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CHINA'S FOOD SECURITY: ISSUES AND CHALLENGES

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"When it comes to crop production, farmland is the foundation, water conservancy is the lifeline, technology is the solution and policy is the driving force.

The Chinese people should hold their rice bowls firmly in their own hands,

with grains mainly produced by themselves"

XI Jinping

Introduction

Concerns on future of humanity's population began to surface as early as 2007-08 due to the steadily declining agricultural output brought on by environmental stressors and unpredictable weather patterns. Arguably, ensuring adequate food supplies has risen to the top of the international community's priorities, thus rebranding it as "global crisis." Food security has evolved into a stated goal and a key issue for all countries, rich or poor, importer or exporter, in the period of rapidly de-globalisation and neoliberal trade policies. In this study, we will look into China's complex issues with food production and food safety.

Food security and China: An Analysis

China took planned steps to assure its own food supply, much like the United States. China started rebuilding itself post gaining freedom. Owing to its enormous population and chronic food shortages, colonial rule in the country was in jeopardy. As it was impossible to plant enough maize to meet domestic demand, China experienced acute food shortages.

Food security was the biggest challenge for China. In the history, there have been numerous famines that have caused unimaginable public misery, fear, and social unrest. No other civilisation has had a continuous tradition of worrying about starvation, and no other nation's modern history has been so heavily influenced by hunger and famine in the period between 108 BC and 1911 AD. In 1920-21, there were 48.8 million people living in the five Provinces, however a widespread famine claimed the lives of almost 500,000 people and left another 19.8 million homeless and famished. Another such famine in the province of Henan in 1943 resulted in the deaths of an additional 3 million people. The threat of famine has thus found resort in the minds of political and economic decision-makers given this protracted period of hunger. China is one of the few nations that prioritises food security. 'Food' has been regarded by the Chinese as an essential good for all. Food distribution and the "mandate of heaven" granted to dynasties in power go back more than 5,000 years. In accordance with the traditional Chinese thought, the principal duty of the King is to guarantee enough food to all and provide immediate relief & support in a famine. Many Chinese think that rulers who reject this ultimate obligation will lose their "mandate from heaven." As a result, the efforts of each ruling regime to guarantee long-term food security of the population has been the foundation for its support in the political and public spheres as well as its formal legitimacy. China's political objectives now centre around the country's ability to produce enough grain to feed its growing population.

In his 1995 book, Dr. Lester R. Brown posed a question, "Who will feed China?"[1] It is no secret that, China has given priority to expand food crop output and implement agricultural reforms. Chinese farmers were given a boost in this domain with the adoption of land contract changes in 1981 and the quota system from 1955 to 1993. Between 1982 to 2017, total grain production in China hiked by 74%, from 354 million tonnes to 618 million tonnes, exceeding the nation's average annual population growth of 34%[2,3].

With only 7% of the global agricultural production, China today feeds 20% of the world's population[4,5]. China has invested considerable amount of money achieve this feat. China's excessive and inefficient use of chemical fertilisers, which has tripled over the past three decades, averaged only 32% efficiency, against the global average of 55%[6], is largely to blame for the country's current dreadful condition of environmental pollution.

[1]Brown L. R. Who will Feed China? Wake-up Call for a Small Planet? *The WorldWatch Environmental Alert Series* (W. W. Norton & Company, New York, USA, 1995).
[2]China Ministry of Agriculture. *China Agricultural Yearbooks* (China Agriculture Press, Beijing, China, 1982–2017).
[3]Carter, C. A., Zhong, F. & Zhu, F. Advances in Chinese agriculture and its global implications. *Appl. Econ. Perspect. Policy* 34, 1–36 (2012).
[4]China Ministry of Agriculture. *China Agricultural Yearbooks* (China Agriculture Press, Beijing, China, 1982–2017).
[5]Carter, C. A., Zhong, F. & Zhu, F. Advances in Chinese agriculture and its global implications. *Appl. Econ. Perspect. Policy* 34, 1–36 (2012).
[6]China Ministry of Agriculture. *China Agricultural Yearbooks* (China Agriculture Press, Beijing, China, 1982–2017).

Although it makes sense for bigger countries in terms of population to choose self-sufficiency as a way to ensure food security, but China's strategy for reaching grain self-sufficiency seems excessive. In 1996, China's goal was to achieve total self-sufficiency in wheat, rice, and maize which has now been accomplished (State Council, People's Republic of China, 1996). In the first-ever national mid- to long-term food security plan (2008-2020), the Chinese government reaffirmed its commitment to achieve 95% self-sufficiency rate in grain supply and 100% self-sufficiency rate in cereal supply (State Council, People's Republic of China, 2008). According to government figures, imports have surged even when domestic grain output in China has increased over the past ten years. Total cereal imports into China shot by almost 300 percent between 2004 and 2014, with a rise of over 800 percent for rice, wheat, and maize. In 2014, China imported 100 million tonnes of grains, including soybeans, which is far above its required level of 95% self-sufficiency.

The Chinese government's obsession with achieving "grain self-sufficiency" has been very expensive and has put an enormous pressure on the nation's natural resources. The production of grains has increased dramatically though intensive farming and excessive use of artificial fertilizers which implies a serious risk to nation's future of agriculture. Secondly, the government would require to make a huge financial commitment to this nutritional plan. According to an OECD analysis, in the year 2012, China's central government gave its farmers USD 165 billion in subsidies, which was a remarkable 200% increase over the previous five years. Thirdly, despite having set the grain purchase price far higher than the market price, the Chinese government failed to compensate farmers for fast rising production expenses. The widespread cultivation of wheat and maize, both of water intensive crops, is an outcome of farmers being dissuaded from cultivating cash crops that utilise comparatively less land.

In response to these issues, China revised its food security plan in December 2013, deciding for the first time to rely on a mix of domestic production and limited imports. China's national food security strategy now includes imports, although the country still stresses on its original goal of "absolute security" in grains. Chinese President, Xi Jinping has underlined the importance of relying only on domestic resources to ensure the food supply ever since he took office in 2013.

Gaining and maintaining political support played a significant role in the decision to prioritise food grain self-sufficiency. In response to the threat that food shortages pose to the nation's internal security and strategic goals, senior Chinese leaders have taken actions to expand both domestic production and access to foreign supply in recent years. Chinese firms including Smithfield Foods have significantly invested in foreign agribusiness and processors as part of these initiatives.

Historical Relevance of Food in Chinese Society

"Fashion is in Europe, living is in America, but eating is in China."

The famous saying speaks for the fondness for Chinese food. In Chinese culture, nutrition is highly valued. The Chinese not only place high importance on food, but they also think it may improve family harmony & social relationships.

- **Rise and Fall of dynasties closely linked to grain production.**

Chinese population, with an astounding 1.4 billion citizens, appreciate scrumptious cuisine. Although it might sound funny, culinary culture of China is a way of life and this unites people together as a community. Cultivating, preparing, and appreciating food is vital and rudimentary to Chinese civilization regardless to the class to which the Chinese belong to. The question "have you eaten?" (ch le ma?) is a typical form of greeting and welcome among the people of China. Commerce, pleasure, need, and happiness, all are rooted in food. The continuation of life is dependent on food. Regardless of wealth, familial situation, or level of education, it serves as the glue that unites China's diverse populace.

Around 50,000 years ago, Suiren, the leader of the Three Sovereigns and Five Emperors of prehistoric China, created "manual wood drilling to make fire," ushering in the era of cooked meals. By the time the book "Eight Delicacies" from the Western Zhou Dynasty (1046-771 B.C.) was published, cooking had become an art form. The cuisines of Shandong, Jiangsu, Guangdong, and Sichuan were developed between 770 and 207 B.C, under the rule of the Eastern Zhou and Qin dynasties. People in the central plains started mixing foods from the west and the flavours of the minorities in the northwest during the Han Dynasty (202-220 BC), which further led to an upsurge in food production continued during the Tang Dynasty (618–907). The "Eight Cuisines" evolved into different culinary styles during the rule of the Ming Dynasty (1368-1644) and Qing Dynasty (1636-1912).

In the time of the Ming dynasty (1368–1644)[7], with the introduction of new goods, creation of irrigation systems, and the colonisation of the provinces of Fujian, Guangzhou, and Guangxi, the population steadily increased. Residents of China's more populous provinces moved to the hilly regions of the South during the Ming and Qing dynasties. To meet the escalating demand in international markets, they became specialists at growing new types of maize and other commodities.[8,9] 90% of the population from wealthy landlords to impoverished tenant farmers[10], in the Qing era (1644–1911) relied on agriculture, While many were day workers or tenants who lived in abysmal poverty, and others, particularly in the south, were landowners who enjoyed greater affluence and stability. There was a threat of both starvation and flooding. The Qing government, in order to avoid local uprisings, created a sophisticated system to safeguard its inhabitants from famines and other catastrophes like sickness. The main use of the building was to store grains in granaries. It

[7]Ma Junya and Tim Wright, "Sacrificing Local Interests: Water control policies of the Ming and Qing governments and the local economy of Huaibei, 1495–1949." *Modern Asian Studies (2013)* 47#4 pp 1348-1370.
[8]William S. Atwell, "Time, Money, and the Weather: Ming China and the 'Great Depression' of the Mid-Fifteenth Century." *Journal of Asian Studies* 61 #1 (2002), pp. 83–113.
[9]Dwight H. Perkins, Agricultural Development in China 1368-1968 (1969) p. 185
[10]Zhihong Shi, Agricultural Development in Qing China (Brill, 2017). Pp 425-434.

reduced the consequences of a famine by offering cereals for free or at a discount. The system was adversely damaged during the Taiping uprising in the 1850s, leaving a sizable population exposed to hunger brought on by floods, droughts, and other natural catastrophes. The introduction of sweet potatoes decreased both the occurrence of revolts and the incidence of famine.[11,12,13]

Following the defeat of uprisings in the 1860s, the central government prioritised improvement in agricultural practices, bringing back social order, and reducing poverty. It decreased taxes, encouraged irrigation, and used corvée workers to recover land.

After 1949, the Chinese government launched numerous significant social programs to boost agricultural productivity. As part of a significant land reform project, first, farmers were given free land. Then, rural areas developed cooperatives, followed by collectives, and ultimately, communes. Due to the nation's development plan, China's agricultural output was modernised during the first two decades of the commune system.[14]

- **Population & Resource Pressure**

In recent years, Chinese officials have made tremendous progress to expand the country's access to food. The country's economic growth has brought forth new demographic demands and environmental difficulties. The malnourished people has drastically decreased as a result of China's rapid economic expansion. In China, the proportion of undernourished people dropped from 16.2% in 2000 to 8.6% in 2017. Owing to its per capita income growth from $330 to $9,460 between 1990 and 2015, China was able to achieve United Nations targets to reduce global famine rates in half by 2015. Between 2010 and 2017, China was the only country in the world to reduce undernourishment by more than two-thirds.

Historically, China's goal has always been to produce enough food to satisfy domestic demand. In 1996, the government released a white paper starting the goal to reach 95% cereal self-sufficiency by 2020. As a matter of fact, China's domestic output has expanded to keep up with the country's rising demand.

China has made enormous progress in feeding its people as a result of its economic growth, but the nation is still pressed in this regard. With only 0.21 acres of arable land available for every person, the Chinese government faces a double whammy in terms of feeding a rising urban population.

Farmable land in China is extremely scarce, and environmental harm caused by inadequate regulation makes the situation worse. 15.5% of China’s groundwater was assigned the most contaminates grade, that is “Grade V”, in 2018. Soil contamination has become so pervasive in China, particularly in Southern areas like Henan

[11]Ruixue Jia, "Weather shocks, sweet potatoes and peasant revolts in historical China." *Economic Journal* 124.575 (2014): 92-118 [htgtps://www.jstor.org/stable/42919302 online].
[12]Pierre-Etienne Will and R. Bin Wong, *Nourish the people: The state civilian granary system in China*, 1650–1850 (University of Michigan Press, 2020).
[13]Kathryn Jean, Edgerton-Tarpley, "From 'Nourish the People' to 'Sacrifice for the Nation': Changing Responses to Disaster in Late Imperial and Modern China." Journal of Asian Studies (2014): 447-469.
[14]Ching, Pao-Yu (2021). *Revolution and counter revolution: China's continuing class struggle since liberation* (2nd ed.). Paris: Foreign languages press. p. 161. ISBN 978-2-491182-89-2. OCLC 1325647379

Province that the government has outlawed growing on 8 million acres of contaminated agricultural land until it can be truly rectified.

- **Impact of Drought and Famines**

The production of food in China is seriously threatened by severe droughts. As a consequence of climate change, draught and extreme heat are the two prominent hazards to agricultural output worldwide (Lesk et al., 2015). In the last thousand years, there have been several short-lived droughts that lasted a few months, as well as at least 15 severe droughts that lasted longer than three years (Zhang, 2005). Droughts of this severity present a concerning threat to China's agricultural food production. According to Edgerton-Tarpley (2008), Zhang (2005), Zhang & Liang (2010), and other sources, droughts of this scale have resulted in severe famines and fatalities. Despite a recent rise in the severity of meteorological droughts, China's annual food production of past 60 years has successfully transitioned from a level close to starvation to a level of continuously high supply (Piao et al., 2010). These changes were observed as the economy moved from a time of food restrictions (1955–1993) to free markets (1994–2003), and finally to a time of subsidised farming (2004–present). The construction of irrigation facilities has been China's main adaptation strategy in the past 60 years for reducing drought induced crop loss. The amount of irrigated land has increased by more than 400% between 1950 and 2013 (63.5 Mha) (National Bureau of Statistics of China, 2010). The core of Chinese food production moved northward in 1978, when the Economic Reform and Opening-up Policy swapped the communal agricultural system with the family responsibility system, given the spatial imbalance between irrigation and economic development.

Supply and Consumptions

- **Supply & Consumption of Staple Grains**

China's grain consumption has almost tripled from 125 million tonnes of grain consumed in 1975 to 420 million tonnes in 2018, Farmers are able to produce huge amounts of essential goods, with a production-to-consumption ratio of grains that is roughly equal to China's extensive investment in agriculture. In a stark contrast to China, which produces exactly as much food as it consumes, India exports the most rice worldwide. In 2018–2019, India exported nearly 9.8 million metric tonnes of rice, which amounts to roughly 22.5% of the global total. China was the sixth-largest exporter at the time, contributing merely 6.3% to global exports.

China's consumption of animal products has increased dramatically in recent years. In 1975, China consumed only 7 million tonnes of beef. This amount reached a whooping 86.5 million tonnes in 2018 making China the world's top consumer of cattle. Pork was the most popular meat in China in 2018 with a consumption of 55,2 million tonnes. In 2018, China consumed more meat per person than Japan (43 kg), but less than the United States (99 kg) and Australia (93 kg).

China's increased meat consumption is partly due to the country's changing demographics. The expansion in China's urban middle class has been accompanied by a change in diet from one reliant on grains to the one heavy on meat. Richer city people also prefer dairy goods and other products harmful for the environment, over the traditional alternatives.

China's evolved spending habits could be to blamed for the country's increasing reliance on imports. China's food imports increased from $14 billion to $104.6 billion between 2003 and 2017. Even when China's food exports climbed by almost quadruple in this period, from $20.2 billion to $59.6 billion, the country's food trade deficit increased.

As a result, Beijing has openly modified its strategy for achieving agricultural self-sufficiency. At the 2013 Annual Central Rural Work Conference, the Chinese government acknowledged the need for "moderate imports" in order to increase domestic production.

- **Impact of Russia-Ukraine War on Food Grain Supply**

Ukraine and Russia are two of the top exporters of cereals with respective shares of 17% and 12% in the world's wheat shipments. Wheat shipments from both Russia and Ukraine have been significantly impacted by the conflict between the two nations. In the worst-case scenario, the conflict would cause a 60% decline in trade, a 50% increase in wheat prices, severe food insecurity, and a 30% decrease in wheat purchasing power (Lin et al., 2023). Food, energy, and inflation shortages have affected many nations, and initiated a domino effect on one another. The United States, China, India, Canada, Australia, France, Argentina, and Germany would all increase their wheat production and exports to reconstruct the world’s supply pattern..

In an effort to strengthen national food security, Ukraine has emerged as one of China's alternative grain suppliers. Inflationary pressures will undoubtedly surface, if imports from the Ukraine to China stopped (Cheng, 2022). Despite its reliance on wheat and maize produced domestically, China remains vulnerable to rise in food prices. Expectedly, the price of importing wheat and maize has increased dramatically.

China acted before the Russia attack on Ukraine. On February 22, China's National Food and Strategic Reserves Bureau decided to release some edible oils from the central reserves in advance of Russia's invasion of Ukraine based on their domestic and global market conditions,. Russian wheat imports were also approved by Chinese customs officials (Cheng, 2022).

The start of the Russia-Ukraine war, which has disrupted supplies from Ukraine and led to restrictions on Russian wheat exports, has impeded China's efforts to diversify its wheat supply. Despite the fact that several nations have imposed economic sanctions on Russia, Beijing may have contributed to the unpredictability of the world wheat market by attempting to increase its wheat supplies during the conflict. For instance, the rise of food protectionism, sanctions against Russia, the conflict in Ukraine (which together account for about 26% of the world's wheat exports), and China's stockpiling of its own wheat supplies, would make it more

difficult for other wheat-importing nations to purchase the already reduced global wheat supplies. This could contribute to an alarming concern for rise in food prices worldwide (Donnellon-May, 2022).

Before the unrest in Russia and Ukraine, China was worried about its imports of soybean. The National Food and Strategic Stockpiles Administration of China made a statement that it will release soybeans from state stockpiles prior to the Russian invasion. In order to ensure a steady supply of soybeans, Beijing continued

to diversify its import sources in addition to increasing domestic output to promote self-sufficiency. China's growth potential is constrained for the foreseeable future due to market and regulatory uncertainty. This further restricts its ability to obtain soybeans from new sources (Donnellon-May, 2022).

Rise in food prices post COVID-19 pandemic

Despite the interruption to economic activity caused by the coronavirus infections and rising commodity prices because of the protracted crisis in Ukraine, Headline consumer inflation in China increased gradually. The official consumer price index (CPI), which had increased by 0.9% in February 2022, reached a three-month high of 1.5% in March 2022, when compared to 2021, a slight triumph over expectation. Costs for raw vegetables increased by 24% in 2022 as compared to 2021. This inflation was brought on by China's draconian zero-COVID measures to battle the pandemic, especially the lockdown imposed on Shanghai (Kawate, 2022).

Analysis of Contemporary

- Balance of Resource Management Environmental Protection and Sustainable Agricultural Development.

By feeding 22% of the world's population on 9% of the planet's arable land, China has accomplished a remarkable feat (Liu, Zhang, & Herbert, 2010). This is true despite obstacles posed by biology, physics, and the environment, such as an extremely unequal distribution of water supplies. The success however, has not come without cost. Like in other nations, farms in China heavily rely on the soil fertility, water availability, and pollination provided by regional ecosystems. The serious ecological issues caused by increasingly intense agricultural practices, include soil and water pollution from excessive pesticide usage, soil erosion from land conversion, deforestation, etc. (Bawa et al., 2010; Liu., 2010; Norse. and Ju., 2015).

According to study by Liu, Zhang, and Herbert (2010), China may produce more than 95% of its own cereals by 2010, ensuring enough sustenance for 22% of the world's population. However, it is anticipated that by 2030, an additional 100 billion kilograms of grain will be required, necessitating a 1% annual increase in production.

The desire to preserve the environment often conflicts with the increasing global demand for agricultural goods (Sayer, 2013). China's agricultural sector is significantly impacted. (Sayer, 2013; Norse and Ju, 2015). Our march towards food security has had a negative influence on the terrain, water, nutrients, biodiversity, etc. The improper or excessive application of agrochemicals, the improper handling of animal waste, the contamination from effluent irrigation, etc are few examples of the practices that wreak havoc on agricultural settings. According to Norse and Ju (2015), environmental damage, inclusive of adverse effects on sustainability of food production and human health, costs between 7% to 10% of China's agricultural GDP. The authors of the study, for instance, cite the wasteful application of nitrogenous fertiliser as a significant factor in the downfall of the economy.

The unofficial ideology of "pollute first, then clean up" was a major factor in the poor environmental performance by Chinese agricultural industry in the past (Liu, 2010), but today, achieving a balance between agriculture and environmental protection is amongst China's top priorities. According to Wei and Ye (2014) and Long, Li, and Dong (2009), agricultural systems are to blame for a wide range of changes in land-use pattern, such as the clearing of forests, conversion of rangelands, pastures, and fishponds, and filling in of wetlands. China's fast development is primarily driven by urbanisation. Studies have found a connection between the practice and declining ecosystem services, habitat degradation, and the emergence of new environmental concerns. Long-term food security is endangered by the over-exploitation of subsurface water while the output rises. Pollution also reduces agricultural output. In a 2012 study, Liu and Yang found that 80% of China's lakes were eutrophic and more than 40% of the country's rivers were highly contaminated. The main cause of environmental contamination is excessive agrochemical and industrial waste.

- Setting up of Self-Sufficiency Target in Food Security

The founding of the republic in 1949 and the introduction of economic reform in the late 1980s were the two pivotal eras in the history of Chinese farming. Implemented as part of the agrarian reforms that sparked the economic revival, the "Household Responsibility System" has significantly increased agricultural output and productivity. Since then, China has increased agricultural production and exports to the point where it meets or exceeds domestic food demands. China's self-sufficiency rate has decreased and food expenditures have increased dramatically in recent years due to the country's rapid socioeconomic development and changes in population, diet, and demographics. Rates of interest were hiked repeatedly in 2011 (Zhihao and Shida, 2012) to counteract growing inflation. The trend of higher food prices as seen around the world has also been observed in China.

The concept of food security has expanded in China as a result of the country's shifting socioeconomic landscape. Due to deterioration of many of the country's land and water resources, food safety is a serious concern now and will remain so in the future. Dangerous substances, possibly originating in water and sediment, have been found in the food supply, putting consumers at risk of a wide range of ailments.

In the past, a nation was considered to be food secure provided its agricultural sector was sufficient to support the requirements of its people. China's agriculture industry has achieved significant advancements, demonstrating the country's potential with the use of correct institutional and technological upgrades. Future agricultural success will require innovations including the widespread use of genetically modified (GM) crops, and land & institutional reforms.

Sustainability and ensuring a steady supply of food will remain at the forefront of China's agricultural sector in the coming years. The largest challenge China faces is figuring out how to sustainably provide a higher quality and more diverse food supply from the agriculture sector.

- Aging Population and One-child policy

The quantity of grain that China would require in the near future is a significant concern. The approach was motivated by China's fast-growing population and the corresponding rise in food demand. The Chinese government implemented the contentious "one child policy" in 1980 in response to demographic predictions quoting a reduction in the birthrate (from over 1.8 before 2000) and a population of 1.6 billion in China by 2050,.[15,16] It appears that this prediction was incorrect given that the overall birthrate has remained below 1.4.

Despite China's "one-child policy" being abolished in 2015, the nation continues to experience demographic problems due to its rapidly ageing population and low fertility rate. Even today, many parents feel discouraged from having more than one child due to the high cost of child care. Therefore, according to some demographers, within the next ten years, the second child policy will not add more than two to four million Chinese residents yearly.

- Increase in Urban population by reducing work force available for agriculture in rural areas.

The increased rate of urbanisation in China has had and will continue to have an effect on the country's overall food consumption. The pace of urbanisation in China was 57% in 2016, and it is expected to reach 65% by 2025 and 80% by 2050. Who, then, will feed the rural areas with these numbers? Despite China's population levelling off due to ageing and reduced food consumption in cities compared to rural regions, a competent workforce is still needed to produce, process, package, and distribute food, competitively and securely.

[15]China Ministry of Industry and Information Technology. China Food Industry Annual Reports (China light Industry Presshnology, Beijing, China, 2011–2016).

[16]China National Statistics Bureau. China Population & Employment Statistic Yearbooks (China Statistics Press, Beijing, China, 2000–2016).

China's Agricultural Reforms for Modern Advanced Food Grain Production and Quest for Food Security

Food security is the top priority for the world's most populous country. Consumers (humans, animals), consumer location (urban, rural), inputs (fertiliser, water), and outputs (environmental condition) all need to be considered for framing a sustainable food system. Inputs (fertiliser, water), outputs (environmental condition), and food production (particularly grain production) are all crucial. A system of incentive-based quotas (1955-1993) and land contract reform (1981) had helped China overcome chronic food shortages during the 20th century. Carter, Zhong, and Zhu (2012) report that between 1982 and 2017, total grain output increased by 74%, from 354 million tonnes to 618 million tonnes, successful outpacing the mere 34% increase in population.[17]

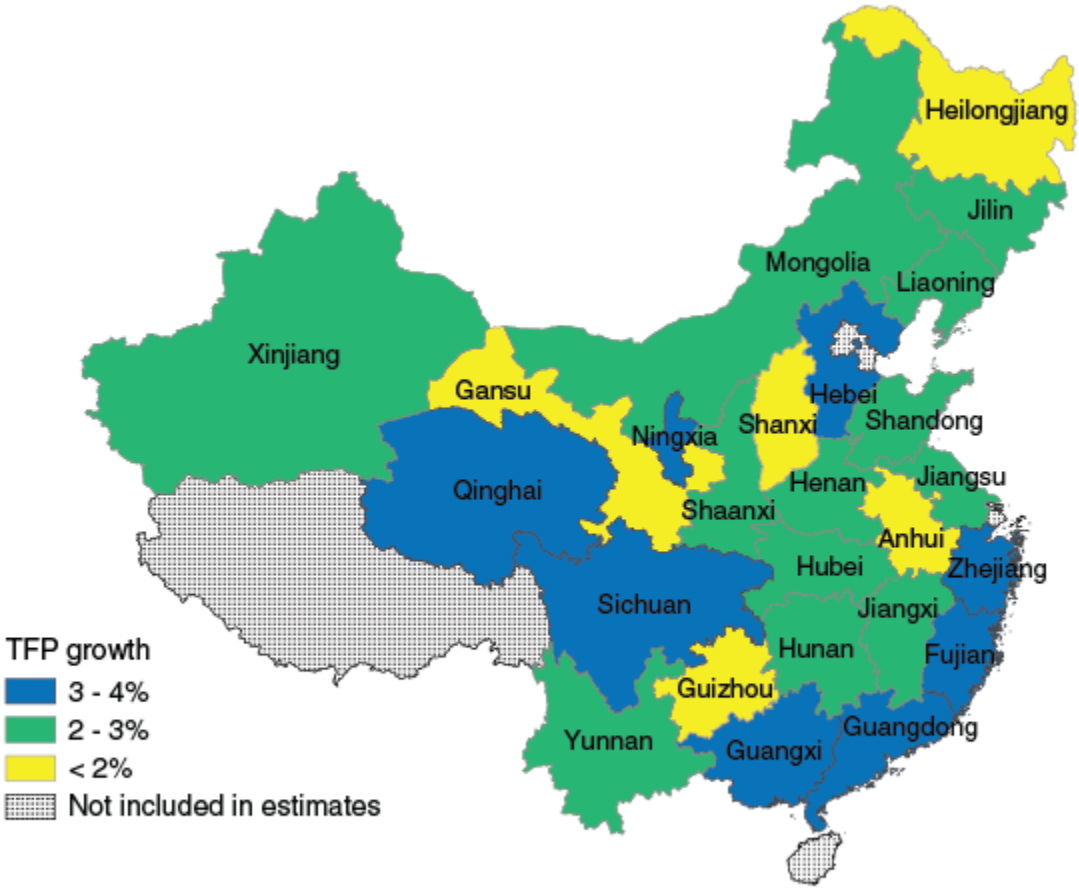
Carter, Zhong, and Zhu (2012) state that China today feeds 20% of the global population from mere 7% of the world's agriculture land. The Chinese government has spent a lot of money on this. China's current condition of severe environmental contamination is mostly attributed to the country's excessive and inefficient usage of chemical fertilisers, which has tripled over the previous three decades.[18]

To keep its promises of food security and self-sufficiency, China is consistently developing new technologies. The "seawater rice" variety, so named because it thrives in the salty soil found near the ocean, was produced by Chinese scientists. The new salt-tolerant rice incorporates a gene from a strain of wild rice in its genetic makeup, making it more resistant to salty and alkaline conditions. In field testing conducted in Tianjin, the new rice variety averaged 4.60 metric tonnes per acre, which is higher than the national average. Seawater rice is expected to assist the country maintain food security despite increasing sea levels, an increased demand for cereal, and disruptions in the food supply chain.[19]

Coming from its commitment to create a "diversified food supply system," China has raised its projections for grain self-sufficiency over the next decade. According to the yearly Agricultural Outlook Report for 2023-2032 published by China's Ministry of Agriculture and Rural Affairs, the country aims to increase its grain production from its current level of 82.2% to 88.4% within the next decade. Grain imports is another area where the country hopes to save money. The imports are expected to drop from 146.9 million metric tonnes in 2018 to 122 million metric tonnes in 2023 (Nulimaimaiti, 2023). The China Agricultural Outlook Report (2023-2032) was released at the 2023 China Agricultural Outlook Conference hosted by the Chinese Academy of Agricultural Sciences. It analysed the state of the market for China's major agricultural products in 2022 and made predictions for their production, consumption, trade, and price over the next decade (Xinhua, 2023).

[17]China Ministry of Agriculture. China Agricultural Yearbooks (China Agriculture Press, Beijing, China, 1982–2017).
[18]China Ministry of Agriculture. China Agricultural Yearbooks (China Agriculture Press, Beijing, China, 1982–2017).
[19]https://ricetoday.irri.org/china-to-use-seawater-rice-to-ensure-food-security/

Average annual TFP growth was strong across China's agricultural sector, 1985-2007



Note: Total factor productivity (TFP) is the ratio of total output over total input, thereby taking into account the use of all inputs in the production process.
Source: USDA, Economic Research Service calculations as reported in Wang et al. (2013).

According to the report, China will have a stronger foundation for food security, provided the 103 million hectares of permanent farmland practice high-quality agriculture in the next decade. The extent of enhancement in crop productivity with development in agriculture is remarkable. It is expected that China's grain output will increase 1.2% every year during the next decade. China's agricultural outlook report for 2023–2032 predicted a large increase in agricultural production capacity and food diversity. A 19.7 percent drop in imports of grain is expected over the next decade as the trade system improves. The survey also anticipated a rise in agricultural trade between China and countries in Southeast Asia, South America, and the Black Sea region.

China pioneered mechanisation and the dissemination of new technologies (including better seed varieties and animal breeds) in agriculture. The sixth annual Goalkeepers Report from the Bill & Melinda Gates Foundation states that innovative solutions, such as the development of new cereal seed varieties, are essential for raising agricultural output in the face of climate change. To counter the effects of heat waves on cereal output, particularly rice and maize, southern China is implementing innovations in the agricultural sector to ensure global food security (Yimeng, 2022).

Conclusion

To sum up, it's fair to say that China faced serious obstacles on its path to ensure national food security. With an ever-increasing population, food insecurity has become a major problem for the country. China has made remarkable progress despite having the largest population on the planet and the least amount of land to maintain it. Food security for China's bloated population has been ensured by the country's strong political resolve and targeted approach towards developing agriculture output. China has several difficulties in front of it as it strives to accomplish this Herculean task, with few associated issues viz. barren land; water pollution; environmental deterioration; an ageing and dependent population; and so on. China intends to face these new problems head-on by adopting cutting-edge technologies and strengthening its geopolitical foreign policy.

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