UNU-CRIS
WORKING PAPER SERIES

#07
December
2020

EU-China Relations on Food Security and Agri-Food Trade

Alice Marinelli

www.cris.unu.edu

UNITED NATIONS
UNIVERSITY
UNU-CRIS
Institute on Comparative
Regional Integration Studies

in alliance with
VUB VRIJE UNIVERSITEIT BRUSSEL
UNIVERSITEIT GENT
Flanders State of the Art
west-vlaanderen de gedreven provincie
BRUGGE

About the author:

Alice Marinelli is a former research intern at UNU-CRIS, she holds a BA in Political Science from LUISS University of Rome and a MA in International Relations also from LUISS University of Rome. Alice currently works as a Junior Consultant at the strategic consulting firm Ianus Group in Brussels.

Abstract

China, the most populous country in the world, must feed around 1.3 billion people but its agricultural capacities are limited as its borders incorporate only one-tenth of the world's arable lands. The agricultural sector has been an important driver of China's economic growth, but due to natural resources' constraints China has implemented different and sometimes discordant agricultural reforms over the years. Food insecurity in China is exacerbated by the contraction of arable lands, water scarcity and environmental degradation. In accordance with the changing institutional setting and economic environment, food trade policies have varied, although every Chinese government has always prioritized the self-sufficiency principle, which places emphasis on domestic production. Drawing upon theories of international trade, this paper attempts to demonstrate how China would be better off if it increasingly engaged in international food trade and if it enhanced cooperation with the European Union (EU) in research & innovation (R&I) to tackle the problem of food security, as the EU can be a model for sustainable agriculture and food safety for China. European scientific initiatives and the sharing of its best practices have the potential to positively impact on China's food security status and on the relationship between the two parties in terms of economic gains and of food safety guarantees.

Sommario

1. Introduction

At the World Food Summit, held in 1996, the definition of food security that was broadly accepted is the following: "*Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life*" (FAO, 2006). Four dimensions can be identified in this definition. A country must ensure that firstly enough food is available by providing it through domestic supply, imports, or aid, and that secondly it is also accessible, meaning that everyone should be able to purchase a fair amount. The third dimension concerns the food's utilization, policy makers must guarantee that food is safe, healthy and possesses nutrition value. Finally, food stability is important, food security should be permanently guaranteed, even in the long term (Bianchi, 2014).

Food security is a challenge that China has faced in the past and continues to face nowadays. Following the Great Chinese Famine of 1959-1961, which led to the death of millions of people, China focused its attention on its food system. Being the most populated country in the world, China must feed 23% of the global population using only one-tenth of the world's arable lands (Ghose, 2014). Although China is still considered a developing country, due to rising inequalities between urban and rural areas and a per capita GDP which remains low in comparison to the standard of other developed countries, it is the second largest economy after the United States and plays a pivotal role in the global order (Ghose, 2014). Since the foundation of the People's Republic of China (PRC) in 1949, the Chinese government's priority has been to strengthen the agricultural sector, namely grain production which is one of the main drivers of the economy, to ensure a secure and safe food supply is maintained. China's food governance has evolved over the years as numerous and sometimes discordant agricultural reforms have been implemented. While self-sufficiency has always been a cornerstone for the Chinese government, China's grain trade policies have varied according to the changing institutional setting and economic environment, as it attempts to make the country more self-reliant in terms of meeting the domestic consumption demand.

China's agricultural trade pattern has always fluctuated, and despite its focus on self-sufficiency, China is now considered to be a net grain importer (Terazono, 2014). The primary explanation for the necessity of importing grain resides in the fact that the arable land area available per worker is very limited. Furthermore, it has been shrinking since 1990 and now corresponds to only 0.1 hectares per capita, less than a half of what other developed countries utilise (Lu, 1997). The market-oriented economic reforms implemented in 1978 by Deng Xiaoping also created new challenges. As the economy grew rapidly so did the demand for food and dietary patterns among the burgeoning middle class have also changed. Furthermore, rapid industrialization led to spiralling levels of air pollution and the production of large quantities of industrial and domestic waste which all had a direct effect on land quality, as the soil became increasingly degraded. The contamination of grain crops, fruits and vegetables, mainly by toxic heavy metals, also had a severe impact on food safety and public health (Ghose, 2014). Pesticides, invented in the 1950s to prevent pests and pathogens from damaging crops with the aim to improve food availability, also have a negative impact on both the environment and human health, due to the high levels of chemical compounds that they release into the soil and water (Zolin, Cassin & Mannino, 2017). In addition to the loss of arable land, water scarcity, particularly in China's northern and eastern provinces, has always constituted a significant problem for the agricultural sector (Jiang, 2009). Hence, it can be deduced that the economic measures of the 1980s and 1990s intended to foster economic growth had a dual effect; while on the

one hand the agricultural system began modernizing, on the other hand rapid urbanization led to the shrinkage and contamination of arable lands (ibid). Given all this, the Chinese central government needs to prioritise working towards meeting the country's needs for both food quantity and quality. One means to do so is through increased international cooperation.

The European Union (EU) was one of China's first trading partners and by 2017, China was the second destination for European food exports after the United States, and the fourth country of origin of agri-food imports in the EU, with a total value amounting to €5.090 million as of 2016 (European Commission, 2017). Between 2012 and 2016, the main EU agri-food products exported to China were, besides beverages, meat, processed cereals and dairy products, whereas the main imports from China were vegetables, fruits and products of animal origin (European Commission, 2017). As food trade between the two countries is rapidly increasing, it is important for the EU and China to strengthen their cooperation to include the exchange of information on a regulatory, scientific and technical level, with the aim of improving China's food security and food safety (European External Action Service, 2018). China is interested in cooperating with the EU as its more sustainable agricultural practices, biotechnology models and innovative methods may help improve Chinese agricultural productivity and attain better levels of food safety.

2. Research Questions and Methodology

The purpose of this working paper is twofold: firstly, to provide an insight on China's current level of food security; secondly, to illustrate China's relationship with the EU to understand how this seeks to become a means to tackle the problem of food security and provide a model of sustainable agriculture and food safety. The paper attempts to respond to the following research questions:

(i) *How has China been addressing its food security challenge?*

(ii) *What drives and explains EU-China cooperation and trade in food and agricultural products?*

To respond to these questions, the paper will be divided into three sections: the first outlines the theoretical framework drawing upon a literature review of secondary sources and international trade theories to explain China's trade policies; the second section provides key definitions of food security and addresses the challenges that China is currently facing in order to attain national food security; the last section, in light of the analysis, seeks to answer the two research questions. It will thus be explained how the EU's share of scientific initiatives and best practices in the agri-food trade could have a positive impact on China's food security status and on the development of the relationship between the two parties. The degree of cooperation between the EU and China will be described in terms of economic gains and in light of further food safety guarantees.

The overall hypothesis is that China's central government reliance on grain self-sufficiency cannot ultimately lead to improvements in food security. Rather an open-market approach combined with the EU's share of best practices and innovations, and investments in agricultural technology and research can embody a more successful strategy. To test this hypothesis, the impacts of alternative policies meant to guarantee food security in the long term will be evaluated. The paper will strive to determine whether the reduction of import tariffs and the development of an EU-China partnership, in the form of a Free Trade

Agreement (FTA), can be a viable solution to defeating hunger and achieving national food security.

Drawing upon a qualitative analysis of secondary sources – books, journals, public documents and websites relevant to the topic - efforts will be made to evaluate how and to what extent China will be able to achieve food security with the support of the EU. The paper will evaluate the comparative food security status across the country, to examine if there is a prevalence of insecurity in some regions rather than others. The purpose of the analysis is to assess the impact of the trade policies carried out in the past in order to identify the most appropriate measures to adopt in the future. The present and future commitments of the Chinese ruling party will also be taken into consideration to investigate how these can influence the country's agricultural productivity and affect national food security. As far as the timeframe is concerned, the main economic and agricultural policies enacted from the beginning of the Reform Era in 1978 until today will be taken into consideration, since China established its first diplomatic relations with the European Economic Community (ECC) in 1975.

2.1. International Trade Theories

Economic trade theories can be used to explain a country's agricultural trade pattern, since foreign trade in the agricultural sector can be considered as a determinant of economic growth, in the least developed countries (LDC) as well as in developing countries like China where agricultural goods play a great role in the economy (Verter, 2015). International trade is the practice of exchanging goods and services between nations and across borders (McDonald, 2018). In opposition to mercantilism, a trade theory which encouraged countries to export goods, the first economic theories of liberalism began appearing in the 18th century. Adam Smith, in 1776, formulated the "Absolute Advantage Trade Theory", claiming that a nation becomes wealthy when specialization in the production of a certain good occurs (ibid). When a country produces a service or commodity at a lower cost than another country, it is said that the former has an absolute advantage over the latter. Therefore, if all nations, through specialization, practiced free trade and exported the goods that they had an absolute advantage on, everyone would benefit. Adam Smith believed that all restrictions to trade should be eliminated and that governments should not intervene in the market (Verter, 2015). Subsequently, in 1817, David Ricardo elaborated upon the "Comparative Advantage Theory", by stating that the good that requires the least labour should be the one traded and exported while the goods for which the country has no specialization should be imported (Costinot and Donaldson, 2012). The theory assumes that technologies differ, and that labour is the only factor of production considered. Therefore, countries engage in trade due to the difference in labour productivity, however, this economic model lacks the inclusion of capital and land factors (ibid).

In the early 1920s, Eli Heckscher and Bertil Ohlin developed another theory of international trade based on Ricardo's principle of comparative advantage. The Swedish economists believed that international trade can compensate for the unequal distribution of the resources of production around the world (Leamer, 1985). The Heckscher-Ohlin (HO) model, also known as "factor endowment theory", states that trade among countries occurs because of the differences in the factors of production costs, assuming that technologies are the same (Negishi, 2001). Countries are endowed with different resources, labour, capital and land (ibid). According to the model, countries trade based on their resource endowment and a country should specialize at producing a commodity for which the

abundant factor of production is best utilized. The price of the factor of production will depend on the abundance or scarcity of the resource endowments. Hence, if a nation is labour-abundant, it should export labour-intensive goods, whereas if a nation is endowed with more capital, it should export capital-intensive commodities and import the others (Verter, 2015). China's trade policies will be explained by using this theoretical model of international trade.

China is a country mainly endowed with the factors of production of land and labour, rather than capital, and agricultural production can be either land or labour-intensive (Lin, 2011: p.163). Farming grain is considered a land-intensive activity, whereas the cultivation of vegetables and fruits is labour-intensive (Wang, 1997: p.6) To plant one mu (0.15ha) of corn takes about 7 labour days, 15 days for one mu of rice, and about 200 labour days for vegetables (Lin, 2011 p.163). Since arable land per capita in China is low, it can be inferred that the country has no comparative advantage in the production of land-intensive commodities. China is, instead, a labour-abundant country, that has its comparative advantage in producing labour intensive agricultural products such as vegetables and fruits. Therefore, if China has a comparative disadvantage in the production of grains and land-intensive harvests, according to the H-O trade model the country should import these commodities and export labour-intensive goods if it wants to be competitive on the international agricultural market. Grain imports have been rising since the 1990s, and future projections show that China will become a net importer of grain once the Chinese government eliminates all international trade barriers (Carter and Rozelle, 2002: p. 27-30). If this trend continues more land can be allocated for labour-intensive crops. Thus, due to China's factors of endowment and limited natural resources, the self-sufficiency policy had some negative consequences for agricultural productivity since China does not have a clear comparative advantage in the production of grain (Long, 1999).

3. China's Food Security Challenge

China is the world's largest consumer of food and, despite its limited natural resources, it has been able to feed 22% of the global population (Hartel, 2018: p. 61). Although in 2015 China achieved the Millennial Development Goal (MG) of eradicating poverty and hunger, estimates show that 134 million people are still undernourished and disparities regarding the ability to access food exist between people living in rural areas and those in the cities (The State of Food Insecurity in the World, FAO, 2015). In China, the concept of food security has always been associated with "grain security" and every Chinese administration has prioritised domestic production as the best means to provide food for its population. In other words, self-reliance has always been at the core of the nation's agricultural policies (Zhong and Zhu, 2017). In 2014, China produced 18% of the global grain supply, 50% of global vegetables and 29% of meat (Ghose, 2014). As the Chinese population is expected to continue increasing, reaching 1.3406 billion people by 2050, food consumption will rapidly expand, and China will struggle to meet such a high demand due to its limited natural resources (Mukhopadhyay et al., 2018).

Although China has increased its food production over the years, a consistent discrepancy between supply and demand endures. Overall, the food self-sufficiency rate has been kept as high as 95%, but, recently, domestic grain production has not matched demand and the demand for meat and dairy products has been growing rapidly (Hartel, 2018: p. 68) as more affluent Chinese consumers demand food of higher quality, nutrient dense and with a high caloric intake (Ghose, 2014).

3.1. Arable Land Scarcity

China is the third largest country in the world, but the area suitable for agricultural activity is very limited and accounts for only 12.8% of the planetary total. Declining arable land availability is one of the most serious issues that China is currently facing (Ghose, 2014). For example, between the years 1996 and 2008, China's arable lands diminished by 6.4% (ibid). Projections show that China's cultivated lands will decrease from 135 million as of 2003 to 129 million hectares by 2030 as a consequence of urban expansion. During the 1950s, per capita cropland was 0.18ha, by 2014 this had fallen to just 0.1ha (ibid).

The agricultural system in China has undergone a series of radical transformations in the twentieth century, firstly during the Chinese Communist revolution in the 1950s and then again during the economic liberalization era of the 1980s (Naughton, 2007: p. 231). The implementation of land reforms has always been a top priority for the Communist Party and any Chinese government (Ye, 2015). Land tenure has often been used as a political tool to appease the populace, as stability in the country's rural areas depended on a fair distribution of farmland among peasants (Hin, 1999: p. 16). The Chinese ruling elite has attempted to devise several solutions to deal with the issue of arable land scarcity, but these mainly addressed problems relating to land property rights and its redistribution rather than the improvement of lands' productivity and efficiency (Suyin, 1976: p. 25). China's area of arable land also continued to shrink due to mismanagement, droughts, deforestation, lack of soil care and the growth of deserts in the northern provinces (ibid: p.25). American experts believed that China's backwardness and low food production was a consequence of a lack of technological equipment, but the Communist Party of China (CPC) asserted that the main cause was an exploitative landlord system and growing urban capitalism, as resources were transferred from the rural areas to the cities (ibid: p.26).

In the 1990s the market-oriented economic reforms paved the way to also reform land property rights. The *Land Administration Law* which assigns private "use rights" to publicly owned land remains the core regulation that protects the country's land resources (Ho, 2005: p. 56). The "use right to agricultural land" imposes on the farmers the obligation to cultivate the land and to not leave it wasted (Ho, 2005: p. 58). However, as collectives own and redistribute lands systematically, farmers are not fully entitled to land tenancy. The peasants thus exploit the land with the purpose of increasing production and are not incentivized to make investments in the improvement of the soil fertility, and this is what leads to inefficiencies in the land's use (Naughton, 2007: p.118-121).

The legal protection of agricultural land in China has now become, more than ever, a priority for the central government in order to safeguard the country's food security and avoid food shortages (Ding, 2004). Another important measure of the *Land Administration Law* concerns the prohibition of the use of arable lands for urban construction projects, the protection of specific cultivated lands such as those being used to grow grain, oil and cotton, and of fields well-suited for the production of vegetables (Hartel, 2018: p. 181-199). The *National Land Consolidation Planning* (2011–2015) is another policy which aims to improve land use and prevent losses of arable lands. This five-year policy has been credited for bringing an additional 400 million mu of arable land into production by 2015 and 8 more million mu will be created by 2020 (Liu, Fang and Li, 2013).

The Chinese government has recently also pursued a policy to highlight the economic use of land resources in order to promote their conservation by improving their quality. Xi Jinping's Twelfth Five-Year Plan established a mechanism of compensation, in the form of grants, to incentivize farmers to take responsibility for the protection of the country's

cultivated lands (Hartel, 2018: p. 181-199). The *Permanent Basic Farmland Delimitation* policy of 2010 included a map system delimiting the Chinese farmland protection areas. By 2014, 156 billion acres of land had been delimited for the purpose of ensuring food security (ibid p. 181-199). Furthermore in 2014, the CPC called for the development of a "rural household management system" with the aim of improving agricultural efficiency and increasing the tillers' income (ibid p. 181-199). More independence will be given to family run businesses in order to encourage them to embrace innovative and technological practices (Hartel, 2018: p. 181-199). However, at the legal level, no settlement mechanisms regarding disputes over land allocation and utilization have been defined, and therefore no specific provisions exist that deal with the protection of uncultivated or waste lands. (Ho, 2005: p. 60-62).

There is still not a uniform call for land protection. On the one hand, the government places emphasis on reinforcing regulations and imposing penalties on those who degrade the quality of cropland through construction projects, on the other hand, urban plans aimed at expanding the country's industrial capacity continue to be encouraged (Veeck, 2013). To improve the productivity of the country's remaining arable lands, irrigation systems have been constructed especially in the arid desert areas in the northern provinces (Economic Research Service, USDA). Despite the benefits that irrigation facilities bring in terms of increased agricultural productivity, these structures themselves take up more than 6 million hectares of potential farmland (Yunlong, 1990: p.345). 40% of such irrigation systems are massive overground structures, if they were instead designed and built in the form of underground pipes many hectares of arable lands could have been saved (ibid). Furthermore, large water storage facilities do not always raise agricultural efficiency but rather have a detrimental impact on the environment (Huaizhi, Jian, Wenju, World Agriculture, 2018). Indeed, the "Three Gorges Dam", the world's largest hydroelectric dam, located in the northern region of Hubei, has led to 60,000 hectares of rice and grain cropland being lost, and caused an environmental catastrophe (Ghose, 2014). Ironically, environmental degradation caused by infrastructure and water storage projects specifically planned to try and mitigate against diminishing land and water resources, have become a major cause of the decline in farmland in China.

3.2. Water Scarcity

China only possesses 8% of the world's freshwater reserves and its demand for this vital resource continues to grow (Ghose, 2014). Historically, China has faced cyclical water shortages in the northern provinces of the country (Jiang, 2009). China's total volume of groundwater and surface water, which mostly comes from precipitation, amounts to 2812 billion cubic meters per year (Ibid). China's current water shortage is estimated to amount to approximately 40 billion cubic metres and by 2050 this could increase to 400 billion cubic metres, of which 56 billion will affect the north alone (ibid). Water scarcity also has a negative impact on industrial activity and therefore it becomes even more crucial to find proper policies that simultaneously increase water supply and decrease demand. Additionally, more than 25 billion cubic metres of water was polluted and left unutilized between 2000 and 2003 (Ibid). Pollution and poor water quality in North and East China have led to shortages in the South where water is usually abundant. The natural distribution of the country's water resources is uneven. Most of the freshwater is located in South China, while the Northern and Eastern parts of the country, where 45% of the Chinese population lives, experiences serious shortages (ibid).

The Chinese institutional water management system has its shortcomings, namely fragmentation and a lack of coordination among the various agencies that deal with the control of water resources. The Ministry of Ecology and Environment (MEE) is the ministry in charge of the department of environmental protection overseeing air, land and water pollution, along with the Ministry of Water Resources (MWR), which is responsible for the supervision of the resources' organization and standards of quality. However, due to a lack of coordination between the two agencies, no proper management is provided, and transaction costs are high. Hence, more effort needs to be made to improve the jurisdiction system on the use of water. If, for instance, the rights of the peasants were clearly defined it would be easier to reduce inefficiencies of usage. A system that defines the quantity of water to which a farmer is entitled to could be put in place so that less water is wasted (Jiang, 2009). The MWR in 2005 called for the water problem in China to be resolved as it deemed that it represented a potential threat to the economic and social stability of the country. The government was urged to provide more investment in the irrigation system and prevent pollution (Parton, 2018). As Parton states: "The problem is that 80% of the water is in southern China, meaning that eight northern provinces suffer from acute water scarcity, four from scarcity, and a further two (Xinjiang and Inner Mongolia) are largely desert. These 12 provinces account for 38% of China's agriculture, 46% of its industry, 50% of its power generation (coal and nuclear use a lot of water), and 41% of its population" (Parton, 09.05.2018).

3.3. Environmental Issues

Soil degradation, caused by mining and agricultural activities, industrial processes and urbanisation, represents a serious issue for China's population, which the central government began addressing only in the 1980s when environmental protections were first adopted. Soil pollution has a negative impact on agricultural activities and therefore on food production. The types of heavy metals that have been detected include lead (Pb), cadmnium (Cd) and chromium (Cr), all of which have severe detrimental effects by lowering farmland productivity (Delang, 2017). Admnium (Cd) typically originates from the combustion of coal, waste treatment, and from the utilization of fertilizers and pesticides and is especially concentrated in South China, in the provinces of Hubei, Hunan, Yunnan, and Guizhou, where several large mines are located (ibid). Environmental lead pollution, due to mining and coal burning is a serious problem in China as food, besides water, air and soil, is the main source of exposure in the population (Wang et al, 2019). Within the megalopolis of Shanghai in the East and Guangzhou in the South, lead concentrations are extremely high (ibid).

Since the beginning of the 1980s, as people's dietary patterns have changed moving from a diet based on cereals to an increasingly protein based one, China's agricultural land has undergone a radical transformation. The soil, once used to grow low value crops, was converted to cultivating crops of higher value (Delang, 2017). To produce fruit and vegetables, highly intensive farming practices utilising new chemicals were required and demand for pesticides has been increasing over the years (Freedonia, 2012). The increased use of pesticides and fertilizers, along with the excretion of animals contaminated the land, raising concerns over food safety. The heavy use of fertilisers has been China's means to counter the fact that its arable land area is limited. Although fertilizers are widely employed all over the world, in China their usage is quite considerable, in 2011 roughly 400 kg of fertilizers were applied on each hectare of land (Delang, 2017). The use of pesticides increased yields by minimising crop loss, yet they can also be detrimental to soil quality.

Another factor that influences soil contamination is livestock waste which peasants recycle as organic composts since these insert mineral nutrients into the land. The reason why animal excrement, if utilized as a fertilizer, is considered dangerous for people's health is because pigs and poultry could have been fed with food containing hormones and antibiotics (ibid).

The other great challenge that China must overcome is that of ensuring adequate water quality levels. Overall, in the urban areas the quality of the water is adequate, whereas, in the rural areas, where 320 million people live, the situation is critical as the amount of contaminated water stands at 90 million cubic meters (Zhang, 2015). In North China, surface water is the worst affected, while in the south, pollution is more concentrated in the underground water reserves (Hu & Cheng, 2013). Crop quality is influenced by the irrigation system which mitigates against water scarcity but in turn has negative consequences for the environment. On the one hand irrigation can raise agricultural production, however on the other hand the chemicals in the sewage pollute the farmlands and its output (Delang, 2017). Thus, the government should improve irrigation systems and implement more long-term strategies to regulate and ensure food safety (Li, 2018).

3.4. Food Self-Sufficiency and Agricultural Trade Policies

To guarantee food security, the Chinese government, since the Maoist period, followed the grain self-sufficiency policy, to be self-reliant in fulfilling the consumption demands of the people living in the rural and urban areas. The strategies through which food self-sufficiency is attained are several, government support to domestic production in the form of agricultural subsidies, restrictions of imports, and application of regulations and standards of improvements for agricultural products (Felloni, Gilbert, Wahl, Wandschneider, 2000: p.6).

While developed countries have been reducing farm subsidies, in 2012 the Chinese government increased its support for domestic agricultural production, spending 165 billion dollars (The Economist, 14/03/2015). China's heavy subsidization of agriculture encourages farmers to grow grain even in lands that are not suitable for crops. Farmers are forced to use large quantities of chemicals in order to produce grain on such unsuitable land, which consequently pollutes the soil and water supplies and ultimately results in inefficiencies in the agricultural sector (The Economist, 21/05/2015).

To maintain self-sufficiency, China's grain trade policies have varied according to changing institutional and economic settings. In the 1980s the country entered a new phase of economic liberalization with the World Bank estimating that between 1980 and 1999, the value of China's trade exchanges of commodities increased to an annual rate of 13%. Nevertheless, the trade of agricultural products remained subject to more protectionism with annual growth rates of only 5% for imports and 6% for exports (Carter and Rozelle, 2002: p. 27-30). Although the government always stressed the importance of attaining self-sufficiency at a rate of 95%, and perceived reliance on the global markets as a threat to domestic production, in the 1990s the trade pattern began leaning towards increased imports and decreased tariffs (ibid). When, in 2001, China acceded to the World Trade Organization (WTO) the government made further commitments to improve transparency and competitiveness (Bacchus, 2011). Among the conditions set out by the WTO, China had to abolish central planning, reduce the monopoly power of state trading companies,

eliminate non-tariffs barriers, and respect food safety along with sanitary standards (Hansen, Tuan, Somwaru and Seeley, 2009).

Changes in dietary patterns, personal habits as well as price and incomes all led to an increase in food imports. Before 1978, the population primarily consumed staple foods with a low daily caloric diet's coefficient, but after the economic reforms which improved urban household incomes, dietary patterns began changing. From the 1980s, the urban middle class started consuming more meat and dairy products, while demand for staple foods declined (Long, 1999). The urban households' food expenditure on cereals amounted to 22% in 1978 but this had fallen to just 8% by 2009 (Zhou, Liu, Gandhi, 2012).

Since the late 1990s China imports of meat, namely beef and mutton, have drastically increased because domestic production, although growing, was still insufficient to meet demand (Gale, Hansen, Jewison, 2015). From 2008, China also increased its imports of grains, feed grains and oilseeds such as soybeans from the United States, Brazil, Australia and Canada, countries with large arable areas. Soybeans are considered an important crop, as it is a protein for livestock and is utilized as oil for food and industrial use (Gale, Hansen, Jewison, 2015). In the past, China has always cultivated soybeans but, being a land-intensive crop, Chinese farmers had to abandon its production and so the country began importing it (Hoering and Sausmikat, 2011: p. 21).

According to the World Trade Statistical Review, China currently has the second highest value of imported agricultural commodities amounting to 160 billion dollars (World Trade Statistical Review, 2016). China's share of total global imports has increased from 8.7% in 2000 to 11.6% in 2015 (ibid). The Chinese share in world exports also grew over the past three decades, from 1.5% in 1980, to 4.6% in 2015, but this is still low when compared to the EU export rate which corresponds to 37.1% and the US one of 10.4% in 2015 (ibid). The United States Department of Agriculture (USDA) draws up a report based on the current trends of China's trade of agricultural commodities and predicts that, in the upcoming years, the exports and imports' pattern will likely continue along the same path. Imports of rice and wheat will remain stable, while corn, feed grains and soybean imports will continue rising (Gale, Hansen, Jewison, 2015). Meat imports will likely rise as well, but attempts will be made to increase the domestic production of pork (Lee and Elmer, 2019). Based on the World Bank's future projections, demand for corn, feed grain, and soybean will grow more rapidly than supply thus lowering the rate of self-sufficiency by 14% (World Bank, 2014: p. 362-364). Rice and wheat self-sufficiency will remain high, the former at a 99% rate, and the latter at 97% (ibid).

4. EU-China Relations and Cooperation on Food Security and Food Safety

4.1. EU-China Agri-Food Trade

In 1975, China and the European Economic Community (EEC) initiated their first diplomatic relations. At the time bilateral trade only amounted to 2.4 billion dollars (Chen, 2009). In 1978, China and the EEC signed their first trade agreement and, after China's accession to the WTO in 2001, trade relations between the countries strengthened (Ministry of Commerce, PRC, 2009). In 2006, the EU became China's largest trade partner, and China became the EU's second largest export market (Huan-Niemi and Niemi, 2008). In general, China is endowed with the factor of labour and so its exports to the EU are labour-intensive,

while the EU, being capital abundant, exports to China technologies and capital-intensive goods (Anxo, 2011: p. 19). It can be said that trade between China and the EU is complementary as it exploits their respective comparative advantages and follows the H-O economic theory. Specifically, in the agricultural domain China tends to export fruits and vegetables to the EU, as these require a significant labour force to produce, and import land-intensive products such as meats, cereals, flour and dairy from the EU (ibid: p. 19).

Between 2002 and 2017, the EU-China agri-food trade rapidly expanded. The agri-food trade statistical factsheet, released in 2017 by the Directorate-General for Agriculture and Rural Development of the European Commission, indicates that since 2015 China, after the US, became the second greatest destination for European food exports and the fourth country of origin of food imports. The main categories of agri-food products the EU exports to China are meat; dairy produce; preparations of cereal, flour, starch; spirits and vinegar. The total value of all agricultural products that the EU exported to China in 2016 was 11.382 million euros (European Commission, 2017). In 2017, Chinese food demand increased even further, cereals, infant food formula and milk powders occupied a large share of the EU exports to China. Pork was the principal imported meat, although recently a decrease has been registered due to the Chinese government's willingness to achieve higher self-sufficiency in the pork sector (European Union 2018). Conversely, the main agri-food products the EU imported from China were roots, tubers, vegetables, fruits, nuts and products of animal origin. The total value of the EU agricultural imports, in 2016, was 5.090 million euros, about 30% of Chinese food exports are sent to the EU market (European Commission, 2017).

In 2014, Xi Jinping's administration lowered domestic grain output targets and undertook a more liberal market approach by increasing food imports (Hornby, 2014). This demonstrates that the central government understands that China cannot solely rely on domestic production, but it must also pursue international trade (Hongzhou, 2016). As a result of rising incomes demand for meat and dairy products in particular will continue to increase until 2030. The government continues to adopt self-sufficiency only for certain products such as poultry, eggs and pork meat, while for beef, mutton and dairy products the self-sufficiency principle is diminishing. When it comes to fruit and vegetables China has a comparative advantage in their production and exports of these are likely to continue rising (World Bank, 2014: 362-364). More emphasis is now also being put on the quality and safety of meat, vegetables and fruit, as well as simply increasing the quantity of production (Hornby, 2014).

4.2. Food Safety Implications

The FAO defines food safety as "*the assurance that food will not cause harm to the consumer when it is prepared or eaten according to its intended use*" (FAO/WHO, 1997). Food safety is considered a challenge for many countries and it requires close cooperation in order to create uniform standards and systems of surveillance (Schmidt & Rodrick, 2003). Nowadays, it is fundamental to consider the quality of the food that farmers grow and that the food industry produces, in order to reduce the risks of foodborne diseases. States have a duty of care to provide the necessary controls to safeguard public health by cooperating with farmers, food processors and regulators (ibid). The importance of food safety was recently stressed during the "Second International Conference on Nutrition (ICN2)", held in Rome in 2014, which reflected on the necessity of achieving good human nutrition by guaranteeing healthy nutritious diets (WHO, 2017). It is moreover a key element to attaining

the *Sustainable Development Goals* of zero hunger and of good health and well-being. Food safety should become a health priority for governments as they establish the regulatory frameworks for food suppliers and producers (Fukuda, 2015).

Since China acceded to the WTO in 2001, food exports and imports have increased sharply, and it became necessary to ensure their safety and quality for consumers. The desire to enhance free trade on the one hand, and that of protecting health on the other has always caused friction between trade partners, particularly between China and the EU. Food safety is a sensitive topic, which has raised questions about the future of EU - China trade relations and could eventually become the source of economic barriers and political mistrust. The EU and China adopt different standards and monitoring mechanisms, as their priorities and means to achieve food safety vary considerably (Schibler, 2014). The EU complies with the Codex Alimentarius, a legal framework of reference established by the WTO in 1963, that has the aim of guaranteeing the quality and safety of food products (Decision 2003/822/EC). The EU is extremely rigorous in establishing high standards of quality and strict requirements because of its commitment to respecting international rules and of its genuine interest in safeguarding its consumers' health (ibid). China on the other hand has been at the centre of several food related controversies as food safety has sometimes been used as an expedient to restrict imports and pursue protectionist policies (Schibler, 2014).

Since 2000 China has experienced several food safety related crises. In 2008, a serious melamine crisis erupted which paved the way for the adoption of a new framework for food safety laws, aimed at improving the regulatory system (Lin, 2017).[1] China has been producing melamine since 1958, and in 2008 it was found in milk powder and infant formula products affecting 300,000 infants and purportedly causing the death of 6 babies (Schibler, 2014). China became the largest exporter of melamine, also detected in coffee and chocolate products in Canada, New Zealand, Australia, UK and in the Netherlands. Consequently, products imported from China which contained milk or soya ingredients were revoked or destroyed. In 2009, Japan, the US and the EU imposed import bans against Chinese dairy products (ibid). The European Commission's decision to establish import barriers was justified on scientific grounds to protect consumers' health (ibid). The Sanitary and Phytosanitary (SPS) barriers were legitimate as they sought to safeguard public health. This seemed to be in contrast to the barriers that China decided to impose on EU beef meat in 2001, which had the purpose of limiting imports (ibid).

In 2001, China began placing an import ban on all beef products coming from European countries in response to the Bovine Spongiform Encephalopathy (BSE), also known as mad cow disease.[2] However, the International Organization for Animal Health gave assurances that EU beef products were in compliance with their norms and were declared not harmful for the animal or people's safety (Schibler, 2014). China, however, did not recognize that EU beef meat was declared nontoxic and disregarded the international food safety regulations. In addition, the Chinese government imposed twenty-two conditions for the entry of beef meat which were deemed to not be related with the risk posed by the disease (ibid). Although China has showed its willingness to improve its trade relations with the EU, the government, at times, has used food safety as a pretext to serve its economic interests

[1] The WHO defines melamine as "an organic based chemical most commonly found in the form of white crystals rich in nitrogen. Melamine is widely used in plastics, adhesives, countertops, dishware, whiteboards" (WHO, 2018).

[2] The WTO defined the BSE as a "fatal neurodegenerative disease of cattle that can be transmitted through the consumption of BSE contaminated meat and cattle feed", the first food incident occurred in the United Kingdom in 1986 and in 2012, ten cases have been diagnosed in the EU.

and echo its protectionist stance (ibid). Such import barriers are likely to have been put in place because, in 2014, China was still self-sufficient in live animal produce. This implies that China would be ready to resume beef imports from the EU when its self-sufficiency level drops and as demand for meat increases due to the change in people's dietary patterns (ibid). The WTO and the European Commission are still in the process of negotiating with China on such import restrictions, urging the Chinese government to lift the ban entirely (European External Action Service, 2017).

4.3. EU-China 2020 Strategic Agenda for Cooperation and Horizon 2020

The Chinese administration, with the aim of achieving food self-sufficiency, has often resorted to policies which involved economic protectionism by placing tariffs on imports (Felloni, Gilbert, Wahl, Wandschneider, 2000: p.6). However, such policies do not seem to have always been successful at ensuring food security for a population of 1.3 billion people due to limited arable lands and scarce water (Ghose, 2014). Therefore, in order to exert less pressure on land resources, China is committing to improve agricultural productivity by investing in research and innovation (R&I) that can provide sustainable agricultural practices such as integrated crop livestock, advanced mechanization and biotechnology models (Fava and Godefroy, 2016).

In November 2013, during the 16th EU-China Summit the EU-China 2020 *Strategic Agenda for Cooperation* was launched and the *EU-China Cooperation Plan in Agriculture and Rural Development* adopted to strengthen collaboration in agricultural research, sustainable production and food safety with the aim of revitalizing Chinese rural areas (European External Action Service, 2013). As a matter of fact, the *Europe 2020* initiative of the EU focuses on a smart and sustainable economic development by putting innovation at the centre of the agri-food industry. Sustainable farming plays a key role in the Horizon 2020 research programme aimed at protecting natural resources, mitigating climate change, and producing safe and high-quality food (Gibello and Puddu, 2017).

Suggested methods to improve the fertility of the soil include crop rotation, the use of organic fertilizers and protecting cultivations from pests. Food safety can be enhanced through controls on the use of chemicals that contaminate raw materials and improving hygienic measures, crucial to preventing the spread of animal food borne diseases and the contamination of fruits and vegetables. Finally, the supply chain system can be improved by identifying products via geographical indication (GI) to ensure their status of origin and quality (Fava and Godefroy, 2016). Through joint programs and R&I initiatives the EU can share its knowledge and best practices to improve Chinese agricultural productivity. Other agenda items of the *EU-China 2020 Strategic Agenda for Cooperation* envisage projects for the improved coordination of urban and rural development, agricultural systems that are more environmentally-friendly, and the recognition of food safety along with consumer's health protection as top priorities (EU-China 2020 Strategic Agenda for Cooperation).

As China has now become an important trade partner of the EU in agri-food, the EU is interested in exporting new technologies and innovative models. The *Flagship initiative on food, agriculture and biotechnologies (FAB)*, established in November 2013, is a project financed under the umbrella of Horizon 2020, the research and innovation programme of the EU that allocates funds from 2014 until 2020. FAB is based on a letter of intent signed

between the Chinese Academy of Agricultural Sciences and the European Commission, in order to enhance scientific cooperation between China and the EU.

Most of the work programme comprises of *Research and Innovation Actions* (RIA), activities which involve new technologies, products or applied research. The project mainly focuses on managing more efficiently the land resources, in improving soil quality, and enhancing food safety monitoring mechanisms (EU-China Food, Agriculture and Biotechnology, FAB; Flagship Initiative). The proposals should have the objective of addressing the problem of land degradation in order to conceive more sustainable and resource-efficient practices. As regards the use of fertilizers, the nutrient rich substance of digestate, widely employed both in China and Europe, these should be utilized much more efficiently. Thus, projects, jointly enacted by agri-food industries, farmers and technology providers, should attempt to devise new technologies that allow the conversion of digestate into organic fertiliser to reduce chemical hazards and pollution from which food safety risks derive. In addition, further food safety controls should be implemented through an integrated approach for hazard monitoring and risk assessment along the entire food chain to detect contaminants and hazardous pathogens. In relation to agri-food trade, the traceability and transparency of food produce needs to be improved and closely monitored (Horizon 2020, Work Programme 2018-2020). As a matter of fact, within the framework of the second work programme of 2016-2017, *EU-China-Safe* was established (Olsen, 2018). The objective of the project is to prevent food fraud and restore trust amongst consumers. A control system will be set up to carry out inspections and monitor legislation with the purpose of raising more awareness and collecting more information on food quality (Olsen, 2018). In addition, the European Commission in collaboration with the Chinese Ministry of Science and Technology have set up a "co-funding mechanism" (CFM) to encourage coordination and research programs between the Chinese and the European universities and institutions (European Commission, 2018).

In addition, the *EU-China 2020 Strategic Agenda for Cooperation*, has a chapter on environmental protection, in reference to the *EU-China Water Platform* (CEWP) project launched in 2012. The purpose of this platform is to tackle the problems related to water scarcity, drought, and water pollution. The EU member states along with several research centres and government agencies came together to realize this innovative strategy for the water sector The *Policies, Innovation, And Network for Enhancing Opportunities for China-Europe Water Cooperation* (PIANO) is an EU project also funded under the Horizon 2020 scheme. The *Strategic Research and Innovation Agenda* (SRIA) has been established to provide guidelines for future cooperation and improve China's water system (ibid). The PIANO-SRIA project areas of interests are agricultural water management, industrial and river basin water management, and water for energy. Agricultural water management is the Chinese government's main priority, and innovative technologies are key to its development, as irrigation and drainage projects have already made important contributions to the agricultural sector (ibid). Rural areas are heavily affected by water pollution since no proper sewage or garbage collection exists (Wang et al. 2008). It is thus important to build better water conservancy infrastructure so that in the event of a drought or flood the impacts can be minimised across the affected area (ibid.). The type of actions employed by the EU are known as research and innovations actions (RIA) and innovation actions (IA). RIAs strengthen the prevention and response mechanisms in case of a drought or flood through an early warning system and on-line monitoring. IAs are aimed at designing new systems for the reuse of wastewater and the abstraction of underground water reserves. When it comes to water pollution, RIAs and IAs will both be implemented

to improve the monitoring of pollution levels, the management of pesticides, and to integrate new techniques to prevent water-soil degradation (European Commission, 2018).

By 2020, the EU aspires to invest 3% of its GDP in innovation and R&D and similarly Xi Jinping's administration affirms its intention of accomplishing sustainable development through scientific and technological knowledge by investing 2.5% of its GDP in R&D by the year 2020 (Herrero, Kwok, Xiangdong, Summers, Yansheng, 2007: p.35-36).

5. Possible Impacts of an EU-China Free Trade Agreement (FTA) on the Agri-Food Sector

Trade between China and the EU occurs under the regulations and agreements of the WTO since no bilateral trade agreement such as a free trade agreement (FTA) exists. The main obstacle to the establishment of a FTA is the EU's lack of recognition of China as a market-economy (Garcia-Herrero, Kwok, Xiangdong, Summers, Yansheng, 2007: p.12). In the *Joint Communication to the European Parliament and the Council* held in 2016 elements for a new EU Strategy on China were established (European Commission, 2016). A "*Comprehensive Agreement on Investment*" was finalized to lay the groundwork for new business opportunities between the EU and China, raising Chinese hopes for the creation of a possible FTA in the future akin to previous FTAs that the EU has concluded with the US, Japan and Canada (European Commission, 2016).

In 2014, Beijing began officially considering the establishment of a FTA between China and the EU, which is China's most important trade and FDI partner. Such an economic treaty may have the potential to further enhance market access as well as bringing political and strategic benefits to both countries (Pelkmans and Francois, 2016). A possible FTA should be thorough and comprehensive in order to include the trade of all goods and services and draw up clear regulatory practices. The first action that must be undertaken in order to advance the FTA is the reduction of import tariffs and of technical barriers to trade (TBTs) which both countries still maintain. However, unlike the EU, China lacks market-driven standards of reference controlled by international entities like the WTO. Additionally, high levels of protection of strategic sectors is still prevalent in China, and State-Owned Enterprises (SOEs) continue to benefit from their privileged economic position vis-à-vis private enterprises (ibid).

For both the EU and China the agriculture sector is quite protected, currently the tariffs that the EU applies to the trade of agri-food products with China amount to 6.90%, while the ones applied by China are higher, amounting to 12.3% (ibid). Vegetables and fruits are among the most sensitive products subject to tariff peaks, as these are the main products that China exports to the European market (Kostadinov, 2017).

According to a study carried out to analyse a possible Free Trade Area between China and the EU, China's high tariffs mainly stem from the protection of farmers' domestic production and the food self-sufficiency policy long carried out by the government. Since China started opening up its agricultural sector, FTAs have been established with Chile, New Zealand and Australia which lowered agricultural tariffs (Pelkmans and Francois, 2016). China still shows reluctance in implementing a FTA with the EU as this would entail a further growth in international competition. However, in the long run a FTA with the EU could generate important gains for China's economy, as the EU, known for its sound food safety system, is willing to export high quality goods and safety standards in order to meet the Chinese

society's new demand for high quality food. In this way, inefficient domestic firms along with mistrusted companies which produce low quality food would be pushed out of the market and Chinese households would have more purchasing options. Thus, China's engagement in international trade and the lessening of food self-sufficiency policy could provide China with the opportunity to further expand trade and provide more choices to the consumers (ibid). The EU has been calling for the creation of the FTA with China since 2006, but until China proceeds with its domestic reforms the EU will not prompt the start of the negotiations (Kostadinov, 2017).

6. Conclusion

China has consistently set itself the target of achieving food security. This is a challenge as the country suffers from arable land scarcity and water shortages, representing a serious problem for a society that still relies heavily on the agricultural sector which occupies a significant share of its economy. China has to feed 22% of the total global population using only 12.8% of the total arable lands and 8% of freshwater supplies. Besides the problems related to land deterioration and water shortages, per capita food consumption levels have also steadily increased, and dietary habits have changed as a result of urbanization and associated increasing levels of affluence. As a result, recently, the Chinese administration began relaxing the food self-sufficiency policy by acknowledging the difficulties in meeting demand by only relying on domestic production.

Having explored China's current food security challenges and examined EU-China cooperation and trade relations in the agri-food sector, several preliminary findings can be drawn. Firstly, interpreted through the Heckscher-Ohlin (HO) economic model, which states that resources' endowment – capital, land, skilled or unskilled labour give a country a comparative advantage over another in the production of a certain good, China should engage in and promote international trade by specializing in what it produces best and in the most efficient way (Verter, 2015). Being a country with a labour-factor abundance, China should focus its agricultural production on labour-intensive crops, namely vegetables and fruits. It can be said that China has a comparative advantage in the production of labour-intensive crops and therefore should export such goods to the EU and import land-intensive crops. Secondly, it has been found that China's R&I and R&D cooperation with the EU has an important and positive impact for China in securing enough food to feed its population.

Furthermore, besides safeguarding food procurement, the Chinese government is now increasingly concerned about food quality and safety. Recent high-profile food safety incidents such as the melamine crisis of 2008 have helped pave the way for the adoption of a new framework for food safety laws. China has thus begun undertaking important steps in this regard by implementing new regulatory systems, but these are still underdeveloped in comparison to the quality assurances that the EU employs. The investments made in the field of R&I by the EU, sponsoring numerous initiatives and funding projects with China, aim to enhance the productivity of China's agricultural sector as well as to improve food safety guarantees. Both countries have been exploring innovative agricultural practices and techniques to produce nutrient-dense food that is safe and sustainably grown for the benefit of consumers, farmers and the environment. The main initiative is the *EU-China Cooperation Plan in Agriculture and Rural Development* which supports agricultural research and rural development. Among others, there is the FAB initiative, the EUCTP-STIS project, and PIANO-SRIA. The latter addresses the problem of water scarcity and

contamination. The poor quality of China's soil and water is a difficult obstacle to tackle, pollution is a consequence of the rapid urbanization process, industrial waste and agricultural activities. Thus, the Chinese government must implement long term strategies to guarantee the safety of the agri-food goods it produces and can do so by encouraging cooperation with partners like the EU to advance projects which aim to improve the management of the Chinese water and soil resources.

Lastly, a conjecture was made on the possibility of starting negotiations over a free trade agreement (FTA) between China and the EU to strengthen their economic-trade relations and foster investments. Although agri-food trade between China and the EU has been growing since 2009, high import tariffs are still imposed by both countries over agricultural and food products. China has the highest tariff peaks because the government still tends to safeguard its farmers and domestic production. Such an agreement could thus be highly beneficial for China, as the EU would export high quality goods and ultimately improve food safety standards. Overall, a FTA between China and the EU, besides presenting important opportunities for both countries in the removal of tariff barriers in the agricultural as well as in other sectors, would provide China with new trade and investment opportunities since the EU is one of its largest trading partners and foreign investors.

References

Anxo D., (2011), *The development of trade between EU and China under the influence of economic integration,* GraduateThesis, Linnaeus University.

Bacchus J. (2011), *China's Continuing Need for the WTO,* China Business Review. Retrieved from: https://www.chinabusinessreview.com/chinas-continuing-need-for-the-wto/

Bianchi E., (2014), *Food Security, the Right to Food and the Human Development Report 1994,* GREEN Working Paper no. 48, University of Warwick. Retrieved from: www.greenfp7.eu/papers/workingpapers

Carter C.A. and Rozelle S., *Will China's Agricultural Trade Reflect Its Comparative Advantage?,* China's Food and Agriculture: Issues for the 21st Century, Economic Research Service/USDA AIB-775. Retrieved from:https://www.ers.usda.gov/webdocs/publications/42432/15176_aib775k_1_.pdf?v=0

Chen X., *Policy Evolution of the China-EU Trade and Economic Relationship*. Retrieved from: http://ies.cass.cn/webpic/web/ies2/en/UploadFiles_8765/201003/2010030813451355.pdf

China's Ongoing Agricultural Modernization: Challenges Remain After 30 Years of Reform, EIB-51, Economic Research Service/USDA (U.S. Department of Agriculture). Retrieved from: https://www.ers.usda.gov/webdocs/publications/44377/12788_eib51b_1_.pdf?v=41055

Delang C. O., (2017), *Causes and distribution of soil pollution in China*, Environmental &Social-economic Studies, Vol. 5, Issue 4, pp. 1-17. Retrieved from: https://doi.org/10.1515/environ-2017-0016

Decision 2003/822/EC: *Council Decision of 17 November 2003 on the accession of the European Community to the Codex Alimentarius Commission.* Retrieved from: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32003D0822

Ding C., (2004), *Farmland Preservation in China,* Lincoln Institute on Land Policy. Retrieved from: https://www.lincolninst.edu/publications/articles/farmland-preservation-china

European Commission (2012), *European Union and China step up cooperation in agriculture and rural development,* 11.06/2012, Brussels. Retrieved from: http://europa.eu/rapid/press-release_IP-12-592_en.htm

European Commission, (2016), Joint Communication to the European Parliament and the Council *Elements for a New EU Strategy on China*, 22.6.2016, Brussels. Retrieved from: http://eeas.europa.eu/archives/docs/china/docs/joint_communication_to_the_european_parliament_and_the_council_-_elements_for_a_new_eu_strategy_on_china.pdf

European Commission (2017), *Agri-Food Trade Statistical Factsheet, European Union-China,* Directorate-General for Agriculture and Rural Development, Brussels. Retrieved from: https://ec.europa.eu/agriculture/sites/agriculture/files/trade-analysis/statistics/outside-eu/countries/agrifood-china_en.pdf

European Commission (2018), *Agri-food trade in 2017, another record year for EU agri-food trade*, MAP 2018-1, Directorate-General for Agriculture and Rural Development, Brussels. Retrieved from: https://ec.europa.eu/info/sites/info/files/food-farming-fisheries/news/documents/agricultural-trade-report_map2018-1_en.pdf

European Commission, (n.d.), *EU-China 2020 Strategic Agenda for Cooperation*. Retrieved from: http://eeas.europa.eu/archives/docs/china/docs/eu-china_2020_strategic_agenda_en.pdf

European Commission, (n.d.), *China food, agriculture and biotechnology (fab) flagship initiative,* Retrieved from: https://ec.europa.eu/research/iscp/pdf/policy/eu-china_research_in_fab.pdf

European Commission, Horizon 2020 - Work Programme 2018-2020, *Food security, sustainable agriculture and forestry, marine, maritime and inland water research and the bioeconomy.* Retrieved from: https://ec.europa.eu/research/participants/data/ref/h2020/wp/2018-2020/main/h2020-wp1820-food_en.pdf

EU-China Trade Project II (n.d.), *Agriculture and Food Safety*. Retrieved from: http://www.euctp.org/index.php/en/agriculture-food-safety

European Union External Action Service (2013), *EU-China 2020 Strategic Agenda for Cooperation*. Retrieved from: https://eeas.europa.eu/delegations/china_en/15398/EU-China%202020%20Strategic%20Agenda%20for%20Cooperation

European Union External Action Service, (2017), *The European Commission welcomes China's announcement on lifting the import ban on French beef*, 6 March 2017. Retrieved from: https://eeas.europa.eu/headquarters/headquarters-homepage/22084/european-commission-welcomes-chinas-announcement-lifting-import-ban-french-beef_en

European External Action Service – China and the EU. Retrieved from: https://eeas.europa.eu/delegations/china_en/15394/China%20and%20the%20EU

FAO (2006), *Food Security, Policy Brief*, Issue No. 2. Retrieved from: http://www.fao.org/fileadmin/templates/faoitaly/documents/pdf/pdf_Food_Security_Cocept_Note.pdf

FAO/ WHO (1997), *Risk management and food safety -FAO Food And Nutrition Paper 65.* Report of a Joint FAO/WHO Consultation Rome 1997. Retrieved from: http://www.fao.org/3/W4982E/W4982E00.htm

FAO, IFAD & WFP, (2015), *The State of Food Insecurity in the World. Meeting the 2015*

international hunger targets: taking stock of uneven progress. Rome FAO.

Freedonia Group, (2012), *Agricultural Pesticides in Chi*na. Industry Study with Forecasts for 2015 & 2020. Study #2580. Retrieved from: https://www.freedoniagroup.com/brochure/28xx/2850smwe.pdf

Fava F. and Godefroy S. B., (2016), *Global Research and Innovation Agenda for Food Security, Sustainability and Safety*, Position Paper developed by the World Food Research and Innovation Forum Consultation Board.

Felloni F., Gilbert J., Wahl T.I., Wandschneider P., (2000), *Self-Sufficiency and Productivity in Chinese Agriculture,* Implications for China's WTO Accession, American Agricultural Economics Association, 28, pp. 173-186. Retrieved from: https://ageconsearch.umn.edu/bitstream/21747/1/sp00fe03.pdf

Fukuda K., (2015), *Food safety in a globalized world,* Bull World Health Organ. 2015 Apr 1; 93(4): 212. Retrieved from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4431568/

Gale F., Hansen J., Jewison M., (2015), *China's Growing Demand for Agricultural Imports*, EIB-136, Economic Research Service/USDA (U.S. Department of Agriculture). Retrieved from: https://www.ers.usda.gov/webdocs/publications/43939/eib-136.pdf?v=0

Ghose B., (2014), *Food security and food self-sufficiency in China: from past to 2050*, Institute of Nutrition and Food Science, No. 3 (2), pp. 86-95, University of Dhaka. Retrieved from: https://onlinelibrary.wiley.com/doi/pdf/10.1002/fes3.48

Hansen J., Tuan F., Somwaru A., and Seeley R., (2009), *Impact of China's Agriculture Policies on Domestic and World Commodity Markets,* United States Department of Agriculture, Economic Research Service.

Hartel I., (2018), Handbook of Agri-Food Law in China, Germany, European Union, Springer.

Herrero A.G., Kwok K.C., Xiangdong L., Summers T., Yanheng Z., (2017), *EU-China Economic Relations to 2025, Building a Common Future. Bruegel, Chatham House,* China Center for International Economic Exchanges and The Chinese University of Hong Kong. Retrieved from: http://bruegel.org/wpcontent/uploads/2017/09/CHHJ5627_China_EU_Report_170912_WEB.pdf

Hin L., (1999), *Urbn Land Reform in China*, Palgrave Macmillan.

Hornby L., (2014), *China scythes grain self-sufficiency policy,* Financial Times. Retrieved from: https://www.ft.com/content/6025b7c8-92ff-11e3-8ea7-00144feab7de

Hu Y., Cheng H., (2013), *Water pollution during China's industrial transition,* Environmental Development 8 (2013) 57–73. Retrieved from: https://doi.org/10.1016/j.envdev.2013.06.001

International Economic Exchanges and The Chinese University of Hong Kong. Retrieved from: http://bruegel.org/wpcontent/uploads/2017/09/CHHJ5627_China_EU_Report_170912_WEB.pdf

Huan-Niemi E., Niemi J., (2008), *Empirical analysis of agricultural trade between EU and China: Explanation behind China's growing agrifood imports*, MTT Agrifood Research Finland, Economic Research Unit, Helsinki, Finland. Retrieved from: https://ageconsearch.umn.edu/bitstream/43962/2/117.pdf

Hongzhou Z., (2016), Food Security in China: Whither the Self-sufficiency Policy?, RSIS Commentary No. 126.

Hoering U., Sausmikat., (2011), *Agriculture in China: between self-sufficiency and global integration*, Asienstiftung /German Asia Foundation in cooperation with the EU-China Civil Society Network.

Ho P., (2005*), Developmental Dilemmas, Land reform and institutional change in China*, Routledge.

Jiang Y., (2009) *China's water scarcity*, Journal of Environmental Management Volume 90, Issue 11, pp. 3185-3196. Retrieved from: https://www.sciencedirect.com/science/article/pii/S0301479709001339

Kostadinov A., (2017), *Eu-China food trade perspectives*, ECONSTOR. Retrieved from: https://www.econstor.eu/bitstream/10419/149572/1/1.NORW.pdf

Lee A., Elmer K., (2019), *China aims to become self-sufficient in pork production despite African swine fever,* South China Morning Post. Retrieved from: https://www.scmp.com/economy/china-economy/article/3026793/china-aims-become-self-sufficient-pork-production-despite

Li Y., (2018), *Institutional Reform in the Irrigation Sector in China*, Wiley Online Library, Irrigation and DrainageVolume 68, Issue 1. Retrieved from: https://onlinelibrary.wiley.com/doi/full/10.1002/ird.2248

Lin C., (2017), Outsource Power, Import Saefty? *Challenges and Opportunities of the US-China Food Safetu Regulatory Cooperation. Food an ddrug law Journal*. Retrieved from: https://www.fdli.org/wp-content/uploads/2017/03/3-Outsource-Power-Import-Safety-4234523.pdf

Lin J.Y., (2011), *Demystifying the Chinese Economy,* Cambridge University Press.

Liu Y., Fang F., Li Y., (2014), *Key issues of land use in China and implications for policy making*, Vol. 40, pp. 6-12. Retrieved from: https://www.sciencedirect.com/science/article/pii/S0264837713000598

Long G., (1999), *Will China Liberalize Its Grain Trade,* Brooking Institution. Retrieved from: https://www.brookings.edu/research/will-china-liberalize-its-grain-trade/

Lu F., (1997), *China's Grain Trade Policy and Its Domestic Grain Economy*, Working Paper Series No. E1997002.

Ministry of Commerce, PRC (14/02/2009), *Europe-China Economic and Trade Relationship Is Developing Fully.* Retrieved from: http://fi2.mofcom.gov.cn/article/bilateralcooperation/inbrief/200902/20090206027519.shtml

Mukhopadhyay, K., Thomassin P.J., Zhang J., (2018), *Food security in China at 2050: a global*
CGE exercise, Economic Structures (2018) 7:1. Retrieved from: https://doi.org/10.1186/s40008-017-0097-4

Naughton B., (2007), *The Chinese Economy Transitions and Growth,* The MIT Press.
Negishi T. (2001) *Heckscher-Ohlin Theory (1). In: Developments of International Trade Theory.* Research Monographs in Japan-U.S. Business & Economics, vol 6. Springer, Boston, MA. Retrieved from: https://link.springer.com/chapter/10.1007/978-1-4757-4959-5_10

Olsen P., (2017), *EU-China-Safe- Delivering an Effective, Resilient and Sustainable EU-China Food Safety Partnership*. Nofima. Retrieved from: https://nofima.no/en/prosjekt/eu-china-safe/

Park A., Rozelle S., Cai F., (1994), Implications for equity, stabilization, and efficiency, China Economic Review, Vol. 4, No. 1, pp. 15-33. Retrieved from: https://www.sciencedirect.com/science/article/pii/1043951X94900132

Parton C., (09.05.2018), *China is heading towards a water crisis: will government changes help?,* China Dialogue. Retrieved from: https://www.chinadialogue.net/article/show/single/en/10583-China-is-heading-towards-a-water-crisis-will-government-changes-help-

Parton C., (27.02.2018), *China's acute water shortage imperils economic future,* The Financial Times. Retrieved from: https://www.ft.com/content/3ee05452-1801-11e8-9376-4a6390addb44

Pelkmans J. Francois J., (2018), *Tomorrow's Silk Road: Assessing an EU-China Free Trade Agreement*, 2nd edition. CEPS. Retrieved from: https://www.ceps.eu/publications/tomorrows-silk-road-assessing-eu-china-free-trade-agreement-2nd-edition

Policies, Innovation, And Network for enhancing Opportunities for China-Europe water cooperation, n.d. Retrieved from/ http://project-piano.net/

Shea E.Y.P., (2010), *Understanding China's Grain procurement policy from a perspective of optimization,* China Economic Review 21, pp. 639-649. Retrieved from: https://econpapers.repec.org/article/eeechieco/v_3a21_3ay_3a2010_3ai_3a4_3ap_3a639-649.htm

Schibler A., (2014), *The Issue of food safety in EU-China Food Trade Relations*, Eu-China Observer, College of Europe, department of EU International Relations and Diplomacy Studies, Issue 4.

Schmidt R.H., Rodrick G. E., (2003), *Food Safety Handbook,* ISBN.

Smithers R., (2018), *China lifts ban on British beef,* The Guardian. Retrieved from: https://www.theguardian.com/environment/2018/jun/27/china-lifts-ban-on-british-beef

Suyin H., (1976), *Wind in the tower: Mao Tsetung and the Chinese Revolution, 1949-1976,* Little Brown.

Terazono E., (2014), *China to become top corn importer in 2020,* Financial Times. Retrieved from: https://www.ft.com/content/4b086784-ca2a-11e3-8a31-00144feabdc0

The Economist (14/03/2015), *The Wong Direction.* Retrieved from: https://www.economist.com/china/2015/05/14/the-wrong-direction

The Economist (15/05/2015), *China's inefficient agricultural system.* Retrieved from: https://www.economist.com/the-economist-explains/2015/05/21/chinas-inefficient-agricultural-system

United Nations, Sustainable Development Goals, Retrieved from: https://www.un.org/sustainabledevelopment/hunger/

Veeck G., (2013), *China's food security: past success and future challenges,* Eurasian Geography and Economics, Vol.54, No.1. Retrieved from: http://dx.doi.org/10.1080/15387216.2013.789669

Verter N., (2015), *The Application of International Trade Theories to Agriculture*, Mediterranean Journal of Social Sciences, Vol. 6, No. 6 S4. Retrieved from: http://www.mcser.org/journal/index.php/mjss/article/view/8287

Yunlong C., (1990*), Land use and management in PR China: Problems and strategies*, Vol. 7, Issue 4, pp. 337-350. Retrieved from: https://www.sciencedirect.com/science/article/pii/026483779090023R

Wang Z., (1997), China Situation and Outlook Series, United States Department of Agriculture, Economic Research Service WRS-97-3.

Wang M., Webber M., Finlayson B., Barnett J., (2008), *Rural industries and water pollution in China*, Journal of Environmental Management Volume 86, Issue 4, March 2008, Pages 648-659. Retrieved from: https://www.sciencedirect.com/science/article/pii/S0301479706004130

Wang M., Liang B., Zhang W., Chen K, Zhang Y., Zhou H., Cheng Y., Liu H., Zhong X., Li Y., Liu Y.. Int J *Dietary Lead Exposure and Associated Health Risks in Guangzhou, China.* Environ Res Public Health. 2019 Apr; 16(8): 1417. Retrieved from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6517897/

WHO (2018), Questions and Answers on Melamine, Retrieved from: http://www.who.int/csr/media/faq/QAmelamine/en/

WHO (2017), Food Safety. Retrieved from: https://www.who.int/news-room/fact-sheets/detail/food-safety

World Bank (2014), *Urban China: Toward Efficient, Inclusive, and Sustainable Urbanization,*

World Bank Development Research Center of the State Council, the People's Republic of China. Washington, DC: World Bank.

World Bank (2014), *Urban China: Toward Efficient, Inclusive, and Sustainable Urbanization.*

World Bank Development Research Center of the State Council, the People's Republic of China. Washington, DC: World Bank.

WTO, (2016), *World Trade Statistical Review 2016.* Retrieved from: https://www.wto.org/english/res_e/statis_e/wts2016_e/wts16_toc_e.htm

Zhan S., (2017), *Riding on self-sufficiency: Grain policy and the rise of agrarian capital in China,* Journal of Rural Studies, Vol. 54, pp. 151-161. Retrieved from: https://www.sciencedirect.com/science/article/pii/S074301671730030X?via%3Dihub

Zhang X., (2015), *Water quality, agriculture and food safety in China: current situation, trends, interdependencies, and management*, Journal of Integrative Agriculture, Vol. 14, No.11, pp. 2365-2379. Retrieved from: https://www.sciencedirect.com/science/article/pii/S2095311915611285?via%3Dihub

Zhong F. and Zhu J., (2017), *Food security in China from a global perspective*, Agricultural & Applied Economics Association, 32 (2). Retrieved from: http://www.choicesmagazine.org/UserFiles/file/cmsarticle_582.pdf

Zolin B., Cassin M., Mannino I., (2017*)*, *Food Security, Food Safety and Pesticides: China and the EU Compared*, University Ca' Foscari of Venice, Dept. of Economics Research Paper Series No. 02/WP. Available at: goo.gl/AG6ddK

UNITED NATIONS UNIVERSITY

UNU-CRIS

Institute on Comparative Regional Integration Studies

in alliance with

VRIJE UNIVERSITEIT BRUSSEL

UNIVERSITEIT GENT

Flanders State of the Art

west-vlaanderen de gedreven provincie

BRUGGE

The United Nations University Institute on Comparative Regional Integration Studies (UNU-CRIS) is a research and training institute of the United Nations University, a global network engaged in research and capacity development to support the universal goals of the United Nations and generate new knowledge and ideas. Based in Bruges, UNU-CRIS focuses on the provision of global and regional public goods, and on processes and consequences of intra- and inter-regional integration. The Institute aims to generate policy-relevant knowledge about new patterns of governance and cooperation and build capacity on a global and regional level. UNU-CRIS acts as a resource for the United Nations system, with strong links to other United Nations bodies dealing with the provision and management of international and regional public goods.

The mission of UNU-CRIS is to contribute to generate policy-relevant knowledge about new forms of governance and cooperation on the regional and global level, about patterns of collective action and decision-making.

UNU-CRIS focuses on issues of imminent concern to the United Nations, such as the 2030 Development Agenda and the challenges arising from new and evolving peace, security, economic and environmental developments regionally and globally. On these issues, the Institute will develop solutions based on research on new patterns of collective action and regional and global governance. The Institute endeavours to pair academic excellence with policy-relevant research in these domains.

For more information, please visit www.cris.unu.edu

UNU-CRIS

Potterierei 72

8000 Bruges

BELGIUM