over the past five years.[15] This is different for instance for soy, of which demand has increased in recent years as a result of the growing domestic demand for meat and dairy (Tortajada and Zhang 2021: 3). Thus, while import dependence is not a major concern for some agricultural commodities, the situation is different for specific grains. As such, the moderate import of agricultural commodities is both a pragmatic and strategic choice.

3.1.2 A global assertiveness in the global agrifood regime

A strategic outlook is also observed in China's global affairs more generally. From the 2000s onwards, policies and programmes have increasingly promoted and incentivized engagement in

[15] Notably, in 2025, China's Ministry of Commerce determined that certain imported pork and pork by-products originating from the European Union were being dumped. Consequently, it decided to impose anti-dumping duties ranging from 4.9% to 19.8% for a five-year period starting 17 December 2025. This measure aims to protect the domestic industry, with affected products including pork and pork offal.

the global agri-food market. Since 2013, China's growing global role has been associated with the country's Belt and Road Initiative (BRI). While the BRI has centred on connectivity (i.e., infrastructure) and trade, it has also included various agriculture and food-focused projects. However, compared to other sectors, projects and investments focused on agriculture remain relatively limited (Nedopil, 2025). Reportedly, around 100 agricultural collaboration agreements have been signed under the BRI (Dong et al., 2024).[16] What such agreements entail is not always clear. The existence of an agreement does not necessarily imply intensive activity "on the ground."[17] Furthermore, the implementation of bilateral agreements and programmes is shaped by the interplay among a range of Chinese actors (individuals, companies, authorities, and actors in overseas economies).

Significantly, securing imports and feeding the Chinese consumers/economy is not the sole driver of China's engagement in global agriculture. Indeed, there are multiple factors that incentivize Chinese companies' overseas engagement. Furthermore, what happens within the framework of these state-led programmes is diverse. The next session will clarify the incentives/demands of Chinese companies' overseas engagement and illustrate the governing framework of agro-collaboration programmes by region and by sectors.

The BRI has helped China to diversify its export destinations and markets from which it can source agricultural commodities, thereby reducing the risks related to overdependencies and securing supplies. In recent years, the importance of overseas agricultural investment and diversifying agricultural imports has been emphasized, with the BRI countries listed as a priority (Xinhuanet, 2020a; Xie 2018 in Tortajada and Zhang 2021). Indeed, the BRI has intensified trade and paved the way for Chinese companies' global endeavours.

As a result of developments spanning the last three decades, Chinese involvement in overseas agricultural sectors has become more prominent. The manifestations and forms of engagement are diverse. For instance, for some Chinese companies have observed a demand for specific crop seeds and agrichemicals in foreign economies, and established businesses overseas in response. Other enteprises initiated or intensified trade (Hofman, 2024; Zhao and Rogers, 2024; Spies, 2025; Xu and Chen, 2025). Chinese agricultural enterprises have also begun producing

[16] Notably, while the BRI gains a lot of attention, the initiative should be seen as a development following earlier—albeit less significant—state-led programmes, namely the "Open up the West campaign" and the "Develop the West" and the "Going Global" programmes, initiated in the 2000s (Yeh and Warton, 2016; Summers, 2016).
[17] Here it should also be noted that various projects that were initiated before the launch of the BRI in 2013 also became labelled as BRI projects in the years after.

crops, livestock and poultry in other countries, sometimes contracting local farmers. These activities are sometimes orientated towards the production of crops for export, but often also towards selling in local markets. Large Chinese agri-businesses, including COFCO and ChemChina, operate globally, where their growing control, modes of operation and interests are comparable to other "global food barons" (ETC, 2022).

As such, China's role in global agriculture has gradually matured. It includes investment in farmland and agricultural value and supply changes, in part driven by an interest in accessing crucial markets and controlling infrastructural nodes. The reach of Chinese companies has expanded with recent mergers and acquisitions, the best known of which is probably the acquisition of Syngenta around 2017 (Syngenta 2017).

The manifestations and impact of China's growing global role are diverse. Chinese agri-companies and the Chinese state affect foreign agri-business, rural economies and societies both directly and indirectly. Indirectly, this happens for instance when Chinese importers set certain *quality* or *variety requirements*, requiring or incentivizing farmers to accommodate and respond to specific needs (Gaudreau 2019; Green 2022). Directly, it can result from land investments, with Chinese companies acquiring access to land and engaging in the primary production of crops, marketing these locally or exporting them to China or globally.[18]
The Chinese state has also stepped up its efforts in relation to *global food security* (State Council 2019). It increasingly engages in multilateral initiatives orientated towards this (WFP 2025). Strikingly, this happens while China has also been a recipient of development aid in recent years. It illustrates the country's ambiguous status as both a recipient and donor of food aid.[19] Engagement serves multiple interests and purposes: International collaboration and engagement overseas are considered essential for a stable global food system, which, in turn, is considered crucial to secure the domestic supply market (Tortajada and Zhang, 2021; Dong et al. 2024).

Interestingly, Zhan (2022: 5) argues that while "constraints on domestic production is a major factor behind China's global food strategy … the success of China's [global food] strategy

[18] An interesting question that remains salient is whether China's approach and Chinese companies are qualitatively different from other actors, who traditionally dominated these markets (Spies, 2025; Hofman, 2024). This question is particularly salient considering current developments in the US and Europe.

[19] The question is whether it can (still) be considered an emerging or developing economy (let alone the contestation of the terms); it occupies a position that does not fit the binary of developed vs developing or Global North vs Global South.

depends on more, not less, domestic production." He stresses that "the goal of China's food strategy is to optimize [the national-global food duality] rather than either maximizing food imports or domestic production" (ibid.).

Such balancing would also allow China to weaponize agricultural trade in light of increasingly complex geopolitical developments and challenges. The increase in domestic production capacity and the stockpiling of agricultural commodities, combined with the diversification of trade, not only reduces its dependency on and the vulnerability of certain imports, but also allows it to use the size of its imports as a tool in trade conflict. This has been illustrated by various trade disputes with the US, Europe and Canada, where import restrictions have been set by the Chinese state for soy, pig meat and canola oil respectively, often in response to restrictions imposed on Chinese (non-agricultural) exports (Genevieve 2025). Clearly, then, global and domestic dynamics and concerns are tightly connected.

This sophisticated and assertive global engagement is however underpinned by a pressing domestic challenge: the need to preserve and optimize a diminishing natural resource base at home. Consequently, the state has at the same time intensified its focus on the biophysical foundations of its domestic agricultural production.

3.2 Preserving natural resources

Facing diminishing available and quality arable land, in recent years the Chinese state has devoted more attention to increasing the production per unit of land, in various ways. For one, the state has taken efforts to "phase out less productive land as part of broader efforts to improve the efficiency of rice production" (OECD and FAO, 2025: 57) alongside other crops. It has set a red line of 1.8 billion mu (120 million hectares) of arable land that should be preserved. This land may only be used for growing grain crops. In addition, plans entail ambitious projects to rejuvenate farmland, such as establishing 1.075 billion mu[20] (亩) of "high-standard farmland (高标准农田 *Gaobiaozhun nongtian*)"[21] by 2025, and local governments across the country are

[20] Mu (亩) is a traditional Chinese unit of area. One mu is equivalent to approximately 666.67 square meters or 0.165 acres.

[21] MARA has defined an ideal model for "high-standard farmland": leveled fields, contiguous plots, well-equipped facilities, water-efficient and high-yielding, supported by agricultural power supply, suitable for mechanized operations, fertile soil, ecologically friendly, resilient to disasters, and compatible with modern agricultural production and management practices, ensuring stable and high yields regardless of drought or flooding. The technical indicators for implementing this definition vary slightly across different regions.

intensifying efforts to attract investment for high-standard farmland construction projects (Interview CH, HM). These measures aim to protect the vital black soil lands of northeast China.[22]

Thus, biophysical/ecological issues have received more attention by the state than before. One clear signal is that the state has adopted several regulations on agro-chemical use in recent years, including a ban on several chemicals (see for instance Zhao and Rogers 2024).[23] Alongside ecological issues, the structure of agricultural producers has been undergoing changes in recent years. The state has supported the establishment of gigantic agribusinesses (龙头企业dragon-head enterprises) and the set-up of agricultural cooperatives to scale up production. This has resulted in land-use-right transfers to cooperatives and the development of greenhouse-horticulture zones with infrastructure (irrigation, electricity, roads) and subsidies for high-standard farm and greenhouses (MARA 2021). With these developments the Chinese state seeks to increase how efficiently resources are used and to boost overall production in agriculture. This has impacted the traditional make-up of the countryside, previously comprised mainly of small scale, household-based farms (Zhan 2022).[24]

3.3 Technological innovation

In addition to attention to quality farmland, soil fertility, and the structures of agricultural producers, the Chinese state is also committed to increasing production by stimulating the development of agricultural technology. This is driven by the expectation that an intensification of agricultural technology can boost productivity on China's limited arable land, and therewith alleviate the pressure on domestic natural resources. The development of agricultural technology, including smart agriculture, is a relatively new priority of the Chinese state. The potential size of the smart agriculture market in China is reported to have increased from 13.7 billion US dollars in 2015 to 26.8 billion US dollars in 2020 (Wu et al., 2024: 1).

A first major initiative was "Made in China 2025" (MIC25), an industrial policy initiative launched in 2015, aimed at turning China from a "low-cost manufacturing hub into a global leader in high technology" (MERICS, 2025). In the agricultural sector, various programmes and policies have

[22] At the same time, it is also aimed at strengthening the prevention and control of invasive species.

[23] In October 2021, the Supreme People's Procuratorate issued a statement urging procuratorial agencies at all levels to rigorously prosecute crimes endangering food safety in accordance with the law, thereby safeguarding the public's 'safety on the tip of the tongue'. See: https://www.spp.gov.cn/xwfbh/wsfbh/202110/t20211018_532413.shtml

[24] It should be noted here that the construction of greenhouse facilities is prohibited in high-standard farmland. This restriction stems from the fact that the high-standard farmland development is meant to enhance grain production and efficiency. Greenhouse facilities, primarily utilized for cash crops (vegetables and fruits) production, are regarded as representing a shift towards non-grain agricultural production.

focused on the seed industry, biotechnology, and smart and digital agriculture. Smart and digital agriculture refers to the application of "cloud calculation, blockchain, artificial intelligence, sensors, [and] intelligent equipment" (Wu et al. 2024: 1).

Agricultural technology has remained top priority upon the closure of the "Made in China" programme. Also, in the 14th Five-Year Plan (2021-25), agricultural technology received considerable attention (MERICS, 2025). The he No. 1 Central Document for 2025 revealed ambitions in agriculture[25]. The 2025 No. 1 Central Document:[26]

- Emphasized the importance of developing new quality productive forces in agriculture matching local conditions.
- Called for the cultivation of leading high-tech agricultural enterprises, and the acceleration of breakthroughs in new crop varieties.
- Stated that China will support the development of smart agriculture and expand its application, for instance using sensors, artificial intelligence, big data, and low-altitude drone systems.

Looking ahead, the forthcoming national blueprint provides further context for these priorities. In November 2025, the CCP revealed the tentative version of the Fifteenth Five-Year Plan (2026-2030). While still provisional, this version emphasizes the overarching themes of industrial security and seeks to enhance the level of self-reliance and control within the supply chain of the industry.[27] These focal points align with the emphasis on security and risk in the No. 1 Document and the longstanding policy stance on self-dependent innovation. However, unlike industrial policies targeting specific sectors, the Fifteenth Five-Year Plan is a comprehensive socio-economic blueprint. Its agricultural section specifically highlights the complementary relationship between agricultural industries and rural development, indicating that the objectives of rural industrialization and market efficiency must serve broader social development goals (i.e., rural revitalisation, deployment of scientific talent to rural areas), functioning as indicators of the Party's governance legitimacy.

One of the most recent plans is the National Smart Agriculture Action Plan (2024-2028) (see also Boroughs, 2024). Firstly, it calls for actions to improve public service capacities in smart agriculture, such as building a national big data platform for agriculture; developing an

[25] See: https://english.moa.gov.cn/news_522/202502/t20250227_301460.html (see also the statement by the CPC Central Committee and the State Council on deepening rural reforms: https://mzt.guizhou.gov.cn/xwzx/mzyw/202502/t20250223_86938015.html

[26] See: https://english.www.gov.cn/policies/latestreleases/202502/23/content_WS67bb002bc6d0868f4e8efe69.html

[27] See https://www.12371.cn/2025/10/28/ARTI1761640401107119.shtml

"integrated map" of agricultural and rural land; and establishing a standard model/criteria for smart agriculture. Secondly, it proposes more applications in key areas of smart agriculture, such as increasing the yield of major crops; setting up smart farms (focused on animal husbandry and fisheries); and promoting the digital transformation of the entire agricultural industry chain. Thirdly, it sets out demonstration goals for smart agriculture, including scaling up pilot projects and exploring future development pathways for smart agriculture (Boroughs, 2024: 5-8).

In order to achieve these goals, but also to promote outward investment and technology transfer by Chinese companies, the Chinese state aims to attract foreign investment and to promote outward investment and technology transfer by Chinese companies. The Plan for Accelerating the Development of an Agricultural Powerhouse (2024–2035) also refers to the use of free trade zones and pilot projects to facilitate two-way agricultural technology exchange.[28] According to Zhan (2022: 16), "China has outspent the United States on agricultural research and development (R&D) by some measures" (see also Chai et al., 2019). Also according to the OECD, "China is the world's top single spender on agricultural innovation, spending about $4.4 billion in 2023. Comparatively, the United States spent $3.8 billion, and the entire European Union spent $7.8 billion in 2023." [29]

As a result of these developments, the reliance on foreign technology has declined in recent years, although the extent of the decline varies across sectors. The development of the domestic agri-tech industry intends to reduce the reliance and dependence on foreign technology. Ongoing geopolitical tensions increase the perceived need to boost agri-tech sector developments. The very specific characteristics of China's agricultural landscape and its climatic diversity means that agricultural technology, especially when designed for small-scale farms, must be tailored and integrated for specific contexts. This, in turn, might make Chinese manufactured and branded agri-tech appealing to foreign rural economies where smallholder agriculture dominates. As Zhan (2022) also notes, China is expected to become a major player in terms of agricultural technological innovation, in addition to food trade.

3.4 Concluding section 3

This section has examined China's strategy of "reform, opening-up, and innovation." Internally, it protects arable land through red lines and is expanding "high-standard farmland." At the same

[28] https://www.gov.cn/zhengce/202504/content_7017471.htm
[29] OECD, see also https://chinapower.csis.org/china-food-security/

time, in some instances it has limited the development of protected agriculture (e.g., greenhouses). Externally, China endorses “moderate imports,” supply diversification, and a more assertive role in global agri-food systems, while retaining the ability to use trade measures strategically to ensure food security. Technology is a central lever: smart agriculture plans (2024–2028) promote data platforms, standards, and wider use of AI, sensors, and drones. The very specific characteristics of China’s agricultural landscape and its climate diversity requires technology to be tailored and integrated for specific contexts, rather than simply copied and pasted from other countries’ industries. The domestic agri-food industry has aimed to reduce dependence on foreign technology, with geopolitical tensions as only one motivation.

4. Securing sufficient and safe food

As noted in Section 3, China's engagement in global agriculture is entwined with (policy) dynamics in its domestic agricultural sector. In this section we focus on the latter: What has happened in the domestic sector in recent years? What efforts has the Chinese state taken to improve domestic production, and to achieve relevant policy objectives? We will discuss challenges and risks experienced by local-state and private agri-enterprises involved in the implementation of agri-policies. Specifically, we seek to understand how agri-enterprises involved in joint international agricultural projects assess and perceive the risks and challenges they encounter. Our analysis is based on scholarly literature, media and policy reports on agricultural policy research, and semi-structured interviews (see Appendix).

In what follows, we first discuss the general governance framework in agricultural projects and provide several case studies. The case studies illustrate the relationship between the government and enterprises within this agri-governance framework in greenhouse cooperation, the role of Dutch stakeholders, and the lessons learned from these projects. Second, based on this analysis we discuss two operational logics of agricultural projects and illuminate how these logics reflect a specific relationship between the state and enterprises across different regions. Third, based on interviews we examine how local business actors perceive and respond to agricultural policies and anticipate impacts, as well as how they understand the risks and challenges in Sino-foreign agricultural cooperation.

4.1 Governing agricultural projects

To understand the operational dynamics of agricultural policy in China, it is essential to first examine its institutional framework. This sub-section maps the formal governance and enterprise relationships that structure the agri-sector, progressing from the general national framework to the specific case of China-Netherlands collaboration. These models highlight how state direction, market actors, and localized implementation interact to translate strategic priorities into agricultural projects.

Figure 1 illustrates the links and relationships between the government and enterprises in the agrifood sector. It illustrates the roles of the state at various levels, such as SASAC, and line ministries (MARA, MOST, MOFCOM, NDRC), state-owned enterprises (e.g., Agriculture

Development Group, State Farm Group, COFCO) and their subsidiaries, agro-industrial parks, and research institutes. It sheds light on how policies and coordination as well as capital management and performance evaluation cascade down.

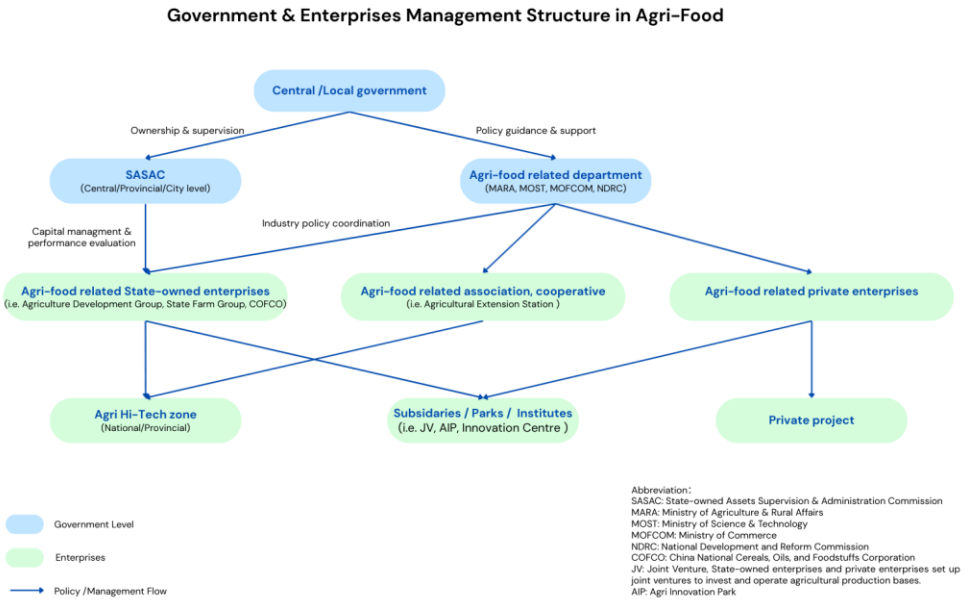

Figure 1. The general government-enterprise relationship within China's agricultural sector (Source: summarized from the interviews)

The relative involvement of the state and enterprises differs across partnerships and projects. We can identify three types of projects: type a) 100% state-led and state-financed projects (see "high-tech agricultural zones" in Figure 1); type b) projects involving state (SOEs) as well as private finance and operation (see "subsidiaries/parks/institute" in Figure 1); and type c), 100% privately-financed and privately-run projects (see "private project" in Figure 1). Fully government-owned projects—such as high-tech agricultural zones—are typically set up to serve as demonstration projects, that is, to showcase cutting-edge agricultural technologies as well as to attract innovation and talent. Public-private joint ventures serve to overcome the capital constraints of private companies. The government usually acts as the majority shareholder, investing in agricultural infrastructure and facilities. The private partner has a minor role in terms of finance, but assumes primary responsibility for operations, leveraging its agricultural expertise. Whereas the fully privately funded agricultural projects operate as commercial ventures, those considered high-tech and innovation-driven are often eligible for state support, for instance through loans from policy banks (e.g., the Agricultural Development Bank of China and the China Development Bank) or through local rural credit cooperatives. These loans can typically cover around 70% of total project funding, with interest rates of around 3.5%.

Case studies

In the above part, we outlined the general framework of government-enterprise management structures in agri-food and identified three project types. In this part, we focus on specific cases from greenhouse agriculture[30] to illustrate which types of enterprises ultimately assume roles throughout the entire engineering, procurement, construction and operation (EPCO) chain. The following four case studies also illustrate how Sino-Dutch cooperation in horticulture takes shape. From a central SOE-private joint venture (case 1) to a local government asset-based project (case 2), to real estate speculation under the logic of land finance (case 3), and finally to an SOE-led poverty alleviation mandate (case 4) —each case reveals a different logic driving investment.

In particular, these cases highlight lessons that Dutch actors could learn from. The market for Dutch greenhouse technology in China is shaped by a complex interplay of state policy, diverse capital sources, and local political interests. For Dutch suppliers, these models offer significant opportunities but also expose the structural vulnerabilities and non-agricultural motivations that often underlie greenhouse projects in China.

While Cases 1 and 2 demonstrate relatively stable, technology-driven collaborations, Cases 3 and 4 will be analysed together in section 4.2 to highlight the divergent institutional logics shaping agricultural investment across China's eastern and western regions. Case 3 (Evergrande) exemplifies a land-driven development logic, where greenhouse investments serve as a mechanism to secure valuable urban construction quotas under China's land finance regime—a model concentrated in the economically advanced east (More information of land finance regime is in 4.2.1). Case 4 (Shuifa), by contrast, illustrates a subsidy-driven and policy-aligned logic, where projects in western regions are embedded in poverty alleviation mandates and inter-regional assistance programmes. Analysing these cases side-by-side reveals how regional policy objectives and central-local government dynamics produce distinct enterprise behaviours, risk profiles, and ultimately, different outcomes for international cooperation partners.

Case 1: Kaisheng Haofeng – Central SOE-Private hybrid EPCO

How a central SOE collaborates with Dutch companies through a private partner

[30] The predominance of case studies from the horticulture sector, as opposed to livestock, can be attributed to the historical depth and breadth of Sino-Dutch agricultural collaboration, which has been most pronounced in horticulture. This sector not only represents the longest-standing area of cooperation but also presents the most complex and persistent challenges, thereby offering richer material for case study analysis.

China National Building Material Group (CNBM) was established in 1984. In 2003, it became a central state-owned enterprise (CSOE) directly supervised by the State-owned Assets Supervision and Administration Commission (SASAC). The Group manages 20 wholly owned enterprises, including 6 publicly listed companies under its control, two of which are listed overseas. As one of China's largest central SOEs, CNBM's core mandate is not only profitability but also the execution of national industrial strategies and policies.

In the field of horticulture, CNBM does not directly operate greenhouses. Instead, it collaborates with a private company (Haofeng) that possesses sector-specific expertise. In 2006, CNBM and Haofeng formed a joint venture called Triumph Haofeng (Kaisheng Haofeng). This joint venture undertakes large-scale greenhouse EPCO (Engineering-Procurement-Construction-Operation) projects in various locations in China.

In such projects, CNBM provides political legitimacy, access to financing and political power, translated into bargaining power in negotiations with local governments. Haofeng contributes knowledge in greenhouse operation and market-oriented management capabilities. Notably, it uses Dutch greenhouse technologies—ranging from climate control systems to cultivation strategies. These have been introduced as a result of Haofeng's long-standing cooperation with Dutch suppliers and consultants.

For CNBM, participation in such projects aligns with national policies, particularly the modernization of agriculture and revitalization of rural economies. At the same time, it allows the group to diversify its portfolio. For Haofeng, the partnership offers access to capital and involvement in large public-sector projects that would otherwise be inaccessible. For Dutch actors, this cooperation model offers clear advantages. EPCO projects involving central SOEs typically have substantially larger and more stable budgets than farm-level or small-scale private investments. As a result, these projects can afford relatively expensive Dutch technologies that would be financially inaccessible to most smallholder or family farms, which generally rely on lower-cost domestic alternatives. Dutch actors enter the system indirectly, embedded in a hybrid organizational structure where state power, private entrepreneurship, and foreign technology are tightly coupled.

Case 2: Chongming greenhouse – local government-private joint venture
How local governments engage with Dutch technology through asset-based partnerships

A typical example is a 1.5-hectare Dutch Venlo-type greenhouse (multi-span glass greenhouse, which is widely used in the Netherlands) project in Chongming District, Shanghai. This project was developed by a joint venture, involving a private company and the district government. In this project, the local government holds 50%, while the private company is fully responsible for daily operations, including production, marketing, and management.

For the local government, the project serves multiple policy objectives. Firstly, demonstrating "modern agriculture" aligned with national modernization goals; secondly, enhancing the district's profile in ecological and high-tech farming; and thirdly, creating a visible showcase for policy performance.

However, local governments typically lack the expertise to operate technologically complex greenhouses. Their role is therefore limited to providing land, basic infrastructure, subsidies, and political endorsement. The private company assumes operational risk and brings in Dutch greenhouse design, equipment and cultivation know-how, often through direct contracts with Dutch suppliers. In this model, "cooperation with the Netherlands" is primarily driven by the private partner but enabled by the government.

For Dutch actors, these government–enterprise demonstration projects offer relatively easy market entry. “Advanced greenhouse technology” is widely associated with the Netherlands in China, making Dutch solutions the default choice when projects are framed around technological advancement and international benchmarking. Such projects are usually designed as showcases rather than cost-minimization exercises, which reduces price sensitivity and allows Dutch companies to supply high-end systems. While profit margins are not necessarily higher than in purely commercial projects, transaction risks are relatively low, and reputational benefits are significant.

Case 3: Evergrande Group – greenhouse horticulture under the logic of land finance
Real estate capital entering greenhouse horticulture through China’s land governance regime

China’s system of land finance (土地财政) and the land quota regime play an important role in Sino-Dutch greenhouse cooperation projects. Local governments rely heavily on revenues from transferring land use rights, making urban developable land quotas (建设用地指标) a scarce [why scarce? Authors: This is because the quota is limited. You can imagine that the numbers of acre from developable land in China is state planned.] fiscal resource. For real estate developers, access to such quotas is often more valuable than the direct profitability of individual projects.
In this context, investment in greenhouse projects can function as a policy-mediated exchange. By building greenhouses, enterprises contribute to goals such as rural development and agriculture modernization, which makes local governments more willing to allocate or facilitate construction of land quotas for their core real estate businesses. This explains why Evergrande Group entered the greenhouse horticulture sector.
For Evergrande, these projects do not seem to be driven by agricultural returns. Even when operating at a loss, the real value lies in securing residential land, where profits are higher. Evergrande’s greenhouse phase I project was well funded and Dutch greenhouse technologies were introduced as turnkey “high-standard”, which helped frame these projects as legitimate demonstration bases in land negotiations[31,32].
However, this cooperation was largely transactional and one-off. Evergrande financially collapsed in 2021, many of its agricultural subsidiaries lost funding, and greenhouse projects were suspended or abandoned, so that the planned second-phase expansions were never realized. This did not result in direct financial losses on delivered projects for Dutch suppliers, but it eliminated long-term operational contracts, follow-up procurement, and market continuity. This case illustrates the fragility of facility greenhouse projects when driven by a land-finance logic: once real estate capital withdraws, the agricultural projects themselves become unsustainable.

Case 4: Shuifa Group – SOE, inter-regional assistance, and poverty alleviation
State-owned enterprise investment under inter-provincial policy mandates

[31] *Evergrande smart agricultural park: 10-hectare greenhouse (2020),* accessed 19 January 2026, https://www.app.dawuhanapp.com/wuhan/p/215476.html

[32] *Beyond Real Estate: Evergrande Leads $100 Billion Pivot to Agriculture (2014),* accessed 19 January 2026, https://www.chinanews.com/cj/2014/08-28/6541957.shtml

Shuifa Group, a provincial SOE from Shandong, can be considered a prominent example of policy-driven agricultural investment[33]. Under China's regional assistance programmes, developed provinces are required to support less-developed regions. In this context, Shuifa established a 314-ha agricultural demonstration park in the Kashgar prefecture, Xinjiang province.

The project was strongly embedded in national objectives: poverty alleviation, employment creation, and regional stabilization. More than 5000 local jobs were created. For Shuifa, the project fulfilled political mandates while also creating a long-term asset base in agriculture[34]. However, as with many SOEs, the group lacked in-house expertise in high-tech greenhouse operations. Dutch greenhouse systems and management models were therefore introduced as part of the project's "modernization package."

In this configuration, cooperation with Dutch actors is subordinated to domestic political goals. Foreign technology is valued not only for productivity gains but also for its symbolic function in demonstrating "advanced" and "standardized" agriculture in strategically sensitive regions.

The case studies above illustrate different partnerships and dependencies, involving a range of actors: industry associations/cooperatives and private agrifood enterprises, and state institutes at various levels.

In recent years, the EPCO model (Engineering, Procurement, Construction, and Operation)[35], where state-owned and private enterprises establish joint ventures to invest in and operate greenhouses, has been widely applied in greenhouse projects in China (see Case 1 in the textbox above). The government can lease small, fragmented plots of land from farmers and consolidate them into larger areas suitable for building large-scale greenhouses. Since the investment costs for large-scale greenhouses are high for private companies, the government facilitates joint ventures between SOEs and private enterprises to invest in agri-businesses such as greenhouse projects.

The joint venture company operating under the EPCO model is registered in different locations in China. Consequently, the local government where the company is registered plays a significant role in its operational activities. The Law of the People's Republic of China on Promoting Rural Revitalisation also emphasises that local governments should play a leading role in rural revitalisation. To advance agricultural development projects, such as optimising grain crop

[33] *About the Group,* official website of Xi'an Shuifa Shennong Group, accessed 19 January 2026, https://www.sfsnjt.cn/col.jsp?id=116

[34] Shuifa Group Inaugurates Xinjiang Regional Headquarter (2025), accessed 19 January 2026, https://finance.sina.com.cn/roll/2025-11-10/doc-infwwvuv1545438.shtml?froms=ggmp

[35] Different from the PPP model, which emphasizes the segregated interest between the state and the market. The EPCO model (quasi-PPP, but not typical) means both state-owned enterprises and private (domestic or foreign) enterprises can formulate another JV to co-invest in the agri-project together.

structures, the companies coordinate with local governments through central subsidies, agricultural production services, and demonstration projects to implement policies (Ren & Cui, 2024).

4.2 The implementation of agricultural policies and projects

Besides government-enterprise dynamics, central-local government relations also influence the execution of agricultural development projects and international cooperation initiatives across eastern and western regions of China. The difference in government relations and operational decisions among agricultural enterprises stem from China's regional development models and policy objectives. The differences profoundly shape corporate strategies and operational outcomes of state-private enterprises cooperation, forming two distinct logics to develop projects (also see the synthesis of the analysis in Figure 3).

4.2.1 Land driven development

The first institutional logic involves agricultural enterprises operating within a long-standing "land finance" (土地财政*tudi caizheng*)[36] and "land quota system" (see the term below). For many local governments in China's eastern provinces, the sales of land use rights (LURs) is an important source of their budget (Tao 2023). Enterprises, especially large-scale companies, often need to gain developable-land (建设用地) quotas from local governments by either participating in land remediation (e.g., reclaiming farmland) or cooperating with local urban redevelopment (e.g., relocating from core areas). One of the motivations driving many enterprises to invest in greenhouse horticulture is to use such investments (such as agricultural construction projects) to offset urban construction land (reserved for real estate development). If a company invests in greenhouse agriculture construction, it can acquire quotas for other developable land and engage in other real estate development (i.e. commercial housing). This explains why real estate developers from the east, such as the Evergrande Group, have ventured into the agricultural sector to invest in greenhouse horticulture. These real estate developers are capital-intensive and often diversified conglomerates. They are not primarily "agricultural companies" in the traditional sense. Data indicates that from 2015 to 2022, the conversion rate of farmland to

[36] The land finance system stemmed largely from the 1994 tax-sharing reform, which created a fiscal mismatch by curtailing local revenue shares while maintaining their spending needs. Only by selling land use rights (LURs) can local governments replenish their finances. This is the institutional backdrop to China's land finance system.

developable-land in eastern regions reached 12.7%, creating a cycle of "land-finance dependency and non-agricultural squeeze (Tao 2023)."[37]

Land Quota System in China

"The land quota system in China (sometimes also referred to as "Farmland conversion quota system") restricts the maximum amount of land used at the subnational level, i.e. provincial level. Then the total quota will be allocated to each city and county town within the province based on their economic performance and population forecast. It should be noted that the land quota is just virtually allocated and can be transferred spatially as long as the land use amount in a city is still within its total allocated land quota.

The land quota system in China was largely introduced in 1998 and initially imposed as a countermeasure for addressing the challenge of losing farmland due to the ever-fast urbanization and the urban sprawl beyond control in urban spatial development, and for safeguarding the country's food security. Two policy tools, prime or basic farmland preservation and farmland conversion quotas, were applied in the system. Prime farmland is basically untouchable as even occupying a small size of prime farmland will require approval by the central government, which usually can be long time consuming and be double checked through a hard process.

Another intention of the system is to encourage or push cities to use their developable land more efficiently by using the land in a more intensive and compact manner. "There are three main sources of urban land supply in China: (1) the conversion of farmland into urban land (requires new quota); (2) the conversion of rural construction land into urban land (requires quota transfer mechanism); and (3) the redevelopment of the existing stock of urban land (without quota limitation but with increasingly higher relocation cost)" (Yuan Xiao, Jinhua Zhao, 2015)."[38]

4.2.2 Subsidy-driven and policy-aligned development

In China's western regions, the role of land in agricultural development is much less pronounced. Local governments, constrained by weaker local tax bases and reliant on central government transfers, are primarily oriented toward broader rural development programmes. Indeed, here, broader rural development programmes and rural industrialization (much less progressed than in the East) are more important, and potentially affect enterprises' operations and plans. Projects have to be cognisant of, and contribute to local government's rural development policies, such as those focused on rural poverty alleviation and rural industrialization. Specific policies are meant to develop the western region, such as those fostering "East-West collaboration."

[37] This phenomenon of non-agricultural squeeze prompted the central government's sensitivity on grain security and restrictions on the expansion of unnecessary investment in greenhouse horticulture https://www.moa.gov.cn/govpublic/ZZYGLS/201809/t20180915_6157403.htm

[38] Transition towards urban sustainability through socially integrative cities in the EU and in China, by Jianming Cai, http://transurbaneuchina.eu/online-compedium/land-quota-system/?no_cache=1

Enterprises are often expected to create local employment, supported by special subsidies and project funds. This fosters a "goal alliance" between government and enterprises: rural projects developed by local enterprises become vehicles for local governments to achieve poverty alleviation targets and implement policies aimed at rural industrialization.

Many western regions face financial and resource constraints, along with infrastructural challenges. The mountainous and hilly terrain complicates agricultural production and market access (Yunnan is an exception). Local governments are actively exploring small-to-medium-scale "specialty agriculture" (特色农业 *tese nongye*) and organic agriculture development. Local authorities are promoting ecotourism, which integrates agriculture with ecology, culture and tourism. For the west, more than the east, investment is needed to develop agricultural projects, particularly those focused on ecotourism and organic agriculture. Here, funds from the East, such as the earmarked "East-West Cooperation Fund (东西部协作基金 *dongxibu xiezuo jijin*)" play an important role. All the greenhouse horticulture enterprises (particularly construction and operation entities) from eastern regions that we interviewed have invested in greenhouse horticulture projects in western areas (Yunnan, Guizhou, Gansu, Shaanxi, etc.).

The distinct conditions in China's regions shape enterprise operations in varied ways, and the development priorities and strategies might attract certain companies to engage in the east, others in the west. Agri-subsidies and financial support resources are concentrated in leading enterprises. This resource allocation model fosters short-term demonstration projects for "agricultural modernization".

4.2.3 Divergent enterprise models and associated risks

The two logics analysed above foster two distinct enterprises' business behaviour with different types of risks (see Figure 3):

"Land-driven" agricultural enterprises prioritize feasibility and value of land conversion in their site selection, especially in the east region. Proximity to urban planning zones, suitability of existing land for reclamation or consolidation, and land value appreciation become more critical factors than pure agricultural resources. Greenhouse horticulture enterprises often pursue diversified business structures, engaging in tourism and leisure alongside agricultural production to enhance land-swap leverage and profitability, aligning with local governments' peri-urban development priorities. The financial value of land appears to be a key factor in selecting their

projects' locations. This model demands substantial upfront funding for land transfer, consolidation and preliminary development, requiring strong financial capacity and tying operations closely to local land and real estate markets. Enterprise operations are tightly bound to the local land and real estate markets. For example, some projects were abruptly abandoned when the involved group faced a liquidity crisis (example Evergrande in Case 3 above).

Meanwhile, some greenhouse horticulture enterprises operate on a "subsidy-driven" model (see Case 4 above)[39], seeking to maximize the use of subsidy policies tied to state priorities such as poverty alleviation mainly in the west. This can lead to excessive expansion to secure subsidies, neglecting actual market demand. In the next section we will elaborate on this point. Thus, policies shape and structure companies' orientation in several ways, and companies strategically respond to the state's priorities and needs. As a result, changes in subsidies can affect enterprise operations, even their liquidity. As in other economies, operational performance and willingness to invest is highly correlated with policy continuity.

Figure 3	**Logic 1: Land-Swap Driven (mainly East)**	**Logic 2: Subsidy-Driven (mainly West)**
Core driver	Land finance (土地财政)	Policy of rural development and poverty alleviation
Key mechanism	"Land quota" exchange: enterprises obtain construction land by participating in land remediation/urban redevelopment	"Goal alliance": enterprises help local governments meet policy targets (e.g., poverty alleviation, job creation)
Priority of the local government	Urban expansion, land value appreciation, high-tech demonstration	Rural industrialization, employment
Type of enterprise	Large-scale, capital-intensive; often real estate or conglomerate-backed	Small-to-medium scale; often state-assisted or Eastern-invested joint ventures

[39] In interviews, it was observed that enterprises perceive no causal link between subsidies and market competitiveness. Dutch enterprises operating on the Chinese market are also aware of subsidies. Their market decisions are influenced by whether and what kind of subsidies are available to potential Chinese partner enterprises (MK, livestock).

Potential risks	Tied to real estate market cycles; liquidity crises can halt projects (e.g., Evergrande)	Policy dependency; Subsidies stop, industry stalls

4.2 Enterprises' perceptions of policy impact on risks and challenges associated with policy implementation

This section summarizes and analyses enterprises' perceptions of policy impacts and risks in policy implementation, as well as how they respond to these impacts. The interviewed enterprises come from the greenhouse and livestock sector across eastern and western regions. Besides regional policies, national policies also have an impact on enterprises. In response to our interview question "which policies impact agricultural projects and agricultural cooperation, and what effects do they produce", respondents consistently highlighted the following national policies as critical to business operations: the No. 1 Central Document, agricultural industrial policies, the "Great Food View" policy, land policies, and environmental protection policies. It should be emphasized that agricultural policies constitute a complex and often contradictory set of measures. Some are perceived as incentivizing policies, while others are seen as regulatory.[40]

Drawing on interview data, this analysis identifies five principal perceived risks associated with the implementation of these national policies.

Risk 1: Policy Implementation Gaps and Contradictory Objectives

First, the local implementation of policies issued by national ministries varies across provinces and cities, sometimes leading to inconsistent standards or procedures when relevant projects are implemented. Local administrative uncertainties lead to project interruptions/inefficiencies: policy fluctuations and conflicts, coupled with differences in local implementation, make projects prone to "delayed" changes or "forced stop-loss." Furthermore, tensions also exist between policy objectives—for instance, food security policies appear to conflict/contrast (or to not align/not be in agreement) with industrial policies that highlight self-dependence/self-sufficiency and policies supporting the globalization of agricultural enterprises. As JW, manager of a black pig breeding enterprise in Guizhou, noted: "There are contradictions between policies.

[40] Incentive-based agricultural policies include those promoting industrialization (e.g., policies encouraging investment in greenhouse horticulture) and those fostering rural social stability and prosperity (e.g., environmental policies, East-West cooperation policies, New Rural Construction policies, etc.). Regulatory policies encompass land policies (particularly those concerning rural land development rights), environmental policies, and policies by China's central government addressing global geopolitical tensions and trade disputes (e.g., the "Great Food View" policy).

Personally, when I read the policies, I noticed these tensions. On the one hand, higher-level policies demand a 'Great Food View' and increased production. On the other hand, regarding breeding sows, they require us to reduce the numbers." Similarly, policies that encourage the scaling up of agricultural production contradict the policy that aims to protect high-standard farmland (Interview BX). The latter restricts enterprises from obtaining large tracts of land for greenhouse construction. This dissonance between policy goals creates a precarious operational situation where compliance with one directive may inadvertently violate another, exposing enterprises to compliance risks. This risk is amplified in the western region, where enterprises must navigate these national-level contradictions while aligning with local poverty alleviation mandates, creating compliance issues for enterprises.

Risk 2: Ineffective Local policy Implementation

A second and related risk is that excessive regulation leads to policies that are not implemented at the local level. An interviewee from a company reported that a cycle of policy oscillation undermines the effectiveness of governance. "Local governments previously insisted on scaling up. This year, they directed us to scale back operations... China's economy faces institutional constraints unlike foreign markets where supply and demand are more market-driven. Domestic policies have both merits and flaws. When effective, our goal is to ensure pig farmers break even. But when policies constantly shift, local implementation gradually loses momentum" (JW, Guizhou, Livestock). Interviewees raised issues stemming from agricultural industrialization and scale expansion, as well as industrial policies encouraging self-sufficiency and self-dependent innovation.

Other problems, such as environmental pollution, weak local policy enforcement and market volatility, are not merely external factors but are perceived as being intensified by inconsistent policy implementation. The implementation gap transforms policy from a facilitating force into a source of uncertainty (Xie et al., 2022). It is worth noting that some of our research questions concerned how interviewees interpreted policies, assessed the policies' risk levels for local agricultural projects, and evaluated policy impact on international cooperation. (See Appendix 1 for details.) In eastern regions, where land-driven models tie enterprises to (declining) real estate markets, policy inconsistency can result in an immediate liquidity crisis. In the west, where enterprises depend on stable subsidy flows, shifts in local implementation can threaten the viability of entire projects.

Risk 3: Geopolitics Puches Agri-food Cooperation Toward Cautious Cooperation

Third, the escalating influence of geopolitics introduces an external risk that has made companies' international cooperation cautious. In recent years, analysts have increasingly focused on the impact of geopolitics on international collaboration in research and development, i.e., innovation, and also, in turn, on how trade disputes can exacerbate tensions. The dynamics observed in the agricultural economy share similarities with developments in other sectors. We observe that disputes originating from high-tech trade and cooperation have been incorporated into China's agricultural international trade and collaboration policies. Recent issues in agricultural cooperation include data security concerns in China's international agricultural partnerships, China's import restrictions on U.S. soybeans (a primary livestock feed source), and the adoption of China's "anti-dumping" ruling against EU pork products. Concerns over IP and data security reduce trust and communication, with China-NL projects tending to limit cooperation to transactional buyer–seller relationships rather than science and technology exchange. Innovation, therefore, is limited. The widespread concern over intellectual property protection and data securities underscores how geopolitical tensions have forced collaborations into cautious, transactional "buyer-seller" relationships rather than innovation exchanges. These findings illustrate the need to (more strongly) integrate geopolitics as an external factor into analyses of agricultural development (cf. Hofman, 2024), and when seeking to understand corporate behaviour. This (potential) risk affects enterprises in both regions.

Risk 4: Low Operational Capability

Fourth, concerning operations and business models, a critical challenge is posed by insufficient sustainable operational capabilities, stemming from a talent gap and an unclear business model. This deficiency often results in two problematic outcomes: "subsidies stop, industry stalls" and "non-operation after construction." This risk is fundamentally shaped by the policy environment in which agricultural projects are conceived and funded. When policies prioritize short-term demonstration effects, rapid infrastructure construction and the absorption of subsidies over long-term market viability, they create perverse incentives for enterprises.

During interviews, company representatives revealed a widespread anxiety that many projects were conceived primarily as "demonstration projects" or political showcases, designed to meet short-term policy targets or to secure initial funding. These projects tend to over-invest in high-tech hardware and infrastructure while critically under-investing in cultivating professional management teams and developing viable, market-oriented business models. Companies are anxious about entering a cycle where projects are launched with fanfare but lack the operational

backbone to survive without perpetual government support, leaving them vulnerable to policy shifts and funding stops. The absence of a clear path to profitability, beyond subsidy capture, raises serious concerns about long-term viability and exposes enterprises to significant financial and reputational risks once public attention and fiscal support move elsewhere.

This risk is particularly acute in the western region, where the subsidy-driven logic explicitly ties project survival to continued policy support. The "goal alliance" between government and enterprises can incentivize rapid construction to secure funding while neglecting post-construction operational planning. In the east, the risk manifests differently: land-driven enterprises may possess strong financial capacity but lack agricultural expertise, leading to operational failures despite impressive infrastructure.

Risk 5: Different Project Types and Misaligned Expectations

Finally, a significant risk arises from the heterogeneity of agri-food project types operating with China. These projects are not always or necessarily market-driven. Different project types vary substantially in their objectives, investment structures and operating mechanisms. As described in 4.1, fully state-owned demonstration projects, projects jointly invested in by state-owned and private firms, and commercially oriented projects led by private investors each follow different logics, with different objectives, investment structures, and operational mechanisms.

A critical failure point, therefore, lies in the misclassification of a project type, or engagement with an inappropriate partner entity both in the eastern and western regions. Such misunderstandings lead to misaligned expectations among stakeholders regarding project goals, financing arrangements, and operational models. This misalignment can impede progress in cooperation, create friction, and in the worst-case scenario, precipitate project failure. This problem demands stakeholders meticulously perform due diligence and alignment from the outset.

4.3 Concluding section 4

This section has analysed the governance of China's agri-business projects and international collaboration, shedding light on its state-led, multi-level character, Central ministries set priorities and rules; local level authorities implement and facilitate projects by securing access to land and finance and mobilizing SOEs and private companies. The latter often involves setting up joint ventures and an EPCO process. However, the characteristics, priorities and provisions differ per region: in China's eastern regions, projects are shaped by market pressure and

“development-rights/land” bargaining. As such, they could be termed “land-driven”. In China’s western regions, by contrast, projects are tied to other policy goals such as poverty alleviation, in which the state has a strong role. The state therefore subsidizes projects, which triggers projects that are primarily “subsidy driven.” In both geographic regions, projects are prone to risks: implementation is not a given but can be affected by geopolitical tensions, and limited operational capacity.

5. Changes in domestic production, needs and opportunities: A sectoral analysis

How do the developments described above play out in different sectors? In this section we focus on the characteristics of Chinese horticulture and livestock sectors and illuminate some of the sectors ´ weaknesses and opportunities as well as needs, as identified by various interlocutors, in light of the policy ambitions described above. Subsequently, we assess how and to what extent Dutch actors could contribute to supporting developments and fulfilling needs. Based on policy reports, local policy documents and interviews, this section first summarizes general developments in the horticulture and livestock sector. We then detail the industrial and institutional challenges identified in both sectors, along with recognized needs and potential opportunities for the involvement of Dutch actors, particularly through joint projects.

5.1 The horticulture sector

China is one of the world's largest producers and consumers of fruits and vegetables, and demand has grown in recent decades. As noted earlier, Chinese consumers have expressed food safety and food quality concerns, as well as an interest in a larger diversity of food items. These desires and concerns have resulted in more stringent requirements for uniform, stable, traceable, and year-round food supplies across diversified retail channels, including supermarkets, community group-buy platforms, and e-commerce (interview YH, QT).

Notably, horticulture production predominantly takes place in greenhouses. The surface under greenhouse production in China is significant: there are 1.89 million ha of greenhousesin China, versus 0.7 million in the rest of the world (Ravensbergen et al. 2024). In 2023, China had 1835.87 ha newly built greenhouses, of which 60% are plastic-film greenhouses, 234.32 ha are glass greenhouses, 12.48 ha are polycarbonate greenhouses, 144.17 ha are solar greenhouses, and 350.8 ha consist of other types (e.g., landscape/restaurant) (Guo et al. 2024).

Greenhouse construction has benefitted significantly from corporate capital investments, with urban capital playing an important role in large-scale greenhouse construction in the 2010s. Local governments actively encouraged these "high-profile" projects, offering various subsidies and policy support. This has resulted in large corporations investingshowcase agricultural projects without a clear feasibility analysis (interview YH, ZX). A number of these projects never became operational. However,

in recent years an increasing number of small and medium-sized enterprises (SMEs), specifically local private companies and research institutes, have been entering the field of large-scale greenhouse investment (interview YH, QT). This has led to the gradual resumption of construction on previously abandoned greenhouses and a transformation of unprofitable "showcase" projects into profitable ventures (interview QT, HL). This trend warrants further attention, and the sector remains dynamic.

According to a recent report by the Rabobank (Van Horen and Van Rijswick 2026), "self-sufficiency" has become the driver of global greenhouse investment. Influenced by the Covid-19 pandemic as well as geopolitical tensions, governments of various countries are placing greater emphasis on domestic food production capacity, including fresh vegetables. The demand for greenhouse technology has been increasing, accordingly. However, while Dutch suppliers of greenhouse technology still have a positive growth outlook for 2026, the growth is lower than 2025. This trend is reflected in data on China, where the area under greenhouses has doubled over the past 12 years, indicating rapid expansion. At the same time, Dutch greenhouse suppliers' revenue expectations for the Chinese market have fallen sharply since 2018. This seems to reflect a lower demand, which might be due to market saturation or a greater emphasis on localized adaptation and domestic provision. Indeed, the policies orientated towards self-sufficiency (自给自足 *ziji zizu*) encourage Chinese horticultural enterprises to localize the production, assembly and sales of greenhouse construction and equipment, along with efficient local after-sales service. The trade dynamics seen in recent years, with Chinese companies exporting specific parts for greenhouse construction, followed by imports for the final construction of greenhouses, is increasingly questioned. Our interviewees expressed an interest in the localisation of production and in genuine joint development within the current policy constraints (interview XJ, YJ 1, DQ, ZX).

A range of technical issues has however affected the sector's further development. For instance, many facilities remain mid (with simple climate control) to low tech (passive plastic tunnel without climate control) with limited durability, thermal performance, and climate robustness. Significant temperature differences within China hamper a one size fits all: winter heating loads in the North and summer cooling constraints in the South require advanced climate control and crop modelling.

5.1.1 Sectoral needs and opportunities

5.1.1.1 Demand for localized and integrated greenhouse design

According to our interviewees, the Chinese government has emphasized short-term, visible demonstration outcomes in agro-projects in recent years. It has largely focused on hardware modernization, with limited attention to software systems and skilled personnel (interview ZX).

Some our interviewees expressed discontent about this model of modernization: in their opinion, international cooperation should not be about copy-pasting hi-tech greenhouse or importing equipment. Instead, it should focus on designing greenhouses adapted to China's local climate conditions and market needs, while ensuring that operational knowledge and technical capabilities keep pace—in other words, the necessary talent and training must be in place to support effective operation and long-term performance. (Interview HL, YG, and XJY)

5.1.1.2 Demand for refined cultivation management

Apart from some of the technical issues mentioned above, interviewees indicated a few domains or aspects where Dutch companies and institutions could support the greenhouse sector. Firstly, in terms of optimizing the use of waste (for heating) and wind and solar technology. The Netherlands is globally recognized for its leadership in hybrid energy utilization (waste heat, heat pumps, CHP, thermal storage), model-based prediction and optimization for off-peak/peak electricity pricing and demand response, as well as quantifying energy savings and carbon reduction.

In addition, interviewees reported a lack of professional workers for the management and daily operation of greenhouses (interview TT, MM, QT, YG, YH, JW1). This results in low utilization efficiency of greenhouse systems and equipment. In recent years, the Netherlands has developed rapidly in greenhouse digitalization, such as data-driven cultivation, AI-assisted growing, and even greenhouse operation robots (leaf picking and harvest robots). Some interviewees expressed interest in improving cultivation management capabilities, with which yields and quality as well as revenue can be increased, and paving the way for further Sino-Dutch collaboration in autonomous greenhouse cultivation and robotics (interview DQ, YJ, H). Dutch companies might be able to provide these technologies and train Chinese specialists, for instance in the form of consultant services or project collaboration (interview TT, MM, YG).[41] For both the Netherlands and China, balancing automation with farmer employment and welfare remains a relevant issue that requires further in-depth research.

5.1.1.3 Demand for joint development in equipment and service localization

Thus, a general concern expressed by our interviewees is skills development and transfer. "We invested a lot of money in a Dutch climate control system, but we don't have skilled staff to operate it. As a result, we can only utilize 20% —it is a huge loss. We requested training from the

[41] However, a few interviewees (YH, MH) stressed that the purpose of greenhouse automation is not to displace farmers or growers. In fact, current agricultural policies in China prioritize farmers' welfare in the rural area (i.e., to improve rural employment and entrepreneurships) as part of a broader "agricultural modernization" agenda, over automation solutions (interview MH).

Chinese office of the Dutch supplier, but a one-time session doesn't solve the problem. What we really need is continuous, regular training." (interview ZT).

YH, a greenhouse designer involved in multiple Sino-Dutch projects, furthermore, suggests Dutch companies could assist Chinese counterparts in conducting thorough market research—including demand analysis and site selection—before launching projects, particularly those tied to industrial parks. "However, there are also challenges Dutch companies must face. For instance, they need to understand the policy constraints faced by local Chinese enterprises. As local businesses, profitability is equally important as assisting local governments in meeting other socioeconomic targets."

5.1.1.4 Demand for new agricultural models in the new era

Earlier greenhouse investments in (mostly eastern) China often aimed to lift nearby land values for property development; today, conversion of surrounding land-use rights is more challenging, making new entrants "renovators" rather than speculators. At the same time, operations often remain with rural collectives (Interview MH). In tandem, regulations have been put in place to avoid short-term profit maximising projects that operate at the expense of the environment.

Thus, Chinese local governments and enterprises have recognized the need to move from short-term investments to long-term sustainable models. For example, agricultural industrial zones such as Agricultural Demonstration Zones (农业示范园区 *nongye shifan yuanqu*), involving horticulture projects that include both industrial and agricultural land, may only be established under the premise of "integrating and benefiting local farmers (联农带农 *liannong dainong*)." Only under these conditions can enterprises within such zones enjoy the same policies as other agricultural enterprises, particularly tax benefits. More initiatives are also taken to spur R&D in the horticulture sector.

In the Netherlands, the agri-food sector has several well-known concepts, such as the Greenport and metropolitan food cluster. Over a decade ago, Dutch research institutes and agri-food enterprises tried to introduce these concepts to China. Greenport Shanghai (Smeets et al. 2010) and Greenport Caofeidian are examples, which have the potential to integrate high-efficiency production, waste heat utilization, CO_2 emission reduction, smart water management, and temperature-controlled transportation into a single park. At the time, some interviewees stated that these models were introduced too early in China, at a time where there was insufficient technological and organizational capacity (Reference Interviews from TT). However, it is now said

that China can revisit Dutch models (Greenport, food clusters, "Golden Triangle"), with Dutch partners acting as system integrators and helping align industry–academia–research for faster commercialization (Interviews YG, TT). Indeed, Dutch stakeholders can serve as the parks' system integrators, participating in top-level solution and functional design to build implementable agricultural industrial parks (Reference Interviews from YG, H, TT). In addition, interviewees stated that the Dutch "Agricultural Golden Triangle" model can help China learn how to align industry, academia and research to close the gap between research and application. It can accelerate the effective incubation and application of scientific research in practice (Reference Interviews from YG, TT).

5.2 Livestock sector

As noted above, the growing demand for animal protein (dairy, meat, poultry, eggs) has boosted the importance and volume of animal husbandry and livestock production in recent years. In policy documents recently published by some provincial governments from the Western region, significant attention is devoted to pig production capacity, as well as support for beef and dairy cattle industries.[42] Apart from increases in production volume, the state attends to veterinary and hygiene standards (e.g., regarding slaughtering and milk processing), zoonotic diseases, feed and forage capacity, and grassland quality.[43] The rapid developments signify the industrialization of livestock production (scale enlargement and intensification), relying considerably on agricultural technology.

Due to new regulations and policies, the livestock sector is focusing increasingly on scale enlargement and is seeking to reduce reliance on imports of feed and meat (particularly pork).[44] As seen in other sectors (horticulture, grains, e.g., soy, and diary), dynamics are entwined with broader international trade disputes. For instance, in September 2025 the Chinese Ministry of Commerce launched policies and imposed tariffs, reportedly because it was concerned about the "dumping" of pork and pork by-products by European actors.[45] Reportedly, the Netherlands plays a key role in the trade, as it supplies piglets which are fattened in other parts of Europe. By

[42] https://mzt.guizhou.gov.cn/xwzx/mzyw/202502/t20250223_86938015.html; http://www.gansu.gov.cn/gsszf/c100064/201912/111314/files/0a48f201a7084a2bb20c8bb2f2116e96.pdf https://mzt.guizhou.gov.cn/xwzx/mzyw/202502/t20250223_86938015.html; http://www.gansu.gov.cn/gsszf/c100064/201912/111314/files/0a48f201a7084a2bb20c8bb2f2116e96.pdf

[44] According to the OECD and FAO outlook (2025: 85), imports of pig meat by China will diminish in the coming decade, which will affect global trade patterns, particularly as a result of the growth of the domestic sector. In 2023, China imported pig meat worth 3.27 billion US dollars (Observatory of Economic Complexity, n.d.). Brazil and Spain were the most important exporters to China in that year (in terms of value, resp. 889 and 787 million US dollar (ibid.).

[45] https://www.mofcom.gov.cn/zcfb/blgg/art/2025/art_64a274d4734143888d8668c99f8730ab.html

stimulating domestic production, the Chinese state aims to become less dependent on major exporters, and reduce the demand for meat imports. It is expected to affect the global market. "[N]on-ruminant meat prices are expected to ease due to moderate production expansion and lower import demand by China" (OECD and FAO, 2025: 85).

The Chinese state's interest in increasing domestic production enhances Chinese companies' interest in international collaboration,[46] further detailed in the follow section.

Needs and opportunities

Demand for innovation to prevent "involution"

Over the past decade, government initiatives to encourage technological innovation have driven significant progress in China's livestock sector. Gene editing, AI and robotics are now widely applied in Chinese livestock breeding and feeding. New breeding techniques have enabled the development of livestock and poultry breeds with superior traits like high productivity and disease resistance. However, high-quality germplasm resources remain scarce, and despite breakthroughs in breeding technology, further advancement has stalled. The livestock sector demonstrates a strong demand for new technologies, but a deeper, more critical need is for a functional *collaboration* to develop them.

One researcher (JY) working in the field of livestock technology commercialization in Beijing, Gansu, Shanxi, stated in an interview that animal breeding technology must be built upon extensive data sharing and collaboration, but that advancing such collaboration proves challenging for the breeding enterprises. "Breakthroughs in animal breeding technology depend on inter-institutional collaboration, yet such collaboration is highly sensitive within China. There is a lack of solidarity (不团结 *butuanjie*) among domestic players, with deep-seated suspicion prevailing. Due to the lack of data sharing on breeding resources among Chinese enterprises, domestic databases have not reached sufficient scale to support effective research. This has consistently been an institutional issue rather than a simple technical one." Many have invested excessive costs, yet amid mutual distrust and intense competition, technological breakthroughs remain elusive.

[46] On 14 February 2026, the Ministry of Finance introduced preferential import tax policies for seed and breeding stock during the 15th Five-Year Plan period. Imported seeds and breeding stock that meet the criteria outlined in the "List of Imported Seeds and Breeding Stock Exempt from Value-Added Tax" are exempt from import VAT. This policy reduces the cost of importing new breeds and encourages enterprises in the animal husbandry sector to engage in collaborative efforts for the promotion of superior breeds and varietal improvement. See: https://gss.mof.gov.cn/gzdt/zhengcefabu/202602/t20260214_3983868.htm

This institutional deficit is exacerbated by market conditions. Pork—China's primary animal protein source[47]—has suffered prolonged price stagnation, and over-capacity, prompting pig farming enterprises to rethink their focus on quantity and scaling-up. During the 2018-19 pork price surge, both major and small-scale farms frantically increased herd sizes and shortened production cycles. This led to sustained price declines in recent years, forcing many small and medium-sized enterprises out of business (Interview CH, HC). Moreover, due to reduced imports of soybeans from the United States, Chinese pig farms are exploring alternative feed resources. This has, for example, spurred collaborative projects between Chinese enterprises (in Shanxi) and the Netherlands to develop circular feed systems (see footnote 48). The goal is to replace imported soybeans in pig feed with other local food resources (Interview JY, AH).

This highly competitive, defensive state, focused on output rather than product diversification, is recognized within the livestock sector as "involution" (内卷 *neijuan*). In recent year, this term has gained widespread recognition in mainland China. It is perceived as a problematic state of hyper-competitive, zero-sum rivalry where companies exhaust themselves chasing marginal gains in output without achieving genuine innovation or profit growth. Interviewees from SMEs in the livestock sector expressed the necessity of accepting this internal competition with a sense of resignation. In 2025, the central government introduced a series of policies and declarations opposing vicious and bottom-of-the-barrel competition.[48] The industry association also released a White Paper by the end of 2025 to advocate that the breeding industry should swiftly address issues such as overcapacity of hogs, and the monopoly[49] by mega breeding companies.

These measures aimed to correct certain industries through administrative discipline, such as the oversaturation of Electronic Vehicles (EVs) and AI companies with over-capacity. Both the World Agricultural Science and Technology Innovation Conference scheduled in October 2025 in Beijing, and the 2025 Swine Industry Development Conference convened by three major swine farming enterprises in November, featured dedicated forums on "prevent-involution (反内卷 *fan neijuan*)" innovation□□this critical juncture against "involution□□□□are voicing □□for an increase in

[47] In terms of meat consumption structure, pork still accounts for the overwhelming majority of China's meat consumption. See: https://ourworldindata.org/data-insights/over-the-last-six-decades-china-has-rapidly-increased-and-diversified-its-meat-consumption

[48] In March 2025, a Chinese government work report identified "prevent-involution" as a key challenge in improving fundamental market systems and eliminating over-production due to local protectionism and market segmentation. See: https://www.gov.cn/yaowen/liebiao/202503/content_7013163.htm

[49] On 18 December 2025, the 11th China Swine Industry Summit Forum and China Swine Industry High-Quality Development Summit convened in Zhuhai. The event featured three academics as lead speakers, support from the top 100 swine enterprises, and drew over a thousand attendees. During the summit, the organizing committee officially released the "White Paper on High-Quality Development of China's Pig Industry".

quality, not just quantity, such as considering carbon emission reduction in the food production, diversified germplasm, diversified food products, and niche markets creation (Interview JY, GL, CH).

Demand for equitable collaboration and competition

Beyond innovation, there is a profound need to fairness in the sector's structure. Due to the scaling-up of the livestock industry, its organizational structure has undergone significant changes. New policies also encourage large-scale livestock farming. The chairman of a pig farming cooperative in Yunnan we interviewed complained that large-scale breeding and feed enterprises increasingly dominate the sector and market share. Fairness, 公平 (*gongping*), is a key issue frequently raised during our interviews. The widening gap between small and medium-sized enterprises (SMEs) and large enterprises has caused growing unease among SMEs.[50] These disparities are primarily reflected in the following ways: large enterprises or leading companies receive greater policy preferences (i.e. funds for R&D collaborations) and have better access to low-interest loans from banks.[51]

The imbalance between large enterprises and SMEs has also spurred SMEs' demand for policy leverage through localized or regionalized technological standardization. Apart from developing distinctive products and "going global" (e.g., overseas investment, collaboration with international research institutions), managers from SMEs think that the only way for them to maintain their position in this sector is to proceed with "technological standardization" (Interview QZ, CH). SMEs view technological standardization as a bottom-up strategy to drive policy changes favouring them and counter the policy and financing advantages held by large enterprises. They also view technology standardization as a strategy for forming partnerships with local governments. Local governments also have a need for bottom-up standardization applications: by continuing to support SMEs in standardization applications, they can set product pricing and gain pricing authority over those products.[52]

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[50] According to our interviewees with private SMEs, livestock private SMEs demand fairer and more multilateral business relationships. Moreover, financially, those SMEs have a stronger capacity to recover from the "pork cycle" and African swine fever outbreaks. "Compared to large (state-owned) enterprises, they are better positioned to become key players in international cooperation." (Interview JY).

[51] We inquired about China's industrial subsidies for the livestock sector. We anticipated this would be a sensitive topic likely to spark market injustices, expecting most Chinese interviewees to avoid discussion. Unexpectedly, however, the SME interviewees became visibly indignant when this issue arose. They felt they received little benefit from agricultural subsidies, arguing that the state subsidies provided to SMEs were negligible compared to the time and labour costs they invested in corporate social responsibility such as recruiting local villagers and constructing rural infrastructure.

[52] Subsequent research could explore the extent to which locally driven agri-technological standardization increases local tax revenue, as well as local governments' role in the securitization of new agri-tech products and the formation of new agri-tech markets.

> "I believe that for the promotion of new technologies—such as breeding and artificial intelligence—the Academy of Agricultural Sciences and large enterprises should take the lead. Then, SMEs like ours can conduct pilot projects, ultimately standardizing the application of these technologies and keeping the standard in the hands of SMEs and maintain it locally. Standardization must be built upon local SMEs' collective acceptance of these innovations. Subsequently, they (SMEs) drive the process—for instance, by lobbying higher-level institutions, such as local governments—to gradually standardize these technologies through a bottom-up approach. Local governments are happy about this." (QZ, founder of a startup using AI facial recognition technology in animal husbandry for the weighing and quarantining of pigs and cattle)

In terms of external collaboration, enterprises feel a stronger need for equitable collaboration. Livestock enterprises in China are no strangers to large-scale import-export trade, and both large and medium-sized enterprises have become significant investors in the global livestock industry. However, a prevalent sentiment among Chinese firms is that the recent projects with foreign partners have not been truly collaborative. For instance, cooperation in the livestock sector has historically been confined to direct trade, such as the exchange of pork meat and products, breeding stock and genetic material. It is only in recent years that Dutch companies have initiated R&D partnerships with Chinese enterprises.[53] This transactional history informs current demands for more integrated relationships. As one regional manager at a leading pork breeding and feed company stated, "I feel European companies still operate with a 'trader' mentality. They primarily focus on the buying and selling process. I believe foreign enterprises need a longer-term investment mindset toward the Chinese market." He elaborated, "Our relationship cannot be limited to mere transactions; we must pursue long-term collaboration and profit-sharing mechanisms."

This mindset stems from China's achievements in agricultural industrialization and internationalization over the past decades, the experiences of unequal treatment accumulated by participants in global collaborations (whether in trade or technological innovation), and their evolving understanding of their roles in the new era of globalization. For both the large enterprises

[53] In 2021, Shanxi Changrong Agricultural Technology Co., Ltd. and Hypor (Henderix Genetics) established a smart breeding farm partnership in China. See: https://cj.sina.com.cn/articles/view/6652117697/18c7f42c1001010zzf In May 2025, Agrifirm Group partnered with Hebei Yufeng Jing'an Breeding Co., Ltd. to establish a breeding innovation centre. See: https://www.agrifirm.cn/list_4/99.html

and SMEs we've interviewed so far, they no longer see themselves as "followers", and do not wish to be viewed as such. They firmly position themselves as equal competitors and partners alongside their international counterparts in the global livestock market. They demand recognition.

Demand for localized knowledge platforms and delicate management

The most critical need identified by experts is for refined, locally grounded knowledge to guide decision-making. Some experts engaged in the livestock sector agree that their greatest operational challenge today stems not from geopolitical tensions or lacking ambition or capital, but from the lack of refined, locally grounded knowledge and management processes to help them identify their priorities and needs (Interview MK, entrepreneur and CY, researcher). "This leads us to overlook the bigger picture in decision-making, resulting in misguided management or blind investments." (Interview CY, researcher) The outbreaks of African Swine Fever (ASF) and Covid-19 prompted the government to implement a series of epidemic response plans and to stimulate research teams to address critical scientific and management issues in ASF prevention and control, while initiating new studies.

Livestock farming enterprises have a significant demand for comprehensive management approaches that enable more refined control over facilities, personnel, disease prevention and technological application. Devastated by losses in 2018 and 2019, China's livestock enterprises recognized the need to strengthen disease prevention and epidemic control, leading to the introduction of numerous management measures and reinforced isolation protocols for livestock. However, this has caused breeding enterprises to invest all their energy in prevention and control, incurring significant costs. For example, new lockdown policies on pig farms require workers entering pig farms to undergo a 15-day quarantine period both upon entry and exit. "It seems to me that the quarantine policies implemented later during the COVID-19 pandemic were essentially an enhanced version of the pig farm isolation protocols." (Interview JY) The enforcement of these upgraded epidemic prevention measures has made many workers reluctant to take jobs at pig farms. For a period, pig farms faced a surplus of pigs coupled with a shortage of personnel (Interview JY, CY).

The need is for a deep understanding of local socioeconomic contexts to ensure collaboration is adapted appropriately. Interviewee QZ (entrepreneur) shared that he observed distinct differences in priorities when communicating with his clients in western and eastern China, as well as in France and Japan: "Everyone's focus is clearly different. The business partners in

developed countries and regions prioritize socio-economic issues like animal welfare and reducing carbon emissions when discussing livestock development and reform. However, in China—especially western regions—the public is more concerned with how new technologies like AI+ applications might impact employment and how antibiotic overuse affects quality." Chinese interviewees also expect their collaborators from different regions, especially foreign collaborators, to gain a deeper understanding of the national conditions in various parts of China. Understanding the sophisticated and unique socioeconomic contexts of local communities, in QZ's mind, may boost the adaptation of technologies to social situations.

The demand for a deeper understanding of local knowledge creates an opportunity for specialized and focused information-sharing platforms and coordinators. Existing channels for establishing cooperative relationships typically include attending industry conferences and trade shows, mutual visits and inspections between companies, or introductions by peers. However, these gatherings are insufficient for a Chinese enterprise seeking to gain a comprehensive understanding of the Dutch market. As QZ stated: "For instance, I don't know the Netherlands particularly well. We need an information platform that facilitates mutual understanding. For example, if we want to understand Dutch companies and research institutions that work with our technology, how do we learn about them and establish connections? Social media is insufficient!"

5.3 Concluding section 5

This section has focused on the needs and opportunities in the Chinese horticulture and livestock farming sectors. For horticulture, China has built massive greenhouse capacity, but performance is often constrained by mismatches between advanced hardware and limited operational capability. Key issues include high heating/cooling loads across diverse climates, uneven digital decision-making despite growing sensor data, and shortages of skilled growers and operation/management teams, resulting in an underutilization of imported systems. The Sino-Dutch cooperation should shift from equipment sales to localized, integrated solutions: climate-adapted greenhouse design, robust feasibility studies, knowledge exchange, and long-term service models. Success depends on turning technology into profitable, scalable operations rather than short-term showcase projects. For the livestock sector, where demand for innovation remains strong but structural frictions persist, scale-up and biosecurity pressures have intensified. Market cycles and overcapacity push companies to prioritize efficiency and differentiation over pure volume.

A core bottleneck is institutional rather than technical: breeding and productivity breakthroughs require cross-organization data sharing, yet distrust and competition limit collaboration. Interviewees also emphasize “fairness” concerns as large players capture more policy and financing advantages, squeezing SMEs. Opportunities for Sino-Dutch collaboration include circular feed systems, improved disease management and operational processes, and platforms that enable targeted knowledge exchange and partnership matching.

China’s agricultural sectors are undergoing a critical transition, moving from a focus on scale and hardware to prioritizing profitability, sustainability, and sophisticated management. This shift is creating distinct needs and is opening doors for advanced international collaboration.

In sum, we identify the following concrete needs:

- From hardware to “software” and integration: Both sectors (horticulture and livestock) suffer from a gap between advanced imported technology and the local expertise needed to use it effectively. The need is no longer for standalone equipment, but for integrated solutions that combine technology with adapted design, training, and ongoing support.
- Localization and adaptation: A one-size-fits-all approach has failed. There is a critical need to tailor technologies and models to China’s diverse climates, markets, regional policies, and socio-economic conditions.
- Long-term partnership over transactional trade: Chinese enterprises are moving beyond their role as passive buyers. They seek equitable, collaborative partnerships for joint R&D, co-development, and knowledge exchange, rather than simple import transactions.
- Skilled human capital and management systems: A severe shortage of skilled professionals (growers, operators, managers) and refined management processes lead to the underutilization of technology and operational inefficiencies.
- Sustainable and profitable business models: The era of unprofitable “showcase” projects subsidized by real estate or short-term policies is ending. The focus is now on developing economically viable, long-term models that address energy costs, environmental impact, and market demand.

6. Conclusion and Recommendations

For the Chinese state, food security is key to regime legitimacy and national security. In recent years, the state's definition of food security has widened beyond staple grains toward a more comprehensive "Great Food View," reflecting dietary transformation, rising expectations for food safety, and a need to build resilience across a broader basket of products, including horticulture and livestock. This shift does not diminish the importance of cereals, but it implies a broader range of crops, as well as other approaches to assure access to food. Thus, the question is no longer only how to maximize domestic output of a few crops, but how to secure a stable, safe and diversified food supply under constraints of land scarcity, water stress, soil degradation, and climate volatility. As a result, recent policies comprise a combination of stockpiling and local accountability ("Rice Bag" and "Vegetable Basket"), farmland protection (including high-standard farmland and arable land red lines), ecological regulation, and technology improvement and innovation. Externally, food sovereignty coexists with "moderate imports", supply diversification, and a more assertive role in global agri-food regimes, enabling China to reduce dependency risks while retaining flexibility under trade and geopolitical tensions.

In its "China notice" (2019),[54] the Dutch government indicated that the Netherlands envisages a role for itself in making China's food system more sustainable and circular. This could be achieved by reducing food waste and making more efficient use of resources through innovation, for example. The government stresses the importance of achieving a more balanced and reciprocal (trade) relationship between both countries based on mutual interests (e.g. with regard to the UN SDGs). This approach is consistent with the 2024 communication regarding the "international orientation" of the Dutch Ministry of Agriculture, in which the Ministry expresses the ambition "to continue contributing, as a reliable partner, to the sustainable improvement of the productivity, resilience and robustness of the global food system for the production of healthy food, while also strengthening global biodiversity." While the Ministry recognizes that international cooperation and the export of knowledge and expertise offer opportunities for Dutch companies and knowledge institutions to contribute to these ambitions, it also acknowledges that "this could make the Netherlands vulnerable to states that attempt to acquire knowledge and technology by improper means."[55] Intellectual property rights (IPR) might be a more of a

[54] https://zoek.officielebekendmakingen.nl/blg-883780.pdf
[55] https://open.overheid.nl/documenten/c661d242-d92e-42cb-a179-44d82f13e24d/file

concern for Dutch actors exporting or transferring hardware and software (including seed), than for Chinese actors (according to our interviewees). Risks perceptions by Dutch actors were not examined for this study, and we recommend that future research performs a SWOT analysis focused on Dutch actors.

Our research focused on two key strategic sectors—horticulture and livestock—which feature large-scale characteristics, but where operational and institutional bottlenecks constrain performance. In horticulture, China's so-called protected agriculture (i.e., greenhouses) has expanded rapidly. However, many projects reveal a "hardware–software" mismatch: high-tech greenhouse equipment and tools are often underutilized due to a lack of skilled growers, and low operation and management capacity. Climate diversity across regions rules out a direct copy-paste of Dutch greenhouse models. The need for localized design, energy optimization, and management systems is high. Governance arrangements (e.g., EPCO and joint ventures with SOEs and local governments) further shape outcomes. Projects are embedded in specific political economies. In some localities land and development-right logics are prominent, while in others poverty alleviation plays a prominent role in agricultural development projects. In both situations, there are risks of policy dependency and "build-but-not-operate" outcomes. In the livestock sector, we described dynamics of market cycles and biosecurity, innovation and differentiation, taking place in and constrained by a context of limited trust, also affecting data-sharing among domestic actors. Companies increasingly recognize that future competitiveness depends on refined management, disease prevention, alternative feed solutions, and institutional coordination— so not only technology procurement.

Against this background, we conclude that Sino-Dutch cooperation remains promising but must evolve from transactional trade to capability-building partnerships aligned with China's policy and market realities. Dutch actors can add most value by offering integrated, localized solutions for greenhouse design and feasibility assessment, energy/resource use efficiency, knowledge exchange. Capability-building partnership ensures performance, not merely exporting equipment. In livestock, opportunities include circular feed systems, management expertise, and platforms enabling structured knowledge exchange.

However, for both sectors, three risks appear decisive: firstly, policy volatility and uneven local implementation; secondly, geopolitical rivalries with increasing concerns about intellectual property rights (IPR), data security and trust (pushing cooperation toward cautious buyer–seller relationships); and thirdly, weak long-term operational capacity. This specifically concerns

projects that primarily rely on subsidies. Sustainable partnerships require transparent regulations with support from various levels, i.e., micro to macro level authorities. In sum, in order to set up sustainable collaborative projects, IPR regimes will have to be addressed, and Dutch actors should concentrate on long-term operational support and partnership designs with a focus on both hardware and software.

We observed and articulated that self-reliance, or self-sufficiency does not equal an isolationist approach. Instead, the attempt to become more self-reliant (or, sovereign) requires partnerships. For China, it is a strategy to strengthen domestic resilience while remaining engaged globally. Thus, for the Netherlands and China, agri-food cooperation offers substantial opportunities, especially through localized innovation and capacity building, which will hopefully trigger environmentally sound and sustainable innovations.

Recommendations for the Dutch government

1. **Establish a strategic dialogue with China at the subnational level:** In recent years, the Dutch and Chinese Ministries (LVVN & MARA) have regularly held meetings to discuss relevant issues. However, a national framework alone is insufficient. To translate ambition into impact, subnational engagement must be elevated. China's provincial governments are not merely administrative extensions of the centre but are powerful economic actors with significant autonomy over agricultural policy, land use and investment.
2. Therefore, we emphasize the importance of and suggest strengthening collaboration with provincial governments in China. The Dutch government can actively foster long-term, "Province-to-Province" partnerships between leading Dutch agricultural regions (e.g., Greenports) and key Chinese provinces (e.g., Shandong, Yunnan). Here, the existing city or town twinning could also enhance relationships and trigger further enterprise engagement. These partnerships should be supported by a second key approach: the formation of Dutch SME consortia. By grouping innovative small and medium-sized enterprises in technology, logistics and finance, the Netherlands can offer integrated solutions that match the scale and complexity of projects in China. This consortium model is particularly vital because many innovative Dutch SMEs are limited in scale. A government-led consortium can help these companies pool resources and expertise to better tap into China's vast agri-food market.

3. **Launch a risk mitigation toolkit:** The Dutch government can initiate a public-private fund (via RVO, Invest-NL, etc.) to co-finance pilot projects that test business models in China (e.g., service-based greenhouse operations, circular feed systems) and to bundle this with a "China Agri-food Risk Toolkit" offering standardized contract modules for IPR, know-how, and data for long-term operational projects. De-risk the move from equipment sales to operational partnerships, which is key for long-term collaboration. Strategies to mitigate geopolitical risks (e.g., lobbying for stable trade rules) are different from those mitigating domestic political-economy risks (e.g., structuring JVs to align with local government KPIs), and an assessment of such strategies is beyond the scope of our research. Conflating specific risks with others can result in ineffective responses. Pilot projects supported by the risk-mitigation toolkit should demonstrate not only hardware but focus on demonstrating "soft" capabilities such as business models, operational capacity and training.
4. **Create a mechanism for long-term tracking:** The Netherlands should establish an official mechanism featuring an accessible database to track and monitor long-term collaborations. This addresses a critical weakness identified by Chinese participants in interviews: many projects stall after signing letters of intent due to personnel changes, official rotations, and/or communication breakdowns. A transparent tracking system would help maintain institutional memory and continuity, ensuring that promising partnerships have the support needed to move from initial agreement to tangible outcomes. Periodic assessments of these partnerships and consortia should be conducted to ensure they address the institutional complexity and necessary scale for successful collaboration.
5. **Develop a clear strategic position on sensitive sectors (such as pork breeding):** Formulate and communicate a clear, unified government stance on the pork sector (acknowledging trade tensions but emphasizing collaboration on genetics, animal health, and emission reduction).

Recommendations for Dutch companies

1. **Shift from supplier to systemic partner and "integrator":** Develop business models that offer integrated solutions: not just focuses on trading, but energy optimization and training services. Dutch companies can position themselves as a "system integrator" for agricultural collaboration, especially in Western China where holistic development is needed. At the same time, Dutch companies should signal a long-term commitment to the Chinese market through clear organizational and resource investments—for

example, by building local teams in China or establishing localized service capabilities—to reduce language and cultural barriers and improve the quality and efficiency of integrated solution delivery, training, and operational/after sale support.

2. **Implement "localization with protection" strategies:** Forge joint-venture R&D centres with clear, legally sound IPR frameworks (using the government's toolkit). When engaging in localization (e.g., JV R&D centres), insist on two-way talent and knowledge flow. Invite Chinese professionals to the Netherlands for training and involve them in global—not just China-specific—collaboration streams.
3. **Navigate the knowledge of local agri-governance:** Invest in understanding the local political economy of China. This report identifies several typical models of agricultural projects in China, including demonstrative projects fully led and financed by SOEs; SOE–private joint-venture EPCO-type projects aimed at scaling-up; and projects fully invested in and operated by private companies. Prior to engaging in cooperation or entering a project, Dutch companies should assess which model applies and, on that basis, assess the decision-making chain, funding sources, performance objectives, risk-sharing arrangements, and exit mechanisms. We also recommend building relationships with both private "champions" and local agricultural bureaus. We identified the latter as the critical entity. Prevent project failures (e.g., another Evergrande). Ensure the alignment of incentives and long-term viability of projects.
4. **Broaden partners' scope:** Place greater emphasis on the role of Small and Medium-sized Enterprises (SMEs) in Sino-Dutch agricultural collaboration. SMEs are often the engines of innovation and can form a more diverse network of partnerships, moving beyond the limitations of large, symbolic pilot projects.
5. **Standard-setting as strategy**: A key pillar of this enhanced subnational strategy should be to actively facilitate joint participation in China's standardization agenda. As Chinese provinces compete to become hubs for next-generation industries, they are also laboratories for new technical standards. Dutch companies should be encouraged and supported to partner with Chinese companies within these provinces to co-develop agri-industry standards. This proactive, ground-level collaboration on standards will not only reduce technical barriers to trade but also build mutual trust and shared intellectual ownership.

It is important to emphasize that these recommendations are intended as an analytical framework for reference, rather than a "standard answer" applicable to every stakeholder. Given differences across government agencies and companies in mandates, resources, risk appetite and decision-making processes, stakeholders should tailor, prioritize and adapt these recommendations to their own circumstances when applying them in practice. In cross-border cooperation in particular, organizational culture, strategic orientation and the working styles of teams and individuals can significantly shape how risks and returns are assessed and which courses of action are taken. We therefore encourage Dutch companies and government to use the above recommendations with careful judgement, adapting them to their own objectives and constraints.

Appendix

Method

Between June and November 2025, we conducted semi-structured interviews with stakeholders active in agricultural cooperation projects between China and Netherlands. Interviewees were drawn from companies and non-enterprises (associations, cooperatives, research institutions) across several eastern and western provinces. Interviews were conducted either in person or online and each interview lasted 60-120 minutes.

One of the authors, Min Xinyuan, interviews cultivation expert in a commercial greenhouse in Yunnan. Photograph by Tian Qian.

Private-owned commercial tomato and rose greenhouse in Shandong Province. 26 ha greenhouse was built jointly by a Chinese greenhouse supplier and a Dutch greenhouse supplier.

(Photograph by Tian Qian)

Private-owned commercial tomato greenhouse in Yunan province. Both mid-tech greenhouse (left) and high-tech greenhouse (right) are profitably growing the same variety.

(Photograph by Tian Qian)

Solar greenhouses (mid-tech greenhouse) in Hebei province (a, b) and Shandong province (c, d). With knowledge support from the Netherlands, Chinese growers are shifting from soil cultivation (a, c) to soil-less/substrate cultivation (b, d) for both cucumber (a, b) and sweet pepper (c, d).

(Photograph by Tian Qian)

In addition to participating in international projects with Dutch or other European partners, most agricultural enterprises are trans-regional. Interviewees worked in enterprises engaged in agriculture at multiple scales and localities: they not only operate within their registered provinces but also conduct business across regions and nationwide. Many agricultural enterprises based in the eastern region serve as investors or operators in cooperative projects in the western region.

The following information has been pseudonymized to protect the interviewee's identity and privacy. When readers encounter quotes from interviews in the main text, they can use the list of pseudonyms to gain a general understanding of the interviewees. In total, 37 stakeholders were interviewed. Among them, 19 participants completed a follow-up questionnaire on entity importance (Table A2), and 14 respondents provided valid responses to the risk assessment items.

Table A1. General profile of interviewees

Name	Sector	Place/region	Profession	Type of organization

QT	Horticulture	Shanghai-Zhejiang	Researcher/entrepreneur of horticulture AI startup	NL AI startup for horticulture
YG	Horticulture	Beijing	Greenhouse builder	CN state-owned enterprise
MW	Horticulture	Netherlands-Gansu-Hebei-Shandong-Qinghai	Cultivation specialist	NL private company
XJ	Horticulture		Regional sales manager for a Dutch greenhouse tech-supplier	NL greenhouse company
JW 2	Horticulture	Beijing	Researcher for horticulture design	CN research institute
KL	Horticulture	Jiangsu	Research manager of greenhouse company	CN private company
TT	Horticulture	Hebei	Specialist in facility agriculture planning and greenhouse design	NL private company
KY	Horticulture	Yunnan	Cultivation specialist	CN private company
YZ	Horticulture		Owner of greenhouse company	CN private company
ZX+PS	Horticulture	Shanghai-Jilin-Beijing-Tianjin-Jiangsu	Expert on greenhouse design and spatial planning	NL private company
YJ 1	Horticulture	Beijing	Specialist in agricultural big data mining and intelligent modelling research	NL research institute
JW 1	Horticulture	Beijing	Consultant for the controlled environment agriculture sector	CN research institute
DXM	Horticulture	Beijing-Xinjiang-Inner Mongolia	Policy maker_Facility Planning and Design Institute (Ministry of Agriculture and Rural Affairs)	CN government
ZC	Horticulture	Yunnan	Owner, grower of a blueberry company	CN private company
ZS	Horticulture		Grower-Greenhouse	CN private company
YZ	Horticulture	Beijing	Former manager of a state-owned greenhouse construction company, current	CN private company

			owner of a private greenhouse construction company	
SZ	Horticulture	Shandong	Manager of 26 ha greenhouse base	CN private company
JX	Horticulture	Beijing/Shanghai	Sales manager of Dutch greenhouse gutter system company in China	NL company
HL	Horticulture+Livestock	Jiangsu	Deputy of NGO	NL NGO
MH	Horticulture+Livestock	Guizhou-Yunnan	Rural policy expert	CN research institute
WX	Horticulture+Livestock	Beijing-Xinjiang-Yunnan-Inner Mongolia	Researcher for agri-policy and research_ Director of research institute for agri-policy and research	CN research institute
ZX	Horticulture+Livestock	Beijing	Researcher/consultant for livestock and horticulture_scientific cooperation between CN and NL	NL research institute
BX	Horticulture+Livestock+Poultry	Beijing-Sichuan-Yunnan-Shanxi	Researcher of seed breeding, feed production and animal husbandry	CN private company
YJ	Livestock	Beijing-Gansu-Shanxi	Researcher/consultant for livestock science + manager of scientific cooperation between CN and NL	NL research institute
ZQ	Livestock	Beijing-Shanxi-Jilin-Heilongjiang	Co-founder/vice chairman of livestock tech-company for animal facial recognition	CN private company
HC	Livestock/Poultry	Guizhou	Specialist/sales manager of agri-insurance	CN state-owned insurance company
MK	Livestock	Netherlands	Sales manager	NL company
RH	Livestock	Beijing-Netherlands-Jiangsu	Sales manager	NL company
WJ	Livestock	Guizhou	Owner/specialist of pig cultivation company	CN private company
GL	Livestock	Guizhou	Director of cooperatives for pig farming	CN cooperatives/NGO
RH	Livestock	Beijing Hebei	Economist specializing in pig industry and agricultural policy	NL research institute

ZY	Livestock	Zhejiang-Henan	Economist specializing in pig insurance and agricultural policy	CN research institute
JW 3	Livestock	Beijing	Researcher of milk cows + Specialist of scientific collaboration on milk cows	CN research institute
CH+CY	Livestock/Poultry	Jiangxi-Yunnan-Guizhou-Guangxi-Sichuan	Regional manager for large-scale pig farming and feed enterprises	CN private mega company

Features of the questionnaires:

A structured questionnaire was conducted to rank the perceived importance of key business stakeholders and potential challenges identified by interviewees across various institutions and collaborative frameworks. Nineteen participants were asked to rate the significance of each entity on a 10-point Likert scale (1 = not important at all; 10 = extremely important).

Which departments/institutions play a key role in China-Netherlands agricultural cooperation? You may also clarify what the roles of these institutions are below.

- Please rank the following institutions by importance in China-Netherlands (or other countries that you have collaborated) cooperation (on a scale of 1 to 10, where higher scores indicate greater importance).
- (Central) Ministry of Agriculture and Rural Affairs: __; Ministry of Commerce: __; Ministry of Science and Technology: __.
- (Local) Bureau of Agriculture and Rural Affairs: __; Bureau of Commerce: __; Bureau of Science and Technology Innovation: __.
- (Enterprises) Private enterprises: __; Central state-owned enterprises: __; Local state-owned enterprises: __.
- (Research Institutions) Ministry-affiliated universities (and their think tanks): __; Provincial universities (and their think tanks): __
- (Other Social Organizations) (Agricultural) industrial associations: __; Cooperatives: __; Agricultural extension stations

The results identify the Ministry of Agriculture and Rural Affairs (8.1/10) and Private Enterprises (7.6/10) as the primary drivers of China-Netherlands agricultural cooperation. These findings suggest a hybrid cooperation model: one that is commercially driven by the private sector yet remains heavily reliant on specialized central government regulation. Consequently, future

initiatives should prioritize strategic engagement with these three core pillars: the Ministry of Agriculture, Local Agricultural Bureaus, and private sector leaders.

Table A2. Average importance scores of institutional actors (trimmed mean, excluding minimum and maximum values)

Institution Category	Entity	Average Score (1-10)
Top Tier (>6.8)	Ministry of Agriculture (Central)	8.1
	Private Enterprises	
	Bureau of Agriculture (Local)	
Mid-Tier (5.0 - 6.8)	Ministry-affiliated Universities	6.6
	Local SOEs	6.1
	Central SOEs	5.9
	Ministry of Science & Technology (Central)	5.5
	Industrial Associations	5.5
Lower Tier (≤5.0)	Provincial Universities	5.0
	Bureau of Science & Tech (Local)	5.0
	Agricultural Extension Stations	4.9
	Ministry of Commerce (Central)	4.6
	Bureau of Commerce (Local)	4.4

Analysis of Questionnaire 1: Stakeholder Importance

Key finding: A hybrid "state-guided, market-executed" model

The results indicate a hierarchy of influence, pointing to a cooperative model that is neither purely top-down nor purely bottom-up.

Ministry of Agriculture and Rural Affairs (MARA) (8.1): The unequivocal top scorer. This underscores that policy direction, regulatory approval, and national subsidy frameworks are the ultimate gatekeepers and enablers. No major initiative can succeed without alignment with MARA's priorities (e.g., the "Great Food View," self-sufficiency, sustainability).

Private enterprises (7.6): The primary engine of execution and commercial innovation. This high score confirms the shift identified in the interviews: The "primary engine." And the dynamic private SMEs and companies are now the key partners for implementing and scaling technology, moving beyond the old model of large, state-backed showcase projects.

Local agricultural bureaus (6.8): The critical bridge. They interpret central policy, manage land use, and facilitate on-the-ground operations. Their buy-in is essential for practical implementation.

The supporting cast (Mid-Tier, 5.0-6.8): This tier includes the knowledge and implementation arms: universities (especially ministry-affiliated ones) for R&D, and state-owned enterprises (SOEs) as stable, policy-aligned partners for large-scale projects. The Ministry of Science and Technology and industrial associations play roles in funding and setting industry standards but are perceived as less directly influential than MARA.

The peripheral players (Lower Tier, ≤5.0): Strikingly low scores for Commerce ministries (central and local) and Cooperatives signal a crucial insight: This cooperation is not viewed primarily as a "trade" issue. It's about technology transfer, co-innovation, and domestic production enhancement. The low score for cooperatives suggests they are not yet seen as primary conduits for high-tech adoption.

Strategic implication: Effective engagement requires a two-pronged strategy: 1) Securing high-level policy alignment with MARA, and 2) building deep, operational partnerships with leading private enterprises and local agricultural bureaus. The significantly lower score for the Ministry of Science & Technology (MST) (5.5) is crucial. It indicates that within this sector, the sector-specific industrial policy (MARA) dominates over general innovation policy (MST). The central government's power is specialized and fragmented, not monolithic.

Analysis of Questionnaire 2: Perceived Critical Risks

Key finding: "Hard" institutional barriers trump market risks.

Based on pilot interviews, a list of major policy- and implementation-related risks were constructed. Participants indicated whether each item constituted a "critical risk" in their project implementation process. Fourteen respondents completed this section with valid responses. Policy volatility, difficulties in technology localization, inadequate intellectual property protection, and data sharing and security were each identified as critical risks by 11 out of 14 active respondents. Ten respondents identified talent/communication barriers as risks to move beyond hardware-centric "demonstration projects" into sustainable, long-term business models. Seven out of 14 noted that institutional differences and administrative barriers can lead to project interruptions. The risks identified are systemic and relational, highlighting the friction points in translating foreign technology into localized, sustainable success.

The Quadruple Risk (Cited by 11/14):

Policy volatility: The ever-present risk of shifting priorities, subsidy changes, or new regulations disrupting business models.

Difficulties in technology localization: Dutch tech cannot be merely copied but must be adapted to Chinese institutional contexts, costs, and user skill levels.

Inadequate IPR protection: A major deterrent to deep knowledge sharing and co-innovation. Fear of imitation stifles the very collaboration needed for localization.

Data sharing and security: A complex barrier touching on competitive advantage, privacy laws, and national security sensitivities. It blocks the data-driven collaboration essential for advances in breeding and precision agriculture.

The critical human factor (Cited by 10/14):

Talent/communication barriers: This is the operational face of the "skills gap". It's not just a lack of trained growers, but also difficulties in management, training, and translating technical

knowledge into daily practice. This is the key reason projects remain “hardware-centric demos” rather than profitable operations.

The structural friction (Cited by 7/14):

Institutional differences and administrative barriers: Refers to mismatches in decision-making speed, bureaucratic processes, and organizational cultures between Chinese and Dutch entities. This can cause delays, frustration, and project stalls.

Strategic implication: Mitigating these risks requires moving beyond a standard business plan.

Future success depends on:

Building regulatory resilience: Constant policy monitoring and flexible project design.

Investing in Co-development: Joint ventures for localization to address both IP and adaptation challenges.

Prioritizing people and project-processes: Major investment in long-term training, cultural-institutional mediation, and management system integration.

Structuring clear data and IPR frameworks: Transparent contracts and joint agreements on data use and ownership.

- In your past involvement with international (i.e., China-Netherlands, China-UK, China-US, etc.) agricultural cooperation, have you encountered (or heard of) the following risks? Please elaborate on the risks you encountered. (Multiple selections allowed)
- Institutional differences and administrative barriers (e.g., complex approval processes, differing regulatory mechanisms)
- Difficulties in technology localization (e.g., incompatibility with local conditions, mismatch between technology and local operational models, lack of local service and technical teams)
- Inadequate intellectual property protection or ambiguous contract terms, concerns about technology or knowledge leakage undermining cooperation trust
- Talent/communication barriers (language, cultural differences, cross-border team collaboration difficulties)
- Data sharing and security (reluctance to share production or environmental data, concerns about data leaks)
- Policy volatility (subsidy policies, import restrictions, localization rate targets, etc.)
- Other (please specify) ___

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