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When Food Meets BRI: China's Emerging Food Silk Road

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Abstract One of the crucial but overlooked aspects of China's Belt and Road Initiative (BRI) is the food and agricultural cooperation. In this paper, we argue that under BRI, China is building a 'Food Silk Road' with which the country attempts to reconstruct global food supply chains through overseas agricultural investment, agricultural technology transfer, massive investment in infrastructure, and accelerated policy coordination. We also discuss the driving factors behind the emerging Food Silk Road, related challenges, and potential implications of China's quest for food security for global food governance.

Keywords

Belt and Road Initiative, food security, global food governance, international agricultural cooperation, China, BRI countries

1. Introduction

The Belt and Road Initiative (BRI) comprises the Silk Road Economic Belt and the 21st century Maritime Silk Road. It now underpins China's global engagement and, to a large extent, its domestic economic development. Since its official introduction in September 2013, the BRI has attracted much scholarly attention around the world (He, 2019). The BRI, though often considered as one of the most ambitious infrastructure projects ever conceived, covers a vast number of industries and sectors. According to Vision and Actions on BRI issued by the Chinese government in 2015, the BRI includes five areas of connectivity: policy, infrastructure and facilities, trade, currency, and populations' engagement (people-to-people bonds) (National Development and Reform Commission, 2015). Over the years, news articles, ThinkTank reports and academic papers on the BRI have focused on topics such as infrastructure development (e.g., ports, road, railways, airports, telecommunications, and oil and gas pipelines), industrial and sub-regional economic collaboration as well as financial cooperation (F. Zhang et al. 2017; Lee et al. 2018; Saud et al. 2019; Tang et al. 2019; Cheng 2020; Wang et al. 2020). Surprisingly, with very few exceptions (e.g., Sternberg et al., 2020; Yao et al., 2020), agricultural sector and food security, which are of paramount policy importance to the Chinese government, are rarely discussed in the English literature. This is in stark contrast to the extensive research on oil and gas sector and energy security (see, for example, Mustafić, 2016; Herberg, 2017; Duan et al., 2018; L. Han et al., 2018; Sarker et al., 2018). With our analyses, we aim to fill this gap.

Over the past few years, ample evidence suggests that agricultural and food security cooperation has become a pillar of the BRI. After the initiative was introduced in September 2013, the BRI countries have been prioritized in China's global agricultural engagements becoming central to China's international engagement. This has been evidenced in the country's Number One

Documents and other official statements (e.g., Ministry of Agriculture, National Development and Reform Commission, Ministry of Commerce and Ministry of Foreign Affairs, 2017).

Under BRI, China has signed over 100 agricultural cooperation agreements with BRI countries. One could argue that the BRI is not the first or the only cooperative platform China has developed. Others include accession to WTO and the creation of the Shanghai Co-operation Organisation, both in 2001, and the establishment of high-level regional cooperation forums such as the Forum on China-Africa Cooperation in 2000, the China-Portuguese-Speaking Countries Economic and Trade Co-operation Forum in 2003, the China-Arab Co-operation Forum in 2004, the China-Caribbean Economic and Trade Co-operation Forum in 2005, and the China-Pacific Island Countries Economic Development and Cooperation Forum in 2006 (OECD, 2021). Additionally, the country has signed Free Trade Agreements (FTAs) with countries such as Pakistan, Chile, New Zealand, Singapore, Peru, Costa Rica, Iceland, Switzerland, South Korea, Australia, and ASEAN countries (China.org.cn., no date). However, the BRI and the other initiatives are not mutually exclusive. As far as food security and agricultural cooperation is concerned, China considers all cooperation platforms and FTAs as important channels to promote agricultural and food security cooperation (EU-China 2020 Strategic Agenda for Cooperation, 2020'; EU-China Cooperation Plan in Agriculture and Rural Development, n.d.).

With the ongoing trade war with the United States, which has been China's largest food supplier for years, there have been growing concerns on the impacts this may have on China's food security. High-level Chinese officials have repeatedly stressed the importance of overseas agricultural investment and agricultural imports diversification, with the BRI countries as a priority (Xie, 2018;

Xinhuanet, 2020a), and with the Chinese agribusinesses being encouraged to invest in, and buy more from BRI countries (Xie 2018). The same message was emphasized in a high-level forum in September 2020 by the head of the Chinese National Food and Strategic Reserves Administration (Xinhuanet, 2020b).

In this paper, we discuss the driving factors behind China's emerging Food Silk Road and the possible implications of China's quest for food security under the BRI as well as the impacts on the global food supply chains. Based on in-depth analyses of official documents, news reports and academic articles, we argue that a Food Silk Road is emerging under the BRI. The Food Silk Road can be considered China's attempt, under the BRI, to reconstruct global food supply chains through overseas agricultural investment, agricultural technology transfer, massive investment in infrastructure, and accelerated policy coordination. We discuss that there are two main driving factors behind the Food Silk Road. First, a paradigm shift in China's food security strategy that underscores the importance of international agricultural cooperation under the BRI. Second, agricultural and food security cooperation that has turned out to be an effective solution to problems faced by BRI countries. The paper also sheds light on the major implications of these trends for global food governance as China's Food Silk Road is poised to change how and where agricultural and food products circulate across the world. In our analysis, we focus mainly on China's needs and trade of staples, primarily wheat and rice, although we also consider non-staples such as meat, edible oil and soybean. The reason is because in the Chinese context, food security is mostly discussed in reference to supply of staples, though, increasingly, more attention is being given to non-staples.

The rest of the paper is organized as follow. Section two provides a brief review of the evolution of China's food security strategy. Following that, section three explains the driving factors behind China's emerging Food Silk Road, and section four discusses the potential of the Food Silk Road to address some of the problems faced by BRI countries. In section five, opportunities and risk of the China's emerging Food Silk Road for BRI countries are discussed, and in section six, we analyse the implications of the Food Silk Road on global food systems. Conclusions are presented in section seven.

2. China's food security strategy

Food security is a universal concept that has four main pillars: food availability, physical accessibility, economic accessibility and food utilization. Every element of the food supply chain contributes to food security, where food must be sourced (from either trade or local production), processed, and distributed to the end consumer. Food availability refers to a sufficient food supply, typically on the national level. It is assessed in terms of domestic production, stock levels and international trade. Physical accessibility refers to the quantity of food within the physical reach of households, as supported by secure and stable supply chains and distribution networks. Economic accessibility refers to the ability to purchase the food one needs and is assessed in terms of household wealth, market prices and social and community support. The physical and economic accessibility of food for vulnerable households is normally safeguarded with additional support from the governments and non-profit organizations. Finally, food utilization refers to the capacity to consume a sufficient quantity and quality of food to meet individual dietary requirements. This includes food safety and nutrition.

China, however, owing to its painful history of periodic famine and its distrust of the international markets during the Cold War, had followed a food security strategy of working towards self-sufficiency in grain. The terminology difference between the term “food security” in Chinese and in English clearly shows the critical importance of grain to China’s food security. The English term “food security” (which should be correctly translated as 食物安全 *shiwu anquan* in Chinese) has been rarely used by the Chinese officials and scholars. In contrast, issues normally related to “food security” are called “grain security” (粮食安全 *liangshi anquan*) in Chinese (Christiansen 2009). Therefore, it comes as no surprise that, for decades, China had considered food self-sufficiency the bottom line of its food security, and food self-sufficiency was primarily a function of the production of grains, which include cereals (rice, wheat, and corn), coarse grains, beans (such as soybean), and potato tubers (Zhong and Zhu 2017). For instance, according to its first-ever food security white paper, “The Grain Issue in China”, published in 1996 as a response to international concerns towards China’s ability to feed itself after Lester Brown’s famous article and subsequent book, *Who Will Feed China?*, the Chinese government outlined the country’s food security strategy and set official targets of 95% self-sufficiency for grains and 100% for cereals (State Council Information Office of China, 1996).

With self-sufficiency as the overriding goal of the country’s food security strategy, China devoted enormous political and fiscal efforts to grain production, with some success. As Table 1 shows, between 2003 and 2013, domestic grain production increased by nearly 50%, from 430 million tonnes to 630 million tonnes. Yet grain self-sufficiency still fell below the 95% target.

<Insert Table 1 Here>

With rising demand, particularly for feed grains, the country has had to rely increasingly more on the international markets for grain supplies. So much, that in 2011, China became the largest agricultural and food importer. In 2017, China's grain imports reached 130 million tonnes, equivalent to 20% of the country's total grain production, reducing slightly afterwards due to the impacts of the US-China trade war. Considering the fact that most of China's grain imports are soybeans, which is very land intensive, if in 2019 China was to produce all the grains on its own, it would need additional 60 million hectares of sown area, accounting for about 35% of the country's total sown area. In other words, China's implicit grain self-sufficiency rate in 2019 was only 70% (Wu and Mi, 2020). Meanwhile, the overemphasis on grain production resulted in a serious structural imbalance in the country's food supply, including grain supply. China has had persistent surplus of low-quality grains but has not been able to meet the growing demand for high-value foods, including high-quality rice and wheat. Thus, it has been increasingly clear to the Chinese leaders that the self-sufficiency policy could not be sustained. In December 2013, China took a major step to reform its food security strategy. A new food security strategy based on 'domestic supply with moderate imports' was introduced (Wu and Zhang, 2017).

In October 2019, six years later, against the background of an epic US-China trade war, high inflation, and growing domestic concerns over food supplies, the government issued its second food security white paper, "Food Security in China". This new white paper reaffirms that food security is based on domestic production, moderate imports, and technological development. It equally states that the country will expand international cooperation in food and agriculture and

will actively participate in global food security governance (State Council Information Office of China, 2019). This reform is of enormous importance for the following reasons.

Importance of staples and non-staples. While grains, particularly staples, are still the focus of China's new food security strategy, Chinese leaders have also begun to stress the importance of non-staples, particularly meat and edible oil, in safeguarding the country's food security. This shift is primarily due to changing food preferences of Chinese consumers. China's per capita grain consumption has been declining steadily since it peaked in 1986, whereas per capita consumption of the major non-grain food products such as meat, fishery products, milk, and eggs have increased enormously. Against this backdrop, safeguarding domestic and international supply of non-staples have become increasingly important to China's food security. In February 2020, president Xi Jinping called for "stabilizing agriculture and guaranteeing the security of grain and key non-staple food" (Du, 2020). This is clearly reflected in the notable change in the terminology used in official documents. The English version of the 1996 Food Security White Paper is entitled "Grain Issues on China". In the 2019 Food Security White Paper, though the Chinese version still uses "grain security" (*liangshi anquan*), in the English version, the title is "Food Security in China". Over the past few years, rising trade tensions between China and the United States have affected the bilateral soybean trade. Within a framework of food security, China has sought replacements for soybean meal and other products produced from soybean. During the 2018-2019 period, as China's soybean imports declined, imports of alternative products increased. As Table 2 shows, China's imports of meat, fish products, and edible oils have grown between 2017 and 2019, representing new risks to China's food security. In addition to official imports, large quantities of pork, beef, seafood, and other non-staples food products are being smuggled in to China. For instance, according to *Outlook*

Weekly (2020), a ThinkTank associated with the *Xinhuanet*, over 2 million tonnes of meat are smuggled into China annually (Outlook Weekly, 2020).

<Insert Table 2 Here>

Policy focus to preserv overall grain-producing capacity. Even though the idea of self-sufficiency is still stressed, China has shifted its policy focus from increasing annual domestic grain production to preserving overall grain-producing capacity. As stated by Han Changfu, Minister of Agriculture and Rural Affairs of China in 2015, the country is shifting from a focus on grain production to increasing grain production capacity (State Council, P.R. China, 2015). In terms of mandatory targets of China’s food security, the 1996 White Paper specified the 95% grain self-sufficiency rate and 100% cereal self-sufficiency rate, whereas the 2019 White Paper states that China will “maintain a comprehensive grain production capacity of above 600 million tonnes” (The State Council Information Office of the People’s Republic of China, 2019, page 21). In addition, Xi Jinping has clearly stated that “ensuring food security is always a top issue that concerns national development and people’s wellbeing, and it is imperative to take production capacity building as a fundamental task” (Xinhuanet 2020).

Moderate imports as a policy option. Food imports and international cooperation have been integral elements for China to safeguard food supply and food security. In the new food security strategy, it is the first time that ‘moderate imports’ as a policy option is explicitly accepted (H. Zhang and Cheng, 2016). In the past, while international imports were considered necessary to

supplement domestic production, such imports were limited to ensuring regular supply in times of irregular domestic production, balancing regional production as well as making up for supply shortages. However, this new food security strategy calls for a global agricultural policy that actively utilizes international food markets and agricultural resources in order to effectively coordinate and supplement domestic grain supply. Numerous academic papers and reports criticize China for outsourcing its domestic food shortages overseas through a mercantilist approach (Brown 2009; Belesky and Lawrence 2019; Holslag 2006). However, China's global agricultural policy is much more comprehensive and multifaceted than that. This is exemplified with China's global agricultural policy that considers broader objectives such as advanced technologies, management know-how, and investment to facilitate the modernization of domestic agricultural and food sectors; expanding China's agricultural exports; supplementing domestic food production and gaining control over its overseas food supply chain; expanding global food production; and contributing to a stable and favorable global food system (Zhang, 2019).

3. China's global quest for food and the BRI

The agricultural going out strategy (which is primarily about encouraging Chinese agribusinesses to invest abroad) was formally established in the "Number One Central Document" of 2007, amid the Global Food Crisis 2007/2008 (Ministry of Agriculture and Rural Affairs of China, 2012). With this major shift in food security strategy, China stepped up efforts to expand its agricultural presence overseas (Erokhin, 2020). Under BRI, China's global agricultural engagement has become much more coordinated, with enormous support at the highest political level, including from the policy and financial viewpoints. For instance, in 2014, soon after BRI was introduced, China established the Inter-Ministerial Joint Conference on Agricultural Cooperation with Foreign

Countries, which comprised 21 central ministries and departments, such as the National Development and Reform Commission, the Ministry of Commerce, the Ministry of Foreign Affairs, and the Ministry of Finance. It aimed to promote high-level decision-making, comprehensive policies, and support services for agriculture outreach. Furthermore, under BRI, in addition to creating new platforms to push forward agricultural and food security cooperation, China aims to fully utilize and consolidate existing cooperative platforms. For instance, according to the 2017 “Vision and Action on Jointly Promoting Agricultural Cooperation on the Belt and Road”, China aims to utilize the South-South Cooperation Assistance Fund to carry out South-South cooperation in agriculture, strengthen the role of multilateral cooperation mechanisms, deepen exchanges and cooperation with international institutions, make full use of existing multilateral mechanisms related to agriculture such as G20, Shanghai Cooperation Organization, Asian Cooperation Dialogue, and further promote exchange and cooperation with the WTO, the Food and Agriculture Organization of the United Nations, and other institutions.

As BRI has become central to China's international engagement and a core priority of Xi Jinping, there have been major changes in the objectives, approaches, geographical focus, and institutional arrangements of China's global agricultural engagements. In particular, BRI countries have clearly been prioritized in China's global agricultural policy since the BRI was introduced in September 2013 (See Table 3). For instance, the 2017 No. 1 Document clearly states that China will support transnational agricultural operations, the establishment of agricultural production bases, and processing, warehousing and logistics facilities abroad, as well as cultivate global agribusinesses with the Belt and Road countries and regions as the priority (State Council Information Office of

China, 2019). Equally, the 2019 Food Security White Paper calls for enhancing grain trade cooperation with the BRI countries.

<Insert Table 3 Here>

Several reasons why BRI countries have become central to China's new food security strategy are discussed below.

BRI countries as producers and exporters of rice, wheat and corn. First, as shown in Figure 1, even though the 65 BRI countries¹ only contribute about one-third of China's overall food imports, they export rice, wheat and corn to China, which are of strategic importance to the country's food security.

<Insert Figure 1 Here>

BRI countries produce nearly 40% of global cereals and oil crops. While the situation varies from country to country, many of the BRI countries are rich in arable land resources and also have enormous potential in terms of further expanding their agricultural exports and production (See Table 4). According to Ye (2017), 14 BRI countries have more than 0.1 hectares of arable land per capita, including some major rice, wheat and corn producers (Kazakhstan with 1.73 hectares, Russia with 0.85 hectares, Ukraine with 0.72 hectares, and even Thailand with 0.25 hectares) but

¹ It is important to note that even though to date China has signed BRI cooperation agreement with 138 countries, according to Chinese official documents and scholars, there are officially 65 BRI countries including the Southeast Asian countries and the members of Commonwealth of Independent States (CIS).

with low yields. This means that with improvements in agricultural technology, agricultural machinery, and infrastructure, grain outputs can be easily improved.

<Insert Table 4 Here>

Regarding rice, ensuring its supply has always been the highest policy priority for the country. Chinese president Xi Jinping uses “rice bowl” as a catchphrase to illustrate just how important rice is for the country’s food security. After decades of being self-sufficient in rice production and a major rice exporter, in late 2013 China overtook Nigeria as the leading rice importer (Zhang, 2018), and it has continued to be one of the largest rice importers in the world. In 2017, China’s rice import reached over 4 million tonnes, highest ever. China’s official rice imports over the past three years have dropped and are forecasted to remain around 2.2 million tonnes in 2020/2021, according to USDA data (See Table 5). However, it should be noted that in addition to formal rice imports, for years, very large amounts of rice have been smuggled into China. For instance, between 2014 and 2017, it was reported that around 3 million tonnes of rice per year were smuggled into China via the land borders from Vietnam and Myanmar (Zhang, 2018). According to Chen Xiwen, who was a senior Chinese official on Agricultural and Rural Affairs, it is likely that more rice is being smuggled into China than the volume received through legal imports. According to a report by USDA (2019b), “China’s overall informal border trade includes as much as 10 MMT of paddy rice, divided among Myanmar, Vietnam, and Thailand. China’s border trade is not consistently referenced in official trade statistics”. In other words, when both the formal and informal rice imports are considered, China is most likely still the largest rice importer in the world. Moreover, China’s rice supply faces serious structural imbalances despite achieving

consecutive bumper harvests: oversupply of Japonica rice but shortages of Indica rice, particularly of high quality. As such, Indica rice from Southeast Asia and South Asia becomes critical to address this widening structural imbalance in China's rice supply.

<Insert Table 5 Here>

China's serious soil erosion and pollution due to intensive farming, overuse of fertilizers and pesticides as well as industrial pollution will also impact rice availability (Guo, 2016). According to a 2011 report, 10 percent of the country's annual rice production is subject to heavy metal pollution and thus unsafe for human consumption (Jiang, et al., 2011). In 2013, "Cadmium rice" became a well-known term in China when the Guangdong government reported that 44 percent of rice samples had excessive levels of cadmium (Tatlow, 2014). To address these concerns, in October 2017, at the 19th Party Congress, Xi Jinping announced, "we will strengthen the control of soil pollution and the restoration of polluted soil, intensify the prevention and control of agricultural pollution from non-point sources, and take measures to improve rural living environments." (Xi, 2017). As China implements rice field restoration programmes and withdraws large areas of land from rice production, domestic rice production might fall in the future. This means that more rice will have to be imported.

To meet its rising demand for rice, China will likely look to Southeast and South Asian countries along the Maritime Silk Road. In particular, it has been suggested by officials and scholars that China's global agricultural policy needs to focus on developing rice potentials in Southeast Asia so that the region could become China's important "offshore rice granary" (J. Han, 2014; Ministry of Agriculture Agricultural Trade Promotion Center, 2016). A main problem with the global rice

trade is that rice is mostly consumed in the same country where it is produced, making rice trade small, both in absolute terms and as a proportion of global production. The current international rice trade volume is about 46 million tonnes per year, or less than 10 percent of total global rice output and about one-third of China's annual rice consumption. To make the matter worse, global rice exports are dominated by a few exporters in Southeast Asia and South Asia. Therefore, China's interest to increase the regional rice production under BRI through direct investment, technological transfer, and infrastructure developments. Similarly, safeguarding wheat and corn supply is of critical importance to China's food security. The importance of wheat is often overlooked, though it is China's second staple. At the national level, rice is the most used staple, but for Chinese consumers in the north, wheat is the most important crop. China is the largest wheat-producing country, but with rising incomes and shifting consumer food preferences, the country is facing a shortage of high-protein wheat. Estimates are that China's supply-demand gap for high-protein wheat is 3.5 to 4 million tonnes per year, and growing (Li, 2017). Therefore, as wheat imports rise, ensuring a stable supply of wheat without disrupting the global and domestic wheat markets has become one of the essential objectives for China's Food Silk Road. The Commonwealth of Independent States (CIS) countries are key players in the global wheat market and have a very large potential to contribute to higher global wheat production in the future. For instance, although Eurasia has the world's largest area of wheat cultivation, the yields in this region are meagre compared to India and China, not to mention the developed countries (Gomez y Paloma et al., 2016). A study also suggests that more than 50 million hectares of farmland has been abandoned in the CIS member states (Swinnen et al., 2017). With financial investment, adoption of new technologies, and proper farm management, this land could potentially be restored for wheat production.

Compared to wheat and rice, domestic corn shortage appears to be an even bigger concern to Chinese policymakers at least in the near future. As Table 5 shows, over the past three years, China's corn imports have increased by several folds, and it is predicted that the country's corn imports could reach 20 million tonnes in 2021, and remain high in the coming years. Growing reliance on international market for corn calls for diversification of corn imports, particularly Eastern European countries, to reduce possible risks (Hansen et al., 2017). Before the launch of the BRI, the U.S. was China's biggest supplier of corn. However, by 2016, Ukraine was providing over 80 percent. In 2019, China imported 8 percent of its corn from Ukraine, with U.S. share falling to 7 percent. After signing the Phase One Trade Deal with the United States, China significantly increased corn imports from the U.S. However, given the uncertainty and lingering tensions between the two countries, further diversification of corn imports from Ukraine, Romania and other European countries remains a very important alternative.

Diversification of food products. The BRI countries are also central to China's efforts towards import diversification of other food products, particularly soybean and meat. As Table 6 shows, China's agricultural imports in general, and edible oilseeds imports in particular were highly dependent on a few suppliers (especially the United States). This concentration of imports was considered a major risk to China's food security. With China's phenomenal economic growth, food preferences have changed, leading to rapidly rising demand for meat and edible vegetable oil. Besides finding new suppliers of soybeans (including Brazil and Argentina), China started importing meat, alternate feed, and edible oils from different sources.

<Insert Table 6 here>

Ever since China became the largest food importer, U.S. has been China's biggest food supplier, especially in terms of soybean and meat products. This dependence has prompted long-standing national security concerns. The ongoing trade war with the U.S. has further elevated the role of the BRI countries in safeguarding China's food security (Zhang, 2020). The high-profile soybean trade is an example. Amid the rising tensions with the U.S., China has been seeking to diversify its overseas soybean suppliers, and Russia has become the focus of these efforts (Wang, 2019). As China's soybean imports from U.S. declined in 2018, its imports of alternative products increased (Table 2). For instance, the country's overall meat and fishery products imports almost doubled in value between 2017 and 2019, though this was also largely driven by the shortage in domestic pork. Similarly, the country's imports of vegetable oil grew by over 60 percent between 2017 and 2019. China imported an additional 2 million tonnes of palm oil and nearly 1 million tonnes of rapeseed oil during the same period.

Avoidance of food supply checkpoints. The Food Silk Road can potentially help China to avoid food supply chokepoints. With a growing dependence on international food markets to feed its 1.4 billion people, China considers chokepoints a serious threat. Approximately 2.8 billion people around the world depend on global trade for supplies of corn, rice, wheat and soybean. Additionally, over 180 million tonnes of fertilizer for farmland is sourced from the international markets annually. As international trade in these commodities grows, the pressure is mounting on a small number of chokepoints, including maritime straits along shipping lanes, coastal infrastructure, and inland transport infrastructure in major crop-exporting regions (Bailey and Wellesley, 2017).

Among the main maritime chokepoints, the Strait of Malacca and the Panama Canal are the most critical due to their positions linking Asian importers (including China) and Western exporters. In 2013, the Strait of Malacca carried 42 percent of China's soybean imports, and the Panama Canal, 34 percent, up from 8 percent and 27 percent, respectively, in 2000 (Bailey and Wellesley, 2017). Chinese leaders are concerned that constraints on space and human resources at these two chokepoints could lead to more frequent delays, or even blockades. Hence, under the BRI, through major infrastructure development such as new ports, airports, railways, highways and water ways, China has been actively expanding the alternate routes to reduce the pressure on major food supply chokepoints. For instance, expanding China–Europe rail links will also provide alternate food supply routes for China, bypassing the Malacca Straits and the Panama Canal.

Increase of agricultural exports. China's global agricultural expansion is also aimed at increasing agricultural exports. Even though the country has become the largest food importer, it is still a leading exporter of agricultural products: it is currently the third-largest food exporter in the world, by value. To the Chinese leaders, agricultural exports are crucial for domestic agricultural modernization and the growth of farmer incomes. As far as agricultural trade between China and BRI countries is concerned, China still enjoys competitiveness in labour intensive agricultural products, particularly fruits and vegetables (W. Zhang et al., 2018). As mentioned earlier, expanding agricultural exports is also among the key objectives of China's global agricultural policy, and thus its Food Silk Road. In 2018, for example, vegetables, fruits, and fish products accounted for 23 percent, 21 percent and 13 percent, respectively, of total Chinese agricultural exports to BRI countries (He et al., 2016; Qiao, 2016; Kenderdine, 2017).

4. The potential of the Food Silk Road to address challenges faced by BRI countries

Since 2013, as the BRI became a top priority in China's foreign and domestic policy (Li M. , 2015), its implementation has encountered numerous challenges, including mounting concerns by the international community and individual host countries regarding the environmental and economic sustainability of many projects, large debt obligations and corruption problems (Himaz, 2019). At the same time, agricultural and food cooperation within the context of the BRI, can provide possible solutions to several major challenges faced by BRI countries. Three examples of the potential it holds for BRI countries are discussed below.

Sustainability of the China-Europe railway under of the “Belt” part of the BRI, the Silk Road Economic Belt (SREB). This is an ambitious plan to support infrastructural development, increase regional connectivity, and stimulate economic integration across the Eurasian continent. The SREB involves over 40 European and Asian countries, with the CIS at its centre. One of the most iconic projects under the SREB is the China–Europe rail routes. Projects were initiated in 2011, and they have become vital for China's efforts to promote trade between Chinese inland provinces and other countries along the routes. A long-standing challenge has been lack of cargo for the return leg from Europe back to China, which has seriously undermined the economic sustainability of many of the routes (Liu and Zhu, 2019). At first, there was no cargo at all for the return trips (Figure 2) and the whole trip often failed to generate profit (Wen et al., 2019). Thus, local governments at the place of origin had to subsidize the freight (Tjia, 2020). This resulted not only in higher freight costs for the outbound trip but also unhealthy competition among Chinese rail operators for the limited cargo.

<Insert Figure 2 Here>

As Chinese consumers have demanded more imported food products considered of high quality, and as the China-Europe railway networks have rapidly developed, more agricultural and food products from the CIS countries and even Western European countries are being imported into China. The railway routes developed over the past few years that connect inland Chinese cities to Europe and Central Asia have significantly reduced transport times compared with ocean freight. This is of great significance for perishable agricultural and food products (Duxbury, 2016). Thus, agricultural trade by rail between China and the CIS countries is booming. In March 2016, the Xi'an Aiju Grain and Oil Industry Group imported 2300 tonnes of vegetable oil (rapeseed and sunflower seed oil) from Dostyk, Kazakhstan, via Chang'an Express. Since then, grain and edible oil exports from Kazakhstan to Xi'an, capital city of Shaanxi Province, have reached 30,000 tonnes per year. With the development of foil-lined containers and temperature-controlled systems, high-value and temperature-sensitive agricultural and food products such as chilled meat, milk powder, ham, cheese, and fine wine can be loaded onto returning trains (State Council Information Office of China, 2020). As more products have been loaded on the return trains, there has been a significant increase in the number of trips (Figure 2). In turn, the strong growth in container volumes in both directions has reduced the cost of shipping on these routes by almost 70 percent.

Trade imbalances between China and BRI countries, especially the Southeast Asian countries along the Maritime Silk Road. The Maritime Silk Road is the sea route connecting China's coastal regions with Southeast and South Asia, the South Pacific, and the Middle East and Eastern Africa, all the way to Europe. While increasing regional trade has been a key objective of the BRI, many of the BRI countries have trade deficits with China. The Southeast Asian countries, which plays

the pivotal role in China's maritime silk road, have been concerned that BRI would further exacerbate the trade imbalances with China. In terms of bilateral trade structure, Southeast Asian countries mainly export agricultural products, raw materials, and light industrial products to China while importing high-value-added goods from China, including machinery, electronics, chemical products and consumer goods. Given the risk that the increased connectivity under the BRI would widen the trade imbalance (Gong 2019), there has been rising pressure on China to address this problem. For instance, at the 2019 China International Import Expo, Vietnamese prime minister Nguyen Xuan Phuc said that "China should import more Vietnamese products, especially agriculture produce, so as to balance bilateral trade" (Nguyen 2019).

With growing agricultural imports, China's agricultural trade deficit with Southeast Asian countries is growing. In 2019, China's total agricultural trade with the BRI countries was estimated to reach RMB 420 billion, and a deficit of RMB 54 billion. Southeast Asia is China's most important agricultural trading partner along the BRI, accounting for two third of the overall agricultural trade volume. The Food Silk Road provides an opportunity to work towards a more balanced trade.

Limited benefits for the general public in many BRI projects. For years, China's economic engagement in Central Asia, Russia and Southeast Asia, which has been led by oil and gas exploration and large-scale infrastructure, has been accused of bringing economic benefits to elites rather than the general public, and exposing local communities to negative socio-economic and environmental impacts. In contrast, more agricultural investment and related cooperation, particularly in agricultural technology transfer and small-scale agricultural infrastructure

development, could bring economic benefits to ordinary people, as agriculture accounts for more than 25 percent of GDP and the lion's share of employment in many BRI countries. For instance, about 50 percent of the employment in Myanmar and Tajikistan, and over 40 percent in Pakistan and Vietnam, is in agriculture. In addition to agricultural investment and trade cooperations, agricultural research and technology cooperation between China and BRI countries has been flourishing in recent years. China has developed advanced technologies for planting and cultivation under various climatic conditions, artificial intelligence as well as rural e-commerce, and the country considers science, technology and innovation central to building bridges with other countries, including the BRI countries (Masood, 2019; Roussi, 2019). Take hybrid rice and wheat for example. Over the past few years, China has been actively promoting the application of hybrid rice and hybrid wheat in the BRI countries, such as Pakistan, Uzbekistan, Nepal, Bangladesh, Vietnam, the Philippines, to name but a few countries. Also, in 2016, China initiated the Digital Belt and Road Program in cooperation with experts from 19 countries and seven international organizations. The Digital Silk Road brings advanced IT infrastructure, such as broadband networks, e-commerce hubs and smart cities to the BRI countries, which will not only create jobs in rural areas but will also enable farmers to improve agricultural productivity and become online vendors. At the Second BRI Forum in April 2019, China announced that the BeiDou-2, a Chinese global navigation system which will have 35 satellites up by 2020, will provide up-to-date data and information to BRI countries to address various challenges, such as adaptation to climate change, mitigating disaster risk, managing water supplies, and increasing agriculture and food security (Guo, 2018). It is projected that information and communication technologies will be able to reduce agricultural sector's water needs by 250 trillion litres per year by 2030.

5. Food Silk Road and the BRI countries: Opportunities and risks

As far as the impacts of China's Food Silk Road on BRI countries are concerned, there are both opportunities and risks. With nearly a billion people already going hungry and the world's population rising, global food production must urgently be increased. The potential for food production growth mostly lies in agricultural investment in Russia, Central Asia, Central and Eastern Europe, Southeast Asia, and Africa. For most of these countries, investment in agriculture remains strikingly low. Against this backdrop, foreign direct investment (FDI) can play an important role over the coming decades in further supplementing the investment requirements in African countries as well as other developing countries' agriculture (Gunasekera et al., 2015). China's growing investment interest in agricultural and food sectors, thus, presents potential opportunities and benefits to those BRI countries with large agricultural sectors, crop yields and farm productivity gaps, and abundant arable land. According to Yao et al. (2020), agricultural FDI has both direct and indirect positive effects on food security and these positive effects are seen clearly when the country attracts agricultural FDIs steadily. The authors conclude that BRI countries can enhance food security by attracting more agricultural FDI, particularly those investments on enhancing local agricultural productivity.

Properly planned, China's Food Silk Road has the potential to substantially improve trade, foreign investment, and living conditions for local populations who remain poor and vulnerable to economic or weather shocks (World Bank, 2019; Yao et al., 2020). Many of these countries, including Cambodia, Laos, Myanmar, Tajikistan, Kyrgyzstan, and Uzbekistan, are still among the least developed and least food-secure countries in the world (Table 7).

<Insert Table 7 Here>

While industrialization has been the traditional approach to reducing poverty and improving food security, the agricultural and food sectors hold more promise, given the remarkable multiplier effects of agricultural growth. In the case of many BRI countries trying to expand their economies and reduce poverty, agriculture remains vital. However, to develop this sector, massive investments are needed in the region's agricultural infrastructure, including roads, storage and irrigation, agricultural science and technology, and agricultural support systems. Funds for such investments are scarce in the region. China's interest thus represents an opportunity for BRI countries to promote agricultural productivity and diversification, build sustainable food supply chains, and increase non-farm rural employment.

China has been providing agricultural assistance in various forms, including training, technical assistance, financial aid and demonstration centres for the BRI countries to develop their agricultural potential. At the First Belt and Road Forum for International Cooperation in 2017, Chinese President Xi Jinping announced that China would provide emergency food aid worth RMB2 billion. According to a Chinese official report, between 2016 and 2019, China has provided emergency food aid to over 50 countries in Asia, Africa and Latin America. Also, by the end of 2019, in cooperation with the World Food Programme and through the South-South Cooperation Assistance Fund, China had provided food assistance to 24 countries in Asia, Africa, Latin America and the Caribbean (China Daily, 2021). Furthermore, by 2019 China had dispatched a total of 81 agricultural expert groups and over 800 person-times to 37 Asian and African countries (China Daily, 2021).

Equally, there is the concern that China's growing agricultural investment in, and trade with, the BRI countries is causing significant risks for these countries. There are worries that China has embarked on a state-sponsored quest to lock up vast tracts of BRI countries to grow food to feed itself. It has been argued that the government is supporting Chinese firms that have acquired food-based businesses so that in the event of a food shortage, they can supply food to China (OECD, 2018). In addition, that the pace of Chinese agricultural and infrastructure investments, and overseas mergers and acquisitions by Chinese agribusinesses, could concentrate global food production and distribution, which could push small-scale farmers, fishers, hunters and rural communities further to the margins. Over the years, China has been charged with being mainly interested in exploiting the natural resources of developing countries with weaker governance and less developed civil society, thus hampering local development (Kolstad and Wiig, 2011; Lagerkvist, 2014). Some Chinese companies have indeed undermined the domestic and export potential of local production, distorted local markets, and harmed local communities and environments. Thus, even with the enormous potential that Chinese investments in the agricultural and food sectors represent for the BRI countries where it invests, if not properly managed, they can also have numerous negative implications.

Apart from direct economic and competition effects, some are also concerned of environmental effects. There is evidence that Chinese foreign agricultural investments in some BRI countries have resulted in increased use of chemical pesticides and fertilizers, causing environmental and health problems. This is well documented in the case of Chinese banana and rubber plantations in Laos and Myanmar under the opium replacement programme. In addition, the environmental

impacts of China's rising agricultural imports should not be overlooked. For example, China's surging demand for Brazil's soybeans is considered one of the key contributing factors to the fires in the Amazon rainforest. Similarly, China's rising palm oil imports have been blamed for deforestation, peat degradation, biodiversity loss, forest fires, and thus haze in Southeast Asia (Sheil et al., 2009; Varkkey, 2015). Furthermore, the link between China's rising food demand and climate change has also been established. It has been suggested that China's insatiable appetite for pork is a threat to the world as the global expansion of livestock production is one of the primary causes related to climate change (The Economist, 2014).

In addition, there are empirical evidences that suggest that some Chinese investments in BRI countries' agricultural and food sectors have generated social, environmental, economic and even political risks (Dwyer 2014; Kenney-Lazar 2017; Lu and Schönweger 2017). Because many of the Chinese agricultural investment agreements involve large areas of farmland, there are growing concerns of the negative impacts on local farmers's livelihoods (Dwyer & Vongvisouk, 2017). For instance, it was found that Chinese banana industry's practice of "shifting plantations", which has transformed the Mekong borderlands into agricultural frontiers, involves the replacement of subsistence farming with the lucrative banana crop. As a result, large amount of pesticides, herbicides and fungicides are required to maintain the monoculture production of bananas in the acquired land, with this process posing serious health risks to workers and the surrounding environment (Santasombat, 2017). Futhermore, rising Chinese agricultural investment in some regions has resulted in strong anti-Chinese movements. Take Russia for example. The Russian government is blamed for selling land to China at a discounted price and many Russians are worried with Chinese investors' excessive use of illegal chemicals in the agricultural sector (South

China Morning Post, 2017). Similarly, in Kazakhstan, there have been protests against the farm reform bill which was developed to free up more land and extend lease periods for Chinese companies (Blua and Sharipzhan, 2017).

In terms of food imports from BRI countries to China, while many welcome China's growing food imports, some food-importing countries are concerned that the 'China factor' could drive up international food prices. For example, in the past years, when there was a sudden increase in China's grain imports (such as corn, rice, wheat and soybean), international grain prices have surged. Given the scale of China's demand, changes in China's grain imports could have profound impacts in both grain importing and exporting BRI countries. While grains may be the most visible agricultural commodities, this same story may well be replicated across a range of other food products, including fish, sugar, fruit, pork, beef, palm oil, and vegetables. In the past few years, China's growing food imports have also contributed to price increase in a wide range of foodstuffs in some countries, despite low global food prices overall (Bahmani-Oskooee, 2019; Jaipragas, 2017; Zhang, 2018). There are also concerns that China will compete directly with other grain-importing countries, putting further stress on global food markets (Abington, 2016), increasing food prices worldwide.

6. Implications of China's Food Silk Road on global food security

As China expands its agricultural presence overseas through investment, technical assistance, and trade facilitation, in addition to the massive investments in BRI infrastructure, the entire global food supply chain is being restructured (McMichael, 2020).

China's Food Silk Road is opening new food trade routes between Europe, Central Asia, Russia, China, and South Asia, as well as the Middle East and Africa. The BRI is "opening up both large new quantities of imports from, and exports to, buyers and sellers of Russian wheat, central European sugar beet, Chinese grains and oilseeds, South Asian cotton, and other key commodities" (knowledge@wharton, 2019). China's massive investments in infrastructure (both at home and abroad), emphasis on greater policy coordination (such as standardization of customs procedures), and agriculture-related investments in BRI countries, as well as agricultural research and technological cooperation, are likely to reconfigure large parts of Asia, Africa, Europe, and the seas in between into production and distribution areas, with warehouses, logistics terminals, and export-import zones facilitating greater agricultural trade.

The restructuring of global food supply chains is clearest in the wheat trade. As mentioned, wheat is not only a basis of China's food security but also an important food source in most of the BRI countries. It is estimated that wheat-planting areas in BRI countries exceed 73 million hectares, which is three and a half times the area of wheat in China (Zheng, 2018). Taking the BRI as a key strategic opportunity, China's agribusinesses have been investing billions of dollars and promoting wheat and corn production, among other crops, in Russia, Central Asia, Eastern Europe, and other BRI countries. In the past, high trade costs and regional economic disintegration have reduced the access to Central Asian countries, some eastern and Central European countries, and some Russian regions to large international markets. In particular, the Central Asian countries are all landlocked and have limited connectivity in all directions except to the north, and the poor quality of transport infrastructure has meant high costs and poor connectivity (Lall and Lebrand, 2019). Under the BRI, with both external and internal integration, transport costs are significantly reduced through a mix

of 'hard' and 'soft' infrastructure projects. These lower costs have opened up trading opportunities for the Central Asian countries. Previously, wheat from Kazakhstan was mainly exported to neighbouring Uzbekistan, Tajikistan, and Afghanistan, or barged across the Caspian Sea to Azerbaijan, Armenia and Georgia. Under the BRI, China has emerged as one of the key destinations of Kazakh wheat (Xinhuanet, 2019), and wheat exports from Kazakhstan to China are expected to reach 2 million tonnes per annum in the coming years.

The BRI's new food trade routes link China to other BRI countries, but also link the BRI countries to each other. In 2017, with the expansion of the China-Europe rail network, China and Kazakhstan established a joint logistics centre at the Port of Lianyungang, one of China's largest trading ports. The centre is primarily intended for wheat exports to Southeast Asian countries (Hisashi, 2017). In March 2017, for the first time, a ship carrying Kazakh wheat set sailed from Lianyungang for Vietnam. With the rapid development of this route, Kazakhstan also began to export wheat to Malaysia. Russia, the world's largest wheat exporter, has been expanding its wheat sales to China and other Asian countries as the BRI has overcome Russia's long-standing transportation obstacles in the region (Nelson and Galberg, 2018). With continued infrastructure investment, regulation harmonization, and growing trade volumes, the transportation costs have been declining steadily.

The China-Europe Railway provides more positive examples. Between 2011 and 2019, strong growth in container volumes reduced the cost of shipping from China to Central Asia and Europe, with rates down by almost 70%, which will further promote agricultural trade among the BRI countries (Wallis, 2019). Given that Southeast Asia is expected to become the main wheat-importing region (Maarten and Schierhorn, 2019; USDA, 2019a), wheat from Russia and

Kazakhstan arriving in Vietnam and other Asian countries is expected to reduce their dependence on the United States and Australia, which have long dominated the regional wheat market. Meanwhile, rice, seafood, tropical fruits and other agricultural commodities from Southeast Asia are being exported to Central Asia and other BRI countries on the same new trade routes (Rangsimaporn, 2020). Similarly, the Maritime Silk Road Initiative has increased the flow of goods from East Africa, including tea, coffee, grains, sugarcane, and palm oil, to other BRI countries (knowledge@wharton, 2019).

The COVID-19 pandemic has disrupted global supply chains and led countries to close their borders, raising concerns over food security and the supply of essential goods. As countries across the world went into lock-down, massive aircraft were grounded, the ocean freight industry was disrupted, and trucks were stopped at national borders. Yet most of the trains on the China-Europe routes continued operating. The railway has demonstrated strategic value in maintaining Chinese and regional food supply chains amid the epidemic. An example is the imports of frozen meats into China from Russia, Poland, Italy and Spain via the China-Europea railways. The new food trade routes have strengthened the food resilience of China and other countries in the region amid the pandemic.

However, not all of the prospects are positive. The new food trade routes present new risks due to a deeper integration of food systems that could result not only on price shocks but also diseases that can be easily transmitted between China and the BRI countries. The spread of the African swine fever virus along the new trade routes is an example. Since its outbreak in Georgia at the beginning of 2007, the virus has spread to many CIS member states, including Russia. In 2018,

amid the trade conflicts with the U.S., China turned to Russia and other CIS states for food imports, including meat. Although there is no conclusive evidence, it is widely held that the swine fever virus entered China through Russia or other Eastern European countries (Liu et al., 2020), as the genotypes isolated from China were closer to those prevalent in Russia, and the virus was first reported in Northeast China (Chang, 2019). After it was seen in China in August 2018, it quickly spread into Vietnam, Cambodia and Laos. By 2020, outbreaks have been confirmed in most of Southeast Asia and Papua New Guinea (DEFRA, 2020).

The frequent high-profile food safety scandals in China (melamine-tainted milk, gutter oil, cadmium rice, ‘lean meat powder’) as well as Chinese pathogens, pests and invasive species, add another dimension to these concerns. With the close ties between China and BRI countries, food safety concerns in China could also affect food markets elsewhere (Chang, 2019).

Regarding food prices, a main challenge is the greater influence of Chinese demand on global food supply. As the biggest agricultural and food importer in the world, China’s long-term objective is to keep the global food market in the state of surplus through overseas agricultural investment and technological transfer to boost global food production. If this is successful, China, as the largest food importer, will gain pricing power over the major exporters. In general, this means that global food prices would remain low, which would be good for food importers, but not so much for exporters. However, in the event of global food shortages, the demands from China could exacerbate problems in other places, affecting all food-importing countries. This would especially apply to the global fisheries trade. It is estimated that over half of the total global increase in seafood and aquatic product consumption over the next decade will be due to China. The growing

consumption and shifting trade position of China will have far-reaching consequences for global fishery trade and production. This could be specially worrying because, unlike the farming sector, global marine fisheries are declining, especially in catches, so more demand from China will inevitably result in increased fish prices for everyone. According to FAO (2020), rising demand from Chinese consumers coupled with a slowdown in the growth of domestic fisheries and aquaculture production in China could lead to a decade of higher prices globally. On the demand side, China will remain by far the world's largest fish consuming country, which is projected to represent about 36 percent of the global total in 2028. On the supply side, however, shrinking marine catch fisheries, and slowing growth in domestic aquaculture production are likely to lead to slower growth in total fishery production. As a result, this can stimulate higher prices in China with repercussions on world prices, owing to rising Chinese imports from other countries.

China's efforts to control its food supply chains beyond the country's borders may bring another challenge to the global food supply chains. In December 2013, Chinese President Xi in stressing the importance of controlling its food supply, stated: "Those who control grain supply, control the trade and the pricing power. We need to have confidence in establishing our own global Agribusiness Giants" (H. Zhang 2018). Hence, as discussed in the earlier section, cultivating China's own global agribusinesses, which has been stressed in policy documents from the central government, has become a policy priority for China under the new food security strategy. Through cultivating its own global agribusiness enterprises, China intends to acquire more information on global food supply and demand, more control on food production resources and logistical gateways to grain marketing, which will enable the country to have a bigger say in global food trade and rules-setting. Furthermore, it will be easier for the Chinese government to use non-market mechanisms to motivate its own agribusinesses (both state-owned enterprises and private

enterprises), rather than multinational agribusinesses to prioritize domestic market in times of global food shortages (H. Zhang, 2018).

Over the last few years, Chinese agribusinesses, such as COFCO and Beidahuang Group, have pursued international competitiveness through huge overseas direct investment, high-profile mergers and acquisitions, and control over critical infrastructure. Within a very short period, COFCO has become the world's largest grain trader by assets. Likewise, by acquiring Syngenta, ChemChina has emerged as one of the leading agricultural input and seed providers in the world. In the case of meat supply, with the acquisition of America's Smithfield Foods, the WH Group is now the biggest pork producer in the world. These Chinese agribusinesses are increasingly reshaping the global food trade system and challenging the dominance of the leading Western agribusinesses (Schneider, 2017). As China creates its own agribusinesses, Chinese control might become an important factor in the access of foreign food exporters to the Chinese market (Gooch and Gale, 2018).

Moving beyond the impact of Chinese agricultural cooperation with a particular country or region, a bigger point worth pondering is how China's Food Silk Road will shape global food governance. In June 2019, Qu Dongyu, Vice-Minister of Agriculture and Rural Affairs of China, was elected Director-General of the Food and Agriculture Organization of the United Nations (FAO, 2019). Qu is the first Chinese national to serve in this post. This is a clear sign that China is playing a more active role in various aspects of food global governance (Duggan and Naarajaervi, 2015; Morton 2012; H. Zhang 2014). More importantly, for years, the Chinese officials and scholars have been advocating "China's solution" to various aspects of global governance challenges, including food security. For instance, at the 2009 World Food Summit, the then Vice-Premier of

China, Hui Liangyu, stated that “the food issue is ultimately a development issue ... and food security is closely related to economic growth, social progress, climate change and energy security” (Zhang, 2018). Then in 2012, at the Seventh Asia-Europe Parliamentary Partnership Meeting (ASEP-7) Zhang Xiaoshan, a member of the 12th National People’s Congress Agriculture and Rural Affairs Committee and a leading food security expert, advocated a development-oriented food security strategy and comprehensive and balanced agricultural development while outlining Chinese approach to global food governance. In recent years, under the auspices of the BRI, China has stepped up efforts in advocating a development approach to global food governance and global food security. Most notably, at the First Belt and Road Forum in May 2017, Chinese President Xi Jinping claimed, “Development holds the master key to solving all problems. In pursuing the Belt and Road Initiative, we should focus on the fundamental issue of development, release the growth potential of various countries and achieve economic integration and interconnected development and deliver benefits to all” (H. Zhang, 2018).

This development approach to safeguard food security is unquestionably based on China’s own experience of the past decades. In the 1980s, China’s strong initial emphasis on agricultural growth greatly alleviated poverty in the country during the early years of the country’s Reform and Opening-up. A study suggests that agricultural growth has had an impact on poverty reduction four times that of the growth in manufacturing, or the growth in service sectors (Z. Chen et al., 2014). Also, China’s large investments in the development and large scale adoption of improved seed varieties, such as hybrid rice, has incentivized grain production, thus contributing to the country’s food security. Moreover, since 2003, for 17 consecutive years, the country’s Number One Documents have been devoted to agriculture, farmers and rural areas, which has resulted in

trillions of dollars investments in rural infrastructure (such as road and irrigation infrastructure), agricultural R&D, farmers' welfare, as well as land and water resources management. With the substantial investments from both the central and local government, China's grain production reached 660 million tonnes 2019, over 50 percent growth as compared with that of 2003 (430 million tonnes) (See Table 1). Around the world, however, there have been decades of underinvestment in the agricultural sector. Hence, there is a high demand for financial investments in the agricultural sector to boost global food production (H. Zhang, 2018). From this perspective, China's Food Silk Road, with a main emphasis on agricultural investment, agricultural infrastructure development, agricultural technological cooperation, and regulation harmonization, could help revitalize global agriculture, particularly in developing BRI countries.

Nevertheless, more comprehensive planning is necessary. As clearly seen in China's own agricultural development, overemphasis on grain production without proper consideration of economic and environmental impacts can result in severe degradation of water and land resources and environmental pollution, as well as on impoverishment of small farmers. A clear example is the small or even negative returns for millions of Chinese farmers in recent years (H. Zhang, 2018). This should not be repeated in the BRI countries.

7. Conclusions

With the major shift in China's food security strategy and the launch of the high-profile BRI, agricultural and food security cooperation has emerged as one of the key aspects of China's engagement with the BRI countries, with a Food Silk Road is emerging. This not only serves China's long-term goal of food security, but also presents both opportunities and challenges for

the BRI countries, though these vary across food sectors and will be felt differently by each country. The extent at which an individual BRI country will benefit or not due to China's Food Silk Road will be largely determined by policies and actions taken at the regional, national and local levels to manage the opportunities and challenges.

At the global level, as China expands its agricultural presence overseas through investment, technical assistance, and trade facilitation, in addition to the massive BRI infrastructure, the entire global food supply chain is being restructured. On the one hand, the emergence of new food suppliers and new food trade routes are revamping global food supply chains, with the global wheat trade as the most visible case. On the other hand, China's quest for global leadership and its promoting of development as the solution to global food security are reshaping how food security is governed at all levels. China's development approach clearly reflects the modernist view that economic development and technology can resolve food security threats, which has been disputed by many. Nevertheless, as far as food security is concerned, after decades of under-investment in agricultural production, there is an urgent need for capital flow into the agricultural sector to increase regional food production. In this light, China's Food Silk Road should be welcomed though challenges remain for China and the BRI countries to set a framework for inclusive and sustainable agricultural and food cooperation.

Author Contributions

Both authors conceived the idea of the paper, analysed the information, drafted the paper and critically reviewed it.

Competing Interests statement

No competing interests.

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Table 1. China's grain production and import 2003-2019 (million tonnes)

	Total Production	Grain Total Imports	Imports as % total production
2003	431	25	5.80%
2004	469	34	7.24%
2005	484	37	7.64%
2006	498	37	7.43%
2007	504	37	7.34%
2008	534	41	7.67%
2009	539	52	9.64%
2010	559	67	11.98%
2011	588	64	10.88%
2012	612	80	13.07%
2013	630	87	13.80%
2014	640	100	15.63%
2015	661	125	18.92%
2016	660	114	17.26%
2017	662	131	19.80%
2018	658	116	17.63%
2019	664	114	17.17%

Source: Bureau of Statistics of China, 2021

Table 2 China's imports of main food products, 2017-2019

	Fish products		Meat		Vegetable oil	
	1000 tonnes	RMB billion	1000 tonnes	RMB billion	1000 tonnes	RMB billion
2019	4440	109.3	6178	133.0	9530	21.3
2018	3400	79.4	4217	75.0	6290	15.2
2017	2940	55.9	4099	66.6	5770	16.1
Change	51.02%	95.36%	50.74%	99.74%	65.16%	32.47%
	Soybean oil		Palm oil		Rapeseeds oil	
	1000 tonnes	RMB billion	1000 tonnes	RMB billion	1000 tonnes	RMB billion
2019	830	43.8	5610	4.1	1620	9.1
2018	550	31.3	3570	2.9	1300	7.2
2017	650	30.7	3460	3.6	760	4.3
Change	27.69%	42.68%	62.14%	12.74%	113.16%	113.55%

Source: Customs of China, 2020

Table 3. China's Global Agricultural Policy and the Belt and Road Initiative

Before 2013	95% grain self-sufficiency and 100% cereals self-sufficiency as the bottom line for China's food security strategy
No. 1 Document for 2014	The new national food security strategy: domestic production with moderate imports (with active utilization of global agricultural resources)
No. 1 Document for 2015	"Expedite the formulation of international agricultural cooperation plan ... support the development of overseas agricultural cooperation, promote the construction of science and technology demonstration park, technical training, scientific research demonstration, brand promotion, and other services."
No. 1 Document for 2016	"Coordinating the design and implementation of overseas agricultural cooperation, strengthen agricultural investment, trade, technology, animal, and plant quarantine cooperation with Belt and Road countries and regions. "
No. 1 Document for 2017	"With the Belt and Road countries and regions as the priority , supporting agribusinesses to undertake transnational operations, establishing overseas production base, processing centres, warehousing and logistics facilities, as well as cultivating global agribusinesses."
May 2017	Vision and Action on Jointly Promoting Agricultural Cooperation on the Belt and Road: fostering top-level design on agricultural cooperation along the Belt and Road countries

No. 1 Document for 2018	Deepening agricultural product trade relations with the Belt and Road countries and regions , actively supporting China’s agriculture going abroad, cultivating internationally competitive agribusinesses
No. 1 Document for 2019	Enhancing agricultural cooperation with the Belt and Road countries and regions , actively expanding imports of agricultural products, diversify importing channels, and foster the development of global agribusinesses.
Oct 2019 White Paper	Enhancing grain trade cooperation with the Belt and Road countries and regions ... establishing a new international platform for grain cooperation, to facilitate the free and orderly flow of agricultural resources and deep integration of markets in the Belt and Road countries and regions .

Source: Ministry of Agriculture and Rural Affairs of China, 2020; State Council Information Office of China, 2019; Xinhuanet, 2017; Zha & Zhang, 2013.

Table 4. Importance of BRI countries in global agricultural production and trade

	Unit	Total	Share of the world (%)
Land Area	million square kilometres	4051.3	31.2
Population	billion people	31.6	43.6
Agricultural exports	US\$ billion	4214.5	23.9
Agricultural imports	US\$ billion	4372.2	23.3
Cereal production	billion tonnes	10.5	38.1
Oilseed crop production	million tonnes	9571	48.6
Fruit production	billion tonnes	2.3	33.4
Vegetable production	billion tonnes	3.3	29.1
Meat production	million tonnes	6223.5	20.1
Egg production	million tonnes	1845.5	25.0
Milk production	million tonnes	3.3	42.9
Fish production	million tonnes	6625.8	33.8

Source: Ye, 2017

Table 5. China's imports of main grains between 2018-2020 (1000 tonnes)

		Soybean	Corn	Rice	Wheat
2018/2019	Production	15,967	257,330	148,490	131,430
	Import	82,540	4483	3200	3145
	Import ratio	83.79%	1.71%	2.11%	2.34%
2019/2020	Production	17,000	260,770	146,730	133590
	Import	90,000	7000	2400	5376
	Import ratio	84.11%	2.61%	1.61%	3.87%
2020/2021	Production	18,000	250,000	148,500	134000
	Import	91,000	22,000	2200	7000
	Import ratio	83.49%	8.09%	1.46%	4.96%

Source: USDA, 2020.

Table 6. Concentration of the sources of China's land-intensive agricultural imports (2015)

Products	Top 5 Sources of Imports	Share of Top 5 Importers (%)
All agricultural products	United States (21.2%), Brazil (17%), Australia (6.9%), Canada (4.5%), Argentina (4.4%)	53.9
Cereals	United States (30.7%), Australia (22.7%), Ukraine (14.3%), France (13.5%), Canada (6.2%)	87.4
Rice	Vietnam (53.2%), Thailand (28.3%), Pakistan (13.1%), Cambodia (3.3%), Laos (1.6%)	99.5
Wheat	Australia (41.9%), Canada (33%), USA (20%), Kazakhstan (3.9%), Russia (0.5%)	99.3
Corn	Ukraine (81.4%), USA (9.8%), Bulgaria (3.4%), Laos (2.6%), Russia (1.7%)	98.9
Soybeans	Brazil (49.1%), USA (34.8%), Argentina (11.6%)	95.4

Source: Ye, 2017.

Table 7. Global food security ranking of selected BRI countries (2019)

Ranking	Country	Overall	Affordability	Availability	Quality and Safety
64	Philippines	61	69	58	50
66	Sri Lanka	61	65	60	52
69	Tunisia	60	62	58	62
71	Uzbekistan	59	66	55	53
76	Ukraine	57	64	50	60
77	Myanmar	57	59	57	51
78	Pakistan	57	63	56	44
79	Nepal	56	59	55	54
83	Bangladesh	53	60	55	31
90	Cambodia	49	57	48	35
92	Laos	49	56	48	37
93	Tajikistan	49	59	41	47

Source: Economist Intelligence Unit, 2019.



Figure 1. Major BRI routes and Chinese food imports from different regions

Source: Authors' work based on BRI Map from Mercator Institute for China Studies (2018)

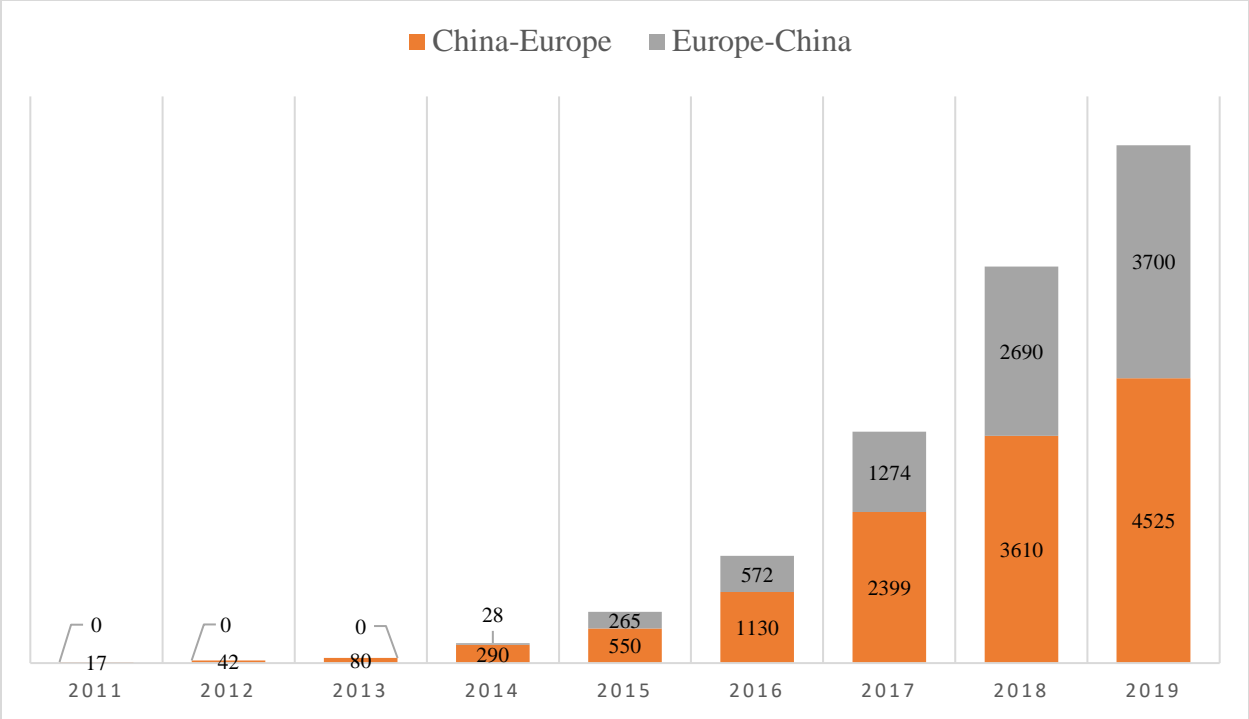


Figure 2. Number of China–Europe rail trips, 2011–2019. **Source:** State Council Information Office of China, 2018; Yang, 2020.