中國食品土畜進出口商會
China Chamber of Commerce of I/E of Foodstuffs, Native Produce and Animal By-products (CFNA)

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Understanding the Development of Agriculture in Brazil and Bilateral Trade and Investment Relationship with China in the Sector

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Chapter I The Transformation and Evolution of Brazilian Agriculture and Livestock Industry

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I.1 Modern, Agro-Industrial Development Policy

For most of its history, the development of Brazilian agriculture was dominated by cycles defined by an agricultural product with high export potential. Some of the main export cycles in Brazil were "Pau-Brasil" (Brazil Wood, 1500's), sugar (1600-1700's), cotton (1700-1800's), rubber (late 1800s, early 1900s), and coffee between 1870 and the early 2000s (Klein and Luna, 2018).

Between 1964 and 1985, Brazilian armed forces controlled the national government. One important objective of the military was to industrialise the country. To achieve this, the Brazilian economy needed to produce a commercial surplus in order to pay for the imports of oil and technology essential to develop new iron/steel, energy, oil, automobiles, and machinery industries (Bertrand et al., 1987).

The adopted government slogan during this period was "Produce more to export more". Agricultural modernisation was critical to increase production, and the perfect opportunity came in 1973 when the US decided to embargo all exports of soybean, leaving Europe and Japan in a critical situation because the US was at that time the only large-scale soybean supplier. Brazil rapidly re-directed its agro-industrialisation strategy to soybean production to meet the global demand.

Four years later, building on agricultural research and innovation initiated several years prior, new adapted and productive varieties were available, and big agricultural companies such as Bunge, Cargill, ADM, Louis Dreyfus, Ford, Case, Massey Ferguson, New Holland, Bayer, and Shell controlled more than 50% of the Brazilian agricultural market (Bertrand, 1987).

At the same time, a partnership with Japan through the Japanese International Cooperation Agency (JICA) created the PRODECER program to conduct research and develop technologies to transform the acidic soils of the Cerrado into productive farmland. The program also promoted farmer settlements in the region.

Accordingly, in the 1970s and early 80s, Brazil entered a modern agricultural phase. This cycle, which continues today, is characterised by a rapid expansion in the volume and diversity of agricultural production instead of a single export (Fishlow and Vieira Filho, 2020). It has positioned Brazil as one of the largest food producers and exporters in the world.

"Modern agriculture", as used here, refers to agro-industrial production systems that emerged during the "green revolution" of the mid-20th century. Modern agriculture achieves high yields through mechanisation, chemical inputs of fertilisers and pest control, and genetic enhancement of crops. Many enabling conditions made the transition to modern agriculture in Brazil possible (Fishlow and Vieira Filho, 2020; McNeil, 2021), including:

(1) Immigration. In the early 20th century, Brazil was one of the main destinations for immigrants, mainly Italians, Germans, and Japanese, bringing labour, knowledge, and organisational capacity.

(2) The industrial revolution of the 19th century. One of the reasons for the large influx of immigrants in Brazil was the elimination of jobs in homeland countries through the second industrial revolution, brought in by the internal combustion engine.

(3) Green revolution. Brazilian agriculture benefited from the green revolution, the set of initiatives transferring research technology between 1950 and the late 1960s, that increased agricultural production in parts of the world through the adoption of new technologies, including: high-yielding varieties, chemical fertilisers, agrochemicals, mechanisation and water-supply (irrigation).

(4) Research and development. Initially, grain production was confined to the temperate south of Brazil. Research led to new varieties suitable to warm, humid conditions of the tropical latitudes. Crop varieties and soil liming/fertilisation made possible the conversion of a large area of the Cerrado savanna woodland to crop production.

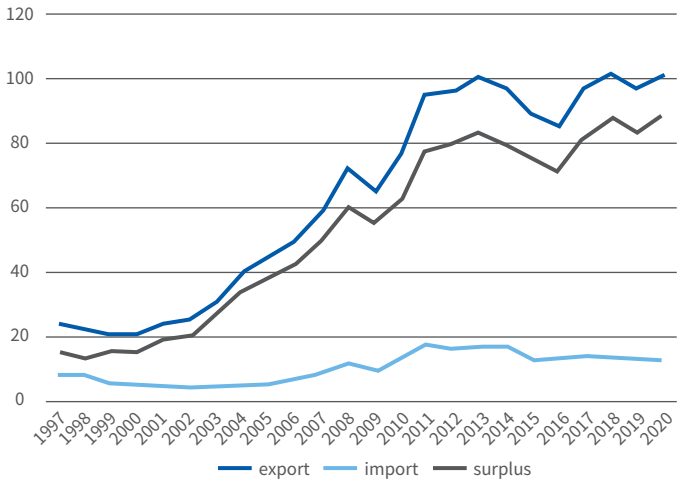
The second boom for the soy demand came in 1988, with the outbreak of bovine spongiform encephalopathy (BSE), commonly known as mad cow disease, an incurable and fatal neurodegenerative disease of cattle. The BSE outbreak led to bans on the use of animal products in feed, forcing farmers to shift to feed with only vegetable proteins (Nepstad et al., 2006). This increased the global demand for soybeans, which are one of the best sources of vegetable protein.

Between 2000 and 2010, the Brazilian economy grew at an annual rate of 3.6%. This economic expansion was due, in large part, to the "Commodity Boom", when international commodity prices increased at a rate of 10.3% per year for agricultural products. Between 2011 and 2020, the global commodity boom weakened, and the growth of the Brazilian economy slowed to only 0.3% per year.

Between 2000 and 2019, the gross value of agricultural more than doubled, rising from R$ 262,43 billion to R$ 609,52 billion (MAPA, 2019). In the same period, grain production nearly tripled, from 83 to 242 million tons (CONAB, 2019). Meat production – including beef, chicken, and pork – almost doubled from 14.8 to 28.5 million tons (MAPA, 2019).

In 2020, agribusiness exports reached US$ 101 billion and represented 42% of total Brazilian exports generating a US$ 88 billion trade surplus (CNA, 2020, Figure 1). As a result, the agribusiness sector enhanced its strategic position within the Brazilian economy, contributing significantly to the development of the country by increasing food production, generating trade surpluses, promoting food safety and security, and improving standards of living in the countryside.

Figure 1: Evolution of Brazilian agricultural trade between 1997 and 2020. Note the rapid growth in exports during the Commodity Boom (2004–2011)



Source: Agrostat - Ministry of Agriculture (accessed on 09/26/2021, elaborated by the authors)

Today, Brazil is recognised as one of the main global agricultural powerhouses. The country is amongst the main producers and exporters of nearly 40 agricultural products such as soybeans, corn, coffee, sugar, ethanol, cotton, orange juice, cotton, beef, poultry, and pork (FAO, 2018). Currently exporting to more than 200 countries, and with a 5.2% share of world agricultural exports in 2020, Brazil is the third largest global agricultural exporter, only behind the EU and the US. In terms of net exports, the country has occupied first place in the ranking since 2004 (Fishlow and Vieira Filho, 2020).

The Brazilian agricultural system is today a set of well-structured, modern and competitive production chains, each one linking rural producers, processors, and traders with consumers and foreign markets.

I.1.1 Research and Technology, the Cerrado, Export Policy

The achievements of the Brazilian farm sector did not occur simply by incorporating more land but, rather, through significant improvements in productivity, the leading factor in

sustaining the evolution of agriculture and livestock activities in the country.

Understanding the reasons for the recent performance of Brazilian agriculture is not a trivial task, as it involves a variety of key factors summarised in five main pillars:

(1) the availability of natural resources, especially land and water;

(2) investment in research and technological development;

(3) adoption of enabling public policies;

(4) entrepreneurship of farmers;

(5) organisation of the value-chain.

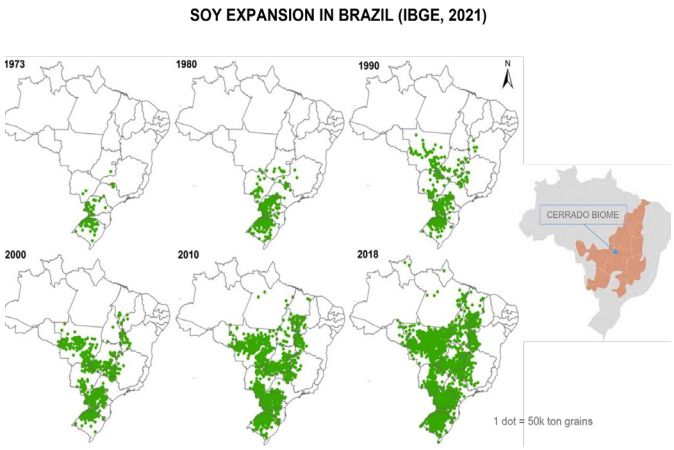
The success achieved in the second pillar is the outcome of the organisation of a complex research system that includes Embrapa (the Brazilian Enterprise for Agricultural Research created in 1973), state institutions, universities, the private sector, and farmers themselves. The interaction between these entities guided the research objectives towards practical questions and applied solutions, making the innovation process more efficient and dynamic (Fishlow and Vieira Filho, 2020).

Embrapa became the most important agricultural research institution in Brazil, with regional centres in almost all states. Together with state level research centres and universities, they constitute the National Agricultural Research System (SNPA), with research programs, including genetic improvement, agricultural development, management, and supportive public policy development.

Throughout the past twenty years, soybeans have become the locomotive of Brazilian agribusiness. However, it took years of research to make this possible. Soy was introduced in Brazil in the first half of the twentieth century, with varieties coming mostly from the US. At that time, soy was a crop of little economic importance, produced primarily in the South and Southeastern regions of the country.

It was in the early 1980's that Embrapa and the Federal University of Viçosa finalised, through genetic improvement techniques, the first soybean variety with a long juvenile period adapted to tropical and sub-tropical regions such as the Cerrado (Embrapa, 2020). In 1980, only 13% of the soybean planted area in Brazil was in the Midwest, while the South and Southeast accounted for 87% of planted area. In 2015, the Cerrado of the Midwest and Northeastern regions already represented 52% of the planted area (Figure 2).

Figure 2: Expansion of agriculture over Brazil, illustrating the rapid growth across the Cerrado biome



Source: IBGE - Produção Agrícola Municipal (2020), elaborated by the Grupo de Estudos sobre Mudanças Sociais, Agronegócio e Políticas Públicas (GEMAP/UFRRJ), and modified by the authors

The development of new genetic varieties, combined with acidity correction techniques for the infertile Cerrado soils, allowed thousands of producers in the South and Southeast of the country to migrate to the vast and inexpensive lands of Central Brazil. Norman Bourlaug, father of the Green Revolution, points to the transformation of the Brazilian Cerrado as one of the technological innovations with the greatest impact on humanity (Embrapa, 2020).

From a macroeconomic view, the Real Plan, adopted in 1994, stabilised inflation, balanced national accounts, and allowed the country to establish a more stable and healthier economic environment, favoring medium and long-term investment in agriculture. The increasing openness of the economy to international trade also forced many sectors to become more efficient in order to compete in the global market. In addition, the government promoted a series of privatisation of ports, railways, and road networks, attracting investment and improving the logistics in the country (Jank et al., 2020).

The economic stability, combined with new management practices in public banks, made it possible for the government to improve the provision of credit to agriculture. Beetween 2003 and 2015, the disbursements of rural credit grew from R$ 27 billion to R$ 216 billion (Input, 2016).

In addition to the improvement in the traditional rural credit system, Brazilian policies created new instruments and operations to help farmers fund their activities. One example of these new instruments is the Farm Product Bond (CPR, Cédula de Produto Rural), which helped to consolidate the "barter" operation in Brazil for pre-planting finance. The CPR is a kind of bond issued by the producer formalising a commitment to deliver agricultural products in exchange for pre-planting finance (Souza and Pimentel, 2005).

Another public policy designed to promote agricultural exports is known as "Lei Kandir" (Kandir Law), which exempted exports of raw and semi-manufactured products from taxes. This law was particularly relevant for the value-added tax, called the Imposto sobre Circulação de Mercadorias e Servicos (ICMS), the Merchandise and Services Flow Tax. Tax exemption for soy and other products destined for export increased the price received by farmers who were growing these crops, improving their income, and fostering the expansion of newly planted lands. However, the soy crushing sector became less competitive through the Lei Kandir since soy meal and oil traded across state boundaries lost the ICMS tax exemption.

A significant challenge facing Brazilian agribusiness is to maintain a balance between the two trends that have supported its growth: productivity and a strong dependence on the foreign market. The first challenge involves sustaining productivity increases on the frontier of technological innovation and diffusion of this technology, thus reducing the gap between a minority of highly productive and efficient producers – responsible for more than 80% of production – and a numerical majority of farmers who are low-income and low-technology, producing less than 5% of the total. The second challenge is described below.

I.2 Brazil's Agriculture Diplomacy and International Cooperation with China

During the last 50 years, the agricultural and food sectors of Brazil and China have been marked by profound reforms and transformations. As two of the four largest global producers and exporters, China and Brazil are important actors in the current and future global agriculture landscape.

This year (2021) marks the 47th anniversary of the establishment of diplomatic relations between China and Brazil. Through diplomatic efforts of the two governments and of several sectors of society, bilateral relations have grown stronger through cooperation on economic, trade, and educational themes. As important forces in the BRICS cooperation alliance of emerging economies (Brazil, Russia, India, China, and South Africa), and the largest emerging economies in Asia and South America, China and Brazil share a wide range of common and complementary interests.

In 2001, after China entered the World Trade Organization (WTO), it implemented its "going outside" strategy, stimulating investments and creating favourable conditions to establish offshore operations. This shift to foreign investment was reinforced in 2013 through the ambitious "Belt and Road Initiative", also known as the "new silk route", with the goal of increasing international cooperation through investment, financing, and contracts in sectors such as infrastructure, logistics, agriculture, and energy (see Chapter III) (Jank et al., 2020).

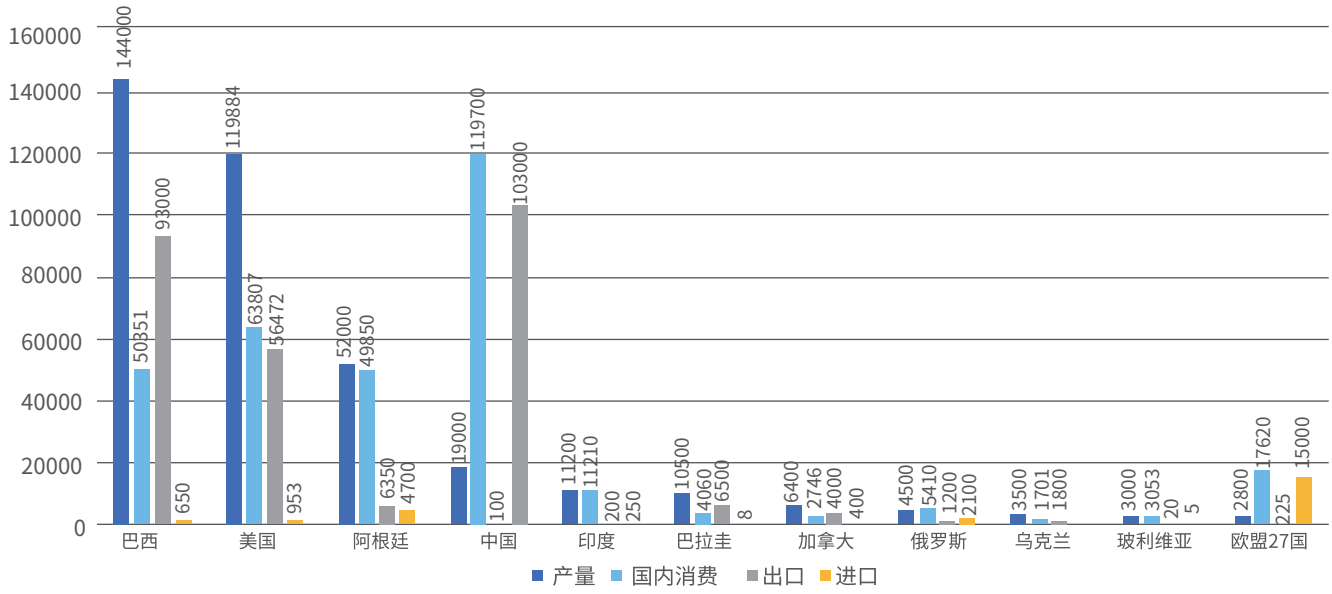
The peak of Chinese offshore investments was achieved in 2016, when the government authorities learned that many of their investments were "high risk" and "irrational". In November that year, the government strengthened the control over offshore investment, with new policies to regulate, classify, and approve investment established in August 2017, including the Guidelines on Further Guiding and Regulating Overseas Investments of the Ministry of Commerce, National Development and Reform Commission, Ministry of Foreign Affairs, and People's Bank of China (Cariello, 2020; UNCTAD, 2017). With an investment stock of U$66 billions in 2020, China became one of the main foreign investors in Brazil, and the destination of 47% of Chinese investment in South America (Cariello, 2021).

The cooperation between China and Brazil in agriculture is highly complementary. Brazil is amongst the top agricultural and animal husbandry producers and exporters, while China is the largest importer of agricultural products in the world. With the spectacular growth of per capita consumption, China has experienced a rapid increase in demand for high-quality agricultural products.

China and Brazil are mutually dependent in their agricultural trade relationship, especially featuring soybeans. Nearly half of the soybeans imported each year by China comes from

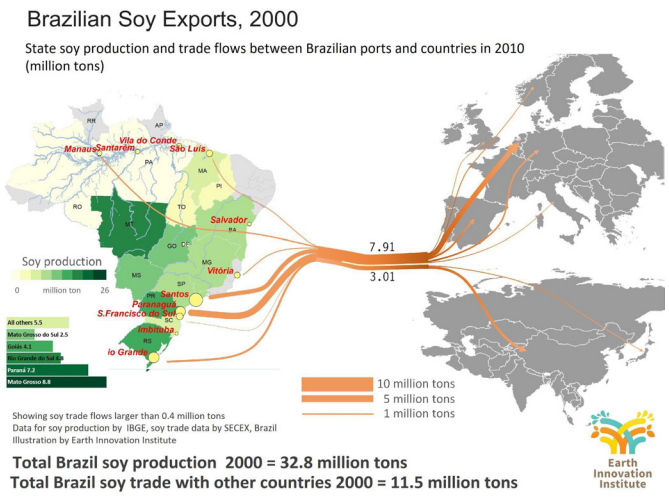
Brazil. China imports are estimated at 103 Mt of soybeans of a total world trade of 173 Mt, hence Brazil is the source of 54% of the soy imports (Gale, 2021). According to the Brazilian Ministry of Agriculture (Agrostat, 2020), China has become by far the largest export destination of its agricultural products (Figure 3). That is, although the EU was the main destination of soy products in 2000 (Figure 4), China became the main destination by 2016 (Figure 5).

Figure 3: Soybean production, trade and consumption in selected countries, and the dominant roles of Brazil, USA, and China as the main players in the world



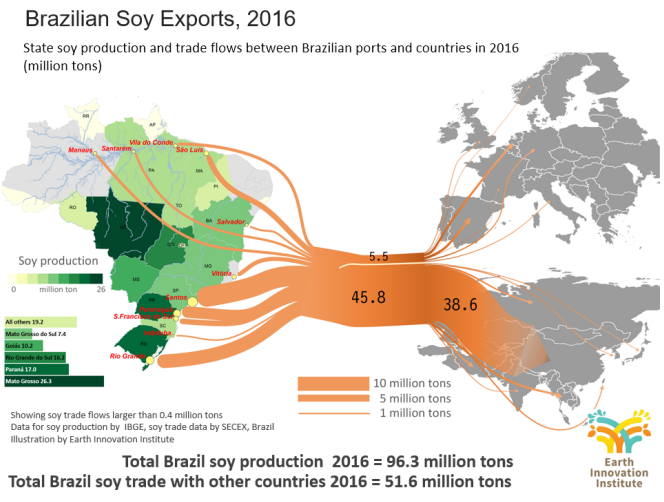
Source: USDA Estimate for 2021, elaborated by authors

Figure 4: Soybean exports in 2000 shipped from Brazilian ports and the destination countries



Source: IBGE and SECEX, Brazil - Illustration by Earth Innovation Institute

Figure 5: Soybean exports in 2016 shipped from Brazilian ports and the destination countries



Source: IBGE and SECEX, Brazil - Illustration by Earth Innovation Institute

1.2.1 The Amazon and Sustainability

The growth strategy for Brazilian agriculture has been to increase production through productivity and cropland expansion, making use of technology, economies of scale, and with the foreign market absorbing the increases in production, thus avoiding a drop-in price that would make this model unfeasible. Although agriculture has proven to be very competitive, it is important to highlight the factors that may prevent this competitiveness from being maintained or increased in the future.

One of these factors has to do with the environmental impacts of agricultural expansion, including deforestation, fires, greenhouse gas emissions, and water, mostly in the Amazon and Cerrado biomes. Soil erosion and excessive use of agrochemicals are also major environmental concerns, with harmful effects to consumers, environmental contamination, and degradation of streams and rivers.

There is a vigorous debate within the Brazilian society and globally about how best to address the Amazon and Cerrado deforestation, with divergent viewpoints (Nepstad and Shimada, 2018; Shimada and Nepstad, 2018, Nepstad et al., 2009). Within agriculture itself, important programs have been implemented that increase productivity and reduce carbon emissions through the intensification of land use (e.g. two or more crops per year in the same location), recovery of degraded pastures, crop-pasture-forest integration, no-till cultivation, biological nitrogen fixation, forest planting, and animal waste treatment. The National Biosafety Policy, the Forest Code and the Rural Environment Registry – known as the CAR – are instruments designed to promote sustainability in agriculture (see Chapter 4).

I.3 Sub-national Innovation in Brazil

In 2019, for the first time, the Northeast region of Brazil attracted the highest number of Chinese projects, mainly in infrastructure and energy sector projects (14, CARIELLO, 2021) when compared with other regions. This performance is the result of continuous efforts made by state governors in the Northeast to attract Chinese investments, organised as a Northeast Consortium and highly aligned with the investments made by Chinese companies in other countries (i.e., infrastructure, natural resources, sustainable development).

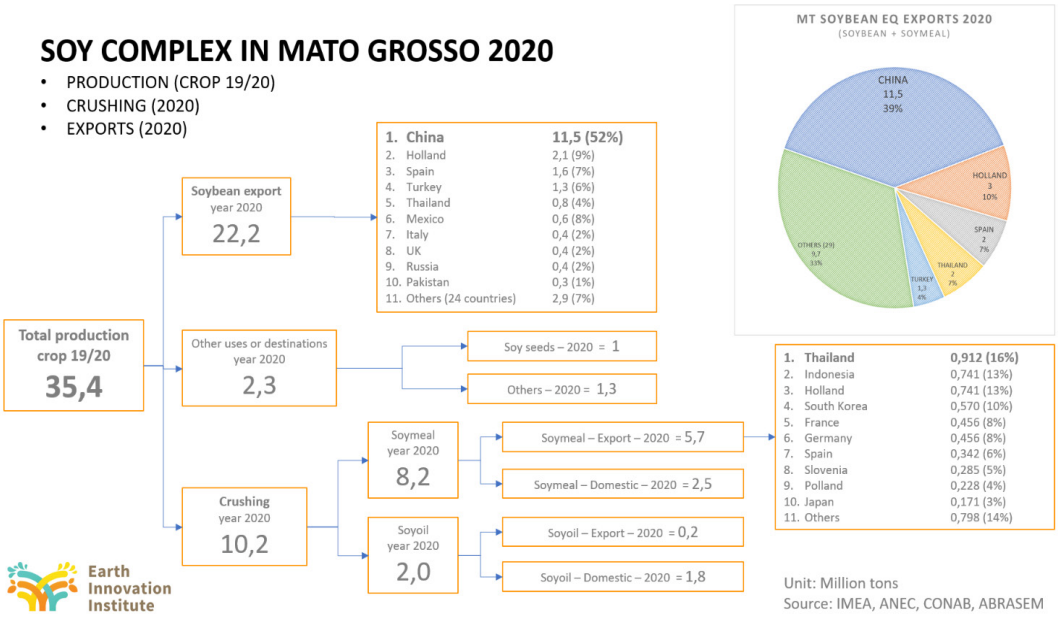
By establishing sustainable sourcing agreements with its tropical suppliers of agricultural products, China could address two major national concerns: climate change and the security of its food imports. To be feasible, sustainable sourcing agreements involving China must deliver large volumes of sustainable commodities at very low added costs.

A "jurisdictional" approach (Nepstad et al., 2013) to sustainable sourcing is the best way to meet these twin challenges, where sustainability is measured at the scale of large political geographies such as states in the case of Brazil. Jurisdictional approaches are potentially far more cost effective than farm-by-farm sustainability approaches, especially if public policies and farm credit programs in the producing region are aligned to support sustainability targets.

Brazilian states that are major exporters of soybean and beef have made important progress in developing the necessary policies to slow deforestation. The front-runner in Brazil developing state-wide strategies for sustainable sourcing is Mato Grosso. This state is slowing deforestation and GHG emissions, and has already established public-private partnerships and market agreements that provide a solid foundation upon which to build sourcing agreements with China market players.

Mato Grosso is the largest producer of soybean in Brazil, growing 36 million tons in 2021. China is the largest market for Mato Grosso, importing 11 million tons (10% of its total imports) of soybean from Mato Grosso in 2020 (Figure 6). The state has reduced deforestation from an average of 7,800 km^2/yr in 1996 to 2005 to 1,600 to 1,800 km^2/yr in recent years (INPE/PRODES, 2021). Mato Grosso alone has avoided the emission of 3.5 billion tons of CO_2 within its borders by slowing deforestation (Nepstad et al., 2022).

Figure 6: Mato Grosso soy complex flows in 2020. China is the main destination for soybeans



Source: IMEA, ANEC, CONAB, and ABRASEM; modified by the authors

Mato Grosso's progress towards sustainability is poised to continue through its "Produce, Conserve, Include" strategy, announced in Paris during the COP-21 in 2015. The "PCI" strategy features time-bound targets and milestones for addressing the agricultural production, environmental conservation, and social inclusion issues. These targets include (a) reduce deforestation by 90% and 95% in the Amazon and Cerrado region by 2030, respectively; (b) re-establish forest on 2.7 million hectares by 2030; (c) increase beef productivity while expanding soy production; (d) eliminate illegal deforestation by 2020; and (e) provide technical assistance to the smallholder farmers of the state to achieve greater market access. The PCI strategy would also mean that the state achieves net zero emissions of forest carbon by 2030, which would be remarkable given the high historical levels of carbon emissions — roughly 300 to 400 Mt CO_2/yr in the early aughts (Nepstad et al., 2022).

The Mato Grosso PCI is an excellent laboratory for developing an operational jurisdictional sourcing system for soy and beef with clear annual performance targets, rules for determining compliance with the agreements, and incentive systems that favor performance at the highest level.

Since 1996, Mato Grosso State and Shaanxi Province have had a cooperation agreement. This agreement includes investments in agriculture and the exchange of research, knowledge, and technology. Seventeen of Brazil's 27 states have partnerships with Chinese provinces (Table 1, see Chapter III for case studies).

Table 1: Chinese Provinces and Brazilian States with partner province agreement.

Chinese Provincies	Brazilian States	Started in
Zhejiang	Paraná	1986
Sichuan	Pernambuco	1992
Shaanxi	Mato Grosso	1996
Jiangsu	Minas Gerais	1996
Tianjin	Amazonas	1997
Hebei	Goiás	1999
Shandong	Bahia	1999
Hubei	Rio Grande do Sul	2001
Henan	Santa Catarina	2002
Suzhou	Porto Alegre	2004
Gansu	Goiás	2005
Liaoning	Rio de Janeiro	2006
Guangdong	Sao Paulo	2007
Sichuan	Pará	2009
Jiangxi	Mato Grosso do Sul	2009
Hainan	Paraná	2010
Chongqing	Bahia	2011

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Chapter II The China-Brazil Bilateral Agricultural Trade

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II.1 China-Brazil Agriculture Trade

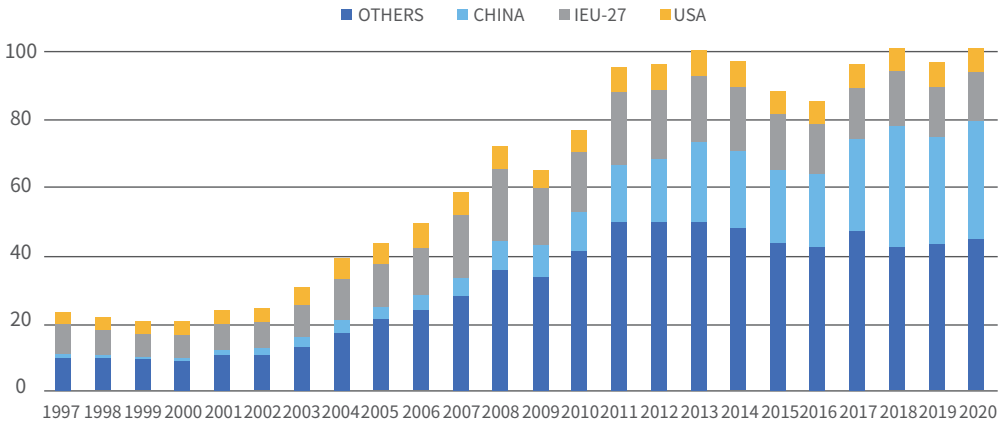
The growth of Brazilian agribusiness in the 2000's coincided with the rapid development of the Chinese economy. The intense process of urbanisation and improvement in per capita income in China brought with it a considerable increase in demand for agricultural commodities, which is directly reflected in its trade relations.

The ultra-high efficiency of China-Brazil economic and trade cooperation in the past 10 years lies in the highly complementary economic relations between the two countries. Despite the diversification, Brazil's exports to China are mainly concentrated in bulk and resource-intensive products (accounting for 80%–90% of Brazil's total exports to China), of which soybeans (36%) and iron ore (30%) account for nearly 70%[1] of the exports.

On the contrary, China's exports to Brazil are mostly diverse industrial products with high added value, covering high-tech and electromechanical products such as electrical machinery, instruments, household appliances, communication equipment, recording equipment, office machinery, and automatic data processors. Although Brazil is not satisfied with the asymmetric trade structure with China, it is difficult to fundamentally change the trade determined by the comparative advantages of the two countries. On the contrary, the trade also shows that China and Brazil are important trading partners in terms of supply and demand.

In the past decade, the performance of the China-Brazil agricultural trade has been solid. Between 2007 and 2013, Brazil's agricultural export to China increased from USD 3.5 billion to USD 22.88 billion. In 2013, China became the main destination for Brazilian agricultural exports, surpassing that of Argentina, the US, and the EU (Figure 7). This growing trend reached a peak in 2020 with U$68 billion shipped (Cariello, 2021). This was the highest amount exported by Brazil to a single partner ever.

Figure 7: Brazil's agricultural exports to China and some selected destinations (1997-2020)



Source: Agrostat - Ministry of Agriculture (modified by Joao Shimada and Daniel Nepstad).

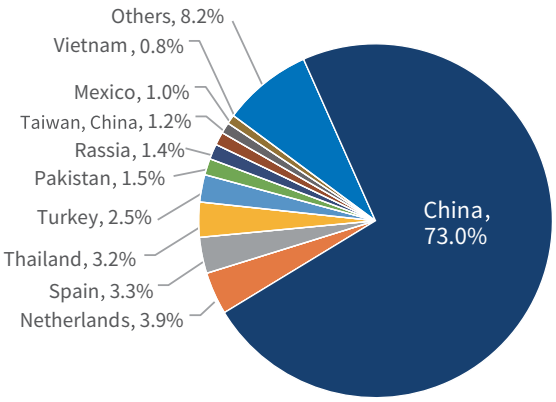
1 Statistical data of Ministério da Economia (http://comexstat.mdic.gov.br/pt/comex-vis)

Also in 2013, China's share of Brazil's total agricultural exports had risen to 22.9%, while the EU's share fell to 20.43%. Since then, China has maintained its position as the top agricultural export market for Brazil, with its share of Brazil's agricultural exports climbing continuously, reaching up to 35% in 2018 due to the China-US Trade Disputes and slightly lower in 2019 mainly due to the impact of the pandemic. Brazil's agricultural exports to China amounted to approximately USD 34.01 billion in 2020, accounting for 33.77% of Brazil's total agricultural exports.

An important highlight of this trend is the high concentration of exports in only few commodities. Soybean, iron ore, and oil represent 75% of the exports from Brazil to China (Cariello, 2021), unchanged since 2000 because of the complementarity: the capacity of Brazil to meet the large and rapidly growing demand of China. Judging from the various exported agricultural products, soybeans, beef, pork, and chicken are the top four most abundant products exported to China.

In the last decade, the share of soybeans in Brazil's total agricultural exports to China has remained at approximately 75%, exceeding the total soybean exports to other markets, making China the most important soybean export market. Brazil's soybean exports to China in 2018 accounted for 82.2% of its total annual soybean exports, which fell back to 78.5% in 2019. In 2020, Brazil's total soybean export value to China was USD 20.9 billion due to a bumper soybean harvest and rigid demand from China, with a year-on-year increase of 2.2%, accounting for approximately 31% of Brazil's total exports to China, remaining the number one product exported to China, and with Brazil's soybean exports to China accounting for approximately 73% of Brazil's total soybean exports (Figure 8). Between January and July 2021, the value of Brazil's soybean exports to China was USD 19.7 billion, with a year-on-year increase of 16.2%, and with the proportion of soybean to its total exports to China increasing to 36% in the same period.

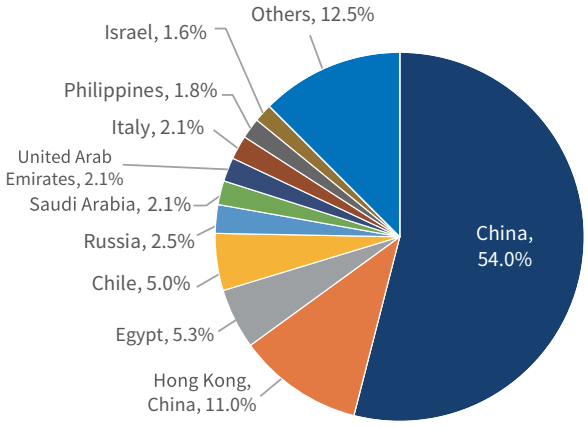
Figure 8: Distribution of Brazilian soybean export markets (2020)



Source: Ministério da Economia (http://comexstat.mdic.gov.br/pt/comex-vis)

Beef exports to China also maintained a rapid growth. Approximately 494,000 tons of beef were exported to China in 2019, with an export value of approximately USD 2.67 billion, representing an increase of 53.2% and 80.1% in export volume and value, respectively, compared to those in 2018, while China's share of Brazil's total beef exports increased from 2.3% in 2018 to 4.3%, securing its position as the largest market for Brazilian beef exports. In 2020, Brazil's beef exports to China amounted to USD 4 billion, a year-on-year increase of approximately 50.3%, accounting for approximately 6% of the total exports to that country, making it the fourth largest product exported to China. Meanwhile, China's share of Brazil's beef exports jumped to 54% (Figure 9). Between January and May in 2021, Brazil's beef exports to China amounted to USD 1.53 billion, a year-on-year increase of 5.41%, accounting for 4.1% of the total exports to China in the same period.

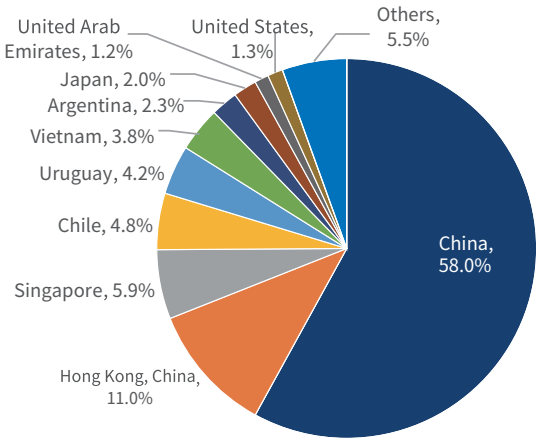
Figure 9: Distribution of Brazilian beef exports (2020)



Source: Ministério da Economia (http://comexstat.mdic.gov.br/pt/comex-vis)

Recently, the export of Brazil's pork to China has increased rapidly. In 2020 alone, the exports amounted to USD 1.23 billion, an increase of 99% compared to 2019 that represents 1.8% of Brazil's total exports to China. China's share of Brazil's total pork exports increased from 42% in 2019 to 58%, which meant that China quickly became the number one market for Brazilian pork exports, largely due to a considerable decrease of pork production in China (Figure 10). Between January and May 2021, Brazil's pork exports to China amounted to USD 600 million, a year-on-year increase of 27% and accounting for 1.6% of the total exports to China in the same period.

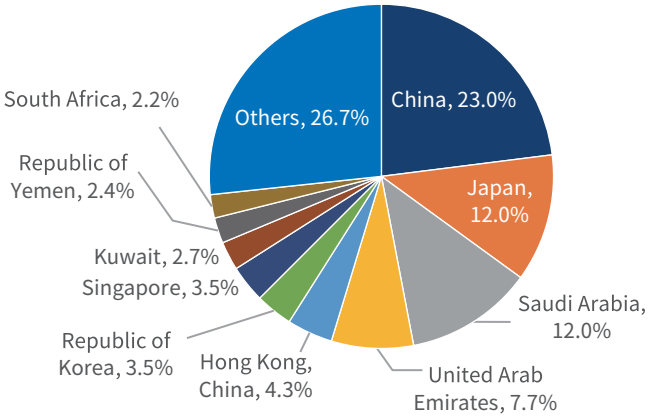
Figure 10: Distribution of Brazilian pork exports (2020)



Source: Ministério da Economia (http://comexstat.mdic.gov.br/pt/comex-vis)

The exports of chicken to China amounted to approximately USD 1.23 billion in 2019, also growing at a year-on-year rate of 53.7%. In 2020, the exports of chicken to China amounted to USD 1.27 billion, a year-on-year increase of 2.49% and accounting for 1.9% of the total exports to China. At the same time, the share of chicken exports accounted for approximately 23%, making China the number one market for Brazilian chicken exports (Figure 11). Between January and May in 2021, the exports of Brazil's chicken to China amounted to USD 479 million, down 17% year-on-year and accounting for 1.3% of the total exports to China in the same period.

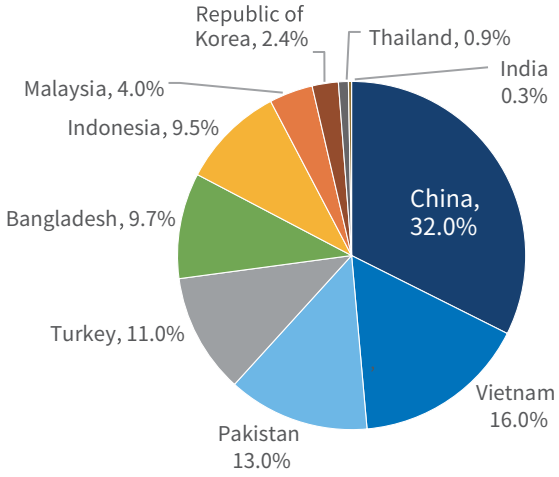
Figure 11: Distribution of Brazilian chicken exports (2020)



Source: Ministério da Economia (http://comexstat.mdic.gov.br/pt/comex-vis)

In summary, regarding the various exported agricultural products, the most important market for Brazilian soybeans, beef, pork, and chicken is China, which is a direct consequence from the China-US Trade Disputes. In addition, it is worth noting that in addition to soybeans and meat products, the growth rate of Brazilian cotton exports to China is also significant, with exports amounting to USD 820 million in 2019, up 56% from 2018, replacing the United States as the largest cotton exporter to China. In 2020, China's imports accounted for 32% of Brazil's total cotton production (Figure 12).

Figure 12: Distribution of Brazilian cotton exports (2020)



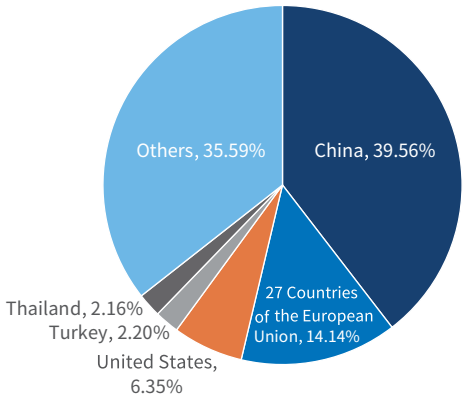
Source: Ministério da Economia (http://comexstat.mdic.gov.br/pt/comex-vis)

Similarly, it is very important for China to import agricultural products from Brazil. Since 2018, Brazil has been China's largest agricultural trading partner. In 2020, Brazil was the top exporter of soybeans, sugar, beef, and chicken to China, with

exports of 64.28 million tons, 3.93 million tons, 850,000 tons, and 690,000 tons, accounting for 64.1%, 74.6%, 41%, and 44% of China's total respective imports. Brazil is also the second largest source[2] of China's cotton imports, with 618,000 tons accounting for 29% of the total imports. In addition, Brazil is the third largest source[3] of China's soybean oil and pork imports, with 210,000 tons and 480,000 tons, accounting for 21.5% and 10.7%[4] of China's total respective imports.

Also according to Brazilian official statistics, between January and May 2021, China's share of Brazil's total agricultural exports was approximately 39.56%, whilst those of the EU's and the US's were approximately 14.14% and 6.35%, respectively (Figure 13). Brazil's exports to China that increased year-on-year included soybean (26.8%), sugar (122.12%), and beef (5.41%), which corresponded to 70.83%, 11.03%, and 54.74% of Brazil's total respective exports. On the other hand, Brazil's exports to China that decreased year-on-year included pulp (8.06%) and chicken (17.12%), with Brazil's total respective exports being 42.08% and 18.71%. Altogether, China ranked first in Brazil's sugar and chicken export markets. It is thus evident from the data that China and Brazil are vital partners in the field of bulk agricultural products trade. On the other hand, this is also a vulnerability; no other country can replace Brazil as supplier and no country can replace China as buyer.

Figure 13: Brazil's share of agricultural products exports (January-May in 2021)



Source: Ministério da Economia (http://comexstat.mdic.gov.br/pt/comex-vis)

2 The largest source is the United States.

3 The top two sources for China's soybean oil imports are Russia and Argentina. The top two sources for China's pork imports are Spain and the United States.

4 Statistical data of General Administration of Customs of the People's Republic of China.

II.2 China-Brazil Collaboration on Sustainable Soy

A closer relationship between Brazil and China requires a strategic alignment on sensitive issues regarding quality control, standards, sanitary measures, and environmental rules. It is important that both countries speak the same language when dealing with these themes, so trade relations can flow easily, benefiting Brazilian producers, Chinese consumers, and the intermediate players in the agri-food value chain.

A set of dialogues has been underway between Aprosoja/Abiove and the China Soy Industries Association (CSIA) since 2015. Individual Chinese soy importing companies have also played a part in these dialogues. A Memorandum of Understanding was signed between Aprosoja (Mato Grosso State Soy Growers Association), Abiove (Brazilian Vegetable Oil Industry Association) and CSIA in 2016, committing the parties to collaboratively develop a sustainable soy sourcing agreement that was mutually satisfactory to all parties.

The agreement has the following work lines: (1) compare China and Brazil regulations on soy, including the soy quality gaps; (2) choose key issues to start the work at short term, and set up the work for medium and long term; (3) start an exchange knowledge by organizing delegations and visits; (4) build a new definition on sustainable soy able to work at large scale and low transaction cost.

In the short and midterm, no other country or region could replace Brazil as a raw material supplier, even with the strategic risk of having such a concentrated portfolio. From a Brazilian perspective, it would be beneficial to expand the number of agricultural products exported to China with an increase in aggregated value products. This shift would face stiff competition mainly from the US and the EU, the main suppliers of high aggregate value products.

The Chinese projections for 2035 (14th Five-Year Plan (2021-2025) for National Economic and Social Development and Vision 2035 of the People's Republic of China) sees GDP doubling per capita, an achievement that would change the consumption pattern, increasing demand for high quality products, proteins, and sustainability. The economic growth of China brings opportunities for partnerships and businesses.

The difficulty in reaching regional and bilateral trade agreements seems to characterise South American countries mainly because of the economic and political instability and lack of long-term planning. Until October 2015, China had signed 13 free trade agreements with another seven under negotiation; only two were signed with South American countries, Chile (2005) and Peru (2009).

If trade and investment dominate the China-Brazil relationship today, innovation, infrastructure, and sustainability will gain relevance within the bilateral agenda. In parallel, if productivity and food security were the main issues in the past, quality and food safety will be as important in the future.

II.3 China's Investment in Brazilian Agriculture

Although Brazil has tightened controls on the foreign investment in land since 2010, it has generally remained open to foreign capital investment in agriculture. The foreign investment system in Brazil is relatively mature, due to the enactment of the Foreign Investment Law of 1964 (Cariello, 2020).[5]

To attract investment, the Brazilian government grants foreign investors with a status similar to domestic ones, and offers them a variety of preferential policies. If the products produced are exported to third countries, the government provides export credits and insurance. The Brazilian government also provides low-interest loans to foreign investors.

In addition, to encourage the development of northern and north-eastern Brazil, the national and local governments have implemented tax breaks on foreign investment. Brazil has enacted many laws and regulations on insurance, credit, and the quality of agricultural products such as the Organic Agriculture Act of 2003 and the Pesticides Act of 1989. Brazil began implementing the new genetically-modified (GM) product labelling regulations in 2013, requiring GM products to be labelled.

Brazil's openness to foreign capital is high in the agriculture sector. At present, only the marine fishing industry in the agricultural sector is not open. As a developing country, Brazil generally lacks agricultural capital and technology compared with developed countries, hence agriculture is an attractive investment target.

According to the statistics of the Conselho Empresarial Brasil-China (CEBC), China's intended investment in Brazil for the 2007–2020 period totals USD 110.6 billion, of which USD 66.1 billion has been confirmed, with an investment implementation rate of approximately 48%.

During this period, China's investment in Brazil can be divided into four phases: the first phase was before 2011, when China's investment was mainly focused on the bulk products industry, especially petroleum, iron ore, and soybeans, which accounted for 83% of China's investment during this phase; the second phase was from 2011 to the first half of 2013, when the focus of investment shifted to the manufacturing industry, aiming to tap Brazil's consumer market; the third phase was from the second half of 2013 to 2014, when China's investment in the service industry rose rapidly, with a significant increase in investment in the financial sector; the fourth phase was from 2014, when power and infrastructure became the key fields of China's investment, and investments in the oil and gas sector, agriculture, and high-tech industries maintained a rapid growth momentum.

In general, the distribution of China's investment in the Brazilian industries between 2007 and 2020 is as follows[6]: electricity 31%, oil and gas exploitation 23%, metal ore mining 11%, agriculture 9%, metallurgy 6%, automobile manufacturing 4%, chemical industry 4%, financial services 4%, infrastructure 3%, and the remaining 6% distributed amongst 14[7] other industries.

Since 2014, China's agricultural investment in Brazil has entered a face of rapid growth, which is mainly reflected in the

5 Carielo.T, 2020. Investimentos Chineses no Brasil, histórico, tendências e desafios globais (2007-2020). Rio de Janeiro - CARIELLO, 2020.

6 Tulio Carielo, Investimentos Chineses no Brasil: Histórico, Tendências e Desafios Globais (2007-2020), CEBC, Agosto de 2021, p.22.

7 They are communication, mechanical equipment manufacturing, information equipment manufacturing, electronic and optical products, electrical equipment material manufacturing, information technology services, air transportation, warehousing and auxiliary transportation, Captação, water treatment and distribution, real estate, pulp manufacturing, paper and paper products, land transportation, retail, maintenance, maintenance and installation of machinery and equipment, and scientific research and development.

acquisition plan by COFCO[8]. In that year, COFCO acquired 51% shares in Nidera Handels compagnie B.V. (hereinafter referred to as Nidera) for USD 1.2 billion. Nidera is one of Brazil's leading producers of soybean and maize seeds and has grain storage and transshipment facilities in major soybean-producing regions, including Mato Grosso and Paraná. In the same year, COFCO acquired 51% shares in Noble Agri's subsidiary in Hong Kong to partner with Noble Agri for USD 1,500 million.

In 2016, COFCO announced another acquisition of the remaining 49% shares in Noble Agri for USD 750 million. Noble Agri's assets in Brazil include a seed processing and storage centre in Mato Grosso, a sugar processing and ethanol production plant in São Paulo, and port facilities in Santos. COFCO's acquisition of the above two companies facilitated the development of the Brazilian agricultural market. This also shows China's increasing dependence on Brazil through its investments in its agribusiness.

In addition, in 2014, the Taida Group acquired Prentis Quimica, an enterprise in Paraná, Brazil, which also reflected Taida's interest in Brazil's agriculture. In 2016, Hunan Dakang Pasture Farming Co., Ltd. and Shanghai Pengxin (Group) Co., Ltd. (hereinafter referred to as Pengxin) jointly acquired 57% shares in Fiagril, a Brazilian grain trading and processing company, for USD 200 million.

China had three investment projects in Brazil related to agriculture and husbandry in 2017, with a total investment of USD 1.356 billion, accounting for 15% of the total investment of China that year. In addition, adding a USD 900-million investment project in warehousing and logistics fields (i.e., totalling USD 2.156 billion), 2017 saw remarkable investment by China in Brazil's agriculture and husbandry market. On the one hand, the China-US "trade war" promoted Chinese investment in other countries, whilst the close bilateral agricultural trade between China and Brazil has driven investment growth. Specific investment projects include CITIC Agricultural Fund and Longping Hi-Tech's joint acquisition of Dow Chemical's maize seed plant in Brazil for USD 1.1 billion; Hunan Dakang Pasture Farming Co., Ltd.'s acquisition of 53.99% share of Brazilian grain company Belagrícola for USD 253 million; Jinhua Brasil's USD 26 million investment in Taquari in Rio Grande do Sul; HNA Modern Logistic and Yangtze River Development Limited's BRL 1.5 billion joint investment in the construction of a warehouse center, including 30 terminals in Mato Grosso.

China increased its indirect presence in the Brazilian agricultural sector by purchasing large international companies with strong positions in the country in 2017. These acquisitions were followed by large investments in mining, oil extraction, energy, and agriculture. Investments were also made in ports and logistics as the largest Chinese banks opened offices in Brazil. A large share of the Brazilian supply of agricultural and food products is tied to the Chinese import demand, with both parties awareness of their mutual dependence. Thus, China has also become an increasingly important investor within Brazilian agribusiness.

In 2018, total investment flows by China in Brazil were USD 3 billion, down 66% from the USD 8.8 billion in 2017. From the investment distribution perspective, the power industry is the most concentrated field of investment by China. In 2018, among the 29 confirmed investment projects, 13 were in the power industry. There are only four projects related to agricultural investment, all of which are intentional investments. As for the first project, the Pingle Group9 announced the opening of a technical and trade representative office in Ponta Grossa, Paraná, and planned to build a spare parts warehouse, with an intended investment of approximately BRL 3.6 million (about USD 700,000). As for the second project, GSPak10 announced the construction of a branch in Castro, Paraná, with an estimated investment of USD 400 million.

As for the third project, GSPak announced the construction of an agricultural product processing plant in Rio Largo, Alagoas, with an estimated investment of BRL 117 million (about USD 23 million). As for the fourth project, Yuren UAV11 announced the investment in the construction of an agricultural drone factory in Mato Grosso, with the intended investment of about USD 22 million.

In 2019, China's non-financial real investment in Brazil was

8 COFCO official website: http://www.cofco.com/

9 Official website of the company: https://www.pinglemachine.com/

10 Official website of the company: http://gspak.com/

11 Official website of the company: https://www.yuren-uav.com/

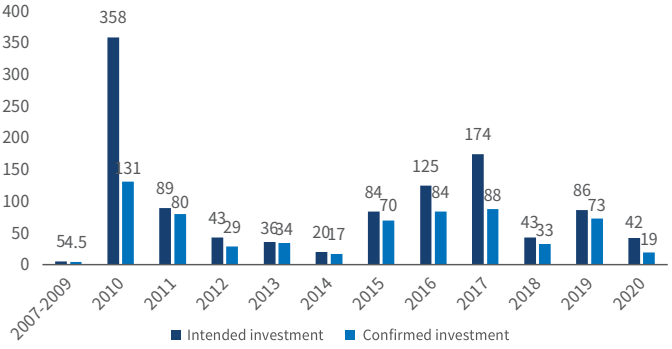
approximately USD 7.3 billion, up 117% that from 2018. This investment was distributed as follows: power sector (57%), oil and gas exploitation (23%), and infrastructure (15%). Despite the significant growth in investment, the number of projects was 25, a 22% decrease compared to that of 2018. Among them, two agricultural investment projects had no specific value disclosed. One of the projects is the Taida Group's acquisition of 100% of the shares in Prentiss Chemical, an enterprise in Paraná, part of Tide Brasil[12], and the other is the establishment of a joint venture by Joey Foods and Minerva Foods, a Brazilian enterprise, for the export of pork to China, with the two enterprises' shares being 51% and 49% respectively.

China's real investment in Brazil was USD 1.9 billion in 2020, down 74% from 2019, making 2020 the lowest investment year since 2014, which is due to the impact of the COVID-19 pandemic and the overall contraction of global investment. The number of announced investment projects was 15, however, only seven projects were implemented. Specifically, China's investment in the power sector accounted for 97% of China's total investment in Brazil, which accounted for 38% of the total investment projects for the year. Two agricultural investment projects had no investment information, including the establishment of an office in São Paulo for FNF Ingredients[13], a Hong Kong company in China; the other was Longping Hi-Tech's announcement of the construction of a maize processing plant and a research center for genetic improvement in Araguari, Minas Gerais.

This shows that China's agricultural investment in Brazil accounted for approximately 3% of China's total investment in Brazil for the 2007–2020 period, amounting to approximately USD 2 billion (Figure 14). China's investment is directly related to the increasingly close agricultural trade between the two countries, for example, the share of agricultural exports to China increased from 35% in 2010 to 50% in 2020, which has directly driven COFCO, Longping Hi-Tech, and the Taida Group to invest in the supply and marketing of agricultural products as well as agrochemicals.

Following, a group of small- and medium-sized Chinese agricultural enterprises entered the Brazilian market. It is worth noting that Chinese enterprises mostly adopted an M&A entry mode to the Brazilian agricultural market, which facilitated the familiarisation with the local market. According to the analysis of specific agricultural investment projects, the focus on production, storage, processing, and transportation of soybeans, maize, and other crops (especially soybeans) dominated. This investment is consistent with the trade of soybeans as Brazil's largest export to China.

Figure 14: China's investment in Brazil between 2007 and 2020 (Unit: USD 100 million)



Source: CEBC

II.4 Logistics of Brazil's Soybeans

Currently, the production-to-port logistics in Brazil is as follows: by road (61.6%), railway (21.7%), waterway (13.6%), pipeline (4.2%), and air (0.4%). However, there are three modes of transportation for soybeans: road, railway, and waterway, of which road and railway transportation account for approximately 47%, and 42%, respectively, while waterway transportation for only 11%, with the average distance from the soybean production area to the port being about 900–1,000 km. From a financial perspective, and based on, the cost of 1,000 km transportation by road, railway, and that of waterway is approximately USD 32, USD 15-18, and USD 7-8. At present, Brazil soybean domestic logistics network includes:

1. Corredor Sul: accounting for approximately 45% of Brazil's soybean logistics. The total mileage of this network is 8,000 km, of which 65%, 31%, and 4% are roads, railway, and waterways, respectively. Within this mileage, there are three ports, namely the Paranaguá Port in Paraná, São Francisco do Sul Port in Santa Catarina, and Rio Grande Port in Rio Grande

12 Official website of the company: https://grupotide.com.br/en/tide-brazil/

13 Official website of the company: http://fnfingredients.com/

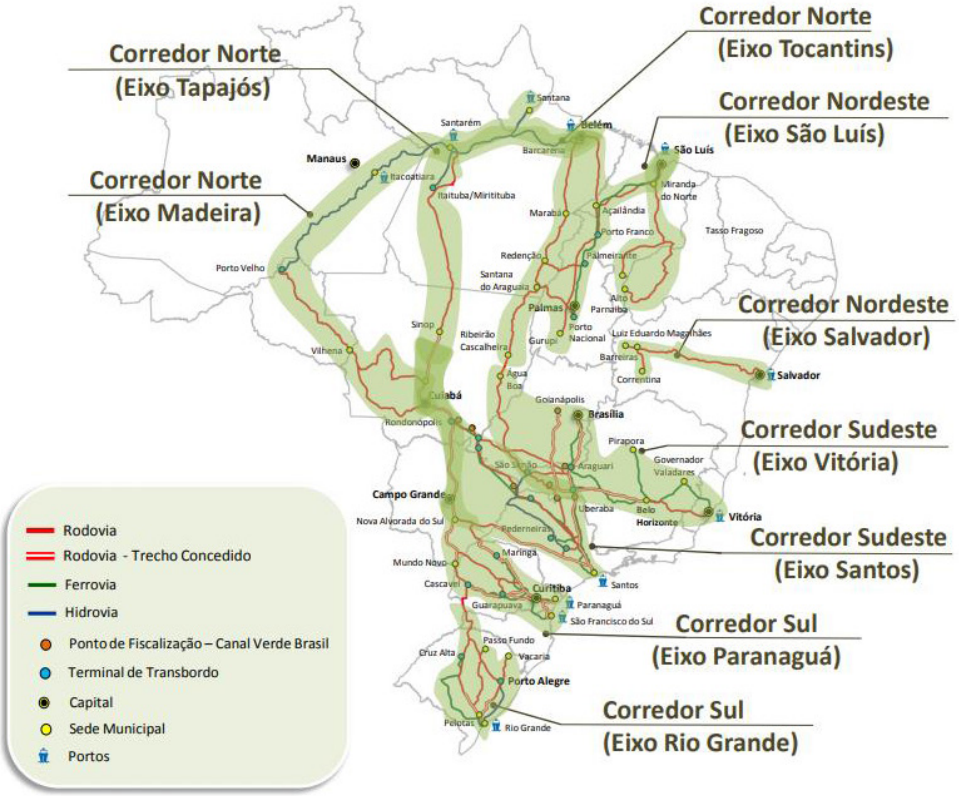
do Sul, and seven transfer stations. The road sections mainly include the BR163 and BR267 within Mato Grosso, BR376 and BR277 within Paraná, and BR386 and BR116 within Rio Grande do Sul. The railways mainly include the ALL and EFPO. Within this mileage, there are five road and one railway sections.

2. Corredor Sudeste: accounting for 31% of Brazil's soybean logistics. The total mileage of this network is approximately 13,000 km, of which 50%, 45%, and 5% are roads, railways, and waterways, respectively. There are two ports, namely the Santos Port in São Paulo and Vitória Port in Espirito Santo, and nine transfer stations. The road sections mainly include the BR364 within Mato Grosso and Goiás, BR163 within Mato Grosso do Sul, BR050 within São Paulo, and BR262 within Minas Gerais. The railways mainly include ALLMP, Ferrovia Centro Atlântica (FCA), and EFVM.

3. Corredor Norte: accounting for 13% of Brazil's soybean logistics. The total mileage of this network is approximately 13,000 km, of which 64%, 10%, and 27% are roads, railways, and waterways, respectively. There are four ports, namely the Santana Port, Belém Port, Vila do Conde Port, and Itaqui Port, and five transfer stations. The road sections mainly include the BR163 and BR158 within Mato Grosso and Par, BR364 within Roraima, BR135 within Maranhao, and BR155 within Par. The railway is mainly the EFC.

4. Corredor Nordeste: accounting for 10% of Brazil's soybean logistics. The total mileage of the network is 3,000 km, all of which are roads. There are two ports, namely the Itaqui Port in Maranhao and Salvador Port in Bahia (Figure 15).

Figure 15: Schematic diagram for domestic soybean logistics network of Brazil



Source: CAN

The main ports where soybeans are exported from include the Santos Port in São Paulo, ranking first in terms of volume, with 21.058 million tons of soybeans leaving the port in 2020, equivalent to 25.6% of Brazil's annual soybean exports (Table 2). The Paranaguá Port in Paraná ranks second in terms of export volume, with 14.26 million tons leaving the port in the same year, accounting for 17.3%. The Rio Grande Port in Rio Grande do Sul, São Luís/Itaqui Port in Maranhao, and Barcarena Port in Par rank third, fourth, and fifth respectively. In addition, in terms of the trade volume, the soybean exporters mainly include ten enterprises, namely Cargill, Bunge, ADM, Louis Dreyfus, Amaggi, Gavilon, COFCO International, Glencore, Coamo, and Engalhart Commodities.

Table 2: Soybean exports from Brazil's ports (2020)

Ports	States	Export volumes (10^4 ton)	Share (%)
Santos	São Paulo	2105,9	25.6
Paranaguá	Paraná	1426,1	17.3
Rio Grande	Rio Grande do Sul	932,4	11.3
São Luís/Itaqui	Maranhao	859,5	10.4
Barcarena	Par	801.7	9.7
São Francisco	Santa Catarina	559,7	6.8
Vitória	Espirito Santo	427,3	5.2
Santarém	Par	370,7	4.5
Aratu/Cotegipe	Bahia	326,2	4.0
Itacoatiara	Amazonas	315,1	3.8
Imbituba	Santa Catarina	77,8	0.9
Santana	Amapa	18,8	0.2
Ilhéus	Bahia	6.3	0.1

Source: Brazilian Cereals Export Association (https://anec.com.br/article/anec-estatisticas-2020)

Chapter III Key Actors and Initiatives in Bilateral Agricultural Economic and Trade Cooperation

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III.1 Role of China's Enterprises in Brazil

Since the turn of the century, three landmark events have successfully promoted the rapid development of the economic and trade relations between China and Latin America and the Caribbean.

Firstly, after 15 years of long and difficult negotiations, China finally joined the World Trade Organization on 11 December 2001, which laid a solid foundation for the opening of the economic and trade relations with Latin America in the new era. Secondly, China issued the policy documents on Latin America in 2008 and 2016, which laid out the development of the economic and trade relations. Finally, marked by the first ministerial meeting, the China-Latin America Forum in 2015, the overall cooperation between China and Latin America started. Under this background, investment, following trade, has become an important driver promoting economic and trade cooperation. Latin America is the second largest region with the most concentrated stock of China's outward direct investment, ranking second after Asia. Brazil, as a country with rich agricultural resources, is the main market for Chinese agricultural investment.

III.1.1 China's Investment in Latin America

Chinese investment in Latin America can be divided into four categories. First, the direct investment in Latin America has significantly increased, however, it is still concentrated in a few countries. The year 2010 has seen a rapid growth in China's investment in Latin America, with a direct investment exceeding USD 10 billion (USD 10.54 billion) for the first time that year, up 43.8% year-on-year. At present, Latin America is the second largest region with the most outward direct investment, ranking only after Asia. The Economic Commission for Latin America report shows that China's direct investment in Latin America between 2005 and 2016 was approximately USD 90 billion, accounting for 5% of the total FDI absorbed by Latin America. In 2017, the expected investment in Latin America was more than USD 25 billion, representing 15% of the total FDI that year, mainly due to the acquisition of several Brazilian power companies. Since 2005, the top three countries in Lain America for Chinese investment (including those estimated in 2017) include Brazil (55%), Peru (17%), and Argentina (9%).[14]

Second, China's investment in Latin America is diversifying. Although a high proportion of the investment is still concentrated in the exploitation of natural resources such as oil and gas and mining, with Huawei and ZTE entering the telecommunications industry and BYD Auto, Chery Automobile, and Jianghuai Automobile entering the automobile industry, China's diversified investment partnership with Latin America has gradually taken shape, with manufacturing, infrastructure, and agriculture gradually becoming new growth points.

The Economic Commission for Latin America report shows that the share of metals and fossil fuels in the value of China's announced investments was 42% and 18% during the 2004–2010 period, and 20% and 6% for 2011–2017, respectively. At the same time, China's investment in Latin American telecommunications, real estate, food, and renewable energy industries is currently on the rise. The energy sector has always been the main value target of merger and acquisition (M&A) by Chinese companies in Latin America, of which 49% shifted to this sector at this stage, whilst 12% entered into the renewable energy sector. Meanwhile, mining and utilities accounted for 9% and 33% of the total value of M&A by China in Latin America, respectively.[15]

14 CEPAL, Exploring new forms of cooperation between China and Latin America and the Caribbean, Jan. 2018, p.56.

15 CEPAL, Exploring new forms of cooperation between China and Latin America and the Caribbean, Jan. 2018, p.57.

Third, the investors are multi-pronged. PetroChina, Sinopec, CNOOC, and Sinochem were once the protagonists of large M&A transactions. However, it should be noted that the ability and resistance of state-owned enterprises in overseas M&A are equal. Due to the nature of "state-owned enterprises", the resistance to central state-owned enterprises is far greater than that of private enterprises. With the support of the Chinese "go global" strategy and improvement of comprehensive strength of enterprises, private enterprises have gradually ramped up their overseas investment. In the future, Chinese investors in Latin America will be more diversified.

Fourth, in terms of investment methods, the initial investment in Latin America was mainly M&A, with less green field investment, closely related to the initial "go global" strategy by Chinese enterprises. Compared with multinational enterprises from developed countries that have long operated in Latin America, Chinese enterprises have less negotiation, operation, and risk control experience. Therefore, the early acquisition of Latin American assets through M&A allows Chinese enterprises to quickly integrate into the local market and reduce transaction costs. With the accumulated experience of Latin American markets, the green field investment[16] will increase correspondingly, which may be more obvious in the manufacturing industry (e.g. automobile or electronics).

III.1.2 China's investment in Brazil agriculture

With the surge in growth of China-Latin America trade, the direct investment also soared in 2010. However, 90% of China's investment in Latin America is concentrated in oil and gas and minerals, with relatively small amounts of capital invested in agriculture, which is less than the European and American investment in Latin American agriculture. At present, agricultural investment is mainly concentrated in fisheries in Peru, sugar cane cultivation in Jamaica, and soybean in Brazil and Argentina. The China's Heilongjiang Beidahuang Land Reclamation Group, Guangxi Land Reclamation Corporation, Chongqing Grain Group, Shandong Guanfeng Group, Shanghai Pengxin (Group) Co., Ltd., Xinjiang Xintian International Economic and Technical Cooperation Co., Ltd., and other enterprises have invested in crop planting in Latin American countries such as Brazil, Argentina, Bolivia, Cuba, Mexico, and Venezuela.

China's agricultural investment in Brazil has the following characteristics. First, a horizontal comparison of the industries revealed that the scale of China's agricultural investment in Brazil was limited compared with the investment in energy resources. According to the foreign investment bulletin released by the Ministério da Economia, China's total investment in Brazil amounted to USD 71.3 billion between 2003 and March 2019, surpassing the US's USD 58.3 billion, making China the largest source of investment in Brazil.[17] However, most of these projects focus on energy development, power supply, resources, and manufacturing, with relatively little investment in agriculture. According to the latest report published by the CEBC, agricultural investments accounted for only 3% of China's total investments over the last 13 years (2007–2020), amounting to approximately USD 1.98 billion.

Second, agricultural investment products and business activities are highly concentrated. Most enterprises invest in selected crops, such as soybeans and sugar, which is mainly determined by the agricultural trade structure between the countries. More than 80% of agricultural trades between the two countries are concentrated in soybeans and soybean oil. Therefore, the most common business activity is to invest in the cultivation and shipping of soybeans back to China, in addition to setting up oil refineries in Brazil to ship the soybean oil and pulp back to China. As a result, this highly concentrated trade structure limits the diversification of China's agricultural investment.

Third, the investors have changed from state-owned dominated enterprises to a diversified trend. China's agricultural enterprises with direct investment in Brazil include COFCO, Sanhe Hopefull Grain&Oil Group Co., Ltd. (hereinafter referred to as Hopefull), Zhejiang Fudi, Shandong Guanfeng, and Chongqing Grain Group. Among them, state-owned enterprises include COFCO and the Chongqing Grain Group.

16 Green field investment, also known as new investment, means that part or all of the assets set up by multinational enterprises and other investors in the host country are owned by foreign investors. This kind of investment will directly lead to the growth of production capacity, output and employment in the host country.

17 Marcos Sawaya Jank, Pei Guo and Sílvia Helena Galvão de Miranda eds., China-Brazil partnership on agriculture and food security, Piracicaba : ESALQ/USP, 2020, p.257.

COFCO is one of the biggest state-owned enterprises of China, and an international grain merchant with global layout and whole industrial chain. By the end of 2020, the total assets of the Group amounted to CNY 669.8 billion, and a total revenue in 2020 of CNY 530.3 billion, with a total profit of CNY 20.6 billion. The Chongqing Grain Group, established in February 2008, is the largest grain merchant group in southwest China, which is a reorganisation of state-owned grain merchant resources. The Group also owns 1.23 million mu of overseas farms in Brazil and Argentina.[18] From the private enterprises, Hopefull, Zhejiang Fudi, and Shandong Guanfeng, the former established trading companies in the United States, Brazil, and Argentina in 2005, entering the raw material production base and starting a new journey for private grain and oil enterprises to deploy overseas.

Fourth, the investment approach has changed from purchasing land to M&A and greenfield investment. Initially, around 2010, Chinese enterprises took advantage of the international financial crisis, which caused asset prices to fall, to conduct "bargain-hunting". During this period, Chinese enterprises mainly bought Brazilian land directly to enter the agricultural field, even when constrained[19] by the adjustment of relevant agricultural policies in Brazil. Then, around 2015, Chinese enterprises, facing the downward prices of primary products and economic downturn in Brazil, carried out conscious development. That is, the agricultural investment entered a new stage of M&A, manifested by the acquisition of assets already operating overseas. M&A is one of the most effective means for Chinese companies to stand firmly in Brazil, because this allows a better control of the mature assets in the domestic market.

Since 2018, the global trade protection trend has intensified. In addition to seizing the favourable low market valuation, which facilitates M&A transactions, more Chinese enterprises have begun to explore the cooperation mode of "construction-operation integration" combining investment, with green field investment beginning to increase.

Fifth, the investment evolving from the link between embedding into the value chain to investment in the whole industrial chain. All agricultural enterprises with international strategic layout have this investment propensity. For example, COFCO International, a subsidiary of the COFCO Group, is accelerating the creation of a unique business model that combines global supply chain with Chinese demand. Relying on the steady growth of the food demand in China and Asia, which organically connects global supply chain systems and grain source control capabilities with domestic logistics, processing and distribution networks continuously deepens the Group's exploration of international operations, and strives to become a world-class integrated agricultural supply chain enterprise. As Baumann (2017) highlighted, China's investment in Brazil's agricultural sector goes beyond the scope of grain production, incorporating the businesses of energy, and railway and port infrastructure, aiming at controlling the many links in the industrial chain.

III.1.3 Investment Cooperation Mode of Key Agricultural Enterprises

According to the CEBC (2017) report, China's investment in Brazil has experienced four different waves. The first wave of large-scale investment was basically of resource-seeking type. In the second wave (2011–2013), China's investment in Brazil showed a sector diversification or market-seeking trend. During this period, Chinese companies focused on the opportunities in the industry (machinery and equipment, automobiles and electronics). During the third wave (2013–2015), the financial services were the main investment target. Chinese banks began to enter Brazil through green field investment or acquisition of shares of Brazilian or foreign banks. The fourth wave started in 2015, which was characterised by Chinese companies investing a lot of money in Brazil's energy industry.

Agriculture has always been an investment target in these four waves. This section will focus on the role of enterprises in agricultural investment and, based on the international practice of three representative enterprises, further elaborate on the agricultural investment cooperation modes in Brazil.

1. COFCO: Quickly realising the internationalisation strategy through M&A

18 Including 780,000 mu of Happy Plateau Farm in Brazil, 250,000 mu of Sunshine Farm in Brazil and 200,000 mu of Aijia Farm in Argentina.

19 Since the global food crisis in 2007-2008, a trend of restricting foreign investment in land purchase gradually appearing in South American countries. At that time, Argentina and Brazil had introduced laws to restrict foreign investment in land purchase.

Globally, COFCO vigorously promotes the expansion of its overseas layout and continuously improves the global grain and oil logistics and storage capacity to ensure the stability of the international supply chain, forming a trade logistics network of agricultural products covering the main producing and selling areas. It is mainly engaged in the procurement, storage, processing, transportation, and trade of bulk agricultural products such as cereals, oils and fats, sugar, meat, and cotton, and has established a stable food corridor connecting emerging markets between South America and Asia. Through the global integrated network layout, COFCO, through its holding COFCO International, is committed to building a comprehensive industrial chain development integrating storage, processing, logistics, sales, trade and distribution on a global scale, so as to achieve efficient operations and low system costs with the overall synergy advantage.

Between 2012 and 2017, when the prices of the major international commodities were in a downward cycle and investment opportunities due to low market valuation were prominent, COFCO, through its subsidiary COFCO International, actively carried out M&A activities to promote their international strategic layout. It has been the most important two-step internationalisation staged strategy to acquire Hong Kong Noble Agri[20] and Nidera[21].

With regard to the acquisition of Noble Agri, COFCO and the International Investment Group (an investment group organised under the leadership of Houpu Fund) acquired 51% equity for USD 1.5 billion and renamed it COFCO Noble Agri in April 2014. By the end of 2014, the sales amounted by COFCO Noble Agri reached USD 14.9 billion, operating 46 million tons of agricultural products worldwide, with 45 subsidiaries and institutions in 29 countries and 9,500 employees. COFCO Noble Agri mainly deals with procurement, processing, storage, and marketing of agricultural products in South America, Africa, Europe, Asia (including India and China), and Australia, involving grains, oilseeds, sugar, ethanol, cotton, coffee, and other varieties. In addition, logistics and processing assets are strategically located in the main flow routes of global agricultural trade.

In December 2015, COFCO and the Noble Group reached a new agreement where COFCO International would acquire 49% equity of COFCO Noble Agri held by Noble Group for USD 750 million. After the completion of this transaction, COFCO International holds all the equity of COFCO Noble Agri, which was renamed COFCO Agri. The company directly connects its upstream grain source control and trading assets to the downstream processing and distribution network of COFCO's subsidiaries, forming an upstream and downstream integration pattern conducive of further layout optimisation for COFCO's global industrial chain.

Taking the phased acquisition of Nidera as an example, COFCO and the International Investment Group (an investment group organised under the leadership of Houpu Fund) acquired 51% equity of Nidera in February 2014. By February 2017, COFCO International acquired 49% equity of Nidera Agri held through Cygne Company.

Nidera is a world-renowned international agricultural product and trading enterprise with annual sales exceeding USD 17 billion. Founded in Rotterdam, the Netherlands in 1920, Nidera is currently engaged in the local distribution and international trade in 18 major import and export countries, with its products sold to more than 60 countries worldwide.

To date, COFCO International owns all the equity of COFCO Agri and Nidera Agri. Through COFCO International, the company integrated the global strategic assets of COFCO Agri and origin and trade advantages of Nidera Agri, and gradually became the fifth largest multinational grain merchant22.

2. Sanhe Hopefull Grain & Oil Group Co., Ltd.: Improving the enterprise competitiveness by extending the industrial chain

Sanhe Hopefull Grain & Oil Group Co., Ltd. (hereinafter referred to as Hopefull), founded in October 1999, is a comprehensive enterprise group focusing on soybean processing. It is a key leading enterprise in national agricultural industrialisation, with Hopefull edible oil and soybean meal as its main

20 Noble Group is a global supply chain manager, whose business is distributed across five fields: agriculture industry, energy industry, logistics industry, finance industry as well as metal, mineral, and ore industry.

21 Nidera is a world-renowned international agricultural product and trading enterprise. Founded in Rotterdam, the Netherlands in 1920, the company focused on trading grain, oil and food in the Netherlands, east indies, Germany, Britain, Russia, and Argentina in its early stage, hence its name.

22 The four major international grain merchants include ADM (Archer Daniels Midland), Bunge, Cargill, and Louis Dreyfus, which are referred to as the "ABCD" in the industry.

products. The company's business involves grain and oil processing, international trade, logistics and transportation, business hotels, and other sectors.

The Group set up an investment holding company in Brazil, established a close cooperative relationship with local farmers, and selected agricultural production areas with room for development. In addition, they established a complete inland warehousing and logistics system, and set up its own procurement system for soybean at the source. In December, 2010, the Group successfully acquired 40% equity of the private grain wharf project at São Francisco do Sul Port, Brazil, obtaining 10 million tons of annual soybean, breaking through the bottleneck of port logistics and becoming the first domestic grain and oil processing enterprise to participate in the construction of overseas port warehousing.[23]

In short, infrastructure is an important factor restricting agricultural development. Hopefull has therefore opened up an important channel for the circulation of agricultural products through the establishment of warehousing and shareholding wharfs, and enjoyed industrial chain dividends from investing industries with reduced transaction costs.

3. Hunan Dakang International Food & Agriculture Co., Ltd.: Building an international platform for agricultural materials and food trade

Hunan Dakang International Food & Agriculture Co., Ltd. (hereinafter referred to as Dakang Agri), founded in 1997, was originally a pig breeding enterprise. It was listed as Class A Share at the end of 2010, and changed its ownership structure after introducing the investor Pengxin, thus gradually clarifying the strategic positioning of "agriculture + food" and the development concept of "global resources and Chinese market". In the field of agricultural materials and food trade, Dakang Agri invested and acquired two Brazilian companies, Fiagril and Belagricola in 2016 and 2017, respectively, based on the research and judgment of the increasing proportion of agricultural products (such as Brazil soybean) in the Chinese market and its strong demand for agricultural materials such as pesticides, and considering the national food security.

Located in two major agricultural producing areas in Brazil, these two companies are the largest platforms for selling agricultural means of production and purchasing grain in Mato Grosso and Parana, have a business history of nearly 30 years, and have established an excellent brand reputation. By providing farmers with one-stop service for purchasing agricultural means of production (including seeds, pesticides, fertilisers, and other products), Dakang Agri maintains close cooperative relations with local farmers, and establishes a sound sales system and a complete industrial chain integrating grain purchase, warehousing, logistics, and export, controlling nearly 7 million tons of grain resources, accounting for approximately 4.7% of the Brazilian grain market.[24]

In summary, the agricultural investment cooperation modes of the three enterprises in Brazil have their own characteristics: COFCO relies on M&A to realise its internationalisation strategy; Hopefull pays attention to building investment in industrial chain, including warehousing and logistics; Dakang Agri establishes a platform for agricultural materials and grain trade. However, the global industrial and value chain have been adjusted towards "near-shore production", digitalisation and regionalisation in the post-pandemic era, and the agricultural investment of Chinese enterprises in Brazil will be faced with more severe challenges.

III.2 Role in the Financial Industry and China-Brazil Cooperation

The modes of financial cooperation between China and Brazil mainly include loan financing, mutual establishment and M&A of financial institutions, cooperation in the field of financial derivatives, establishment of investment funds, and financial technology cooperation. Financial institutions are the carriers of financial cooperation. With the continuous development of China-Brazil financial cooperation, three major businessforms

23 Zhao Jianmin: The rapidly developing Sanhe Hopefull Grain&Oil Group, China Grain Economy, No.1, 2015, p. 60.

24 Wang Ye: Dakang Agri: Deeply Working in Overseas Agricultural Resources, Agricultural Economics, October 2020, p. 62.

(development finance[25], commercial finance[26], and corporate finance[27]) have taken shape (Table 3), turning Brazil into a country with relatively complete financial business forms in Latin America.

Table 3: Distribution of Chinese financial institutions in Latin America

Business form	Institution	Country
Developmental financial institution	China Development Bank	Representative offices in: Brazil, and Venezuela Working groups in: Mexico, Cuba, Jamaica, Colombia, Ecuador, Chile, Peru, and Argentina
Commercial finance	Industrial and Commercial Bank of China	Branches in: Mexico, Colombia, Peru, Brazil, and Argentina (clearing bank)
	Bank of China	Branches in: Panama, Colombia, Brazil and Peru
	China Construction Bank	Branches in: Brazil, and Chile (clearing bank)
	Agricultural Bank of China	Representative office in: Brazil
	Bank of Communications	Branch in: Brazil
Corporate finance	Banco XCMG Brasil S.A.	Brazil

Source: collected by the author based on public information

First, development finance is the most important component of China-Brazil financial cooperation. According to Brazilian data, Chinese banks provided approximately USD 42 billion of loans to Brazil between 2007 and 2017, making them the largest recipient of Chinese loans in Latin America next to Venezuela. Of that, 85% came from the China Development Bank (CDB), and most loans went to Petrobras. China's direct investment in Brazil is mainly M&A, which targets foreign-owned enterprises and Brazilian local enterprises.[28]

Second, layout of commercial finance has basically been completed and started to exert its strength. In addition to the China Development Bank and Export-Import Bank of China, two development and policy-based financial institutions, China's major commercial banks (Bank of China, Industrial and Commercial Bank of China, China Construction Bank, Agricultural Bank of China, and Bank of Communications) have set up branches or representative offices in Brazil to provide consulting services, trade settlement, corporate credit, corporate finance, foreign exchange management and other services for enterprises and individuals engaged in the bilateral trade between China and Brazil. Chinese commercial banks are also actively engaged in investment mergers and acquisitions in Brazil. For example, the China Construction Bank acquired 72% equity in BicBanco in 2013; the Bank of Communications acquired 80% equity in Banco BOCOM (BBM) in Brazil in 2015.

Finally, Chinese enterprises have also begun to explore the establishment of financial institutions to better provide financial services and support to themselves. In October 2019, the BANCO XCMG S.A. was officially approved by the Banco Central do Brasil for establishment, and it is planned to set up a branch or representative office in São Paulo to engage in financial leasing, credit, interbank lending, and investment. The BANCO XCMG S.A. is a 100% foreign bank. The Jiangsu Xuzhou Construction Machinery Group (XCMG), considering that it is still affected by the local financial environment and the unstable BRL value, making its profit level difficult to guarantee since it has been operating in Brazil for many years, hopes that the establishment of financial institutions will help the development of the group and effectively avoid exchange rate risks. The BANCO XCMG S.A. is not only the first overseas bank in China's manufacturing industry, but also the first

25 Development finance is the deepening and development of policy-based finance. It aims at serving the national development strategy, relies on national credit, takes market operation as the basic mode, considers the principle of capital preservation and low profit as the operating principle, and takes medium-and long-term investment and financing as the carrier. It has unique advantages and functions in realising the government development goals, making up for market failures, providing public goods, improving the efficiency of social resource allocation and smoothing economic cyclical fluctuations, and is an irreplaceable component of the economic and financial system. Source: China Development Bank, http://www.cdb.com.cn/kfxjr/gykfxjr/, access date: 1 September 2021.

26 Commercial finance refers to a series of monetary commercial financial activities generated by applying market rules under national industrial policies to guide economic behaviors such as rational allocation of resources and flow of monetary funds. See: Bai Qinxian and Jian Mei: Relationship between Policy-based Finance and Commercial Finance, Shanghai Finance, No.1, 2005; some studies also believe that commercial finance refers to a market-led financial model. See Zhong Chunping, Substitution and Complementary Effects of Commercial Finance and Policy-based finance, Fujian Tribune (The Humanities & Social Sciences Monthly), No.1, 2016.

27 Corporate finance refers to the financial business involved by non-financial enterprises.

28 CICDHA, http://chinaambienteyderechos.lat/reports/, access date: 23 June 2021.

foreign bank directly approved by the Banco Central do Brasil, realising a breakthrough in the combination between industry and finance of Chinese construction machinery enterprises.

III.2.1 Assessing the Commercial Finance Supporting Agriculture

As for finance, the role of leverage may be given full play to promote the rapid growth and capital agglomeration in a short period of time, effectively solve the bottleneck of capital shortage, and provide effective support for industry development and business operation. Using bank credit to raise funds from commercial banks and other financial institutions in the form of loans is the most basic way of financing under the market economy. Banks tend to favor mature enterprises with stable market share and certain fixed assets or land that can be mortgaged, while the bottleneck of capital shortage in asset-light industries is solved by mainly relying on capital market financing, and the use of equity and direct financing.

III.2.1.1 Commercial Finance and Driving Forces for Supporting Agriculture

The main characteristics of commercial finance include: first, the decision-makers are state-owned commercial banks rather than the national government; the second is to pursue profit maximisation; the third is to act as a credit intermediary and implement paid lending; fourth, the profitability, safety, and liquidity of funds are the main operating principles. The support of commercial financial institutions to "go global" agricultural enterprises is mainly reflected in providing completely market-oriented commercial financing and service support with financial market funds as the source. Compared with development finance/policy-based finance, the particularity of commercial financial institutions mainly lies in slightly higher financing costs, relatively diverse business types, stronger service coverage and flexibility, relatively less state-owned components, and so on.

For agriculture and agricultural enterprises, the industry's own characteristics and risk factors, as well as the characteristics of commercial finance, determine the support strength and ways of commercial banks. Firstly, the overall agricultural yield is lower than that of infrastructure construction and other fields, hence it is difficult for commercial banks aiming at profit acquisition to play a greater role. Secondly, the agricultural industry chain is long, and breeding, planting, purchasing, processing, and distribution are interlinked, especially affected by the unstable factors of agricultural product prices (for example, the prices of agricultural products such as soybean, maize, and coffee are greatly influenced by the market supply and demand), which leads to the uncertainty of agricultural yield and insufficient attraction of agriculture to commercial finance.

Thirdly, more perfect post-market services need to be established for agriculture, especially the establishment of agricultural cooperatives to cope with price changes, which is obviously inconsistent with the nature of commercial finance's pursuit of maximising profits. Finally, there is exchange rate risks in taking US dollars as the main currency for agricultural product trading, while commercial financial support has insufficient driving forces.

III.2.1.2 Existing Commercial Financial Models

Commercial financial institutions mainly rely on established strategies and their own funds, services and customer resources in the market to provide financial support to foreign agricultural cooperation projects. At present, the commercial financial support modes in the agricultural cooperation between China and Brazil mainly include trade financing, bilateral loans, syndicated loans, etc. The financial network has not yet been established, and the product system is still incomplete, thus the potential of supporting agricultural enterprises to go global needs to be tapped.

1. Trade financing

Trade financing refers to short-term financing or credit facilities provided by banks to importers or exporters and related trade settlement. In commodity trading, trade financing refers to the financing made by banks using short-term structured financing instruments, which is based on assets such as inventory, advance payment, and accounts receivable in commodity trading (such as crude oil and agricultural products). Borrowers in financing have no other production and business activities, substantial assets on the balance sheet, and independent repayment ability other than the income from commodity sales. Trade financing can promote the import and export between countries and enterprises, and it is the most basic form of commercial finance.

Agricultural production has certain cyclical characteristics, and its capital demand is cyclical and temporary. At the same time, some external factors (such as requirements for environmental and community protection) will also lead to phased requirements for funds, which all require flexibility.

2. Bilateral loans

Bilateral loans, also known as "government loans", have an intergovernmental cooperation nature. For example, the "Special loan for China-Latin America infrastructure projects"[29] of USD 20 billion launched by the China Development Bank is a government loan, which can be used to support Chinese enterprises to participate in energy, roads, communications, ports, logistics, electricity, mining, agriculture, and other infrastructure projects in Latin American and Caribbean countries.

This kind of financial support is operated by the current market interest rate and commercialisation mode, and the specific credit structure and conditions are determined based on the project, considering factors such as project duration, rate of return, and ownership. For example, relevant projects in the "Special loan for China-Latin America infrastructure projects" shall contain Chinese elements (i.e. equipment and services from China) of not less than 60% of the total investment, the total loan amount shall not exceed 70% of the total project investment in principle, and Chinese institutions and enterprises are encouraged to participate in the capital investment of the projects.[30]

Bilateral loans refer to medium and long-term loans provided by commercial banks to enterprises to compensate for the shortage of working capital or fixed assets expenditure, or those for other general corporate purposes. The advantage of bilateral loans lies in that banks can provide more independent, flexible, and customised services when negotiating with enterprises. The advantage of using bank loans for financing is that the source of funds is abundant, and the security of obtaining loans is high when the loan conditions are met.

The loan period can vary according to the actual needs of the project, the repayment method is relatively flexible, and the financing cost is generally low. The key problem that must be solved when using bank credit for financing is the loan conditions. If the profitability of the project itself is not strong and the possibility of project financing is very small, collateral guarantee must be provided as the repayment bond.

3. Syndicated loans

Syndicated loans refer to the business in which two or more lenders jointly provide loans to one or more borrowers under the same loan conditions and different division of labour, and sign the same agreement. Usually, a bank will be selected as an agent to manage the loan on behalf of the syndicate members. Syndicated loans have four characteristics: first, the loan amount is large and the term is long, which can meet the long-term and large-scale capital needs of borrowers. It is generally used for new project loans in transportation, petrochemical, telecommunications, electric power, and other industries, large-scale equipment leasing, enterprise merger, and acquisition financing; second, financing takes less time and energy. After the borrower and the arranged bank agree on the loan conditions, the bank is responsible for the formation of the syndicate.

In the loan enforcement stage, the borrower does not need to face all the syndicate members, and the related loan management (such as withdrawal, repayment of principal and interest) is completed by the agent bank; third, syndicated loans are offered in various forms. Within the same syndicated loan, various forms of loans (such as fixed-term loans, revolving loans, and standby letter of credit limits) may be provided based on the borrower's needs, and different currencies or currency combinations such as RMB, US dollars, Euros, and British pounds can also be selected based on the borrower's needs; fourth, it is beneficial for the borrower to establish a good market image. The successful formation of the syndicate is based on the full recognition of the borrower's financial and operating conditions by all participating banks, and the borrower can take this business

29 In July 2014, President Xi Jinping attended the meeting of leaders of China-Latin America countries and the Caribbean countries held in Brasilia, and announced that China will formally launch a USD 10 billion special loan for China-Latin America infrastructure projects and will, on this basis, further increase the credit line to USD 20 billion.

30 Economic and Commercial Counsellor's Office of the Embassy of the People's Republic of China in Suriname, "Explanation on applying for special loans for China-Latin America infrastructure", http://sr.mofcom.gov.cn/article/ddfg/Qita/201506/2015060102280.shtml, access date: 20 June 2021.

opportunity to expand his reputation.[31]

III.2.1.3 Future Development of Key Modes: Green Finance and Sustainable Agriculture

China and Latin American countries have all entered a critical period of economic restructuring and transformation of development mode, and the development of green finance has received increasing attention. In the field of agriculture, the importance of sustainable practices in the China-Brazil agricultural cooperation has recently increased. In May 2021, the Ministers of Agriculture of China and Brazil both mentioned the importance of "sustainable agriculture" to their respective countries and the exchange and mutual learning of development experience during the "China-Brazil Sustainable Agriculture Dialogue".

Green finance has emerged with the low-carbon economy, which has received attention worldwide. The Superfund Act promulgated by the United States in the early 1980s stipulated that enterprises must bear the responsibility for environmental pollution, and commercial banks shall pay more attention to the credit risk of those enterprises with potential environmental pollution. Green finance refers to the allocation of established funds in the green industry of energy conservation and environmental protection to minimise environmental pollution and maximise capital gains through the optimal allocation of financial resources. Latin American countries have high environmental vulnerability and protection requirements. The Sino-US trade friction gave birth to the external demand of Chinese agriculture, Brazil's abundant agricultural products became the direct profit-winner, and China's demand for soybeans surged, causing domestic tension that China's growing demand would destroy Brazil's land carrying capacity.

China's commercial banks shall look to better adapt to the China-Brazil agricultural cooperation and participate in local environmental protection. Sustainable green financial strategies and well-known green financial brands shall be established in terms of strategic positioning. Therefore, it is necessary to define three major goals: strive to assume corporate environmental and social responsibilities, and enhance the industry responsibility image of Chinese financial institutions; seize the opportunity of global agricultural cooperation to promote the green and low-carbon development of the China-Brazil agricultural trade chain; optimise the structure of financial products, and effectively prevent the risks of violating environmental protection policies.

At present, the enterprises and investments from China are often criticised for their low environmental standards in many Latin American countries. For example, Shougang Group, which entered Peru in 1992, has been troubled by local resident communities for many years because of "environmental standards". The national governments in Latin America have formulated and implemented a series of social and environmental laws and standards, and urged their important trading partners (such as Chinese companies and those companies that export to China) to abide by these rules and regulations.

For example, Shougang Hierro Peru S.A.A. listed a column in its official website to disclose compliance with environmental standards[32]. Commercial banks shall consider the whole and take low-carbon integration as an opportunity to strengthen internal integration and improve operational efficiency; at the same time, they shall emphasise and implement the concept of green finance, carry out environmental standards throughout the operation and development of financial institutions, and increase the resource investment of commercial banks in green credits, bonds, and asset-backed securities.

III.2.2 Case Study

There are seven Chinese agricultural enterprises with direct investment in Brazil. According to the investigation report of the "China Global Investment Tracker" project by the American Enterprise Institute (AEI), four Chinese enterprises have invested in Brazil with an amount exceeding USD 100 million (Table 4)[33].

Chongqing Grain Group, the first Chinese agricultural enterprise to enter Brazil, established Brazil Green Tiandi Agriculture Co., Ltd. in 2011 in Salvador, Bahia, which is engaged in farm development and cultivation, trade and investment of agricultural products, and obtained 1.03

31 Bank of China, https://www.boc.cn/lu/cbservice/cb4/201711/t20171130_10808409.html, access date: June 30, 2021.

32 See SHOUGANG HIERRO PERU S.A.A., http://www.shougang.com.pe/pcambiental.htm, access date: 12 September 2021.

33 Six Chinese enterprises mentioned in the speech of Tang Renjian (the Minister of Agriculture) on the "China-Brazil Sustainable Agriculture Dialogue" in May, 2021.

million mu (68,000 hectares) of agricultural planting land with permanent property rights in Brazil. The projects of managed by the Chongqing Grain Group in Brazil are self-funded, mainly by loans from domestic financial institutions, with high interest rates for short-term loans and long-term investments. It tried to lend abroad, but it ended due to high interest rates.

COFCO, Pengxin, and Longping Hi-Tech successively entered the Brazilian agricultural market through acquisitions. As mentioned above, COFCO International Co., Ltd. (i.e., COFCO International), a subsidiary of the COFCO Group, acquired all the residual equity in Nidera Agriculture held by Dutch Cygne Company in 2016, and held 100% of the equity in Nidera Agriculture.

Pengxin controls nearly 7 million tons of grain resources (serving a total of 14,000 farmers and covering 80,000 km2 of cultivated area, accounting for approximately 2% of the arable land in 2016) in Brazil through the acquisition of two local companies. These two Brazilian companies use the asset-light business model to sell seeds, pesticides, and technologies to large local growers. After harvesting crops such as soybeans and maize, foreign growers pay for such companies with crops. This "bartering" core supply and marketing model locks the quantity of agricultural products that can be received in the harvest season in advance, thus ensuring the supply of agricultural products. It not only improves the bargaining power with large international grain merchants, but also enhances the stability of soybean sources and trade initiative. In this process, the revenue mainly comes from the gross profit and interest difference of agricultural materials such as chemical fertilisers, pesticides, herbicides, etc. Instead, the finally paid agricultural products are not the main profit points, which also avoids certain operational risks. In addition, Pengxin has set up a risk management center in Brazil to control risks in exchange rate, price, and credit.

In November 2017, CITIC Agricultural Fund, together with Longping Hi-Tech, completed the acquisition of the Brazil maize seed project of the Dow Group[34] through special overseas fund raising. The consideration of this transaction is USD 1.1 billion, and the target assets include the maize germplasm resource bank of the Dow Group in Brazil, R&D and production center, and the ownership of advantageous brands. CITIC Agricultural Fund and Longping Hi-Tech will further integrate the acquisition of assets, lay out overseas agricultural investment, and accelerate Longping Hi-Tech's development from a domestic market leader in China to an internationally competitive global seed company, which indicates that Longping Hi-Tech has taken substantial steps towards internationalisation.

Table 4: Business of Chinese agricultural enterprises in Brazil

Time	Enterprise	Project	Total investment	Capital model
2011	Chongqing Grain Group	Greenfield investment in Happy Plateau Farm	BRL 570 million*	Self-raised funds, and direct loans from domestic financial institutions
2013	COFCO	Greenfield investment	USD 320 million	Self-raised funds
2014		Acquisition of Noble Group	USD 750 million	Unknown
2016	Shanghai Pengxin (Group) Co., Ltd.	Acquisition of 57.57% equity of Fiagril, a Brazilian grain trading company	USD 290 million	Unknown
2017		Acquisition of 53.99% equity of Belagricola, a Brazilian grain trading company	USD 250 million	Unknown
2017	Longping Hi-Tech	Acquisition of Brazil maize seed project of the Dow Group	USD 1.1 billion	Special overseas fund raising of CITIC Agricultural Fund

Note: *The data from the American Enterprise Institute (AEI) is USD 570 million, and the data provided by Chongqing Grain Group is BRL 140 million.

Source: American Enterprise Institute (AEI), https://www.aei.org/china-global-investment-tracker/.

34 Dow, which is a leading diversified chemical company, runs the principle of sustainability through chemistry and innovation, and is committed to solving many challenges in the contemporary world, such as meeting the demand for clean water, improving energy efficiency, realising the production of renewable energy, increasing crop yield, and so on.

III.3 "The Belt and Road" Initiative Embodied in Brazil

Since the launch of "the Belt and Road Initiative" (BRI) in 2013, it has opened a new era of China's opening to the outside world to gradually become one of the important pillars to promote global multilateral cooperation and the development of emerging economies. Latin America has gradually become an important participant and beneficiary of the BRI since 2017. The cooperation between China and Latin American countries in the fields of policy coordination, unimpeded trade, facility connectivity, financial integration, and people-to-people bond has been increasingly strengthened, pushing bilateral relations towards the goal of optimisation, upgrading, and innovative development.

In January 2018, China officially invited Latin American countries to join the BRI at the second ministerial meeting of the China-Latin America Forum held in Santiago, Chile, and China and Latin America jointly issued the Special Statement on "the Belt and Road Initiative", which clarified Latin America's conceptual recognition of the Initiative. Up to now, China has reached consensus with several Latin American countries on "the Belt and Road" cooperation, and 19 Latin American countries have signed the Memorandum of Understanding on "the Belt and Road" Cooperation with China.

As the top power in Latin America and an important emerging economy in the world, Brazil is an indispensable part of China's big power diplomacy in the new era, and also an important node for the extension of the BRI to Latin America. China and Brazil are the largest developing countries in the eastern and western hemispheres, respectively. In addition, they are both members of the BRICS countries and active participants in global governance. The dimension and connotation of comprehensive strategic cooperation between the two countries are highly consistent with the BRI, which provides continuous impetus for "the Belt and Road" cooperation between China and Brazil.

In May 2019, President Xi Jinping stressed during his meeting with Mourao (Brazilian Vice President) that China supports Brazil's prosperity and development, welcomes their participation in the construction of "the Belt and Road", and is willing to strengthen the docking of development plans to achieve common development[35]. Mourao said that the new Brazilian government led by President Bolsonaro continues to attach great importance to the relations with China. Brazil is willing to promote the connection between its "Investment Partnerships Program" and the BRI, expand cooperation in trade, science and technology, innovation and other fields, and welcomes China to expand its investment in the country. In October 2019, the two countries issued a joint statement during President Bolsonaro's visit to China, stating that "China's development policy and international initiatives such as 'the Belt and Road Initiative' may be in line with Brazil's development policy and investment plan such as 'Investment Partnerships Program' "[36].

Although Brazil has not yet signed the BRI cooperation agreement with China, in fact the bilateral pragmatic cooperation has been steadily promoted under its framework as the BRI is highly compatible with the Brazilian government's idea of investment-driven growth. In terms of policy coordination, the two countries established a set of cross-perfect bilateral and multilateral dialogue mechanisms as early as 2009. In May of the same year, the Brazilian Vice President visited China to restart the Sino-Brazilian High-level Coordination Commission and comprehensively promote bilateral policy coordination and cooperation in various fields. The two countries have made use of international multilateral mechanisms such as the G20, BRICS, and BASIC to strengthen communication and cooperation, and make positive contributions to global governance.

In terms of facilities connectivity, as an important partner in Brazil's infrastructure field, China has participated in the construction of a series of infrastructure projects such as hydropower stations, airports, wharfs, and transmission lines. In terms of unimpeded trade, China has been Brazil's largest trading partner for more than ten continuous years, and bilateral trade has grown to a new high against the trend during the epidemic, which fully demonstrates the resilience and vitality of trade relations between the two countries. In terms of financial integration, the importance of China's investment for the development of Brazil has

35 Website of the National Development and Reform Commission of the People's Republic of China, Xi Jinping Met with Brazilian Vice President Mourao: Welcome Brazil's Participation in Building "the Belt and Road", https://www.ndrc.gov.cn/fggz/gjhz/zywj/201905/t20190531_1106844.html?code=&state=123

36 Website of the Ministry of Foreign Affairs, Full text: Joint Statement between the People's Republic of China and the Federative Republic of Brazil, http://new.fmprc.gov.cn/web/zyxw/t1710767.shtml

become increasingly prominent. The two sides maintain close cooperation in international multilateral financial institutions such as the Asian Infrastructure Investment Bank (AIIB) and BRICS New Development Bank (NDB), and also enjoy important bilateral and multilateral mechanisms such as the China-Brazil Capacity Expansion Cooperation Fund (hereinafter referred to as "China-Brazil Fund"), China-LAC Cooperation Fund (hereinafter referred to as "China-LAC Fund"), and China-LAC Capacity Cooperation Investment Fund. Among them, the BRICS New Development Bank was jointly established by BRICS countries to provide funds for infrastructure and sustainable projects in emerging economies (such as BRICS countries) and developing countries.

In April 2017, BNDES and the BRICS New Development Bank signed the first agreement for Brazil, involving a total loan of USD 300 million with a 12 years term, which is mainly used for developing renewable energy projects in Brazil. In addition to supporting infrastructure and sustainable projects, the New Development Bank also provides financial guarantee for member countries to weather the economic crisis safely. After the outbreak of the COVID-19, the New Development Bank announced that it would provide Brazil with a loan of USD 1 billion to support the government in providing emergency subsidies to low-income people during the epidemic.

At the same time, Brazil also actively responded to China's initiative to establish the Asian Infrastructure Investment Bank. The Brazilian government announced its willingness to join in March 2015. However, due to political turmoil and shortage of funds, the Brazilian Senate finally passed the text of the Asian Infrastructure Investment Bank Agreement on 5 August 2020, thus approving Brazil to become a founding member of the Asian Infrastructure Investment Bank. Brazil originally planned to subscribe for the share capital worth USD 3.18 billion, but it later reassessed the amount, and finally set at USD 5 million due to financial constraints. As a member of the Asian Infrastructure Investment Bank, Brazil will have the opportunity to participate in the financing activities of infrastructure construction projects in Asia and other parts of the world. The China-Brazil Fund originated from the intention reached with the Brazilian government to set up a mutual fund for bilateral capacity cooperation during the visit of Chinese leaders to Latin America in May 2015.

In June of the same year, China and Brazil agreed to set up a bilateral mutual fund with a scale of USD 20 billion, focusing on supporting capacity cooperation projects. Since then, the two sides have communicated and formed the Operating Regulations of China-Brazil Fund. According to the agreement, China contributes USD 15 billion to the Fund, while Brazil contributes USD 5 billion. The two sides will jointly seek cooperation opportunities for specific projects according to the market-oriented operation mechanism, make final investment decisions based on commercial principles, and earnestly implement the operational concept of the project-based China-Brazil Fund. The establishment of the China-Brazil Fund is conducive to promoting the "go global" of China's high-quality production capacity and helping Brazil's industrialisation process.

In June 2012, then-Premier Wen Jiabao proposed at the Economic Commission for Latin America and the Caribbean (ECLAC) in Santiago an initiative to establish the China-LAC Fund with an initial value of USD 5 billion. In July 2014, President Xi Jinping visited Brazil and announced the full launch of the China-LAC Fund. The initial value of fund was USD 1 billion, which was to be invested in six fields, including energy resources, infrastructure construction, agriculture, manufacturing, scientific and technological innovation, and information technology, which could be extended to other fields as appropriate. The bidding project for the 30-year franchise of Sao Simao Hydropower Station in Brazil is a typical case of the China-LAC Cooperation Fund implementing the BRI and cooperation consensus of senior leaders of the two countries on clean energy, assisting Chinese hydropower enterprises to "go global" and creating brands in the Latin American market.

Established in June 2015, the China-LAC Capacity Cooperation Investment Fund is a medium- and long-term development investment fund jointly funded by the Foreign Exchange Reserve and China Development Bank, established in accordance with the Company Law of the People's Republic of China, with an initial value of USD 10 billion. China-LAC Capacity Cooperation Investment Fund invests in manufacturing, high-tech, agriculture, energy and minerals, infrastructure, and financial cooperation in Latin America through various means such as equity and creditor's rights, so as to realise the medium and long-term financial sustainability of the Fund. After the Fund was operational, the first equity investment invited other funds to jointly support the Three Gorges Corporation to participate in the bidding project for the 30-year franchise of the Jubia and Ilia Hydropower

Stations (with a total installed capacity of approximately 5 GW) in Brazil.

In terms of people-to-people bond, the increasingly frequent exchanges and cooperation between universities and think tanks of China and Brazil have led to a deep mutual understanding of the people. Especially during the pandemic, the two countries conducted exchanges and dialogues around multi-disciplinary anti-pandemic cooperation in innovative forms such as online seminars and cloud interaction, further tightening the cultural bond.

III.3.1 Progress of the BRI Cooperation between China and Brazil

III.3.1.1 Agricultural Investment

As China builds a moderately prosperous society and starts a new journey of modernisation under the 14th Five-Year Plan, in the process of building a new economic development pattern, the domestic consumer market is becoming more and more perfect, the people's consumption capacity is steadily improving, and the consumption structure is continuously upgrading. Currently, China's GDP per capita has exceeded USD 10,000, making China the largest and most promising consumer market in the world. Over the past five years, China's agricultural imports have maintained an average annual growth rate of 10%. The long-term trend of upgrading the consumption structure of domestic agricultural products and expanding their import will open up a broader space for agricultural cooperation between China and Brazil.

At the same time, the importance of agricultural trade in China-Brazil economic and trade relations is beyond doubt. As mentioned in Chapter I, China has been Brazil's largest agricultural export destination since 2008. In 2020, despite the COVID-19 pandemic and sluggish global trade, the agricultural trade between China and Brazil achieved recession-defying growth. Brazil's agricultural exports to China rose nearly 10% year-on-year to USD 34 billion, accounting for one-third of Brazil's total agricultural exports and half of its total exports to China. Under the guidance of the Belt and Road Initiative, the sustained release of domestic market potential and the outstanding performance of China-Brazil agricultural trade have driven China's agricultural investment in Brazil to increase, mainly characterised by gradual expansion of investment scale, increasingly diversified fields, and continuous improvement of platform construction.

China's non-financial direct investment in Latin America grew rapidly after the global financial crisis in 2008. With the upgrading and adjustment of China's consumption structure and increasingly prominent gap between supply and demand for agricultural imports, China's agricultural investment in Brazil has gradually expanded, becoming an important element of agricultural cooperation between the two countries. Brazil is China's largest agricultural investment destination in South America. More than ten large-scale Chinese agricultural enterprises have taken Brazil as their key oversea cooperation partner, and their investments involve cereal, grain and oil, sugar industry, forestry, fishery, tobacco, and other fields. For example, COFCO, China's largest food processing and trading enterprise, has long been deeply involved in Brazil, with a cumulative investment of nearly USD 5 billion, including projects such as terminals, silos, and soybean factories, as well as ranking among the main cereal exporters in Brazil together with the four dominant grain merchants—the ABCDs (ADM, Bunge, Cargill, and Louis-Dreyfus).

In addition, the governments and relevant organisations of the two countries are also trying to build and broaden the platform for agricultural investment, and further enhance the deep-level cooperation in the agricultural field between China and Brazil. The Brazilian Confederation of Agriculture and Livestock (A Confederação da Agricultura e Pecuária do Brasil - CNA) has set up an agricultural information platform "Fengshoubao Investment" for Chinese investors, providing importers with export demand and investment projects of Brazilian agricultural and livestock products, and sharing information and guidance.

Nevertheless, China's agricultural investment in Brazil is limited in scale and simple in form due to the trade structure between the two countries. The investment report by the Ministry of Economy of Brazil (Ministério da Economia) shows that between 2003 and March 2019, China's total investment in Brazil reached USD 71.3 billion, surpassing that of the United States (USD 58.3 billion) by USD 13 billion, making it the largest source of investment in Brazil. However, most of the investment projects are concentrated in the fields of energy development, power supply, mineral resources, and manufacturing, with relatively small investment in agriculture.

There are seven Chinese-funded enterprises entering the

agricultural field, most of which focus on planting agricultural crops, notably soybeans. These enterprises initially acquired land ownership or land use rights through direct purchase or long-term leases, and then engaged in planting agricultural products with large domestic demand or high import dependence (e.g. soybeans). The most common investment method is that Chinese enterprises plant soybeans in Brazil and ship them back to China, or build refineries in Brazil and ship back soybean oil. With the introduction of land purchase and lease restriction policy in Brazil, enterprises turned to indirectly acquiring related agricultural assets through mergers and acquisitions.

It is worth noting that, in order to guarantee national sovereignty in strategic economic and development areas, in 2010, the Advocate General of the Union (Advocacia-Geral da União) imposed restrictions on foreign enterprises or individuals to purchase land in Brazil. In 2019, Brazil further reduced the permitted area for foreigners to use rural land on the basis of the original laws. Although Brazil prohibits foreign enterprises from purchasing land directly, Chinese enterprises have been able to do so by acquiring Brazilian companies or establishing new companies in Brazil.

III.3.1.2 Investment Cases

1. Fudi Agriculture Group

Zhejiang Fudi Agriculture Group has purchased two farms in Brazil with a total area of 16,800 hectares through its subsidiary; Sol Agrícola is a trinity farm in Tocantins, and the other is Sunshine Farm, in Rio Grande do Sul, which is used for soybean planting. In early 2009, promoted by Zhu Zhangjin, who was then the head of Zhejiang Fudi Agriculture Group and also the village secretary of Huafeng Village, Xieqiao Town, Haining City, Zhejiang Province, the village established the "Huafeng Grain & Oil and Planting Cooperative" to encourage peasant households to voluntarily invest in shares and go to Brazil to engage in agricultural development. He mobilised 732 households to buy shares, attracting capital investment totaling CNY 5.544 million. In June of the same year, three shareholder representatives of the cooperative went to Brazil to plant soybeans. According to Haining Daily, "This is the first farmer team in China to go to South America to develop agriculture"[37]. There are also reports that the Heilongjiang Farms & Land Reclamation Administration also participated in the project by providing large agricultural machinery and assigning technical and management personnel.[38]

Of course, planting soybeans is not the ultimate goal of the investment. The main intention of investors is to obtain raw materials directly from the place of origin by participating in planting and local procurement, and then sell them to China or directly engage in edible oil processing, so as to provide added value for primary products. At that time, with the support of relevant national policies of Brazil, information on Zhejiang Fudi's project in Brazil receiving certain government subsidies in addition to bank financing became available. However, because of a change in investment interest or other reasons, in 2011, Zhejiang Fudi decided to withdraw from Brazil and transferred its assets to Chongqing Red Dragonfly Oil Co., Ltd. (hereinafter referred to as Red Dragonfly Company), a wholly-owned subsidiary of Chongqing Grain Group at that time.

At the end of 2011, Zhejiang Fudi and Zhu Zhangjin signed a Share Transfer with Red Dragonfly Company to transfer 74% equity of Sol Agrícola owned by Zhejiang Fudi to Red Dragonfly Company, which was incorporated into the Sol Agrícola in a wholly-owned manner. According to the document, the assets of Sol Agrícola owned by Zhejiang Fudi include four plots of land in Sunshine Farm and one plot of land in Trinity Farm.

2. Chongqing Grain Group

In view of the fact that the oil business plays an extremely important role in the income of the Group, and with the call and promotion of local governments, Chongqing Grain Group has been finding opportunities to expand overseas since its establishment. Between 2008 and 2010, the Chongqing Grain Group visited Brazil six times. In April 2010, Hu Junlie, Chairman of the Chongqing Grain Group, attended the second meeting of BRICS leaders in Brasilia with the Chinese delegation and officially announced the decision to invest CNY 5.75 billion to build 200,000-hectare high quality soybean

37 Farmers in Huafeng Go to Brazil to Engage in Agriculture. Haining Daily. 19 June 2009. p.1.

38 Situations, Insights and Suggestions on "Going Global" of Heilongjiang Reclamation Area. Northeast Revitalization, National Development and Reform Commission. Work Brief on Revitalization of the Old Industrial Bases, 2010 (107).

bases with Brazil, stating that, in the first phase CNY 2.203 billion will be invested to build a 108,000-hectare soybean base in Correntina, Bahia.

However, just over four months after the announcement of this investment plan, Brazil conspicuously promulgated the Parecer nº LA 01[39], which reinterpreted its Decree 5709, adopted on 7 October 1971. According to the new regulations, foreigners, foreign enterprises or foreign-owned Brazilian enterprises shall not buy or lease lands of more than 50 módulo[40] in Brazil, and the amount of land held by them in a city shall not exceed 25% of the area of the city, and foreigners of the same nationality may not own more than 10% of the city's area. The situation is not known as to whether the introduction of the restriction directly targets the land investment intentions of large Chinese state-owned enterprises such as Chongqing Grain Group.

However, the new policy did not result in the Chongqing Grain Group's investment plan in Brazil being completely aborted, as the outside world imagined. According to Chongqing Daily, on the suggestion of legal experts, the Chongqing Grain Group later cooperated with local farmers to acquire 48% of their real estate equity, and at the same time obtained 51% of the management rights handed over by them according to the contract.[41]

According to the news from Brazil, Jusmari Oliveira, the mayor of Barreiras, had a positive attitude towards Chongqing Grain Group's investment. After the Chongqing Grain Group clearly indicated that it would invest hundreds of millions of dollars to build a food industrial park in Barreiras, the municipal government decided to directly give the Group 100 hectares[42] of land to build the park. It fully demonstrated that the municipal government at that time attached importance to and welcomed the investment of Chinese agricultural enterprises, so as to promote the local industrialisation and improve people's livelihood and create employment. In order to hold this land, the Chongqing Grain Group needs to speed up investment and build plants. According to the field investigation, the project actually was stopped because of insufficient investigation before the decision to build the plant was made, and many operational difficulties were encountered later[43].

According to data provided by the Chongqing Grain Group, the total investment amount for the Brazil soybean production base was CNY 2.506 billion. As of March 2015, the farm area operated by the foreign subsidiary, Brazil Green World Agriculture LLC, was 68,618 hectares, with 13,637 hectares reclaimed and 6,335 hectares of soybeans sown. In addition, through the acquisition of majority equity in the aforementioned Sol Agrícola, the Chongliang Grain Group acquired five land assets owned by the latter for agricultural cultivation, totaling 16,800 hectares.

3. Heilongjiang Beidahuang Group Co., Ltd.

Beidahuang Group Co., Ltd. (hereinafter referred to as Beidahuang Group) is located in the south of Xiaoxinganling Mountain, Songnen Plain, and Three River Plain in northeast China. The total land area of the jurisdiction is 55,400 square kilometers, with 44.48 million mu of cultivated land, 13.62 million mu of forest land, 5.07 million mu of grassland, and 3.88 million mu of surface water. It is a national ecological demonstration area. In recent years, to ensure national food security and the full use of international and domestic markets and resources, the Beidahuang Group has accelerated the implementation of the "going global" strategy, actively built an "overseas reclamation area", and relied on overseas land resources to expand grain production capacity, and remarkable results have been achieved. During the "Eleventh Five-Year Plan" (2016-2010), Heilongjiang Reclamation Area developed 1.2 million mu of land in Russia, Brazil, the Philippines and other countries and regions, invested more than CNY 250 million overseas, exported more than 3,000 sets of agricultural machinery, exported 8,746 man-time of labor services, produced more than 750 million kg of grain, and realised benefits of CNY 150 million.[44]

39 Brazilian Government website, http://www.planalto.gov.br/CCIVIL_03/AGU/PRC-LA01-2010.htm

40 Módulo is a unit of area for land sales in Brazil, and refers to land with no defined use. Depending on the geographical location of the land, 1 módulo is equivalent to 5 to 100 hectares.

41 Chongqing Grain Group Building a 3 Million mu Soybean Base in Brazil to Guarantee the "Oil Bottle" of Chongqing people. Chongqing Daily, 21 September 2012.

42 "Barreiras/BA terá maior esmagadora de soja do Brasil", 02/07/21, http://agrolink.com.br/noticias/barreiras-bater-225-maior-esmagadora-de-soja-do-brasil_131153.html

43 Guo Jie, Agricultural Investment of Chinese Enterprises in Latin America: Case Study and Analysis. China International Strategy Review, 30 September 2016, p.140.

44 China Daily, Heilongjiang Reclamation Area Implementing "Going Global" Strategy to Build "Overseas Reclamation Area", http://www.chinadaily.com.cn/dfpd/hlj/2011-03/09/content _ 12144315.htm.

Since 2011, the Beidahuang Group has focused its investment on Latin America, and plans to promote the project of acquiring reclaimable wasteland in Brazil, promote the agricultural planting project of the Beidahuang Group in Argentina, accelerate the process of raw material procurement and logistics system construction project of the Jiusan Oils & Grains Industries Group Co., Ltd., and establish an international logistics system of agricultural product procurement, transportation, port, and storage mainly for soybeans by relying on the overseas branches established in São Paulo, Brazil, Chicago, USA, and Hong Kong, China. In October 2011, the Heilongjiang Development and Reform Commission approved Heilongjiang Beidahuang Group Co., Ltd.'s 400,000-mu agricultural development project in Brazil, which was registered by the Department of Foreign Capital and Overseas Investment of the National Development and Reform Commission.

4. Anhui BBCA Group

Anhui BBCA Group Co., Ltd. is a large-scale enterprise in the fields of biochemistry, bioenergy, and biopharmaceuticals in China, a national high-tech enterprise, a national innovative enterprise, and a national innovation base to invigorate trade through science and technology. As a pioneer enterprise of "going global" in Bengbu, the Anhui BBCA Group Co., Ltd. has a wide range of overseas businesses and has set up many overseas enterprises in Asia, Europe, and South America.

Affected by the price inflation of raw and auxiliary materials of maize starch in China, the cancellation of export rebates, imposition of tariffs, implementation of quota management, and other factors, the annual export volume of maize starch in China has dropped sharply, and export volume of various varieties of starch sugar has been declining. In order to fill the large product gap in the international market, Anhui BBCA Group Co., Ltd. went to Brazil, a large maize producing country, several times between 2011 and 2012, to negotiate cooperation with the government of Mato Grosso do Sul. After several negotiations and in-depth investigation, the BBCA Group and Mato Grosso do Sul reached the cooperation intention of maize processing project, using the BBCA Group's technical, capital, and Mato Grosso do Sul's raw material advantages to establish production bases in Mato Grosso do Sul and carry out deep processing of agricultural products.

In 2012, the BBCA Group signed a Memorandum of Cooperation and a Framework Agreement with the Mato Grosso do Sul Government in November and December, respectively. On 15 April 2013, the Governor of Mato Grosso do Sul made a special visit to the Anhui BBCA Group Co., Ltd., in Bengbu, Anhui Province, and formally signed a cooperation agreement on the maize processing project with the Group. In October 2013, the National Development and Reform Commission approved that the Group would establish a 600,000 t/y maize starch sugar processing project in Brazil.

According to Chinanews.com, in November 2013, the BBCA Group established BBCA Brazil Industrial & Investment Co., Ltd. as a joint venture in Maracaju, Mato Grosso do Sul, Brazil, with an initial investment of USD 108 million to establish a 300,000-ton maize deep processing project. In July 2014, the Ministry of Commerce approved an additional investment of USD 63.825 million for the Anhui BBCA Group's investment project, bringing the total investment to USD 177 million; the additional investment was for the second-phase of the starch and sorbitol project with an annual output of 200,000 tons.

5. COFCO

On 28 February 2014, COFCO, together with a multinational investment group, acquired 51% in Nidera Handels compagnie B.V., a Dutch agricultural products and bulk commodities trading group, with a 60:40 investment ratio with COFCO as the holding party. On 2 April 2014, the investing parties led by Hopu Investment acquired a 51% equity of Noble Agri, a subsidiary of the Noble Group (a Hong Kong-based global supply chain management company for agricultural products, energy products, metals and minerals), with COFCO remaining the majority shareholder accounting for two-thirds in relation to Hopu Investment and other financial investors.

With the help of the existing Nidera and Noble platforms in Latin America, COFCO has expanded its business to relevant countries in the region in the most direct and rapid way. Nidera Handels Compagnie B.V., founded in Rotterdam, the Netherlands, began its business in Latin America in 1929. At that time, some partners of the company moved to Argentina and founded Nidera S.A. (Argentina). After more than 80 years of development, Nidera has developed a mature processing, warehousing, and logistics network in Argentina, Brazil, Uruguay, and other countries.

In terms of business scope, Nidera is mainly engaged in soybeans, wheat and maize in Latin America, and also has

greater advantages in seeds, fertilisers and pesticide research and development. Among them, the seed field is particularly noteworthy. Back in the 1980s, Nidera began to increase investment in seed research and development. In 1989, Nidera acquired the subsidiary of Asgrow Seed (a leading company in soybean seed research and development) in Argentina, and in 2005, it incorporated Bayer's maize and soybean seed businesses in Brazil. Currently, its seed R&D capabilities and business dominate the South American market.

Established in 1988, Noble Agri is the agricultural business platform of the Noble Group, mainly engaged in trading and processing of agricultural products. The relevant business sections mainly include: procuring, processing, and distribution of maize, wheat, soybeans, vegetable oil, and other grain and oilseed products; engaging in trading of cocoa, cotton, coffee, sugar, and other commodities; producing raw sugar, processed sugar, and ethanol as well as operating sugar mills and planting sugarcane. It is said that Noble Agri is the fifth largest soybean exporter in South America and the sixth largest sugar trader in the world.

Previously, COFCO and Noble Agri formed a joint venture company "COFCO Noble" with a shareholding ratio of 51:49. In March 2016, COFCO International Co., Ltd., a subsidiary of COFCO Corporation, announced that it had acquired the remaining 49% equity of COFCO Noble and completed the closing, subsequently changing its name to "COFCO Agriculture". At this point, COFCO had indirectly acquired the assets owned by Noble Agri in Latin America through a complete acquisition of the latter, with the agricultural assets in Brazil listed below (Table 5).

Table 5: Agricultural assets of COFCO in Brazil

Location	Asset	Description
Nova Maringá, Sorriso and Campo Verde, Mato Grosso	Maize and soybean warehouses	The warehouse storage capacity of the three places is 45,000 tons, 60,000 tons and 100,000 tons, respectively.
Rondonópolis, Mato Grosso	Oilseed pressing facility	With a daily oil pressing capacity of 4,000 tons, it can store 246,000 tons of oilseeds, and has another biodiesel facility with a daily output of 600 tons.
Rondonópolis, Mato Grosso	NBC fertiliser mixing facility	It can accommodate 2,000 tons of mixed fertiliser and 4,000 tons of raw materials.
Votuporanga, São Paulo	Sugar factory and ethanol production facility	It has an annual sugarcane pressing capacity of 5 million tons; it also produces ethanol and sells 55 MW of electricity to the grid.
Meridiano, São Paulo	Sugar factory and ethanol production facility	It has an annual sugarcane pressing capacity of 4 million tons; it also produces ethanol and sells 55 MW of electricity to the grid.
Catanduva, São Paulo	Sugar factory and ethanol production facility	It has an annual sugarcane pressing capacity of 4.6 million tons, equipped with a modern sugar factory, which can produce rock sugar and refined white granulated sugar.
Potirendaba, São Paulo	Sugar factory and ethanol production facility	It has an annual sugarcane pressing capacity of 3.4 million tons. Under full-load production, the combined annual production capacity of the sugar factory and Catanduva sugar factory is approximately 600,000 tons (products include rock sugar, refined white granulated sugar, and high-grade raw sugar), and it also produces 300,000 m^3 of ethanol.
Santos Port, São Paulo	T12A Terminal	It is mainly used for the export of agricultural products such as soybeans, sugar, and feed. It was put into operation in 2010 and covers an area of 10,000 m^2 with an annual transit capacity of over 3 million tons.
Alfenas, Minas Gerais	Coffee processing and storage facility	It is a technologically advanced, fully automated, and intelligent coffee bean preparation facility, equipped with computer-controlled coffee processing machinery. It covers a total floor area of 157,000 m^2
Luís Eduardo Magalhães, Bahia	Cotton warehouse	It can store 22,000 tons of cotton.
Paranaguá, Paraná	NBC fertiliser warehouse	It can store 3,000 tons of fertiliser, and the scale of the cargo handling tools equipped is up to 100 tons.
Maringá, Jussara and Japurá, Paranaguá	Warehouse	The warehouse storage capacity of the three places is 55,000 tons, 3,600 tons and 7,000 tons, respectively.

6. Hunan Dakang Agriculture

Hunan Dakang International Agricultural Food Co., Ltd. (hereinafter referred to as Dakang Agriculture) was formerly known as Hunan Dakang Pasture Farming Co., Ltd. In 2014, Shanghai Pengxin (Group) Co., Ltd. became a major shareholder of the Dakang Agriculture. After Shanghai Pengxin (Group) Co., Ltd. took control of Dakang Agriculture, it focused on international transformation, trying to quickly control the high-quality and green agricultural food resources globally through mergers and acquisitions, and building itself into a global resource integrator and value-added service provider of modern agricultural food, for which Brazil became one of its most important distribution markets.

On 15 June 2016, Dakang Agriculture announced that it had acquired 57.57% equity of Fiagril Ltda, the largest single agricultural service company in Brazil, at a price of USD 200 million. This is the first time that a Chinese private enterprise completed a direct investment in Brazilian agriculture, and it is also the largest deal ever for a Chinese enterprise to invest in Brazilian agriculture. The investment cooperation between Dakang Agriculture and Fiagril Ltda includes the trade of soybean, maize and other food crops, the exchange of agricultural science and technology, and agricultural supporting facilities for warehousing or logistics. Founded in 1989, Fiagril Ltda is one of the largest soybean and maize trading platforms and agricultural means of production distributor platforms in Brazil, and is the largest supplier to international grain companies, including Monsanto and Syngenta.

In June 2017, Dakang Agriculture announced that it had acquired 53.99% equity in Belagricola, a famous agricultural sales platform in Brazil, at a price not exceeding USD 253 million. At the end of October of the same year, both parties formally completed the legal business transaction of the project, and Dakang Agriculture made another step on its layout. Belagricola, as one of the largest agricultural means of production sales platforms in Brazil, has 57 retail stores, providing farmers with one-stop purchasing solutions for agricultural means of production such as seeds, pesticides, and fertilisers.

The business models of Fiagril Ltda and Belagricola, on the one hand, mainly provide local farmers with one-stop purchasing of agricultural means of production such as seeds, pesticides, and fertilisers, agricultural finance, and technical consultancy services, thus forming a close relationship with them. On the other hand, they have established a set of complete industrial chain layout integrating grain purchasing, storage, logistics and export. Fiagril Ltda's customers are mainly large-scale farmers, and Belagricola's customers are mostly small and medium-sized farmers, from which a synergistically relationship in business, management, and market is to be developed.

According to the plan, Dakang Agriculture will integrate Belagricola with Fiagril Ltda, which was acquired previously, so that Belagricola can reach an agricultural trade volume of 10 million tons, accounting for 4% to 5% of Brazil's market share. Agricultural means of production accounts for more than 3% of Brazil's market share. In the next step, pesticides and fertilisers with overcapacity in China would be transported to Brazil through two platforms, Belagricola and Fiagril Ltda, and 20% to 30% of soybeans produced in Brazil would be supplied to soybean pressing enterprises in China.

Dakang Agriculture uses the synergy effect to coordinate the Brazil's grain platforms with China's supply and demand to achieve the China-Brazil trade synergy with a system-wide and all-round mode. Relying on the Pengxin Group, Dakang Agriculture has gradually expanded from a single pig farming and sales business into multiple business areas such as grain trading, livestock breeding, dairy business, and food distribution. Dakang Agriculture has established two core industries, "agriculture + food", and is gradually building up five business sectors, including grain trade, food distribution, dairy products, hogs, and beef cattle.

III.3.1.3 Affiliated Investments

An important project of China's agricultural investment in Brazil is to invest in Brazil's infrastructure construction. It is well known that the overall poor state of Latin America's infrastructure poses a serious constraint on the economic growth and trade within and outside the region. According to the Global Competitiveness Report published by the World Economic Forum, the infrastructure in Latin America has been underdeveloped in terms of quality, while the assessed values and global rankings of regionally important agricultural producers such as Brazil and Argentina are particularly unsatisfactory.

As a major agricultural country in Latin America and the world, Brazil's production is considerable, but the poor infrastructure conditions have led to a serious logistic deficits, forming a bottleneck for Brazil to expand foreign trade of agricultural products. At present, highway transportation is the main mode of freight transportation in Brazil. The proportion of suitable hardened roads in Brazil is only 13%, while the rest are narrow, gullies, with regular traffic jams, interfering with the smooth transport of Brazil's inland agricultural products to the port[45].

Brazil's railroad construction is poorly developed, with many scattered railroads, without forming a network linking all parts of Brazil. In addition, the construction of river ports and harbors in Brazil is relatively slow, with heavy load and limited transportation capacity. This not only seriously hinders the logistics efficiency in Brazil, making it difficult to guarantee the delivery time and even quality of the goods delivered, but also limiting the space for the continued expansion of agricultural trade. The Organization for Economic Cooperation and Development and Food and Agriculture Organization of the United Nations highlighted the lagging and aging of the infrastructure as a strategic challenge for Brazilian agriculture.[46]

As one of the most important trade partners, China is the largest importer of raw agricultural products to Brazil, and China's total purchases of Brazilian agricultural products account for nearly one-third of the sales of agricultural enterprises. Investing in the construction of Brazilian agricultural infrastructure is not only beneficial to the development and improvement of Brazil's agricultural logistics system, but also to the long-term development of China-Brazil agricultural cooperation. China has a rich experience and technology in the infrastructure field. As one of the five cores of the Belt and Road Initiative, infrastructures such as ports and railways have become an important part of China's agricultural investment in Brazil.

1. Ports

The competitiveness between ports is one of the main factors that facilitate the commodity transportation and promote international trade. Brazil is ranked 120th out of 140 countries in terms of efficiency of port operations. Although Brazil is one of the countries with the longest coastline in the world, the number of freight ports is limited. There are several ports with high handling capacity such as Santos Port, Rio de Janeiro Port and Grande Port, but it is difficult to effectively meet the demand with their relevant supporting logistics capacity. On 16 May 2013, the Brazil Congress passed a bill of interim measures "MPV595-2012" to open state-owned ports to private capital. The bill makes significant changes to the Port Act, i.e. Act No.8630, which was promulgated and implemented in 1993. The most notable changes include lifting the ban on private companies operating state-owned ports and terminals and committing private companies to a 25-year concession from the date when the lease agreement is signed, with a 25-year extension at the end of such a term. The bill provides the possibility and basis for Chinese enterprises to invest and operate logistics at ports and terminals in Brazil.

a. TCP terminal project of China Merchants Group in Paranaguá Port

In February 2018, China Merchants Port Holdings Co., Ltd. completed the acquisition of the Terminal de Contêineres de Paranaguá (TCP) Company, the largest terminal operator in the Paranaguá Port. This deal has set the highest amount for deal of mergers and acquisitions for container terminals in Brazil and even Latin America. It is also the first time for Chinese enterprises to enter the South American port sector and a new breakthrough for Chinese enterprises to implement the Belt and Road Initiative in Latin America.

The TCP Terminal is the second largest container terminal in Brazil with three container berths and an annual design handling capacity of 1.5 million TEU, with the annual handling capacity increasing to 2.5 million TEU after the terminal was expanded in 2019. Paranaguá, where the TCP Terminal is located, ranks in the top of Brazil's economic development level and is an important agricultural and animal husbandry producing area in Brazil. The economic hinterlands under its radiation cover the most important coastal area in southeastern Brazil, concentrating 45% of the population and 48% of the country's GDP. Because of the excellent conditions for collection, distribution, and transportation using roads and railways, the TCP is the only terminal in southern Brazil that has direct railway connection.

45 Brazilian Agriculture: The Secret Behind USD 96 Billion in Exports. China Business Network. https://baijiahao.baidu.com/s?id=1600770332604662942&wfr=spider&for=pc

46 Yu Yue. The Agriculture Development of Brazil and Perspectives of China-Brazil Agriculture Cooperation. Journal of Southwest Forestry University (Social Sciences), 2018 (5), p.2.

The TCP has storage and yard facilities in Parana, Curitiba, and Ponta Grossa, with only Ponta Grossa connected to the railroad system. These supporting logistics services, which extend from the terminal to inland, not only provide convenience and efficiency for end customers, but also reduce logistics costs. The investment not only contributes to the rapid development of the Paranaguá Port and improves the port's competitiveness, but also increases local tax revenues and provides more than 3,000 jobs directly or indirectly from the terminal expansion project alone.

b. Greenfield project of San Luis Port funded by China Communications Construction Co., Ltd. (CCCC)

The San Luis Project Port, located in São Luis, Maranhão, northeast Brazil, is the first port from a complete industrial chain investment project by the CCCC, with a total investment of over USD 700 million. The plan is to build four berths and supporting storage facilities in the port, mainly for handling grains, oils, pulps, and fertilisers. The project opening ceremony was officially held on 16 March 2018, after the signing of a financing cooperation agreement witnessed by the heads of state of China and Brazil during the BRICS Summit in 2017. This project is China's first Greenfield investment project in Brazil's transportation infrastructure field, and the first overseas integrated port investment, construction, and operation of the CCCC. Upon completion, it will become one of the largest bulk cargo deep-water ports in Brazil and an important logistics channel in northeast Brazil.

The San Luis Port Project is a joint investment, developed and constructed by the CCCC Southern America Regional and Thorell, a renowned Brazilian company. The project is financed by the Industrial and Commercial Bank of China (ICBC), and CCCC will hold a 51% stake and undertake the engineering, procurement, and construction of the project. CCCC-controlled Conkmart Company in Brazil undertook large design and consulting work in the early stages of the project, and the port operation will also be controlled by CCCC. The facility will be a multi-purpose terminal for the transportation of dry bulk cargo, liquid bulk cargo, and general cargo, with an annual handling capacity of 24.8 million tons. The port will have six berths with a natural draft of 18 m. The project is a multi-purpose privatised terminal and the largest private port in the northeast of Brazil.

c. Santa Catarina Grain Terminal (TGSC) of the Hopefull Grain & Oil Group

In 2014, the Hopefull Grain & Oil Group, headquartered in Sanhe, Langfang City, announced the plan to invest in the Terminal Graneleiro de Santa Catarina (TGSC), Brazil. According to the plan, the project will be co-invested by LogZ, Litoral Agência Marítima and China Hopefull Grain & Oil Group to build a warehouse in Rabo Azedo Mountain in Bela Vista near the port. Two berths are planned for the project; the total length of the terminal is 453 m and the natural draft is 14 m. While the outside berth includes four Pescantes-type fixed towers for export, the inside one can be used for import and export using two ship loaders and one ship unloader. It also plans to build the infrastructure to connect the terminal with adjacent warehouses. With a total investment of nearly BRL 10 billion, TGSC will focus on the export of vegetables and grains (soybean and corn). At present, TGSC has obtained all relevant licenses, and is in the earlier stage of construction.

2. Railways

In Brazil, not many areas are covered by the railway network, with outdated facilities along the line and relatively small transport capacity as a whole. Compared with the total length of railway networks in China and the United States, which are close to 130,000 km and 230,000 km, respectively, railways in Brazil are only 30,000 km long, mainly distributed in the south, southeast, and northeast of the country. Brazil has only 3.5 km of railways per 1,000 sq.km; more than 35% of which were built 60 years ago. In addition, with outmoded tracks and locomotive equipment, some railways only have a speed of less than 30 km/h. The underdevelopment of the railway in Brazil is an important factors restricting the development of its national economy and the deepening of the China-Brazil agricultural cooperation. Therefore, the cooperation for investing in the construction of the railways is beneficial for Chinese-funded enterprises to engage in the Brazilian market and promote the establishment of lasting and stable trade relations between the two countries.

a. Transoceanic railway project

The South America's bi-oceanic rail corridor from Brazil to Peru consists of east and west sections. The east section consists of No.4 (890 km) and No.5 (1,110 km) railways planned and built by Brazil (or using existing railways),

with a length of approximately 2,000 km; the west section (3,524 km) starts from Lucas do Rio Verde, Mato Grosso, Brazil, passes through Rondonia and Acre and ends at Port of Bayovar, Peru. The project has been incorporated into the China-Brazil-Peru joint statement. On 16 July 2014, Xi Jinping, Rousseff, and Humala (the Presidents of China, Brazil, and Peru, respectively) met in Brasilia, the capital of Brazil, to exchange views on expanding the transportation infrastructure construction in South America and promoting the interconnection with Asian markets. At the meeting, they stressed their willingness to jointly tap the potential to realise the railway connection between Brazil and Peru. At the APEC meeting held in Beijing in November 2014, a memorandum was signed among these three countries, under which a joint working group was formed. The China Railway Eryuan Engineering Group Co., Ltd. has completed the Memorandum of Cooperation on Joint Basic Project Feasibility Study by China, Brazil, and Peru (Draft).

Transoceanic railway can facilitate the transportation of products in South America and promote the integration of infrastructure in this region. Once completed, it will be the first railway line crossing the South American continent, becoming the backbone network for the nations. Moreover, by constructing industrial parks and processing enterprises along the line, it will also drive investment in Latin America and promote economic growth. As an important part of promoting international capacity cooperation, the project can play a supporting and bridging role in the process of production capacity cooperation between China and Latin America, making it an important hub for the China-Latin America economic cooperation and serving as a model for other future cooperation.

b. Ferrovia de Integracão Oeste-Leste (FIOL)

In August 2017, the China Railway Group Limited (China Railway), China Communications Construction Company Limited (CCCC), and Dalian Huarui Heavy Industry Group Co., Ltd. (DHHI) formed a China investment consortium. In September 2017, at the BRICS 2017 China, Bahia State Government, Bahia Mineração, and the China Investment Consortium members signed a MOD; in February 2018, the Chinese consortium and ERG company signed the Framework Agreement of Joint Venture for Integrated Project of FIOL Railway and Supporting Works in Brazil. In March 2018, a project investment management team organised by the China Railway Engineering Corporation (CREC) went to Brazil for investigation and communication, and the regional branch also assigned people to participate in the process. In April 2018, a technical team organised by the CCCC Overseas Business Division, regional company, CCCC Third Harbor Consultants Co., Ltd., CCCC Second Harbor Engineering Co., Ltd., CCCC Third Harbor Engineering Co., Ltd., and Shanghai Zhenhua Heavy Industries Co. Ltd. conducted the project investigation, and completed the initiating and technical reports, which were submitted to the administration of the General Manager of Overseas Business Division for approval.

c. Ferrogrão (Grain Railway)

The project, as a franchised "greenfield" railway project, has five major grain companies (Amaggi, ADM, Bunge, Cargill, and Louis Dreyfus) as sponsors, collectively known as the AABCD. The planned line is 1,142 km long, with an estimated investment of BRL 12.6 billion and a franchise period of 65 years. In 2017, CCCC South America Regional Company, the project sponsor AABCD, and the Brazil's Ministry of Agriculture repeatedly communicated information on the project. At the end of 2017, the Regional Company discussed with Hidrovias Brasil.S.A (HBSA) and planned to co-invest with HBSA to jointly hold 80% of the shares, with AABCD holding 20% of the shares. It also drafted a MOU for HBSA. Many public hearings have been held for the project. However, one section of the railway still faces an EIA problem, which may require adjusting the route and increasing the investment.

d. Ferrovia Norte-Sul (FNS, or North-South Railway)

The FNS is of great significance to the port of São Luis invested and constructed by the CCCC. Goods such as grains and fertilisers in the port of São Luis will be collected, distributed, and transported via FNS and Estrada de Ferro Carajás (EFC), thus realising the extension of the port economic hinterland. The CCCC communicated with VLi, a railway operator in Brazil, to secure cooperation. VLi will undertake the investment and construction of the inbound railway of port of São Luis, participate in the port operation, and seek further equity and operation cooperation.

III.3.2 Cooperation Mechanism between China-Brazil Local Governments

In recent years, the construction of local government cooperation mechanisms has become a new bright spot in bilateral economic and trade cooperation between China and Brazil. Different from the past, the current cooperation between local governments is more pragmatic and operational, focusing on their respective comparative advantages and considering the main areas of economic cooperation between the two countries. Generally speaking, agriculture has become a priority area for local government cooperation, especially in the main agricultural producing areas of China and Brazil.

III.3.2.1 Cooperation between Henan Province and Regions such as Santa Catarina

In April 2002, a sister province-state relationship was established between Henan Province and Santa Catarina. On 12 November 2004, Henan Province and Mato Grosso signed a cooperation agreement on strengthening economic, science and technology, culture, tourism, economy, and trade cooperation. In November 2008, Xinxiang City, Henan Province, and Itajai City signed a formal agreement on sister city relationship and an agreement on promoting friendly exchanges and economic and trade cooperation.

In September 2010, Zhoukou City, Henan Province and Da'ao City, Santa Catarina signed an agreement on establishing sister city relationship, under which, the two cities will continue to promote and expand economic cooperation and cultural exchanges on the basis of friendly cooperation, equality and mutual benefit, work together to develop business and trade relations, and strengthen economic, trade, science and technology, culture, and education exchanges.

In June 2010, Henan Province and Rio Grande do Norte signed the Memorandum on Strengthening Friendly Exchanges and Cooperations in Economy, Trade and Energy between Henan Province and State of Rio Grande do Norte. In October 2013, Anyang City and Xanxerê City signed a letter of intent for friendly exchanges. In 2019, Henan Provincial Development and Reform Commission and the Agriculture Bureau of São Paulo signed a biofuel cooperation agreement to set up a consultation mechanism to promote the exchanges between governments and enterprises, strengthen cooperative R&D, and enhance education.

III.3.2.2 Cooperation between Shanxi Province and Regions such as Mato Grosso

On 28 October 2016, the delegation of Shanxi Province met with representatives of Mato Grosso to exchange views agriculture, trade, finance, and tourism cooperation. On 4 November 2018, Qu Xiaoli, Vice Governor of Shanxi, led a delegation of Shanxi Provincial Government to visit Rondônia and met with the Governor Danielle Pereira. The two sides discussed exchanges in social security, medical care and other issues in the province/state. After the discussion, Qu and Pereira signed the Memorandum on Establishing Friendly Relations between Shanxi Province of the People's Republic of China and Rondônia State of the Federative Republic of Brazil. On 26 August 2019, Cui Yuanbin, deputy mayor of Yuncheng City, Shanxi Province, led an agricultural delegation to Brazil, and signed a memorandum of developing sister city relations between the two cities with the assistant mayor (now a member of parliament) of São Gonçalo City, Brazil, on behalf of São Gonçalo.

III.3.2.3 Cooperation between Shaanxi Province and Mato Grosso

In 1996, Shaanxi Province and Mato Grosso established a sister province-state relationship. In July 2018, Shaanxi Province and Mato Grosso signed the Memorandum of 2018-2020 Friendly Exchange Plan, aiming at strengthening economic and trade cooperation between them and promoting their agricultural, economic, trade, sports, education, tourism, and science and technology cooperation. Shaanxi Nonferrous Metals Holding Group Co., Ltd., Shaanxi Yanchang Petroleum (Group) Co., Ltd., and Lantian County Government signed agreements with the Brazil Manganese Series Materials Industry Park Project, Brazil Shallow Sea Oil Field Cooperation Project, China-South America Xi'an International Trade New City Project, respectively. Moreover, Yangling District of Shaanxi Free Trade Zone and Northwest A&F University signed cooperation agreements with relevant organisations from Mato Grosso.

Among them, a Letter of Intent for Cooperation was signed by the Management Committee of Yangling District of Shaanxi Free Trade Zone and the Secretary of Economic Development

in Mato Grosso (Sedec) to promote trade and bilateral dialogue, and cooperation in modern agricultural production, technology, investment, and personnel exchange as follows: increasing bilateral trade of soybean, sorghum, beef, pork, and poultry; jointly promoting investment in agricultural industry; strengthening exchanges and cooperation in agricultural technology and food security; jointly promoting information exchange, carrying out trade, technology, and skills training for government officials in agricultural technology and industry; providing professional support in public policies, funds, technical support, management, and operation; exploring and improving agricultural trade patterns; improving production capacity, and food security; promoting exchanges between government authorities and educational and research institutions; exploring overseas technical training for farmers, and a new mode of coordinated development.

The National Beef Cattle Improvement Center of Northwest A&F University and Mato Grosso Meat Research Institute (IMAC) signed the cooperation agreement on "China-Brazil Beef Cattle Germplasm Resources Cooperative Development and Utilization Project", which marked the official start of scientific and technological cooperation and exchange between the University and Brazil related to beef cattle.

In September 2021, the two sides held a video conference to discuss the cooperation in beef cattle breeds improvement research and the introduction of an advanced technology industrial chain in the Brazilian beef cattle field. Both sides agreed to establish the Shaanxi-Mato Grosso beef cattle expert working group mechanism to share information and study together.

III.3.2.4 Cooperation between Shanghai and São Paulo

On 2 April 2019, João Doria, the Governor of São Paulo, announced the opening of a trade representative office in Shanghai. In August 2019, the Shanghai representative office of the Investment Promotion Bureau of São Paulo, Brazil was formally established. As the first global investment and trade representative office established overseas by São Paulo, it aims at promoting cooperation with China in the fields of agriculture, science and technology, infrastructure, logistics, transportation, medical care, economic development, energy, and tourism. On 9 August 2019, the government of São Paulo and the Invest Shanghai signed an agreement of intent on cooperation, aiming at promoting investment and export and strengthening the economic and trade between Shanghai and São Paulo.

III.3.2.5 Other Cooperation

On 30 August 2007, Huang Huahua, Governor of Guangdong Province, and José Serra, Governor of São Paulo, signed an agreement on establishing a sister province-state relationship, aiming at strengthening cooperation between the province and the state in the fields of economy, trade, science and technology, culture, education, sports, and human resources. In 2014, Shenzhen City, Guangdong Province and the Investment Promotion Bureau of São Paulo signed an agreement on trade and economic cooperation.

In October 2009, Jiangxi Province and Mato Grosso do Sul Brazil signed an agreement to establish a sister province-state relationship. According to the agreement, the two sides will exchange and cooperate in agriculture, economy and trade, eco-tourism, and culture.

In 1999, Hebei Province and Goiás established a friendly and cooperative relationship. In 2010, the Hebei Education Department and Goiás established a cooperative relationship in education, involving the visits of principals, and the exchanges of teachers, students, international students, and visiting scholars, and the cooperation in running schools.

On 15 August 2011, the Dongjiakou Area in Qingdao Port and Vitória Port in Brazil signed a strategic cooperation agreement to continue to promote their business exchanges, increase the number of ships between the ports, explore the special tariff policy for goods between the ports, and strengthen exchanges in science, technology, patents, information, and statistics.

In December 2014, Lishui City, Zhejiang Province, and Itaboraí, Rio de Janeiro, Brazil, formally forged a friendly exchange city relationship, aiming at strengthening the economic, culture, tourism, and education exchanges and cooperation.

In April 2015, Changzhou, Jiangsu Province, and Curitiba signed an agreement on the establishment of a sister city relationship to expand exchanges and cooperation in education, culture and other fields while increasing economic and trade exchanges.

On 11 August 2017, Mato Grosso and Anhui Province signed the Letter of Intent for Sister State-Province Cooperation to promote agricultural, animal husbandry, economy, trade, culture, and education exchanges and cooperation.

In December 2019, Nuerlan Abudumanjin, chairman of the Xinjiang Uygur Autonomous Region Committee of the Chinese People's Political Consultative Conference (CPPCC) and head of the special leading group for overseas Chinese affairs related to Xinjiang, visited Brazil and signed a letter of intent on establishing a sister region-state relationship between Xinjiang Uygur Autonomous Region, China, and Amazonas, Brazil, to strengthen agricultural, animal husbandry, energy resources, cultural, and educational exchanges and cooperation.

From 31 August to 2 September 2020, Arianna Oliveira, a consultant for international affairs (Asia) of Mato Grosso, Brazil, visited Fuzhou, Pingtan and Fuqing in Fujian Province to promote in agricultural, investment, trade, culture, and tourism exchanges and cooperation.

Chapter IV Brazil's Progress Towards Agricultural Sustainability and Environmental Leadership: Opportunities for New Partnerships with China

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IV.1 Brazil's Progress on Forests and Climate Change

This chapter reviews the emergence of Brazil as a global environmental leader, the international debate focused on the Amazon forest, steps taken to increase the sustainability of the agricultural production of Brazil, and potential Brazil-China partnerships related to their shared commitment to solve environmental issues while expanding trade relations.

The rise of Brazil as an agricultural power since the 1980's has been accompanied by important policy steps to protect forests and slow greenhouse gas emissions. However, some of these steps have been weakened under the Bolsonaro administration. In 1984, Brazil held free elections for the first time since the military coup of 1967. With the return to democracy, the new "Constituição da República Federativa do Brasil" constitution took effect in 1988, reinforcing the concept of "social function" of the land. This meant that privately-held land must be managed to enhance the public good. In the context of the new Constitution, the Brazilian Forest Code of 1965, which established mandatory requirements for forest conservation on rural properties, took on greater significance as the main regulatory tool for fulfilling the social function of the land.

In 1988, the Brazilian space agency (INPE) launched its Programa de Cálculo do Desflorestamento da Amazônia (PRODES) for monitoring deforestation in the Amazon region, a program that continues to this day. Each year, the program releases an estimate of the deforestation rate. In 2004, the Brazilian government took an additional important step towards transparency, releasing the shape files of all deforestation patches dating back to 2000.

Brazil was chosen by the UN to host the 1992 "Earth Summit", the United Nations Conference on Environment and Development (UNCED). This important meeting established the Convention on Biodiversity (CBD) and UN Framework Convention on Climate Change (UNFCCC). Brazil has been one of the most active delegations in the CBD and UNFCCC. Since the creation of the CBD, Brazil has been a leading nation in establishing nature reserves and other types of protected areas (Silveira et al., 2018). Taking the conservation of the Brazilian Amazon as an example, more than 60% of its forests are located within protected public areas (Nepstad et al., 2014).

Recently, the loss and degradation of tropical forests is the source of approximately one tenth of global emissions (IPCC, 2021). The success of Brazil in slowing deforestation of the Amazon since 2005 (see next section) galvanized international support for tropical forests as a climate solution. A non-governmental proposal introduced to climate dialogues to create a mechanism for compensating nations that reduce emissions from deforestation (Santilli et al., 2005) was officially included in the UNFCCC negotiation process in 2007 as the Reductions in Emissions from Deforestation and forest Degradation known as "REDD+".

In 2009, at the 15th Conference of the Parties (COP15) of the UNFCCC held in Copenhagen, Brazil launched its National Plan for Climate Change (Plano Nacional de Mudanças Climáticas), soon formalized as the National Policy for Climate Change, establishing the first formal targets for nationwide greenhouse gas emission reductions and mechanisms for incentivizing reductions from deforestation and agriculture. When launched, deforestation of the Amazon and Cerrado represented roughly two thirds of the greenhouse gas (GHG) emissions of Brazil (Nepstad et al., 2022).

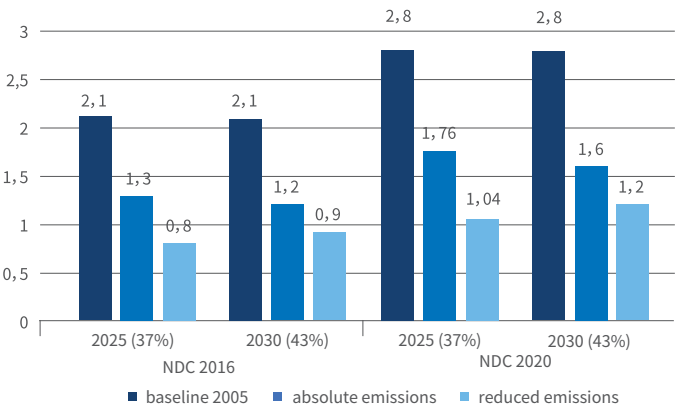
The National REDD+ Strategy (ENREDD+) of Brazil was completed in 2015, establishing a system for measuring, verifying, and monetizing the emissions reductions by slowing

deforestation. As of 2020, Brazil has reduced emissions in the Amazon from deforestation by more than 7 billion tons of CO_2 and has received $1.7 billion in compensation from the international community, mostly from Norway to the Amazon Fund through "results-based-payment" contracts, compensating for 4% of emissions reductions (InfoHub, 2022; Nepstad et al., 2022).

The first Brazilian Nationally Determined Contribution (NDC) to the Paris Agreement of 2015 was ratified in 2016, formalizing their commitment to reduce nation-wide GHG emissions 37% by 2025, and 43% by 2030, both using the 2005 national greenhouse gas (GHG) inventory as the baseline (2.1 Gt CO_2). This NDC also had an annex detailing policies to achieve clearly defined sectoral targets. Among the 2030 targets were net zero emissions from deforestation and forest recovery in the Amazon, zero illegal deforestation, 12 M ha of new forests, low carbon agriculture, degraded pasture recovery, renewable energy, and biofuels (Nepstad et al., 2022).

In 2020, Brazil announced the new NDC using an updated national greenhouse gas inventory, using the 2005 baseline of 2.8 $GtCO_2$. The targets for percentage reductions in emission in this new NDC remained the same: to reduce GHG emissions 37% by 2025, and 43% by 2030. Prior to the COP26, the Government announced a non-official NDC target of 50% reduction by 2030. In absolute terms, the new NDC allows for a larger amount of emissions by 2025 because of the higher baseline. The differences between 2016 and 2020 NDC of Brazil under the Paris Agreement are summarised in Figure 17.

Figure 17: Brazil 2016 and 2020 nationally-determined contribution (NDC) under the Paris Agreement.



Source: Nepstad et al., 2022.

Another important change in the new NDC (2020) is the absence of the annex with the policies and sectoral targets explaining how the emissions reductions will be reached. The removal of these policies weakens the credibility of the NDC. The 2020 NDC also brought forward the 2060 nation-wide carbon neutrality commitment to 2050 with the added condition of $10 billion per year in international climate finance, beginning in 2021. This shift was justified on the basis of the low level of compensation Brazil received for its previous emission reductions associated with the Amazon deforestation.

IV.2 The Amazon Forest

The single most important environmental issue for Brazil in its international trade and diplomacy has been the deforestation of the Amazon. This is especially true with the trade relationship with the European Union (EU). Sixty percent of the Amazon forest and most of the historical clearing lie within Brazil. We herewith review the status of the Brazilian Amazon forest and the potential for Brazil to build a sustainable partnership with China focused on the sustainable production of agricultural products in the near future.

The linkage between the agricultural export expansion of Brazil and the loss of native ecosystems has been most pronounced in the Cerrado woodland, where 60% of soybeans are produced compared to only 11% in the Amazon forest biome. In both biomes, cattle pastures cover approximately two thirds of the land cleared of native vegetation, considering that approximately 80% of the cattle production is destined for domestic markets (Shimada and Nepstad, 2018).

More attention has been focused on the loss of the Amazon forest than that on the loss of the Cerrado woodland, given the international recognition of the Amazon as the largest tropical forest worldwide. Further, the Amazon forest carries a greater importance for climate change. Briefly, the fate of the Amazon forest will largely depend on the outcome of global strategies to tackle the climate change crisis. The carbon stored in the trees is equivalent to the global anthropogenic CO_2 emissions of last decade (Nepstad et al., in review). A significant portion of this carbon pool is likely to be released to the atmosphere over the next few decades through the conversion to cattle pastures or crop production and unintentional or accidental forest fire (Nepstad et al., 2008).

Within the Amazon, the dependence on rainfall (Leite Filho et al., 2021) means that the regional economy and well-being of its population are also forest-dependent. Rainfall disruptions associated with forest loss can reduce agricultural and livestock production (Leite Filho et al., 2020), exacerbate fire and smoke-related health issues (Mendonça et al., 2004), threaten hydropower generation (Stickler et al., 2013b), and interrupt transportation (Marengo et al., 2008). Forest loss has already increased the length of the dry season in the southern Amazon (Leite Filho et al., 2020), increasing forest susceptibility to fire and the risk of a forest dieback (Nepstad et al., 2008). The importance of forests for securing the rainfall system is likely to increase as global climate change advances.

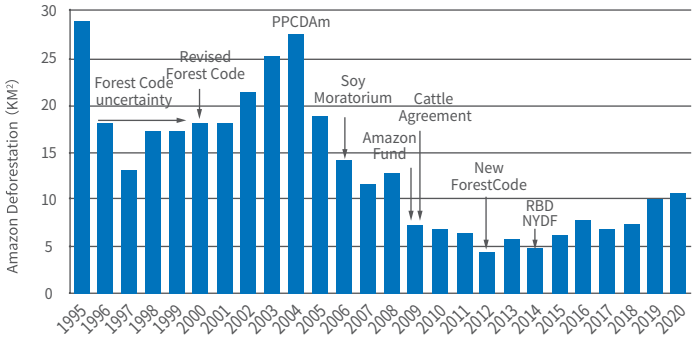
Despite the global and regional importance of Amazon forests and unprecedented interventions to keep them standing, deforestation is accelerating. Here we review the current prevailing strategies, policies, and laws slowing deforestation.

IV.2.1 Policy measures of Brazil to conserve the Amazon

Brazil has made important policy decisions to conserve the Amazon, often on the heels of deforestation spikes. When deforestation reached an all-time high in 1995 following the stabilization of the currency in 1994 through the Real plan, President Fernando Henrique Cardoso responded in 1996 by increasing the legal forest reserve requirement of the Forest Code for Amazon forest region properties from 50% to 80% for each farm. The decision was accompanied by measures to help farmers comply with the new requirement, although few of these were implemented (Stickler et al. 2013a).

In 2004, also following a spike in deforestation in the Amazon region that was driven in part by the northward expansion of soybean cultivation in the State of Mato Grosso (Nepstad et al., 2006; Conservation Biol), Brazil, under President Luis Inácio Lula da Silva, launched the "Plan for the Prevention and Control of Amazon Deforestation" (PPCDAm) in 2004. This ambitious plan orchestrated actions across 13 federal agencies to expand the system of protected areas, increased law enforcement, and suspended access to farm credit in high-deforestation areas (municípios) (Nepstad et al., 2014). Between 2005 and 2012, deforestation declined by 77%, which was achieved largely through the PPCDAm (Figure 18). The PPCDAm was expensive to maintain and provided few positive incentives to farmers, businesses, and communities who were keeping their forests standing (Nepstad et al., 2014). It was strong on rather expensive law enforcement and command-and-control sticks, while light on carrots.

Figure 18: Annual deforestation in the Brazilian Amazon and some of the main interventions designed to slow it.



Notes: RBD, Rio Branco Declaration; NYDF, New York Declaration on Forests. Source: Nepstad et al., 2014.

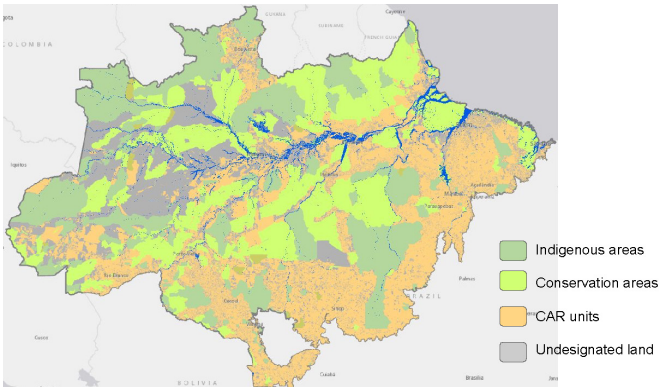
In 2008, inspired by its success in slowing deforestation, Brazil launched the Amazon Fund with a major financial commitment from the Norwegian Government. This "results-based payment" rewarded the success of Brazil in slowing deforestation with further payments from Germany. A total of $1.5 billion were approved for the Fund, which was later suspended under the Bolsonaro Administration in 2019. One of the key values of the Amazon Fund was for state and federal governments to improve their law enforcement capacity. However, the farm sector was largely excluded from the Fund.

In 2012, after a bitter battle between the farm sector and environmental groups, the Brazilian Forest Code underwent major reforms. Farmers insisted that the Forest Code, which had been revised in 2000, was impossible to comply with, and proposed revisions to the law. Environmental groups insisted that illegal clearing that took place in the past under the previous version of the law should not be forgiven. In the end, the basic restrictions on forest clearing remained intact under the new forest code of 2013. The biggest change made was the amnesty given to all farmers who had cleared native vegetation illegally prior to 2008. The second important modification created a provision for incentivizing farm-level forest conservation. The new version also introduced a major new innovation, the Rural Environmental Registry (CAR), a tool for bringing rural properties into compliance with the new law (Stickler et al., 2013a).

In 2015, the Brazilian National REDD+ Strategy was completed, formalising the system for attracting results-based payments to reduce deforestation. Two states of the Brazilian Amazon region--Acre and Mato Grosso--have received funding from Germany and the UK through this mechanism, and there is potential to increase the finances delivered.

We then asked the question: how much of the Amazon forest of Brazil would be protected if the formal protection of forests through parks and other reserves, indigenous territories, and the 80% protection requirement on private lands through the Forest Code were fully implemented? Today, 81% of the original forest is still standing (INPE/PRODES, 2022). Implementing the law would protect 74% of the original forest. The most vulnerable forests in the Brazilian Amazon are those located on private farms because of their proximity to crops and grazing land; many of these are actively protected from fire by landholders (Figure 19).

Figure 19: The Brazilian Amazon region. Ninety-four percent of the remaining forests (74% of the original forest) would be protected under a full legal compliance scenario, which is endorsed by the powerful farm sector and governors of the region. The most vulnerable forests are found on farms; 740,000 farm level CAR (Rural Environment Registry) applications encompass 22% of the remaining forests of the region (orange).



Source: Nepstad et al., 2022.

IV.2.2 International Market-based Approaches to Amazon Deforestation: The Zero-deforestation Movement

One strategy for protecting Amazon forests that has garnered considerable attention in recent years is the "zero deforestation" (ZD) supply chain movement, in which dozens of companies that buy soy and beef grown in the Amazon, under pressure from environmental advocacy groups, have pledged to reject those commodities whose production was associated with deforestation (Donofrio et al., 2017). It is grounded in the premise that the market demand for ZD commodities, if large enough, will shift production away from forest-clearing soy and beef expansion, slowing regional deforestation.

The ZD movement has succeeded in securing hundreds of corporate commitments to help keep tropical forests standing. The most important zero deforestation initiative in Brazil, and perhaps in the world, is the Brazilian Soy Moratorium (BSM) of 2006. It established a deforestation cut-off date in the Brazilian Amazon region. The soy produced on land cleared after July 2006 (later moved to July 2008) would be rejected by traders who were part of the BSM (Nepstad and Shimada, 2018). A similar arrangement was set for cattle, the main driver of deforestation, in 2009, namely, the "Brazilian Cattle Agreement" (Shimada and Nepstad, 2018).

The BSM has demonstrated that supply chains for an agricultural commodity, destined largely for international markets such as soy, can become virtually deforestation-free when the buyers demand it. The BSM has reduced the direct impact of soy production on forest clearing (Heilmeyer et al., 2020). The indirect impacts of the BSM on regional deforestation dynamics, for example, through the increased in land value of cattle pastures suitable for conversion to soy, have not yet been quantified; hence, we do not know if the impact of the BSM was negative or positive (Nepstad et al., 2014).

Farmers have not supported the ZD movement largely because it has missed opportunities to recognize and reinforce those landholders who are fully implementing the Forest Code (FC). Specifically, neither the BSM nor the Brazilian Cattle Agreement exempted farmers from the ZD requirement who have forests on their farms that can be legally cleared (Nepstad and Shimada, 2018). The state governors of the Amazon, similarly, have not endorsed the ZD

supply chain movement. As public administrators, governors are responsible for implementing public policies and laws established through formal democratic processes.

IV.2.3 Proposal from governors and farmers for the Amazon forest

A second strategy for reducing deforestation in the Amazon region, which has received far less attention than the ZD movement, is proposed by both farm leaders and the governors of Amazon states. These actors figured prominently in the implementation of the PPCDAm plan, which reduced deforestation by 77% between 2005 and 2012 (Nepstad under review). Their strategy is focused on legal compliance, a feature of the PPCDAm plan, and positive incentives for forest conservation, which the PPCDAm strategy failed to deliver.

The forest legislation of Brazil, the Forest Code of 2013, requires more forest conservation on private farms than that of comparable legislation anywhere in the world. Eighty percent (80%) of Amazon farms must be devoted to forest conservation, which is still a work in progress. Collaboration to fully implement the FC and protect/manage the extensive network of protected areas and indigenous territories is proposed as the pathway to slow deforestation. Both groups propose that corporations with ZD pledges and commercial agreements with other nations recognize compliance with the FC as the main criterion of success.

Forest conservation incentives are also proposed to reward farmers and states that are keeping forest standings. As the value of forested land on farms is lower than that of cleared land in the regional land market (15,16, SI), financial incentives are needed. A second reason is the cost of the transition to forest-friendly development. The governors of the Brazilian Amazon states have made clear the need to embed the forest agenda in a broader scheme of poverty alleviation and innovation for low-carbon economies (Consorçio dos Governadores da Amazônia, 2021).

The proposal of farmers and governors for the Amazon forest is highly significant because of the direct influence these actors have over the forests of the region. Farmers and state governments of the Amazon region control 46% of the remaining forests of the Brazilian Amazon, including 70 M ha of forest on private landholdings, 44 M ha of forest in state-managed protected areas, and 35 M ha of forest of undesignated land (Figure 3.3).

Privately-held forests include those most at risk of clearing or degradation through fire because of their proximity to crop and grazing land, and many are actively protected from fire by landholders. The federal government and indigenous peoples control 24% and 30% of remaining forests, respectively; the role of these important stakeholders has been featured elsewhere.

The role of state governments in forest conservation goes well beyond the protected areas and undesignated lands under their jurisdiction. They share environmental law enforcement responsibilities with the federal government across the entire state. The law enforcement units and budgets are, in the aggregate, larger than that of the federal government. Moreover, the governors of Amazon states recently signed guiding principles of collaboration together with several organizations of indigenous peoples. Some states have developed programs to support indigenous peoples, formalizing their representation within government agencies (DiGiano et al., 2018).

Governors of all Amazon states of Brazil formalized their appeal for a collaborative approach to the forest challenge by signing the Rio Branco Declaration of 2014, pledging to reduce annual deforestation rates by 80% by 2020 if sufficient finance and commercial partnerships were in place (Stickler et al., 2020). However, neither of these conditions were met. Only two out of nine Brazilian Amazon states have been rewarded for their success in slowing deforestation through "results-based-payment" contracts with Germany and the UK.

Farmers and the broader category of ruralistas, a right-wing association of activists, are often blamed for the rise in deforestation in the Amazon, calling into question the credibility of their forest proposal. Indeed, many Amazon "landholders" are best described as illegal land grabbers (Nepstad et al., 2021). Hence, it is important to differentiate these illegal operators from the farmers who strive to comply with the law and are the proponents of the forest proposal.

IV.2.4 The Forest Carbon Market

The potential for delivering the long-awaited payments

to Amazon states and farmers who conserve forests is rapidly growing through the surge of corporate "net zero" climate commitments. Most companies that make these commitments will need to purchase verified emissions reductions (VERs) to achieve their goals, and forests are an important and growing source of these carbon offsets (Ecosystem Marketplace, 2021).

Brazil is well positioned to capture a large share of the growing demand for forest carbon "offsets" and for the global market for forest carbon that could be created through the Paris Agreement (Seroa da Motta et al., 2021; Nepstad et al., 2022). There are three main mechanisms through which international funding could reach the Amazon region to help keep the forest standing. The results-based-payment mechanism, recognized in Article 5 of the Paris Agreement and already functioning, which could deliver up to US$4 billion by 2030 (Nepstad et al., 2022).

The voluntary carbon market is also functioning through international standards such as Verra or the Gold Standard. Of particular relevance for the Brazilian Amazon is the prospect of voluntary market transactions of credits from jurisdictional REDD+ programs. REDD+ stands for "Reductions in Emissions from Deforestation and Forest Degradation" and is an UN-recognized mechanism for compensating emissions reductions from forests. "Jurisdictional" refers to state-wide REDD+ programs, for which international standards are now operational. These include the Architecture for REDD+ Transactions / REDD+ Environmental Excellence Standard (ART/TREES), and the Jurisdictional Nested REDD+ Standard (JNR). The sale of jurisdictional REDD+ credits by Brazilian states could generate financial revenues of $15 billion or more by 2030--revenues that would only flow if deforestation and forest degradation decline rapidly (Nepstad et al., 2022).

Finally, new market mechanisms defined under Article 6 of the Paris Agreement such as the International Transfer of Mitigation Outcomes described in Article 6.2 could deliver tens of billions of dollars in forest conservation finance to Brazil by 2030 (Nepstad et al., 2022).

One manifestation of this growing potential of the forest carbon market is the recent commitment by companies (e.g., Amazon, Delta Airlines, Salesforce or Bayer) and governments (Norway, the US, the UK) to a minimum purchase of $1B in credits from state-wide "jurisdictional REDD" (J-REDD) programs through the "LEAF Coalition" initiative. The payments that would flow from this commitment are still several years away.

IV.2.5 Carbon Neutral Soybeans and Beef

Brazil has also made progress in bringing carbon-neutral commodities to the market. Farm-level approaches, in which the emissions from production are compensated (neutralized) on the farm, have been developed for beef and soybeans. Marfrig, a meat processor, has begun to market "carbon neutral" beef across Brazilian supermarket chains, in which the bovine methane emissions from enteric fermentation are compensated through tree plantations on participating farms (Alves et al. 2015). In this sense, the product from Marfrig is not fully carbon neutral since it does not neutralize other types of GHG emissions associated with beef production.

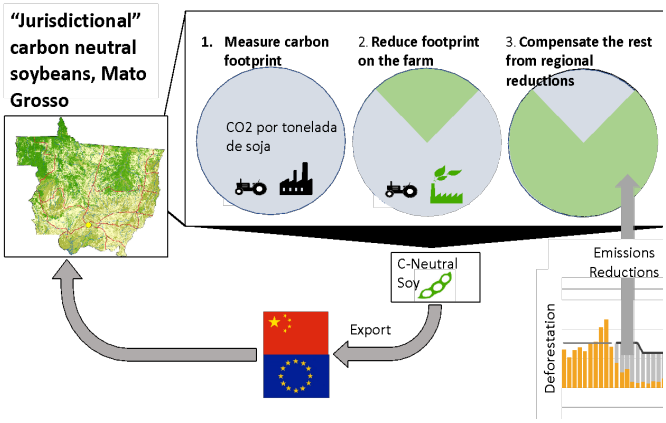
Bayer, an agricultural input supplier, has invested in a carbon-neutral soybeans product in which emissions associated with soy production and transport are estimated and compensated or offset through agricultural practices that enhance soil carbon content in a methodology developed by Embrapa (Oliveira, 2014). Soil sampling and carbon measurement are expensive, and are surmounted by large volumes of carbon neutral soy that would be relevant to the trade with China.

A jurisdictional approach to carbon neutral soybeans is also under development by the Earth Innovation Institute and the Government of Mato Grosso. In this approach, on-farm emissions associated with soy production are estimated, partially compensated on-farm (e.g., through tree planting), while residual emissions are compensated using reductions verified at the scale of the entire state through the Brazilian National REDD+ methodology (Figure 20, Nepstad et al., in review).

The State of Mato Grosso, the largest agricultural producer of Brazil and source of 10% of soy imports to China, has a large pool of emissions reductions that could be used to offer carbon neutral soy at scale to China. Since 2005, Mato Grosso and the federal government of Brazil have sufficiently reduced deforestation in the state, avoiding the

emission of approximately 3 billion tons of CO_2. The National REDD Council (CONAREDD) allocates emissions reductions achieved in the Amazon forest biome between the federal and state governments. Just in the last five years, the emission reduction of Mato Grosso was approximately 200 M tons of CO_2, and the state is free to use these reductions as it sees fit.

Figure 20: Jurisdictional approach to the development of carbon-neutral soybeans in the State of Mato Grosso. The system could deliver carbon neutral soy at scale to China.



Source: Nepstad et al., in review.

A jurisdictional approach could also be used to create incentives for farmers who are increasing soil carbon through the adoption of good agricultural practices. We recommend that indirect methods for estimating changes in soil carbon, based upon studies of the impact of no-till agriculture and other practices, can present a way to avoid the prohibitive costs of direct soil carbon measurements.

IV.2.6 Sustainability Certification

Agriculture is the main form of land management. Agroindustrial commodity production operates under increasing risks from the adverse effects of climate change to the adoption of resource-intensive production models.

Over the last 28 years, voluntary sustainability standards and initiatives have been created as market-based mechanisms for addressing social and environmental issues in a number of agricultural commodities value chains. Sustainability certification of agricultural commodities operates within the "theory of market transformation," in which it is assumed that if market demand for certified sustainable production exceeds a critical threshold, most producers will strive to become certified. These certification schemes are designed to increase the sustainability of agricultural production by shifting the demand side and incentivizing producers to change their practices. Commonly structured in the form of Principles and Criteria, standards provide guidance and performance indicators to farm-level production.

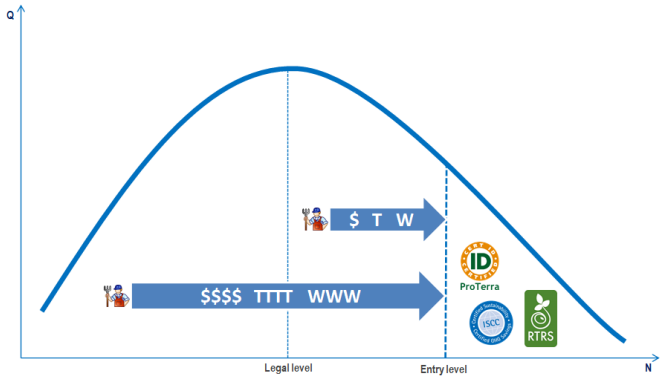
Since 2005, international standards have been developed through multi-stakeholder roundtables, bringing together producers, market players, and civil societies to define, promote, and update better management practices for specific agricultural commodities such as palm oil (RSPO - Roundtable for Sustainable Palm Oil), soy (RTRS - Roundtable for Responsible Soy), sugar (Bonsucro), beef (GRSB - Global Roundtable for Sustainable Beef), and cotton (BCI - Better Cotton Initiative).

The progress of the certification movement to date demonstrates the challenges of attaining the market demand threshold posited by the theory of market transformation. One fifth of the world production of palm has been certified under the RSPO standard, far more than any other standard, yet the market demand has lagged behind the supply, suppressing the price premium that is the main mechanism in place for covering the farm-level costs of complying with the standard.

The following factors constrain the success of the certification movement: (1) many producers incur greater costs to comply with the standards covered by price premium; (2) the costs are highest for producers that are the least sustainable--that is, the producers that are doing the most environmental damage; (3) the costs are highest as a percentage of income for smallholders, limiting their participation; (4) production systems and, hence, compliance with standards varies greatly between regions; and (5) farm-level changes have not achieved enough scale generate changes at the landscape level (Figure 21).

Figure 21: Hypothetical curve representing the number of farmers (y axis) at different levels of sustainability (x axis) and one of the reasons certification standards have not gone mainstream. Only a small group has achieved a high level of environmental management that is sufficient

for them to comply with certification standards. A second group is able to comply with the law (e.g., Brazilian Forest Code) and could achieve certification through a fairly small money ($), time (T), and work (W) investment. A third group of producers is not in legal compliance and faces large (and usually insurmountable) costs, time-consuming, and work load to achieve certification.



In order to mainstream certification schemes to access markets that demand sustainably-produced commodities, a significant change in consumer behavior is needed, including the willingness to pay more for products made with sustainably produced raw materials. Consumer demand for sustainably-produced food and willingness to pay more for these products is still weak, resulting in an oversupply of certified products and low-price premiums. Table 6 shows the main agricultural initiatives, including the most common certification schemes in Brazil.

Table 6: Main features of the sustainable commodity initiatives operating in Brazil. Source: Websites of sustainability initiatives.

mandatory criteria √ YES × NO ● OPTIONAL	main products	zero deforestation	non-GMO	certification scheme	voluntary initiative	legal compliance	good agricultural practices	carbon footprint calculation
RTRS-Roundtable on Sustainable Soy	SOY	√	●	√	√	√	√	●
ProTerra Standard	SOY,CORN	√	√	√	√	√	√	×
IscC Standard	SOY,CORN	√	×	√	√	√	√	√
RSPO- Roundtable on Sustainable Palm Oil	PALM OIL	√	×	√	√	√	√	×
FSC-Forest Stewardship Council	TIMBER	×	×	√	√	√	√	×
GlobalGAP	MULTI	×	×	√	√	√	√	×
Bonsucro Standard	SUGAR	×	×	√	√	√	√	√
GIPS-Sustainable Cattle Ranching Indicators	BEEF	×	×	×	√	√	√	×
Soja Plus Program (discontinued)	SOY	×	×	×	√	√	√	×
Brazilian Beef Agreemen	BEEF	√	×	×	×	×	×	×
Brazilian Soy Moratorium	SOY	√	×	×	√	×	×	×

IV.3 Progress towards a Sustainable Agricultural Sector in Brazil

IV.3.1 Public Programs and Policies

The Low Carbon Agriculture Plan (ABC Plan), an ambitious policy aimed at improving and encouraging the adoption of technologies and practices that would allow for more efficient production while reducing emissions, was approved in 2011. The ABC Plan includes strategies for disseminating knowledge and fostering the implementation of good agricultural practices, featuring technical assistance, training, technology transfer, field studies, seminars, workshops, the implementation of Technological Reference Units at the state level, and publicity campaigns.

The first phase of the ABC plan 2010-2020 covered 52 M ha and has mitigated 170 M tons of CO_2 emissions. The second phase, called ABC+, will run from 2021–2030 and aims to cover 72 M ha and mitigate 1.1 billion tons of CO_2 emissions.

The technologies are financed as investments in the rural area, using official credit, according to the amount and interest rates approved every year within the Federal Harvest Plan (Plano Safra). The Low Carbon Agriculture Program defines the amount of credit available for each crop season, and interest rates applicable.

The deployment of the ABC Plan technologies is critical to promote a resilient and sustainable agriculture in Brazil. In line with this, Brazil included agriculture at the iNDC, as the first developing country to present an absolute emission reduction target of 37% compared to 2005 levels, by the year 2025. In addition, it indicated a potential reduction of 43% below emission levels from 2005 to 2030.

The evolution of the GHG emissions profile makes agriculture, forestry, and land use (Afolu) extremely relevant for climate policy in Brazil. Up until 2005, deforestation (land use) was the activity that contributed most to GHG emissions, reaching 1,905 M ton of CO_2 equivalent (CO_2eq), which represented more than 70% of total emissions.

IV.3.2 CAR and the Missing Forest Incentive

The Brazilian Forest Code is the most important public policy for forests on private land, defining forest conservation and restoration requirements within two main categories: Permanent Preservation Areas (APP initials in Portuguese), which include riparian zones and steep slopes; and the Legal Reserve (RL initials in Portuguese) defined as the minimum percentage of each landholding that must be maintained under forest cover (Stickler et al., 2013a).

The Brazilian Forest Code is implemented through two management tools for monitoring and regularization. The Rural Environmental Register (CAR initials in Portuguese), which is filled out by the land holder and reviewed by state agencies, defines the APP and RL areas, and those that will be restored to comply with Code requirements. The Environmental Regularization Program (PRA initials in Portuguese) establishes a schedule and plan for reforestation to comply with the Forest Code. A total of 7 M CAR applications have been submitted nationally and nearly 1 M for land holdings in the Amazon forest biome (MMA - Apr/2021). Nonetheless, the validation process of CAR applications has been slow.

The CAR is the lynchpin for controlling deforestation, environmental licensing, monitoring, payment for environmental services, and traceability. It provides a clear connection between the tax identification number of the property owner and the compliance of the property with the Forest Code and other regulations. Farms that are not in compliance can be placed under "embargo" by state agencies, which means that those people or companies that purchase commodities from the embargoed farm are fined.

The CAR also holds great potential for positive incentives. For example, it could facilitate carbon payments for farmers who are reducing emissions. Farms with validated CARs and forests in excess of the RL requirement, for example, could qualify for payments to forgo their legal right to clear those forests. Currently the validation process for the CAR is extremely slow, restricting the utility of this important mechanism for tracking and rewarding legal compliances.

IV.3.3 Innovation and Practice of Agricultural Technology

There are many technologies developed by EMBRAPA and the National Agricultural Research System (SNPA). A survey of agricultural researchers conducted by ICONE identified 308 technologies for nine different crops and three livestock production systems, and other cross-application technologies. The SNPA included: State level Agricultural Research institutes, Universities, Private Agricultural Research organizations, and others conducting direct or indirect research on agriculture.

The mapping fails to represent an exhaustive review of available technologies. Innovations can be organized in seven different types: 1) production system; 2) genetic improvement and breeding; 3) fertilization, feeding, and pasture management; 4) pest and disease control, sanity, and health; 5) machinery and infrastructure; 6) processing; and 7) management and quality control.

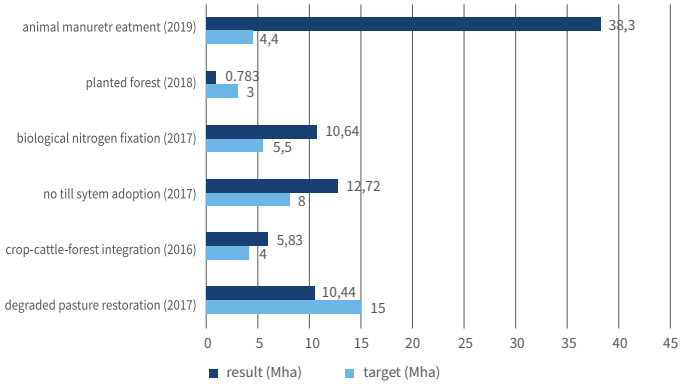
Among all these technologies, some must be highlighted because they introduce new production concepts, management approaches, applicability for many crops, significantly impact productivity, and can reduce environmental risks and impacts. These particularly important technologies are summarized in Table 7. These technologies, when fully implemented, will count total emissions reductions between 133.9 and 162.9 M ton of CO_2eq (Manzatto, 2020).

Table 7: Major innovations in agricultural and livestock production systems in Brazil that have increased productivity and/or reduced negative environmental impacts.

Technology	Description	Impacts
No-till cultivation	Adopted in 80% of cropped areas and combined with crop rotation that promotes the permanent coverage of the soil with mulch and minimum tillage.	Reduction of erosion (95%); fuel saving (40%); water loss (70%); CO_2 emissions reductions and productivity increase.
Crop rotation or double cropping	Adopted in most regions, allow planting of two or three different crops in the same area during the same year.	Soil fertility improvement; better weed, pest and disease control; recovers organic material and reduces erosion.
Green manure	Uses plants, mainly leguminosae, together with the main crop because of the capacity to symbiotically fix nitrogen.	Reduction of nitrogen fertilizer; avoid soil erosion; recover degraded soil and improve the soil fertility.
Soil correction	Use limestone and/or agricultural plaster to reduce the soil acidity and immobilize aluminum, providing better nutrient retention and exchange capacity.	Improves nutrient availability in the soil, resistance to drought, and productivity (soybean 38%, rice 14%, corn 13%)
Inoculation with Rhizobium	The bacteria colonises plant cells fixing biologically atmospheric nitrogen providing nitrogenous compounds to the plant.	Reduces the use of nitrogen fertilizer (soybean 99%); lower cost production.
Integrated Crop, Cattle and Forest production	Is a complex production system of harmonizing crops, forest, and cattle; the system is dynamic and can be adopted by combining these elements in many different ways.	Diversification of farm activities; reduce the costs to recover degraded pastureland; high production of mulch to the no-till system; improve the control of pests and weeds; optimize the use of machinery; and reduce CO_2 emissions.

The ABC and ABC+ plans, as described above, are the main current programs driving the transition to sustainable, low-carbon agriculture in Brazil and broader application of the technologies summarized in Table 7. The targets and results of the first phase of the ABC plan are summarized in Figure 22. Most of the results achieved by the program exceed those of the targets established.

Figure 22: Brazilian Low carbon agriculture program, action plan and its performance.



Source: Agroicone: Plano ABC: Evidências do período 2010-2020 e propostas para uma nova fase 2021-2030; elaborated by authors.

Brazilian agriculture has faced several challenges when considering the environment. The case of climate policies and opportunities arising from this agenda highlight the importance for agriculture to build on the ABC program to deepen the transition to more efficient, low-carbon production systems that are resilient in the face of climate change.

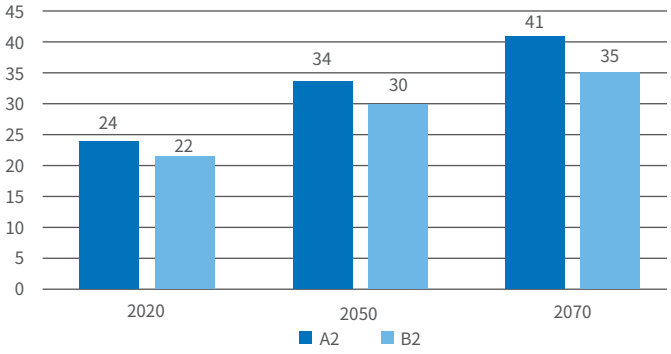
The conservation and restoration of native vegetation on farms, as stipulated by the Forest Code, plays a critical role to not only comply with environmental regulation, but also to assure environmental assets embedded in the products such as carbon, biodiversity, soil, and water services.

Fostering sustainable agriculture relies on producers, policies, international trade, consumers and, from a broader view, civil society. Taking this into consideration, it is worth noting that Brazil and China can build stronger relations for a mutually supportive food security system connected to a sustainable production. This is a challenge for sustaining life, while having the sustainable development agenda as a core basis.

IV.3.4 Climate Change and the Effects on Soy Crop in Brazil

Another important challenge facing Brazilian agriculture and livestock sectors is the effect of climate change on production. Projections were made using the climate model (Providing Regional Climates for Impact Studies, PRECIS) developed by the Hadley Center in the UK, under the following Intergovernmental Panel on Climate Change (IPCC) scenarios by 2100: A2 with temperatures increasing between 2 ° C and 5.4 ° C; B2 with temperatures increasing between 1.4 ° C and 3.8 ° C (IPCC, 2007). Soy crops will be most affected by climate change through a reduction in the area of suitable land for soy production. In the worst climate scenario (A2), the loss in soy production area could be as high as 41% by 2070 (Assad and Pinto, 2008) (Figure 23). The most affected regions are the south and northwestern Cerrado, because of the less frequent rainfall and higher evaporative demand of the air.

Figure 23: Impact of climate change on soy crops in Brazil considering two Intergovernmental Panel on Climate Change (IPCC) scenarios. The number shows the percentage of planted area under climatic risk.



Source: Assad & Pinto, 2008.

At first glance, these future scenarios may have dramatic consequences, however, the intensity will happen only if the production model is not changed. As discussed, low carbon agriculture techniques are already developed, and can mitigate some of the climate change impacts; unfortunately, some loss will be inescapable.

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Chapter V Existing Problems, Risks, and Suggestions

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V.1 Risks in Agricultural Investment

In order to scientifically and comprehensively evaluate the risk of China's investment in Brazilian agriculture, this section discusses the following five aspects: 1) the risk of policy uncertainty; 2) the business environment and cost; 3) exchange rate risks; 4) labour and environmental protection laws and regulations; 5) requirements of localisation rate.

At present, a systemic crisis in the Brazilian economy is less likely. First, Brazil has a large economy. After years of economic development, it is capable of self-repairing under the premise of political stability. Second, with the lessons learned from the debt crisis in Latin America in the 1980s and the Asian financial crisis in 1997, Brazil has established a macro and prudential policy framework, implemented a more flexible exchange rate system, rationally adjusted its foreign debt structure, and had sufficient foreign exchange reserves, all of which enhanced its ability to resist shocks. Third, there is a consensus within Brazil on structural reform. Nevertheless, for China, investing in Brazil still represents some risks.

First, there are great political risks in the short term. Since Bolsonaro came to power, Brazil has been facing tense relations among the three powers (the legislative, executive, and judicial branches), with ceaseless political games. With the inauguration of the new President of the Senate and President of the Chamber of Deputies supported by the President and several adjustments of cabinet members, the relationship between the government and Congress gradually eased, while the conflict wrestling with the judicial branch escalated. On 7 September 2021, the Independence Day parade became an outbreak point with the accumulation of contradictions between the executive and the judicial branches.

The direct cause is the differences between Bolsonaro, the Supreme Court Justice Alexandre de Moraes, Superior Electoral Court's president Barroso, and others on the election voting, which are constantly expanding. Bolsonaro claims that the electronic voting system is susceptible to fraud, so paper ballots should be adopted. However, his views and opinions are severely refuted by the latter, leading to gradually escalating contradictions. In the short term, facing tough COVID-19 epidemic, rising inflation, sluggish labour market, gradually advancing of judicial investigations involving the president and his family, and constantly decline of support rate as the general election approaches, President Bolsonaro is bound to strengthen political mobilisation, boost his popularity with the masses, get rid of the declining trend, and transfer domestic social contradictions at the same time. Under these conditions, the atmosphere of the 2022 election is not only very antagonistic, but also shows signs of confrontation. Therefore, China needs to be alert to the rising political risks in Brazil.

Second, the risks brought by policy uncertainty. At present, the biggest risk is the economic policy uncertainty of the Bolsonaro right-wing administration, which is mainly reflected in three aspects. I) Bolsonaro is famous for his nationalist and conservative positions, but his team of economic advisers is liberal-policy-oriented. The primary issue is how to coordinate policy objectives between them, such the degree of privatisation. II) In view of the increasing fragmentation of political parties in Congress, obvious political polarisation and the constraints of vested interest groups, it is more difficult for Bolsonaro to govern, and many major reforms that need to undergo constitutional amendment will face severe challenges in Congress. III) Bolsonaro once made unfriendly remarks to China, misreading Chinese investment as "buying Brazil", claiming that it is necessary to set up "special clauses" for China's M&A in Brazil, so as to keep Brazil's special "golden shares" among M&A companies and avoid being completely dominated by Chinese enterprises. Although he weakened his position at the end of the election, China still has to supervise his policy restrictions on Chinese investment. For example, Bolsonaro expressed his concerns regarding China's purchase of farmlands and push into the energy sector of

Brazil. Therefore, Chinese enterprises should be prepared for possible policy changes. In addition, the policy trends of extreme ideology, pro-American attitude, weakening of the South-South cooperation, and multilateralism embodied by the Bolsonaro administration will also have a certain impact on the China-Brazil economic and trade cooperation.

Third, the risks brought about by changes in the business environment. According to the latest World Competitiveness Ranking 2021 published by the International Institute for Management Development (IMD) based in Lausanne, Switzerland, Brazil ranks 57th among 64 economies, and in Latin America, it is inferior to Chile (44), Mexico (55), Colombia (56), and other countries. Among BRICS countries, it is also inferior to China (16), India (43) and Russia (45). From the specific indexes, the economic performance ranks 51st, government efficiency ranks 62nd, enterprise efficiency ranks 49th, and infrastructure ranks 52nd. From a more microscopic perspective, Brazil's lower ranking indexes include public finance (64), education (64), social system (64), and institutional system (61)[47]. According to the Doing Business 2020[48] released by the World Bank, Brazil ranks 124th among 190 economies, 15 places lower than the previous year, and lower than some Latin American countries such as Chile (59), Mexico (60), Colombia (67), Jamaica (71), Costa Rica (74), Peru (76), and Panama (86), which indicates that its economic development is at global lower-middle level. Among BRICS countries, Brazil ranks even lower than South Africa (84). Therefore, it shows that Brazil's business cost is at a relatively obvious disadvantage in emerging economies.

In addition, the Doing Business 2020 also shows that the ranking of the business environment in Brazil by subitems has different positions and changes (Table 8). In the ten rankings by subitems of business environment, there is a slight improvement in "Starting a business", "Dealing with construction permits", and "Registering property". However, the rankings by "Getting electricity", "Getting credit", "Protecting minority investors", "Trading across borders", and "Enforcing contracts" are declining. Although the ranking of "taxes paid" has not changed, it ranks 184th in the world, which highlights the negative effects of the tax system on the business environment.

47 Please refer to IMD, World Competitiveness Ranking 2021, June 2021.

48 Please refer to World Bank, Doing Business 2020 (https://openknowledge.worldbank.org/bitstream/handle/10986/32436/9781464814402.pdf)

Table 8: Overall ranking of the business environment in Brazil and ranking by subitems

Index	Ranking in Doing Business 2019 (190 economies)	Ranking in Doing Business 2020 (190 economies)	Changes in ranking
Overall environmental ranking	109	124	Down by 15 places
1. Starting a business	140	138	Up by 2 places
2. Dealing with construction permits	175	170	Up by 5 places
3. Getting electricity	40	98	Down by 58 places
4. Registering property	137	133	Up by 4 places
5. Getting credit	99	104	Down by 5 places
6. Protecting minority investors	48	61	Down by 13 places
7. Paying taxes	184	184	Unchanged
8. Trading across borders	106	108	Down by 2 places
9. Enforcing contracts	48	58	Down by 10 places
10. Resolving insolvency	77	77	Unchanged

Source: http://www.doingbusiness.org/en/rankings

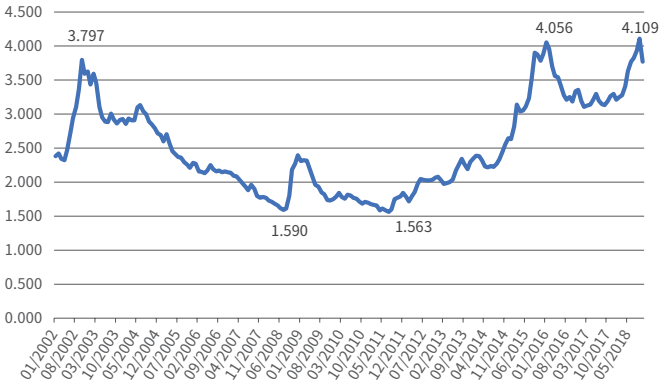
Fourth, the currency and exchange rate are in a fluctuation cycle. From the long-term perspective, between January 2002 and October 2018, the Brazilian Real (BRL) currency generally experienced a trend of "depreciation after appreciation". In these 16 years, there were three periods of accelerated depreciation (see Figure 2) as follows: the 2002 general election made investors worry about the political prospects, thus leading to financial market turmoil; the international financial crisis of 2008–2009; in 2015–2016, Brazil fell into a political and economic crisis.

At the beginning of 2020, when the COVID-19 pandemic broke out in Brazil, causing strong reactions from the market and high-risk aversion, coupled with the unstable political and economic situation, the BRL to USD exchange rate broke through 1 to 5. In 2020, the BRL depreciated by 28.9%, ranking top among emerging economies. Since the beginning of 2021, the market sentiment has stabilised with the prolongation

of the anti-pandemic cycle, and the BRL has gained a wave of slight appreciation, breaking the 1 to 5 mark at the end of June. However, recently, due to the continuous turmoil in Brazil related to the reorganisation of the political structure, approaching of the general election, rise of inflation, and spread of droughts, the BRL depreciated significantly, with a depreciation rate of 6.1% between the end of June and August.

In 2022, Brazil will hold a new general election. At present, the contest between political forces is fiercer than during previous elections. At the same time, the pandemic levels in Brazil have long been at high level. The economic contraction rate in 2020 was 4.1%, the largest annual decline since 1990, and the economy will not return to the pre-pandemic level until 2022. In addition, the expectation of USD interest rate increase, collective interest rate increase of emerging economies, intensification of the "government-court dispute" in Brazil, and other factors may also exert greater pressure on the exchange rate of the BRL, with a high probability of violent fluctuations, and a market forecast that the BRL to USD exchange rate may break through 1 to 6 (Figure 24).

Figure 24: BRL to USD exchange rate between January 2002 and October 2018 (monthly average)



Source: CEIC database

The interest rate also witnessed a large adjustment. In September 2021, the Banco Central do Brasil announced an interest rate increase of 100 basis points, raising the benchmark interest rate to 6.25% from the previous 5.25%. This is the fifth consecutive interest rate increase by the Banco Central do Brasil this year and the second consecutive interest rate increase of 100 basis points since August to hedge inflation expectations. At present, the interest rate in Brazil has reached its highest level since 2019. This acceleration indicates that the pressure to curb inflation is even greater. Brazil's inflation rate is close to 10%, far exceeding the median government control target for the year (3.75%). The soaring inflation rate is mainly attributed to the following factors: high commodity prices, the worst drought in 91 years, which led to the increase in food and electricity prices, and the concern regarding fiscal risks before the general election, which led to the continued weakening of the BRL. Although the rise in base interest rate can curb inflation and prevent capital flight, it will also increase the debt burden of sovereignty, companies, and consumers. Currently, in addition to Brazil's most aggressive monetary tightening policy, Mexico, Chile, Colombia, and Peru have also started a cycle of raising interest rates, which has also put pressure on the regional debt burden. The United States is likely to announce a plan to trim its bond -buying program in November, and it is possible to advance the expected interest rate hike before the end of 2022 to 2023. Once the United States accelerates its withdrawal from quantitative easing, Latin American countries, including Brazil, will face a new round of debt risk outbreak.

Fifth, the risk of agricultural commodity price fluctuation. In view of the fact that Brazil's mode of relying on agricultural commodity exports has not changed, the fluctuation of commodity prices will have a significant impact on the Brazilian economy. From the beginning of 2020 to May 2021, the international commodity price index experienced a "V" trend, and after May, it entered a two-way fluctuation with high prices. The direct impact of the agricultural commodity price fluctuation on the economy is reflected in two aspects: on the one hand, agricultural export income fluctuates; on the other hand, imported inflation is repeated, which further affects the stability of monetary policy.

To prevent the risk of agricultural commodity price fluctuation, we need to predict the following factors. 1) An imbalance between supply and demand defining whether the demand for agricultural products in global economic recovery matches the speed of agricultural productivity recovery or not. 2) The frequency of speculation in the financial market. Speculation contributes to the fluctuation of international agricultural product prices. 3) The US Dollar index. Most commodities are denominated in USD, whose strength will affect the trend of commodity prices. 4) The impact of environmental changes such as abnormal climate and natural disasters on the prices of agricultural products.

5) The market structure of a monopsony or monopoly. The top four multinational grain merchants monopolise 80% of the world's grain trading volume. They manipulate the global grain import and export, food processing, and price setting. Therefore, in order to prevent the risks and predict the price trend of agricultural commodities, Chinese-funded enterprises should pay attention to the above-mentioned five factors, and design plans to deal with them timely.

Sixth, the risks brought by labour issues and environmental protection requirements. Trade unions in various industries in Brazil have always been strong and are accustomed to intervening in various labour affairs. They will unconditionally support workers' demands for wages and welfare, which often complicates general labour disputes. Moreover, since Brazil's labour law or regulations are too complicated and cumbersome, it is difficult for Chinese-funded enterprises to fully understand and skilfully implement such rules and regulations in a short period of time.

In addition, in Brazil, people have a strong sense of environmental protection and non-governmental organisations are very active and have great social influence and strong ability to lead public opinion. If non-governmental environmental protection organisations cannot accept an investment project even if it has been approved by the government or national legislature, then the risks in the implementation process of such projects cannot be underestimated.

Some development projects may happen to be located in areas where Native Americans live in concentrated communities, and because of their unique cultural traditions, they may be opposed to it in terms of the ecological environment or unwelcome to foreign investment developers, all of which means unpredictable risks. During the election campaign in 2018, and since taking office in January 2019, on environmental issues, Borsonaro has been opposing the establishment of more environmental protection zones in Brazil, claiming that it is possible to relax environmental control for agriculture and mining. It remains to be seen what impact these changes will have on investment.

In addition, the Amazon is known as the "Lungs of our Planet", and the sustainability of its ecological environment has attracted global attention. In recent years, many NGOs have been monitoring the Amazon deforestation and tracking the process of agricultural investment, which deeply influences the investment behaviour in this region, providing the ability to influence public opinion. Chinese investment in environmentally sensitive areas in Brazil is faced with external influence from local communities and international NGOs. At the same time, more academic research institutions are beginning to evaluate the reports on China's investment. With China's increasing investment in Latin America, more and more attention are focused on the development of financial institutions and Chinese-funded enterprises, while China's agricultural investment in Latin America is often labelled as "resource plundering" and "destroying the local environment".

Seven, Brazil's ultra-high localisation rate creates resistance to Chinese enterprises. Brazil has always been a country with strong protectionism. Although the opening degree of Brazil's market has greatly improved since the end of the import substitution industrialisation (ISI) strategy in the 1980s, the economic recession and "de-manufacturing" since 2015 have weakened such opening degree. Especially with the current global "re-industrialisation" wave, Brazil has set a higher rule threshold for enterprises entering its market. Therefore, foreign enterprises entering Brazil should conduct early thorough research, and avoid these high threshold by setting up subsidiaries, cooperating with local companies or investing with other countries.

V.2 Suggestions on Agricultural Investment

Compared with the investment in energy and minerals, the marginal utility of China's investment in agriculture in Brazil will be greater, because agriculture is a basic industry with dual economic and social effects, especially in resisting the global food crisis, reducing poverty, and fighting the pandemic. In the future, in addition to maintaining the advantages of traditional cooperation, we should also strengthen cooperation with investment agreements, digital agriculture, bioenergy, scientific and technological exchanges, human capital cooperation, and agricultural infrastructure construction.

First, actively negotiate investment agreements to facilitate the further deepening of bilateral agricultural trade and investment. In terms of investment, Brazil can benefit from

Chinese capital and technology to improve the weak links in fisheries, biomass energy, and agricultural infrastructure, while Chinese enterprises can improve their international competitiveness through the "going global" strategy. For example, they can build farms in Brazil and jointly develop new agricultural or export industries.

Second, actively participate in the construction of agricultural infrastructure in Brazil. Brazil's development has long been constrained by weak infrastructure and insufficient investment, including insufficient agricultural infrastructure. Therefore, the infrastructure investment is well received by the Brazilian government, which has planned to attract foreign investment by a series of preferential measures (such as low-interest loans). This will provide Chinese enterprises with new investment opportunities, especially in the fields of agricultural and animal products, warehousing and international transportation, such as canals, highways, airports, terminals and ports. With years of professional experience, the China Development Bank can also offer financing guarantee to Chinese enterprises to participate in these projects. In the next stage, it is recommended to design stepwise plans before implementation. We should explain to Brazil the great significance of infrastructure connectivity to smooth transactions, narrow regional differences, and exert development potential, altogether from jointly planning. We should start with reasonable scale sub-projects, easy to obtain early harvest to build Chinese brands, and make stepwise progress. Meanwhile, in addition to construction and delivery of infrastructure, we should prepare for long-term operation. On the basis of scientific argumentation, we should be open to the participation of private enterprises and financial institutions.

Third, in addition to agricultural trade, China and Brazil have also cooperated in agricultural materials business such as crop planting, processing and transportation of agricultural products, and seeds. We should made good use of the advantages of both sides to further deepen our cooperation, so as to strengthen China's food supply security and make China more confident in opposing trade protectionism. We can consider Brazil's desire to keep more added value at home, and arrange the relevant links to directly import to China the agricultural processed products in demand.

Fourth, tap the development potential of the China-Brazil digital agriculture. Digital agriculture is an important part for China to implement national strategies for food security and promote the transformation, upgrading, and development of traditional agriculture. Digital agriculture can realise precise environmental control and remote planting guidance, reduce the application of chemical pesticides and fertilisers in the process of crop growth, and ensure people's demand for food security. At the second China-Latin America and the Caribbean Agricultural Ministers Forum held in February 2021, Bárcena, the Executive Secretary of the Economic Commission for Latin America and the Caribbean (ECLAC), urged the region's countries, in the face of the challenge caused by the COVID-19 pandemic, to focus on promoting the digital development of agriculture, pay attention to social inclusion and agricultural ecological transformation, and make joint efforts to promote agricultural development. Therefore, there is great potential for China and Brazil to cooperate in digital agriculture.

Fifth, strengthen the cooperation in agricultural science and technology and human capital. In order to deepen the agricultural cooperation between China and Brazil, China should actively build agricultural sci-tech R&D centers and joint labs, build agricultural demonstration parks to promote high-yield technology popularisation, and strengthen the development and training of agricultural human resources. We should make good use of existing platforms such as the China-Brazil Joint Lab between Chinese Academy of Agricultural Sciences and Brazilian Institute of Agriculture and Animal Husbandry (Empresa Brasileira de Pesquisa Agropecuária, EMBRABA), China-Brazil Agricultural Innovation Center between China Agricultural University (CAU) and the Agricultural College, University of São Paulo (USP) in Brazil, and optimise the advantages for both sides. We should expand new cooperation modes based on past experience learned, give priority to areas that have great significance in promoting agricultural development to both China and Brazil, and gradually explore new cooperation areas such as technologies for sustainable development in agriculture.

Sixth, uphold the information transparency rules, disclose information in time, and interact with society so as to strengthen the sense of social responsibility. We should pay attention to environmental protection and sustainability during cooperation, and assume due social responsibilities. We should also appropriately invest in family agriculture in Brazil to promote employment by purchasing or cooperative planting, giving appropriate training with good publicity, which will not only help to prevent Brazil's grain sources

from being controlled by giant multinationals, but also help to establish a good image of Chinese enterprises and realise the "people-to-people bond". It is recommended to establish identification, evaluation and monitoring mechanisms, strengthen internal supervision mechanism, realise early warning and prevention of violations, and, more importantly, strengthen the communication with the public for ecological compensation. For sensitive environmental issues in Brazil such as deforestation, over-reclamation, change of land use, and social issues such as anti-commercial bribery, anti-monopoly, government relations, labor and employment, and community security, corresponding emergency plans should be prepared. As a financial tool, Payment for Ecosystem Services (PES) has been promoted in Brazil. Chinese enterprises can cooperate with various financial and insurance institutions to show their "environmental protection responsibility" with monetary incentives.

Seventh, coordinate the climate position and strengthen the cooperation in green and low-carbon agriculture. In September 2020, China announced that it would reinforce the effort to achieve its Nationally Determined Contributions (NDCs), and strive to peak CO_2 emissions before 2030 and achieve carbon neutrality before 2060. In December 2020, Brazil announced to reduce emissions by 37% and 43% from 2005 levels by 2025 and 2030 respectively, end illegal deforestation by 2030, restore 12 million hectares of forests, increase the renewable energy ratio to 45%, and strive to achieve carbon neutrality by 2060. Since agriculture and animal husbandry account for approximately 70% of the emissions, the core goal of Brazil's agriculture and climate policy is bound to be green and low carbon. Brazil has improved its laws and regulations, and strictly requires "decoupling" between crop production and illegal deforestation. In view of this, China and Brazil can coordinate their climate targets through multilateral mechanisms such as BRICS (Brazil, Russia, India, China, and South Africa) and BASIC countries (Brazil, South Africa, India and China). At the same time, when developing agricultural economic and trade cooperation with Brazil, Chinese enterprises not only need to carry out strict traceability investigation on agricultural land and products supply to effectively avoid environmental disputes, but can also explore bilateral cooperation in green and low-carbon agricultural technologies.

Eighth, establish risk audit and early warning mechanism. Chinese enterprises can use external independent audits to control the risks, and choose one local branch of the Big Four [Deloitte, Ernst & Young (EY), PricewaterhouseCoopers (PwC), and Klynveld Peat Marwick Goerdeler (KPMG)] to conduct legal, tax, labor, and other risk audits. Cross-border trade and investment both face the currency volatility exposure of target countries. Due to the serious depreciation of the BRL, enterprises should actively take hedging transactions to avoid exchange rate risks for financing projects and trading objects denominated in USD. At the national level, an early warning model of currency crises can be established to guide and support the investment decisions of enterprises, promote bilateral local currency settlement between China and Brazil, and cultivate an RMB platform offshore.

Overall, the investment prospects of China in Brazil are still promising. In view of the uncertainty generated by the new Brazilian government, China and Brazil can communicate and coordinate through policies. In particular, the 12 sub-committees under the China-Brazil High-Level Coordination and Cooperation Committee (CBHCCC) can guide the development of strategies to resolve and overcome related difficulties. Moreover, the traditional political mutual trust and political friendship between the two countries will also be conducive to solving the problems faced by China in investing in Brazil. Chinese enterprises should adhere to the principle of marketisation, follow the local laws and regulations of Brazil, use the correct justice and interests approach to regulate their investment in Brazil, actively promote mutual benefit and win-win cooperation between the two sides, and show the positive image of China as a responsible power so as to make Brazil more willing to continue the investment cooperation with China. Chinese enterprises should pay special attention to the protection of the local ecological environment, so as to secure the China-Brazil cooperation and build a community with a shared stable and far-reaching future for mankind, and enhance the common well-being of Chinese and Brazilian people.

Chapter VI Discussion and Conclusion

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VI.1 Brazilian Agricultural Policy and Sectoral Development

Brazil's rapid increase in agricultural and livestock production started in 1973, when the US embargoed its own soy exports. It has, since then, seized all important opportunities at the international level to industrialise and modernise its agricultural sector. This process has established a solid foundation for Brazil to become a global agricultural powerhouse, and to develop mutually dependent agri-business relationships with many markets, for a variety of soft commodities. Domestically, in addition to a favourable international scenario, there is no doubt that investment in Brazil's agricultural sector is dependent on several enabling conditions, including abundant land, favourable growing conditions, e.g., temperature and rainfall, as well as a large immigrant population, including labour, know-how and agricultural organisations.

While being an opportunist and taking advantage of favourable international conditions, Brazil's overarching structure of public policy has been effectively elaborated to improve its agricultural productivity, together with fostering food independence and export income. Policy reforms and innovation were directed mainly surrounding the areas of science and technology, and market-based and financial mechanisms for organised farm settlements, as explained below. They also influenced external relations and infrastructure building.

Firstly, Brazil has been focusing on science and technology since the 1970s, and instituted research corporations Embrapa and SNPA, both of which further enabled soybeans to become the locomotive of Brazilian agribusiness. Nonetheless, it could be argued that investments in technology have favoured large-scale producers more than smallholders. The productivity gap between top producers and the majority of farmers remains an important problem in the structure of the farming sector, which to a large extent undermines a fair and socially civilised production system.

Secondly, the privatisation reform of logistics, rural credit provision and tax exemption instruments has consolidated farmers' commitment to the industrialisation of agriculture, and accelerated the distribution and export of Brazilian food products.

Our analysis also calls attention to the influence of initiatives at the sub-national level on Brazil's agricultural policy. Initiatives including the Northeast Consortium and the jurisdiction approach have institutionalised cooperation with China in agricultural trade and investment. Several states have also reached out to provinces in China on the topics of modernised agricultural production, research and technology, trade and investment, coupled with food safety.

VI.2 Sino-Brazil Bilateral Trade and Investment in Agriculture

In the first half of 2021, China's consumer market received the largest share of Brazilian total agricultural product exports. Among Brazil's well-structured and competitive production chains for almost 40 types of soft commodities, the most crucial commodity that leads the Sino-Brazilian bilateral trade and investment is soybeans. The sheer volume of soybeans that they trade is tremendous, reaching 66 million tons in 2020, which was larger than the total production of all other exporters except for the US. Brazil's rapid expansion of soybean production and export corresponded to China's rapid expansion of soybean consumption and importation, as growing economic prosperity increased the demand for beef, dairy, poultry and pork. In this sense, China and Brazil have become deeply interdependent in the soy sector.

Based on this evidence, this report points out that, by both experiencing emerging economic development, the two countries share joint interests in maintaining and underpinning agricultural trade and investment. This is key for China's food security and Brazil's economy. Considering the fact that Brazil aims to enlarge its economic scale and

China is increasing its demand for high-quality food products, both also share complementary interests in the trade relationship. This further indicates that a closer and strategic relationship between both sides is urgently needed, for both to align and to speak the same language on sensitive issues – ranging from sanitary measures, to quality control, through to environmental regulations.

Nonetheless, critically speaking, international trade risks associated with dependencies often lead to risk mitigation responses. Thus, China has mitigated its dependence on Brazilian soybean imports by investing in its own soybean trading and input capacity in Brazil, and by prioritising Brazil as a target of its investment programme in South America.

Accordingly, China is a key foreign investor in Brazilian agriculture and related infrastructure. Moreover, a 47-year bilateral diplomatic relationship, the BRICS cooperation platform, and China's Belt and Road initiative, have all contributed to China's deepening involvement in Brazil's agricultural and related sectors. However, we also discover that, by horizontally comparing China's scale of investment in all industries, its investment in agriculture is rather limited, accounting for around only 3% of China's total investment in Brazil between 2007 and 2020.

Vertically, China's investment in the agricultural sector reached its apex between 2014 and 2017, when many large-scale state-owned enterprises were launched on the markets with a great amount of assets. From 2018, we witnessed a diversifying trend: China's medium- and small-sized enterprises followed the investment behaviour of leading enterprises and started entering the Brazilian investment market.

It is common for China's enterprises to adopt the merging and acquisition of assets as an entry point into the Brazilian agriculture investment market. This approach mitigates transaction costs and facilitates rapid familiarisation with and adaptation to the local market. China's investment approach is also exhibiting the trend of moving forward into green-field investment.

Through our research, we also learned that China's investment in Brazil's agricultural products is concentrated on a few soft commodities. Particularly, the investment focus is on the production, storage, processing and distribution of soybeans, which coincides with the enormous trade volume of soybeans between the two markets. However, this also reflects the fact that China's enterprises are gaining more control over their supply chain in Brazil, and are linking the full cycle of production with the end-user market in China.

Brazil also benefits from foreign investors' demand to supply capitals and technologies, to help achieve its ambition of being an agricultural giant. Its well-established regulatory system in the field of foreign investment, including both national law and sub-national preferential instruments, attracts foreign investors and undoubtedly encourages China's investment in Brazilian agriculture. China's investors in Brazil also enjoy export credits, low-interest loans, and insurance when they export their products back to China.

Brazilian national law and policy in the sectors of food and agriculture, which focus on improving the safety and quality of food products, also to a certain extent promote the export of Brazilian food to China. These include the Organic Agriculture Act, the Pesticides Act, and labelling of genetically modified food. We suggest that as food quality is becoming more essential in Sino-Brazil trade after achieving food security, an increasing share of highly aggregated valuable soft commodities in the Brazilian agri-food exports is strategic for consolidating the complementary nature of the Sino-Brazilian bilateral trade relationship.

In this report, we also investigated the role of financial actors in the bilateral trade and investment relationship. The CDB (China Development Bank) is a key development bank that provides services and products to support China's direct investment in Brazil. Commercial banks and financial institutions are increasingly mushrooming by establishing branches and representative offices in Brazil. Chinese enterprises have also opened their own financial institutions to better serve their own financial needs, corresponding to their corporate development strategies.

At the sub-national level, Brazilian states have also played a leadership role in agricultural innovation and commodity trade with China. For instance, the State of Mato Grosso, Brazil's largest agricultural and livestock producer, has created its own agricultural technology and innovation capacity, and institutions devoted to overcoming trade barriers.

Finally, we highlighted seven risks that investors may face

when investing in the agricultural sector in Brazil, which are derived from five dimensions, comprising policy uncertainty, the business environment and cost, exchange rate risks, labour and environmental protection laws, and regulations and requirements regarding the localisation rate. Based on these risks, we proposed eight suggestions regarding agricultural investment in Brazil, targeting both public and private stakeholders. These covered bilateral in-depth negotiation for maximising the complementary interests and needs; developing the agriculture-related infrastructure and the whole life cycle of soft commodities, including seed and crop planting in Brazil; digital agriculture, science and technology, and human resources; information disclosure; decarbonised agriculture; and risk-audit and early-warning systems during practice. We are convinced that topics such as innovation, infrastructure and sustainability will gain relevance within the bilateral agenda.

VI.3 The Perspective of Environmental Protection

The extent to which Brazil's agricultural industrialisation and modernisation is reliant on the natural environment, especially the Amazon rainforest and the Cerrado savannah, has been a compelling issue. We argued that Brazil's rise as a major agricultural exporter was accompanied by its rise as a global environmental leader, which can be traced back to the enactment of its first nationwide legislation – the Forest Code of 1965. We also underscored that this leadership has been eroded in recent years, although the main public policies remain intact.

We categorised five pillars supporting Brazil's position as a global agricultural leader; one of which is the availability of natural resources. However, simply expanding Brazil's cultivated land area is not enough to dominate agricultural production in the world. Instead, making use of technology, public policy, farmers' entrepreneurship, and value chain establishment, are also essential to increase productivity and consolidate its leadership status.

We pointed out that, to maintain the competitive position of Brazilian agriculture in the international arena, the environmental footprints of its cropland expansion have to be considered and minimised; these include deforestation, fires, greenhouse gas emissions and water contamination. The Brazilian authorities have been focusing on a two-pronged approach to solve these issues: i.e., regulatory measures and market-based instruments.

Firstly, associating agriculture with the regulatory and policy revolution in the sectors of the environment and climate change aims to govern and minimise the environmental footprints of the agricultural commodities. The Forest Code, National Biosafety Policy, National Climate Change Policy, the Rural Environment Registry and National REDD+ Strategy are among the most ambitious public policies in the world for reducing deforestation and pertinent greenhouse gas emissions. We assessed the value of individual regulatory and policy efforts, and found that the ambitious and expensive PPCDAm plan contributed significantly to tackling deforestation, which declined to 77% below its historical average from 2005 until 2012, when the deforestation started growing slowly again.

This, to a certain extent, illustrates that implementing command-and-control measures is not sustainable without consistent funding to keep supporting these measures. It is also important to provide positive incentives to encourage the participation of farmers and businesspeople. Moreover, it may become necessary to identify those who illegally seize native vegetations from farmers, and acknowledge the credibility of the conservation proposals and plans advanced by farmers in response to governmental and corporate zero-deforestation movements. The majority of these positive incentives have not been implemented, even though they were initially proposed.

This illustrates that Brazil has a low degree of law and policy enforcement capacity, despite the fact that it has tried to improve this through internal initiatives, including the PPCDAm, the Rural Environmental Registry for tracking farms' compliance with the Forest Code, as well as external partnerships – for instance, the Amazon Fund received payments from Norway and Germany.

Incorporating the issue of climate change into agriculture is also a well-structured policy development orientation. Brazil's low-carbon agriculture production guided by the ABC plan, now in its second phase (ABC+), is providing finance and technical support for farmers wishing to transition to more sustainable and low-carbon production. As of 2020, Brazil has kept more than seven billion tons of CO_2 in

Amazon trees and out of the atmosphere, through its efforts to slow deforestation. Brazil could deliver large volumes of carbon-neutral soybeans in exchange for investments in infrastructure, agricultural finance, or other incentive mechanisms.

At the international level, Brazil actively participated in the CBD and UNFCCC, and launched its national strategies and objectives to align agriculture with the challenge of reducing deforestation and tackling climate change. However, these positive steps forward have been accompanied by measures such as Brazil's newly announced NDC in 2020, which is less ambitious than the previous NDC; it allows for a larger amount of emissions by 2025, and lacks supporting action plans.

At the Sino-Brazil bilateral level, China has been sending signals of pursuing sectoral sustainable development – such as the recent high-level China–Brazil Sustainable Agriculture Dialogue in 2021, which advanced and will keep underscoring the importance of sustainable agriculture in the bilateral agenda. Since the Bolsonaro Administration suspended the Amazon Fund, a results-based payment partnership with European countries, it is unlikely to see fundamental changes or positive anti-deforestation result made by Brazilian society alone.

Brazil has developed several market-based mechanisms to encourage multiple stakeholders to participate in mitigating habitat conversion. The engagement of enterprises in zero-deforestation movements such as the Soy Moratorium and Cattle Agreement have driven the business sector to improve its tracing capacity and sourcing of deforestation-free commodities. Indeed, the Soy Moratorium succeeded in nearly eliminating deforestation directly associated with soy production in the Brazilian Amazon; but its indirect impacts need further quantification to determine if the overall result is positive or negative. It has also triggered a backlash from soy farmers. We therefore believe that the Moratorium's efforts to curb Amazon deforestation have had mixed results.

Sustainability certification of soybeans, such as the RTRS, has not expanded beyond a niche market space, with only a small percentage of the market shifting to sourcing from certified sustainable production. We explained several crucial factors that constrain the adoption of certification; one of the prime concerns is that price premiums for certified soybeans are not sufficient to cover the costs of meeting the RTRS standard requirements, especially for producers who produce in the most unsustainable ways. We therefore stated that sufficient demand and willingness to pay for certified food products are extremely important in driving sustainable production and the application of certification.

Financially, with the increasingly important role of green finance, our researchers suggest that it has the potential to accelerate the agricultural sector's transition to become forest- and climate-friendly, through establishing green financial strategies, optimising financial products, and promoting low-carbon development of the trade chain. We also explored three mechanisms developed by Brazil and international society to financially support the conservation of the Amazon rainforest, and to compensate those complying with local and national command-and-control laws and measurements. These include the results-based payment system, the voluntary transactions of jurisdictional REDD+ credits, and new market mechanisms.

With these three mechanisms in place to facilitate the flow of funding, it could be argued that Brazil is well positioned to implement these mechanisms primarily through embracing forest carbon offsets. These offsets can also meet the demand from an increasing number of leading companies that have made net zero emissions commitments, as well as the Western governments who purchase emissions credits.

The second approach Brazil has adopted to protect native vegetation is through technology breakthroughs in the areas of forest monitoring, land use intensification, recovery of degraded pastures, crop-pasture-forest integration, no-till cultivation, biological nitrogen fixation, forest planting, and animal waste treatment.

Brazilian research institutions and its commercial sector are also creating a mature and comprehensive methodology for offsetting carbon emissions during agricultural activities, including offsetting a variety of greenhouse gases through several methods. However, achieving a large scale of carbon-neutral farming is still not viable, in terms of the affordability and accessibility of offsetting methods and the certification process. A jurisdictional approach to the provision of carbon neutral commodities, such as soybeans, is a promising way to link regional performance in slowing deforestation to farm-level practices.

Finally, we also examined this topic from the perspective of sub-national level governments, which have exerted great efforts to achieve the sustainable development of agriculture. We highlighted the PCI strategy and jurisdictional carbon neutral soybeans, established by the Mato Grosso state for the purpose of achieving net zero emissions of forest carbon by 2030. Of particular relevance to the Brazil–China soybean trade relationship is the possibility of decarbonising this trade, starting with the state of Mato Grosso, which possesses a pool of 200-million-tons CO_2 reduction. Therefore, we review the status of Brazil's Amazon with an eye towards building partnerships between the states of Amazonia and China, for sustainably produced soft commodities.