



Agriculture in China

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Abstract

China is the most populated nation and needs to produce enough food just to meet the demand of its 1.4 billion inhabitants. Agriculture dominated most of the pre-industrial history in China. China's land is highly employed for agriculture. Since China needs to feed the largest population on earth, the Chinese government attaches great importance to agriculture. Throughout China's history, its relative lack of arable land has been a challenge. China is the largest producer of rice, wheat, soybeans, cereals, cotton, fruits, vegetables, meat, poultry, eggs, and fish in the world. China will implement a national plan on modernization of agriculture and rural areas. This paper introduces the reader to the practice of agriculture in China.

Keywords: agriculture, farming, China, Chinese agriculture, traditional agriculture

Introduction

The People's Republic of China is located in the eastern part of the Asian continent, on the western of the Pacific Ocean. It was established in 1949 and has an area of about 9,600,000 km² (3,700,000 sq mi). Agricultural land makes up about 54.7% of land. Due to its size, the People's Republic of China is organized into 23 provinces, as shown in the map in Figure 1 ^[1]. To run the country, the government has established parallel national bureaucracies extending from Beijing down to local levels. Owing to tremendous differences in latitude, longitude, and altitude, the climate of China is extremely diverse. Today, China is the world's fourth largest nation by territory (behind Russia, Canada, and the USA), and it has the largest population of 1.4 billion people. China is the homeland for many different ethnic and racial groups. The island of Taiwan is not considered part of China, but it is regarded as a Chinese territory. The Taiwanese people are markedly politically different and have a free market capitalist based economy while the mainland Chinese government employ a communistic state run economy. There are five major religions that have been recognized by the state: Buddhism, Taoism, Protestantism, Catholicism, and Islam ^[2].



Fig 1: The map of China [1]

Agriculture remains the largest employer and 315 million laborers work on 200 million farmsteads. Of the enormous labor force in China, 27.7% work in agriculture. Despite a huge total farmed land area of 528.6bn hectares, only a relatively small amount of 119m ha is suitable for arable production. Figure 2 shows agricultural regions in China [3]. China's primary agricultural import is wheat from Argentina, Australia, Canada, and France. Wheat has been imported nearly every year since the early 1950s. Corn is also imported for human consumption and for livestock feed. These imports are used to improve living standards, especially in urban areas. China's most important agricultural export is rice. China exports about 750,000 metric tons of rice per year.

Other significant agricultural exports from China are potatoes, corn, tobacco, soybeans, tomato, sorghum, wheat, peanuts, tea, apples, cotton, pork, mutton, eggs, fish, and shrimp. The United States, Hong Kong, Japan, EU countries, and South Korea are the major export destinations. Since 1949 agricultural exports for most years exceeded agricultural imports [4]. The growth in wheat production reflects the changing consumer demand as China switches from traditional rice-based meals to a more "Western" diet of breads, noodles and pastas. Early visitors marveled at the high productivity of Chinese farming, its ingenious crop rotations, sophisticated water-raising devices and other equipment.

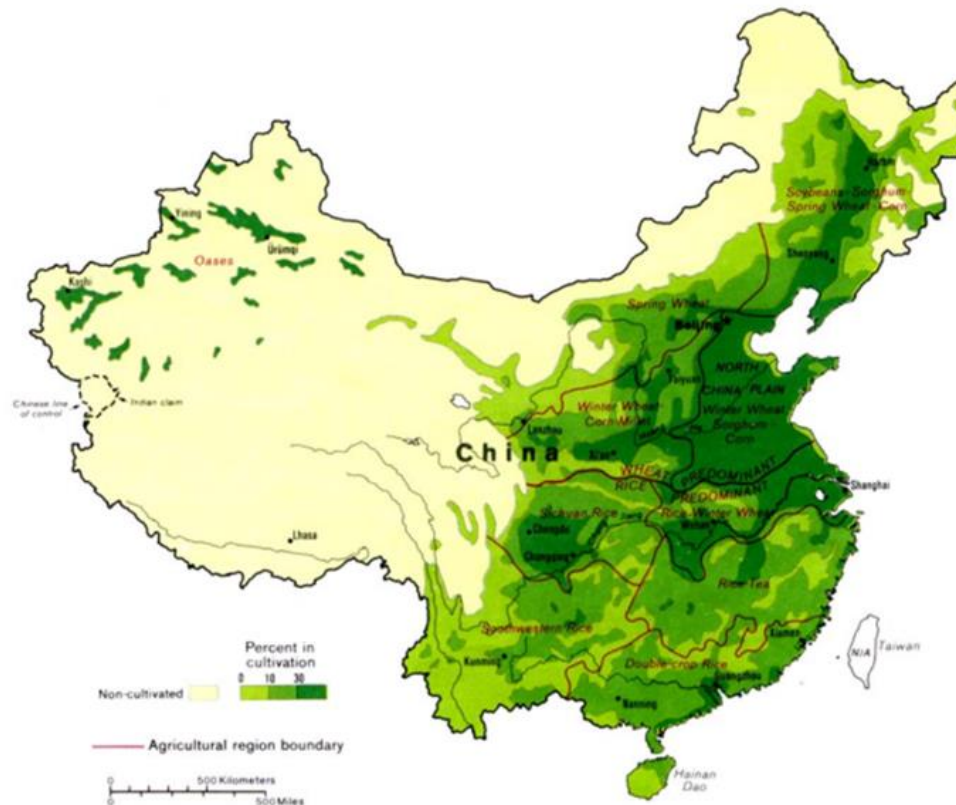


Fig 2: Agricultural regions in China [3]

Brief history of Chinese agriculture

Agriculture has been considered one of the most important stage developments in human history. The history of agriculture in China has been one of constantly improving crop yields through innovations, improvements in techniques, and intensification. In China, Agriculture has remained the largest employer. The ancient Chinese agricultural technology system focused on land and water mobilizations from 8000 BC to 1911 AD. The diffusion of ancient Chinese agricultural technology started in the Neolithic Period. The Neolithic Revolution provided humans with stone and iron tools utilized for planting and cultivation to establish an agrarian society. During the pre-development of agriculture in the Neolithic Period, no attention was given to crop protection. Most of the technologies initiated in the Neolithic period belonged to "tools and machines." New technologies focused on selections of pest-resilient crops, uses of soil cultivation methods and pest traps, and appropriate uses of fire to disinfect crops from pests and diseases. Both food crops and cash crops were actively

domesticated. The main crops planted were millet and its varieties. Due to more frequent exchanges between China and other countries, foreign crops such as potatoes, corn, peanuts, and sweet potatoes were introduced and planted [5].

In late imperial times, the agricultural land in northern China was cultivated by people who owned the land, while the land in the south was owned by landlords who did not work the land themselves. During the 1950s, the government of China made a concerted effort to redistribute land more equitably. By the early 1960s, agriculture was severely depressed, with millions of Chinese starving due to grain requisitions by the government. In the late 1980s, China remained a predominantly agricultural country. As of 1985 about 63% of the population lived in rural areas, and nearly 63 percent of the national labor force was engaged in agriculture. From the 1980s to 1998, food production and consumption continued to grow. The pace of industrialization quickened and diversified after 1990. As China continues to industrialize, vast amounts of agricultural land are being converted into industrial land. As of 2023, approximately 40% of China's

workforce is engaged in farming, primarily at small scale. The Chinese sought technical information abroad as well through the import of technology and machinery and the international exchange of delegations. China's agricultural imports, exports, and production have expanded greatly since China's WTO (World Trade Organization) accession in 2001. China is embarking on a new journey of Rural Revitalization during the 14th Five-Year development period from 2021 to 2025. The plan was released in September 2021 and outlines among key priorities maintaining subsidies for grain producers and increasing minimum purchase prices for wheat and rice as appropriate. It will witness a transition from poverty reduction to rural revitalization. At the same time, policy actions targeted deregulation and diversification of marketing channels. Budgetary allocations favored input subsidies and general services to the sector. The minimum purchase prices for wheat and rice are set every year by the National Development and Reform Commission (NDRC).

Traditional Chinese Agriculture

The development of agriculture over the course of China's history has played a key role in supporting the growth of one of the largest populations in the world. In the 20th century, China struggled to feed its large population with farming being very labor-intensive. Following the Chinese Communist Party's victory in the Chinese Civil War, control of the farmlands was taken away from landlords and redistributed to the 300 million peasant farmers. Agriculture in China is labor intensive with women doing about 60 percent of the work. Animals such as mules, oxen, and water buffalo are considered luxuries and most plowing is done with sticks or hoes by farmers. Planting is often done by hand with dribble sticks to make a hole and plowing is done with a hoe or an animal such as a water buffalo or ox. Peasant farmers in the south have traditionally used water buffalo to plow their fields, donkeys to carry goods, and treadmills to pump water into irrigation ditches. Some places still use water clocks to determine when the gates of the irrigation system. Many ethnic minorities in the south use large mortars and pestles to crush grain into flour [5].

Modern agriculture

China's modern agricultural industry was under strict local and national government control until the late 1980's when the reform and opening policies led to a more market-based approach to the agricultural industry in China. Technology developments have made significant impacts on both humans and the environment in which they live. There was a gradual increase in technologies in Chinese agriculture. Modern technology had spread slowly in the vast farm areas, causing growth in agricultural output to lag behind production increases in the rest of the economy. A typical example of mechanized farming is shown in Figure 3 [7]. By upgrading farming policies and technologies, China has become self-sufficient and is able to increase farming production and efficiency. Since 1994, the government has instituted a number of policy changes aimed at limiting grain importation and increasing economic stability. As China continues to industrialize, vast amounts of agricultural land are being converted into industrial land [8]. The biggest farm in the world (in terms of acreage) is in Heilongjiang, China; the farm manages 22,500,000 acres. China was the leading agricultural producer worldwide in 2020. It is the largest rice-producing nation in the world. All rice cultivation is highly

labor-intensive. Figure 4 shows an agriculture technician checking the growth of rice seedlings [9]. Corn is grown in most parts of China but is most common in areas that also produce wheat. Consumers have traditionally considered corn less desirable for human use than rice or wheat. China is the largest producer and exporter of garlic. It exports garlic to the United Arab Emirates, the United States, Vietnam, and Indonesia. China is also the largest producer of many vegetables including onions and cabbage. With China's different agricultural climatic regions, many varieties of vegetables are grown. In addition, China produces soybeans, kaoliang (sorghum), wheat, millet, and corn. Sheep and goats are China's most important grazing animals.



Fig 3: A typical example of mechanized farming [7]



Fig 4: An agriculture technician checking the growth of rice seedlings [9]

Modern technology had spread slowly in the vast farm areas, and the availability of modern supplies was less than adequate, causing growth in agricultural output to lag behind production increases in the rest of the economy. Much can be done in revolutionizing the efficiency as smarter agriculture thrives and changes how grains and animal proteins are produced, for a more self-sufficient and resilient outlook. China's farmers can lay claim to being the world's biggest producers of a number of crops including [10]:

Rice - 207 million tonnes
Wheat - 126 million tonnes

Potatoes - 95 million tonnes
 Apples - 45 million tonnes
 Pears - 19 million tonnes
 Cotton - 7 million tonnes

China's projected share of the global production of selected crops in the 2020/21 season (in percent) is shown in Figure 5^[11]. Drones are another hot staple in China's agricultural tech scene. They are able to gather data at scale and automatically spray pesticides instead of farmers.

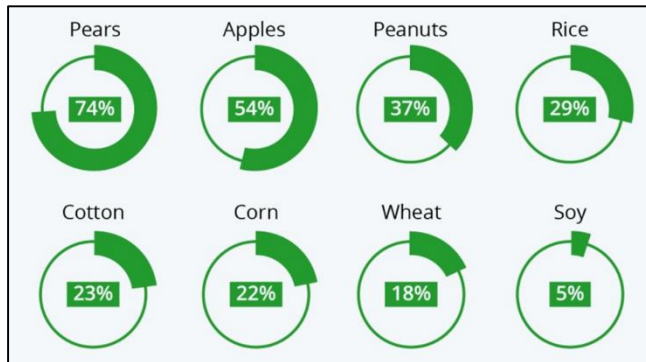


Fig 5: China's projected share of the global production of selected crops in the 2020/21 season^[11]

The government of China has always placed great importance on work relating to agriculture and the rural population. The government has implemented a series of policies to strengthen agriculture, benefit the rural population, and enable people in rural areas to prosper and thus ensuring balanced development of urban and rural areas. Besides the technological advances in agriculture, policy support is the most crucial component to promote the use of technology as well as incentivize farmers to strive for high-yield grain production. The success of agricultural development in China has come from both productivity growth and increased input use. Productivity growth is important because it underpins continued growth of rural income, an improvement of farmer livelihood, and the security of the domestic food supply. China has achieved significant productivity growth in agriculture through either land reform, technological innovation, market reforms or public investment in rural infrastructure^[12].

Benefits

China produces more food than any other country in the world, but it also consumes more. It has to feed nearly 20% of the global population. As of at least 2022, China produces almost all of its own food. Despite limited natural resources, China has been able to meet its growing demand for food largely through its own agricultural production. China has developed a Green Food program where produce is certified for low pesticide input. It has very advanced agricultural R & D centers and laboratories.

Nothing is wasted in China: human waste is collected from family outhouses and used as fertilizer. The *Law of the People's Republic of China on Food Waste* entered into force in April 2021. China has a long history of using human excrement as fertilizer. Urine is collected in 65-gallon drums and used for medicine and fertilizer. Today, many farmers have switched to nitrogen and phosphorous fertilizer, which run off and cause water pollution.

Today, China produces 18% of the world's cereal grains,

29% of the world's meat, and 50% of the world's vegetables. This success makes China the world's largest agricultural economy. Growth in agriculture and rising off-farm employment have dramatically reduced rural poverty, while increasing the income of farmers. The number of people in rural China in extreme poverty fell from 250 million in 1978 to less than 15 million in 2007. In spite of the success, China remains a developing country. In China, 36% of the population still lives on less than \$2 per day and most of these poor are in the countryside^[13].

The most recent innovation in Chinese agriculture is a push into organic agriculture. China's organic food production has experienced a rapid expansion in the 2010s. The Chinese upper and middle class have begun to embrace organic farming as a source of safe food as China has seen an unending string of food scandals. In spite of the positive developments, China's organic agriculture sector faces some critical challenges.

Challenges

In spite of the rapid growth in output, the Chinese agricultural sector faces several challenges such as ageing rural force, complex land system, supply chain disruptions, water shortages, degrading farmland, rising labor cost, low efficiency, and corruption. The results of China's agricultural policies in terms of output have been mixed. China traditionally has struggled to feed its large population. Although China is the top food producer, China still relies on imports to feed both its livestock and growing population. Although China's agricultural output is the largest in the world, only 10% of its total land area can be cultivated. The limited space for farming has been a problem throughout its history, leading to chronic food shortage and famine. While China's agricultural production is sufficient to feed the country, it still has to import grain. Although China produces almost all of its own food, food security remained a prominent challenge; in 2022 China experienced its worst drought. Food security is one of the most important issues in human society, especially in the most populated country, China. Over the past 70 years, climate change seriously reduced China's food security, mainly by inducing drought and flooding. In the near future, climate change may cause a reduction of output in wheat, rice, and corn.

The sustained growth in agricultural output is exerting pressures on natural resources such as land and water. Famines and floods were serious risks. The challenge of feeding a growing nation on a shrinking supply of arable land while confronting severe water shortages has long been a major concern. China's farmers have long used techniques such as fertilization and irrigation to increase the productivity of their scarce land. In contrast to the irrigation systems in the north, which mainly used water channels, irrigation systems in the south used a combination of channels, storage ponds, and waterwheels based on different spatial conditions. But irrigation with canals is very inefficient. Lots of water wasted since the governments subsidize water so heavily that farmers have little incentive to save it. Air pollution from reliance on coal is a major issue, along with water pollution from untreated wastes and use of debated standards of pollutant.

Women have been a major labor presence in China since the People's Republic was established. About two-fifths of all women over age 15 are employed. Figure 6 shows some

Chinese women farmers ^[14].



Fig 6: Some Chinese women farmers ^[14]

Conclusion

China has the world's largest population and the second largest land area. It has a long history of farming and a tradition of intensive cultivation. The rapid growth of food demand in China has been largely met through its own agricultural production. While successfully feeding its large population, China is also supplying agricultural products all over the world. This is mainly due to modern technology and supportive governmental policies. Today, agriculture in China is an industry of food, fiber, and energy production based on the growth and development of plants to sustain and enhance human life ^[15].

For millennia, agriculture has played an important role in the Chinese economy and society. China ranks first in the world in terms of the production of cereals, cotton, fruits, vegetables, meat, poultry, eggs, and fish. The development of agricultural technology in ancient China was an extremely slow process. The Chinese government has always placed high priority on the development of agriculture. China has succeeded in producing one fourth of world's grain and feeding one fifth of world's population with less than 10 percent of world arable land. Today China is the largest importer of agricultural products in the world. It has consistently been a net agro-food importer since 2003.

Current agricultural policies in China are aimed at improving the quality and nutrition of crops, which means teaching farmers how to maintain yields without overusing fertilizer and pesticides. Modernization has always been the goal of agricultural and rural development of China. This is where digital and technological platform (modern agriculture platform and smart farming technology including drone and satellite imagery) can make a huge difference. The modernization has made strong headway in poverty reduction ^[16]. More information about agriculture in China can be found in the book in ^[17-22].

References

1. Discover the 23 provinces of China, <https://www.thoughtco.com/china-provinces-4158617>
2. Geography of China," *Wikipedia*, the free encyclopedia, https://en.wikipedia.org/wiki/Geography_of_China
3. Agriculture in China: Challenges, shortages, imports and and organic farming, <https://factsanddetails.com/china/cat9/sub63/item348.html>
4. History of agriculture in China, *Wikipedia*, the free encyclopedia, https://en.wikipedia.org/wiki/History_of_agriculture_in_China
5. S Wu, *et al.* The development of ancient Chinese agricultural and water technology from 8000 BC to 1911 AD, *Humanities and Social Sciences Communications*, 2019, 5(77).
6. Traditional Chinese agriculture and farming, <https://factsanddetails.com/china/cat9/sub63/item1892.html>
7. China boosts investment in foreign agriculture, Unknown Source.
8. Agriculture in China, *Wikipedia*, the free encyclopedia, https://en.wikipedia.org/wiki/Agriculture_in_China
9. China's agricultural sector gets boost thanks to advanced tech, April 2020, Unknown Source
10. Spotlight on agriculture in China, March 2018, <https://www.adama.com/en/our-commitment/global-farming/farming-stories/insight-into-agriculture-in-china>
11. King of crops: China's gigantic agricultural production, September 2020, <https://www.pakistangulfeconomist.com/2020/09/28/king-of-crops-chinas-gigantic-agricultural-production/>
12. J Huang, *et al.* Agricultural and rural development in China during the past four decades: An introduction, *Australian Journal of Agricultural and Resource Economics*. 2019; 64:1-13.
13. CA Carter. China's agriculture: Achievements and challenges, https://s.giannini.ucop.edu/uploads/giannini_public/42/47/42478f51-6d6a-4575-8dae-d88e2dcf174f/v14n5_2.pdf
14. China at a glance, <https://www.fao.org/china/fao-in-china/china-at-a-glance/en/>
15. X Jiao, N Mongol, F Zhang. The transformation of agriculture in China: Looking back and looking forward, *Journal of Integrative Agriculture*, 2017, 16.
16. Q Hengde. Smart farming technology can transform Chinese agriculture and help feed the planet, 2021. <https://www.globaltimes.cn/page/202102/1215818.shtml>
17. W Chen, *Challenges and Opportunities for Chinese Agriculture: Feeding Many While Protecting the Environment*. Springer, 2020.
18. FH King. *Farmers of Forty Centuries; Or, Permanent Agriculture in China, Korea and Japan*. Harcourt, 1911.
19. NR Lardy. *Agriculture in China's Modern Economic Development*. Cambridge University Press, 1983.
20. J Huang, C Chen. *Effects of Trade Liberalization And Structural Aspects*. CGPRT Centre, 1999.
21. J Wang, *et al.*, *Can China Continue Feeding Itself? The Impact of Climate Change on Agriculture*. World Bank Publications, 2012.
22. DH Perkins. *Agricultural Development in China, 1368-1968*. Routledge, 2017.