American Crops into China : Discourse on Influences of Corn, Sweet Potato, and Potato

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美洲作物传入中国：从玉米、番薯、马铃薯看美洲高产粮食作物的传入对中国社会的影响

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ABSTRACT

Since the 16th century, about 30 kinds of edible American plants have been introduced to China, among which corn, sweet potato, potato, and the like have had a particularly far-reaching influence. The author thus terms the period from the 16th to 17th centuries 'the influx of American crops into China'. From the perspective of food history and the history of food exchange between China and foreign countries, this chapter emphasizes the impact of introduction of American crops to Chinese society's agricultural production, food structure, dietary life, population growth, and ecological environment.

摘要

16世纪以来，约近30种可食性美洲植物品种相继传入我国，尤其是其中的玉米、番薯、马铃薯等品种的扩布，其影响更是重大深远。作者将这一历史阶段性现象称之为“美洲作物涌入中国”。本文从饮食史、中外食事交流史的视域展开，侧重讨论了美洲作物传入对中国社会饮食生活、食物结构、人口增长、生态环境、农业生产等相关方面的影响。

INTRODUCTION

Of the existing crops in China, at least 50 species were introduced from abroad. Before the Tang Dynasty (618–907), the most frequently introduced crops were native to western Asia, the Mediterranean, Africa, or India, which were primarily brought to the country by the Silk Road. Following the mid-7th century, with the southward shift of the Chinese economic centre, the Maritime Silk Road developed rapidly, leading to constant introduction of new crops. Most of these early incoming crops were fruits and vegetables.

After the mid-15th century, arrival of the era of the Great Geographical Discovery saw dramatic influx and spread of high-yielding American food crops in China. This opened a new chapter in the history of Chinese crops. The introduction, cultivation and promotion of these exotic crops had a profound impact on social economy, agricultural production, and wider social life; it was an event of great historical significance.

In the Ming (1368–1644) and Qing Dynasties (1644–1912), more than 30 crop species originating in America were introduced to China, including corn, sweet potato, potato, cassava, peanuts, sunflowers, peppers, squash, tomatoes, beans, pineapple, sweetsop, guava, avocado, cashew, cocoa, America ginseng, papaya and other oil crops, tobacco, and industrial raw materials such as cotton.

During this influx of American crops in the 16th century, rapid expansion of corn, sweet potatoes, potatoes, pepper, tobacco, and the like had an especially decisive influence. Their role was almost a tsunami; the impact was extremely far-reaching. Accordingly, this chapter specifically acknowledges this historical stage, terming it 'the influx of American crops into China'. In other words, the phenomenon does not convey a general sense of entry and landing; the introduction of these crops was concentrated, high-density, and large-scale, with cluster shock effects and explosive diffusion. Obviously, as a major issue in the history of transportation and food culture exchange, research on the influx of American crops into China and its influence on Chinese society has great significance and cannot be ignored.

Discussion of the introduction routes, times, and communicators of corn, sweet potato, and potato into China are complicated; space limitations prevent an in-depth discussion in this chapter. Rather, the article focuses on the impacts of the American crop introduction on Chinese society. With respect to the introduction of corn into China, the document *Dian Nan Ben Cao* (滇南本草) is highly interesting and worthy of attention. A brief introduction follows.

LANDING OF CORN IN HINA

Corn is planted over a vast area between the 58th parallel north and the 40th parallel south, and is one of the most important food crops in the world. Excluding Antarctica, all the other six continents plant corn, with the largest acreage in North America, followed by Asia and Africa, Latin America, and Europe. The most suitable areas for corn are the north central regions of the US, Mexico and Peru in Central and South America, the Danube Valley in Europe, and the North Plain and Northeast Plain in China. In present-day China, corn-planting area is exceeded only by rice and wheat.

There is no doubt that corn is native to America (Crosby, Jr. 1972: 171). With Columbus's discovery of the New World, corn began its globalization. It is generally believed corn spread to Asia the early 16th century, when it was introduced into India and Bangladesh, then from India through Tibet into Mainland

China. Another possible route may have been from Turkey through Iran and Afghanistan to East Asia (Умнова 1965: 1−13).

World historians generally agree that corn began to spread around the world from America after Columbus's discovery, but differing opinions have been presented.

The earliest records of corn in Chinese literature are usually considered to be *yumai*, found in *Xiang Cheng Xian Zhi* (襄城县志), written in the 30th year of Emperor Jiajing (嘉靖三十年, 1551) in Henan Province; *fanmai* (蕃麦) and *xitianmai* (西天麦), recorded in *Ping Liang Fu Zhi* (平凉府志) in Gansu Province in the 39th year of Emperor Jiajing (嘉靖三十九年, 1560); and *yumai* (御麦), recorded in *Liu Qing Ri Zha* (留青日札), with the preface written in 1572 by Hangzhou scholar Yiheng Tian (田艺蘅) in the Ming Dynasty.

The most noteworthy document, however, is *Dian Nan Ben Cao* (滇南本草), written by Mao Lan (兰茂), who was born in 1397 and died in 1470 or 1476. The book, which was completed in 1436, contains the following record:

> *Yumaixu* (玉麦须, corn silks), sweet, lukewarm-nature, loosen the bowels and lower pressure in the Yangming Stomach Channel, treat women's red and swollen nipples or children blew by wind , or sleep being pressed, stoppage of human milk, swelling and pain, cold, fever, headache, and physical fatigue. Fresh corn silks are dried to powder, regardless of how many, conducted and drunk with yellow wine. It obtains instant results. Not to be seen as an abandoned thing and ignored.

Corn silks refers to the filaments of the plant's pistil, or the stigma (Lan 1977: 12). If the document is accurate, this is the earliest record of corn in China.

The text is based on observation, analysis, experience, acquaintance, induction, and summary of clinical practice to understand the properties and efficacy certain drugs in traditional Chinese herbalism. That is to say, in the 15th century, before humanity opened the door to modern science, observation and direct understanding were necessary in decentralized, closed, conservative Chinese rural society; subjective speculation was not sufficient to accurately understand the properties and efficacy of herbal medicines.

However, due to the theory that corn was introduced after Columbus discovered the New World and the version of *Dian Nan Ben Cao* (滇南本草), current academic circles doubt the legitimacy of the reference to *yumaixu* (玉麦须, corn-silks) in *Dian Nan Ben Cao* (滇南本草). However, Professor Xiuling You, a famous agricultural history expert in China, presents a noteworthy opinion. In his article 'The Time and Path of Corn Introduced to China and Asia and Its Origin', he notes: '*Dian Nan Ben Cao* (滇南本草) compiled by the Yunnan People's Publishing House is a collection of various manuscripts and block-printed editions of the past. They repeatedly proofread one by one and mark out the differences each of the entries. It can be judged that the *yumaixu* (玉麦须, corn silks) is the original content, not the later generations' (You 1999: 99).

If the historical material is legitimate, the history of traditional corn communication must be rewritten. The advance of corn's historical introduction into China calls into question not only the theory that corn was introduced after Columbus discovered the New World, but also the historical exchanges between Asia and the American mainland.

Indian scholar Randhawa, in his famous book *A History of Agriculture in India*, which described new crops introduced by the Portuguese to India, excluded only corn, not listing it after 1492. This reflected the author's prudent attitude toward the time of corn's introduction to India (Randhawa 1980: 178–179).

Some research by international scholars is also noteworthy. About 20 years ago, American scholars investigated and studied corn stone carving in Hoysala Temple, close to Mysore in south India. They consequently published 'Maize Ears Sculptured in 12th and 13th Century A.D. India as Indicators of Pre-Columbian Diffusion'. The researchers conducted a scientific, rigorous morphological comparison between the corn stone carving and modern corn, and concluded that the overall shape and detail show that real corn was the model for the corn stone carvings (Johannessen and Parker 1989: 52–58).

Upon viewing stone carvings in Hoysala Temple, it is impossible to imagine anything other than corn cobs. The comment of an older man near Hoysala Temple is interesting: "Of course it is corn, what else would it be?" This corresponds to the custom in which corn is widely planted and eaten in the local area. Faith and the dependence of life on food are synchronous; dedicated food in religious temples should be a pledge of life.

However, despite this paper's conclusion that corn was introduced to China prior to Columbus's discovery of America, it does not deny that corn was introduced into Asia again following this discovery. On the contrary, subsequent exchanges between the old and new continents were more frequent. This provided a convenient, powerful way to exchange materials and disseminate species.

PROFOUND IMPACTS OF INTRODUCTION OF AMERICAN CROPS ON CHINESE SOCIETY

The introduction of American corn, sweet potato, potato, and other crops had profound impacts on Chinese agricultural production, social economy, diet, ecological environment, and other factors.

1. Effects on Agricultural Production

Some scholars identify two lengthy 'revolutions' nearly a thousand years ago in the history of Chinese crops. The first began in 1012 during the Northern Song Dynasty. At this time, the drought-tolerant and early-maturing Champa (占城) rice of Vietnam gradually extended to the area south of Huai River, greatly increasing the country's rice production. The second revolution in Chinese history began in the 16th century with the influx of American corn, sweet potato, potato, and other

crops, which has had long-term impacts on agricultural production in China.

New breeds for food production and changed Chinese crop structure

For thousands of years, China's ancestors relied on rice, millet, glutinous millet, wheat, beans, grain, and other cereals for sustenance. In the Ming Dynasty (1368–1644), China's grain structures were still fundamentally based on the pattern of rice and wheat. In the late Ming Dynasty, Yingxing Song's (宋应星, 1587–1666?) *Tian Gong Kai Wu* (天工开物) stated, 'Today, rice accounts for 7/10, and *laimou* (来牟, wheat), broomcorn millet (黍), and millet (稷) account for 3/10, on people's food' (Song 1993: 229; 233). This indicates that in the country as a whole, rice accounted for 70% and all other crops for 30% in crop structure, though there were differences between the north and south.

This crop structure changed rapidly after the introduction and spread of American crops like corn, sweet potato, and potato. Because the new crops were high-yielding, resilient, easy to plant, and labour-saving, their cultivated area expanded constantly after their adoption. Shortly after the introduction of corn, it was called the 'sixth main cereal' (六谷), and played an important role in agricultural production and crop structure. It even overshadowed proso and millet, regarded among the more important five main cereals, largely replaced the traditional position of millet and sorghum, and took over some of the wheat cultivation area.

Sweet potato quickly replaced traditional taro and yam as a staple food, relegating taro and yam to the rank of vegetables. In the Ming Dynasty (1368–1644), books such as *Ben Cao Gang Mu* (本草纲目), *Nong Zheng Quan Shu* (农政全书), *Qun Fang Pu* (群芳谱), and other local chronicles categorized sweet potato as a vegetable. After the reign of Emperor Qianlong (乾隆帝, r. 1736–1796) and Emperor Jiaqing (嘉庆帝, r. 1796–1820), documents categorized it as a cereal. This change demonstrates the increasing importance of the sweet potato in agricultural production.

Potato's promotion occurred later in China, but it quickly assumed an irreplaceable role in some of the main planting areas. As *Yi Du Xian Zhi* (宜都县志) of Hubei Province recorded in 1865, 'In the bitterly cold region of remote mountains, rice, wheat, and even corn cannot be planted. People eat sweet potato and potato as staple foods'. In 1871, *Shi Nan Fu Zhi* (施南府志) of Hubei Province recorded, 'the country is in the mountains…in the highest mountains, it is bitterly cold and residents stay alive by relying on potato'. Potatoes could be grown in the most barren and coldest areas; its soil fertility and climate requirements were lower than those of corn and sweet potato. Lands that could not support other cereals all planted the potato.

After several centuries of development, corn, sweet potato, and potato ultimately become the main grain crops in China. They now occupy an important position in agricultural production and crop structure. At present, our country's grain crops form a sequence, in order of cultivation area and importance, of rice,

wheat and corn, sweet potato, millet, sorghum, barley, and potato.

Cultivated area increased

Due to their drought-resistance and adaption to nutrient-poor environments, American corn, sweet potato, and potato were widely naturalized in sandy land, infertile soil, hillsides, deep mountains, forests, and other places previously unsuitable for crop growth.

With the promotion of corn cultivation, the hills, wilderness, and dry land south of the Yangtze river basin, which had been unsuitable for rice production, were quickly exploited, and north of the Yellow River, corn gradually replaced the original low-yielding crops, becoming a major dry land crop. With the promotion of sweet potato, significant coastal sandy land, barren highland, and hill areas were exploited. With the promotion of potato, deep mountains and forests and cold zones were reclaimed and cultivated. Gradually, these processes effectively increased the country's arable land.

Although it is difficult to ascertain specific data on the cultivated land expanded by American food crops, it must have been considerable. In about 150 years, from 1724 (雍正二年) to 1887 (光绪十三年), the total arable area increased by 26.03%, almost 1.883437 billion mu (亩)[1] (Liang 1980: 334, 380). This was concurrent with the period of American crop promotion, meaning new land reclamation would have accounted for a considerable share.

Grain output increased

Corn, sweet potato, and potato are high-yielding crops. For corn, average yield per mu of one crop per year was highest, among one crop per year, two crops per year, and three crops per two years. Yield per mu per year was about 2.18 stone (石).[2] The average yield per mu of three crops per two years was lowest, about 1.86 stone. The average of the three was 1.967 stone (Zhao 1995: 62). Moreover, crop rotation and multiple cropping of corn and wheat, millet, or sorghum not only increased land utilization rate, but also greatly improved yield per mu. The multiple cropping index was an estimated 1.23 in the Qing Dynasty (1644–1912), and was greater for the cropping systems that incorporated corn. The yield of the north increased by 23.75%, and of the south by 28.33%.

Sweet potato requires less manpower but yields a much higher harvest than any other food crops. People of the time noted this and took full advantage of it. The average yield per mu of fresh sweet potato reached 1,000 jin (斤)[3] in the Qing Dynasty (1644–1912), and the finished product was about 250 jin, equivalent to 500 jin or 3.84 stone of rice and 417 jin or 3.09 stone of millet (Zhao 1995: 62). Similar to corn, sweet potato can be rotated and multiple cropped with wheat, millet, beans, or rice. Because the period from planting to harvesting is short, sweet potato crops did not need to conform to the fixed planting times of wheat, rice, and other crops; this greatly improved the yield per mu, and also effectively improved the annual total grain output. Crop rotation and multiple cropping with

sweet potato increased output by an estimated 50% in the north; the south increased as much as 86.33% in the Qing Dynasty (1644–1912) (Wu 1985: 186–187).

During the Ming (1368–1644) and Qing Dynasties (1644–1912), yield per mu increased by 10.77 jin owing to the cultivation of sweet potato, and by 10.37 jin owing to the cultivation of corn. The Ming Dynasty's (1368–1644) output increased about 2.38 jin overall (sweet potato 1.08 jin, corn 1.3 jin) and the Qing Dynasty's (1644–1912) about 18.76 jin (sweet potato 9.69 jin, corn 9.07 jin), for a total increase of 21.14 jin. Comparing the yield per mu between the reign of Emperor Qianlong (乾隆帝, r. 1736–1796) and the Ming Dynasty (1368–1644), cultivation of corn and sweet potato accounted for about half of the increase, and farming intensification and increased multiple cropping index in the north and south played or the other half (Zhao 1995: 64–65). However, we must note that corn accounted for 6% to 7.63% of the country's total cultivated area, and sweet potato for only about 2% in the middle of the Qing Dynasty (1736–1840). They provided such an enormous contribution within a very small area, illustrating their highly significant roles.

Because potato was introduced and spread later, its role in increasing yield per mu was less remarkable than that of corn and sweet potato in the Ming (1368–1644) and Qing Dynasties (1644–1912). The planting and spread of corn and sweet potato crops enlarged China's farming area, improved unit output, contributed to overall increase in grain yield, and alleviated the long struggle between the population and the land.

Hubei and Hunan Provinces planted corn and sweet potato on a large scale during the Qing Dynasty (1644–1912). It is estimated that in the late Qing Dynasty (1840–1912), the cultivation area of corn was estimated at about a million mu, and sweet potato at about 1.8 million. We calculate that the corn yield per mu was about 2 stone, and sweet potato about 3 stone. Thus, in the late Qing Dynasty (1840–1912), Hubei and Hunan provinces could produce about two million stone of corn 5.4 million stone of sweet potato, totalling more than 7.4 million stone. At a use rate of 4 stone of grain per person per year, these crops could feed about 1.85 million people.

Nationally, at the start of the 20th century corn accounted for about 6% of all cultivated areas, and sweet potato for about 2%. The introduction of corn brought about an increase of 7 to 8 million tons in output per year, and sweet potato an increase of 4 million tons per year prior to 1918 (Perkins 1984; Wu 1985; Zhao 1995).

The population of China increased by nearly 300 million in a century, from 1741 to 1850 (Liang 1980: 201, 261), whereas cultivated area increased by only about 26% during the same period. Population explosion during this period coincided with the rapid promotion and popularization of corn, sweet potato, and potato. The introduction and popularization of high-yielding American crops eased the struggle between the people and land in the Qing Dynasty (1644–1912),

allowing agriculture to support more people. However, the high-yielding, easy-to-plant crops that brought about this new population growth further enhanced the imbalance between people and land. This formed a loop cycle, as seen in Ireland with rapid increase in cultivation of potatoes.

2. Effects on Social Economics

In the Qing Dynasty (1644–1912), corn, sweet potato, and potato were often used as feed or raw material to make wine, fuel, fertilizer, and so on, in addition to their use as food. Chinese herbal medicine also explored their medicinal value. The comprehensive utilization of American crops had a profound impact on social economic development.

The influence of the American crops on economy was mainly reflected in the regulation of grain market prices. Because high-yielding corn, sweet potato, and potato crops increased food supply, they were commonly eaten by poor people. In addition to using the crops for food, surplus could be sold, making corn, sweet potato, and potato useful as trade commodities. Relatively highly priced rice and other food also could be saved and sold or exchanged on the market. This stabilized food prices and promoted commercialization of food in the Ming (1368–1644) and Qing Dynasties (1644–1912).

Additionally, corn and sweet potato played an important role as raw materials for handicrafts or food for workers. The crops' price and harvests both had effects. *Xiao Feng Xian Zhi* (孝丰县志) from the time of Emperor Guangxu (光绪帝, r. 1875–1903) recorded that 'If corn wins a bumper harvest, corn value must greatly reduce. When the factory expands, workers gather more and more. But if corn has poor harvest, it is expensive, and the factory also stops work'.

Potato, though not as important as corn or sweet potato, was also sold for profit, and its harvests also affected market prices. In 1921, *Bao Shan Xian Xu Zhi* (宝山县续志) recorded that 'potato is commonly called Yang Shan Yu (洋山芋). When we sow and cut it into the soil, it is extremely easy to grow and harvest, maturing twice in summer and autumn. Nan Xiang (南乡) plants much of it for large exports… But the price depends on the number of potatoes. When the price is high, it is worth about one or two jiao (角, dime) per jin; when the price is cheap, over half is thrown along the riverside'.

3. Effects on Social Life

People's daily lives

We usually think of northerners as eating wheat and southerners as eating rice in China. In fact, this is not quite accurate. The middle classes often eat corn and sweet potato during the year; rice and wheat account for less than 30% of the country's crop structure. It is clear that the food structure of China has changed greatly after the introduction of American crops. The majority of common people rely heavily on corn and sweet potato for sustenance. In the literature and local

histories of the Qing Dynasty during the Qianlong period and later (1736–1912), records of this were numerous and abounding.

Various methods exist to eat corn as a staple food. It can be fried, boiled, made into porridge, or made flour for bread and cake. It includes the popcorn that we now often eat. At the end of the Qing Dynasty (1840–1912) in Beijing, civilian staples included cornmeal *wotou* (窝头, steamed corn bread), *tiebingzi* (贴饼子, pan-baked corn cakes), and cornmeal porridge. Corn could also be made into snacks to treat guests in upper-class society, such as rose-filled steamed pancakes and goose-oil steamed pancakes (Lanling Xiaoxiao Sheng 2008: 262, 306).

At the end of the Qing Dynasty (1840–1912), corn flour produced in Jilin City had become a tribute to the court as a local specialty (Xu 2010: 410–411). At the end of the Qing Dynasty (1840–1912), the cornmeal wotou was even in the Qing Emperor's menu (*Gong Zhong Za Jian Shan Dan, No. 2248*). In the era of Empress Dowager Ci Xi (慈禧太后, 1861–1908), daily food production and consumption by the privileged stratum was pushed to an extreme in Chinese history. The fabulous imperial dietary culture was based on the common people's poor lives and hard meals.

Final uses of corn included boiling it as molasses and making wine. Corn cobs could be cooked and eaten as vegetables, tasting quite like winter bamboo shoots.

Sweet potato also played an important role in people's lives.

> The aged eat it that they do not suffer from choking. It can care for the aged people; children crying eat and then stop crying. It also can nurture young children; the beggars along the road eat it and it makes them feel equal; in addition to the chicken, dog, and pig, it can feed domestic animals; as for the gentlemen, they can make up for a lack of food (He 1995: 4437).

In 1786, the Emperor Qianlong ordered the 'widely cultivated [sweet potato] to help the people to supplement food' (Qing and Dong 1978: 18619). Up to the middle of the Qing Dynasty (1736–1840), the sweet potato was planted in many provinces, and farmers relied on it as food for half the year.

There were many historical ways to eat sweet potatoes. They tasted like pear and jujube, and their effects were the same as rice and sorghum. They could be boiled, steamed, grilled, fried, or made into flour. After cooking and steaming, they could be used as a dry grain for storing, and could also be mixed with rice and millet to cook congee. Sweet potatoes could be dried and milled into flour for cakes. The flour could also make thick soup when combined with warm water, small ball-like pearl rice, or vermicelli by pounding and filtering; it could be used to make wine. Sweet potato flour was thought regarded like the lotus, and was often given as a gift in the Qing Dynasty (1644–1912).

The leaves of the sweet potato plant could be cooked as vegetables. After large-scale planting during the Ming (1368–1644) and Qing Dynasties (1644–

1912), sweet potato was recognized as a staple food. Only the leaves were used as vegetables in a dish.

Compared to the countryside, city life was rich and delicate. Cooked and baked sweet potatoes were a flavour loved by residents in Beijing in the Qing Dynasty (1644–1912).

Finally, sweet potato could also be candied or used for oil extraction, as recorded by Hongbao Shi (施鸿保) in his *Min Za Ji* (闽杂记): sweet potato was 'pressed for oil, called sweet potato oil… Liancheng (连城) people cut them into thick slices, soaked them in honey and turned them crimson. They boxed sweet potato preserves and gave them to relatives and faraway friends as gifts' (Shi 1858).

In the 19th century, cultivation of potato was gradually popularized, and it also occupied a more and more important position in the people's dietary life. *An Illustrated Book on Plants* (植物名实图考, 1848) by Qijun Wu (1789–1847) presented a faithful account of potato planting and consumption: *yang yu* (洋芋, potato) 'allays people's hunger and relieves famine. The poor save it… I hear that people plant it especially complex ways on Zhongnan Mountain and the rich can harvest hundreds of stone per year' (Wu 1957: 144–145). In 20th century, more and more potatoes were planted. Early 20th-century Shanxi (山西) had the following slang idiom: 'we are not afraid of poor harvest in the valley because we have two mu of yam eggs [potatoes]'. The Gansu people also had a common saying during the Republic of China era (1912–1949): 'Gansu has three treasures—potato, terrines, and large fur-lined jackets'. Potatoes in the Shanghai region were exported in bulk as commodities. The northeast, the main production area for potato, had a larger area of cultivation during the early 20th century. In 1910, Manchurian agricultural products were soybean, sorghum, corn, millet, and wheat, with potato as the main crop.

Disaster Relief

American crops can spread easily in Chinese soil, which has historically faced major challenges in producing adequate food for the people. For thousands of years of Chinese history, rulers of all the ages were stymied by the sharp imbalance between the people and land, and by lack of sufficient food to support the ordinary people. After 1492, the spread of corn, sweet potato, and potato helped to alleviate this situation.

Corn was 'most suitable for newly cultivated land; with its early planting, early germination, high seeding, and extremely strong roots, other plants cannot compete with it. Early planting makes the roots deep, and corn is tolerant to drought, yields a bumper harvest, and matures early' (Huang 1982: 9). Compared with rice and other crop varieties, some people of the time thought that corn was more filling and able to satisfy their hunger. Although corn was 'cast aside by the rich', 'the villagers live on it' (Qu 1902). In addition, corn cob and corn straw were life-saving foods in years of great hunger.

Corn can be planted throughout the year, from January to December. The harvest period of corn occurs in the traditional food shortage between two harvests — no crop like it had been seen in Chinese history. The resilient, early-maturing, high-yielding corn became an important food source to sustain life.

The function of sweet potato in famine relief was even more outstanding. The crop was initially introduced mainly for disaster prevention and to rescue people from hunger. Fujian Province was one of the earliest areas to introduce the sweet potato, where it rescued many during famine. *Min Book* (闽书) by Qiaoyuan He (1558–1631) recorded, 'When it [sweet potato] entered our Fujian, famine stared us in the face. People got enough for one year' (He 1995: 4436–4437).

Sweet potato is high-yielding, tolerant to drought, and resistant to locusts; it is adaptable to all seasons, has a longer sowing time, and can be eaten while it is grown. These are all beneficial qualities. 'February, March, July, and August, all can be sown'; 'fruits grow from August and September to the winter solstice and we can eat them while they are grown' (Wang 1985: 53). The famine relief capacity of the sweet potato was thus very strong, allowing it to solve food shortage problems during disaster.

4. Effects on the Environment

Due to the combination of a patriarchal society and the feudal state's population policy encouraging fertility, the imbalance between the people and land has been sharp and difficult to resolve throughout thousands of years of China's history.

The total population in the Ming Dynasty, 30th year of Shen Emperor Wanli (明神宗万历三十年, 1602), was about 100 million; this number plummeted after the war in the late Ming and early Qing Dynasty (1600–1700). In the Qing Dynasty, 8th year of Emperor Shunzhi (顺治八年, 1651), the male adult population was over 10 million. In the 23rd year of Emperor Kangxi (康熙二十三年, 1684), it was more than 20 million. In Chinese history, the average male adult population was about 2.65 per household, and the number of persons about 5.25 per household; thus, in 1684, the total population was likely over 40 million. In the 6th year of Emperor Qianlong (乾隆六年, 1741), national population was about 140 million. In the 27th year of Qianlong (乾隆二十七年, 1762), it had risen to 200 million; in the 55th year of Qianlong (乾隆五十五年, 1790), it exceeded 300 million. In Emperor Daoguang's 14th year (道光十四年, 1834), national population was over 400 million; in Daoguang's 30th year (道光三十年, 1834) it exceeded 430 million, the highest point in Chinese history (Liang 1980: 201, 248, 251–254, 256, 261).

Compared with this population explosion, arable land increased by only 26% during the same period. The rapid population growth, shortage of arable land, and relatively low grain yield threatened people's survival. The imbalance between people and the land grew sharper, and more and more people moved from the densely populated and plains regions to the frontier and mountainous areas.

The resilience of American crops enabled migration flow to and survival in the barren mountain areas; this flow and reclamation of wasteland in turn spurred

rapid growth in the cultivated area of American crops. Corn, sweet potato, and potato became the preferred food crops of mountain reclamation immigrants.

However, this cultivation was based on deforestation and typical extensive management. This had a devastating impact on the previously relatively stable environment; harm was especially great in corn cultivation areas. *Qi Men Xian Zhi* (祁门县志) recorded the following in 1827:

> In Emperor Qianlong's period [乾隆帝, r. 1736–1796], people from Anqing (安庆) transported corn to the mountains to cultivate. The native people did likewise. One method was to burn all the mountain plants and grub up roots. They would exhaust soil fertility and let not even a blade of grass grow. Not only were the mountains barren of trees, the farmland also suffered great damages. If rainwater was extensive, sand and stones both streamed down; when the rain stopped, the source of water was exhausted immediately. The field in every place could not be rehabilitated and it led to the congestion. The larger stream could not be impounded in drought. Floodwaters could not be released. This situation increased flood risk and wasted water resources. Most fields on the highland were overwhelmed. The threat of the country was no greater than this. The word "incomplete" was right.

People who sought to plant corn often transformed the landscape into farmland. This led to soil erosion and other ecological damage, resulting in frequent natural disasters, especially south of the Yangtze River and in Hubei, Hunan, Sichuan, and Shaanxi provinces.

Officials repeatedly reported these circumstances to the Emperor. Both Emperor Jiaqing (嘉庆帝, r. 1796–1820) and Emperor Daoguang (道光帝, r. 1820–1850) issued repeatedly decrees forbidding people to enter the mountains to cultivate corn. Even so, the flow of refugees into the mountains to cultivate corn could not be stopped. The opportunity was irresistible in the face of great pressure for survival. In fact, environmental damage has occurred for thousands of years, but never so seriously or so quickly as in period after Emperor Qianlong (乾隆帝, r. 1736–1796). Under the savage reclamation of millions of refugees, China's already poor forest resources disappeared at an unprecedented rate. According to research, forest cover was about 6.3% in Central Henan Province in the 39th year of Emperor Kangxi (康熙三十九年, 1700); during the period of Emperor Daoguang (道光帝, r. 1820–1850), this dropped to about 2%.

Destruction of the forest caused soil erosion, and with the silting of the rivers, sediment covered the farmland. Because the ability of the trees and land to accumulate moisture was extinguished, rains quickly filled the rivers, causing frequent surges and floods. Decline in the forest's water storage capacity, which caused floods in times of heavy rainfall, also led to or exacerbated drought, as the forest was no longer able to slowly release accumulated water to the land surface.

According to statistics on the early years of the Republic of China, the corn cultivation area was about 100 million mu, accounting for 7.6% of the total arable

land. We can conclude that the planting area must have been much larger than this when it reached a climax through reclamation in the middle Qing Dynasty (1736–1840), and because this land was located in the precipitous and remote mountains, the actual planting area was certainly far greater than the government statistics.

If every piece of land were farmed for 10 years, with an average of 20 mu per family, how much forest would be destroyed by five million families over a hundred years? Additionally, because destruction of the ecological environment is irreversible, our descendants must pay a higher cost. The people may have conquered nature, but they were at the same time punished by it, forced to swallow their bitter fruit.

According to statistics, from AD 101 to 1949, the Xiang River flooded 291 times, and experienced drought 213 times. From 1736 (the first year of Emperor Qianlong) to 1949, the number of floods accounted for 46% of this total, and the droughts also for 46%. The destroyed mountain, barren land, and destroyed environment also led to decline in grain yield and food supply in the late Qing Dynasty (1840–1912).

CONCLUSION

The introduction of American crops and the growth of population were mutually causative. The more grass, the more sheep. The more bran, the more pigs. The more food, the more people. However, this paper does not intend to blame the introduction of American crops for population increase, mountain reclamation, and ecological destruction. Deep thinking and analysis show that these processes were closely related to the regime and the historical situation. People want to live; the government wants to be stable; both consider their current situation in priority to long-term considerations of social sustainability.

The introduction of American crops into China, as a persistent historical event, profoundly and extensively influenced Chinese society and history; a single article cannot provide a full and accurate summary. However, from the perspective of food history, social history, and cultural history, we can succinctly summarize two basic aspects, positive and negative.

The positive aspect of this historical event is that without a doubt, it made Chinese food production and food culture more rich and colourful; enriched Chinese crop varieties; changed the traditional Chinese food production structure; increased cultivated areas; improved food production; developed people's daily diet; and broadened Chinese vision and nourished Chinese heart.

In considering the negative aspect, it is necessary to recall that the crops themselves are not at fault; the consequences of government, nation, and culture vary from person to person and from place to place The high-yielding, easy-planting American crops increased of grain production, which the people and officials were eager for. But the Chinese-style patriarchal society and feudal system led to inevitable consequences: population expansion led to heavier land

pressure; the depth of reclamation led to accelerated ecological destruction; frequent natural disasters led to serious famine. The crisis of Chinese living mentality deepened. Total grain outputs increased, but the problem of hunger was not solved, and the imbalance between population and land only grew sharper. The introduction of American crops into China caused more Chinese to go hungry and greater ecological damage. This case was very serious throughout the Qing Dynasty (1644–1912). After the mid-17th century, Chinese famine and starvation occurred or shorter periods, but with heavier damage. The social economy perspective explains this by means of the increasingly sharpened imbalance between population and land. If the government and the people can maintain rational population growth, the portion of the total crop yield that would otherwise be consumed by increase population numbers can instead be applied to relieve labour intensity and social stress; this should reduce and relieve imbalances and shortages.

The civil Taiping rebellion was the climax of many riots, unrest, and extreme dissatisfaction among the people. This was caused in part by the population crisis besetting the country, which rapidly exhausted resources.

In the face of a growing population and land imbalance, more and more Chinese experience food problems. The long-term, heavy pressure on survival has had severe consequences on the mental health and perspectives of the people.

Humans are not like the silkworm, which dedicates its life to eating and then transforms into a cocoon. Human life should not only be governed by the eating process alone; and life has not the value to transform the eating process into a cocoon.

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Notes

1) A mu (亩) is a Chinese unit of land area presently equivalent to 666.66 square meters. During the Ming (1368–1644) and Qing Dynasties (1644–1912), one mu was equivalent to approximately 614.4 square meters.
2) A stone (石) is a Chinese historical unit of measurement; its weight differed in each historical era. During the Ming (1368–1644) and Qing Dynasties (1644–1912), one stone was approximately equal to 120–130 jin (斤; see Note 3). AZ Q`
3) A jin (斤) is a Chinese unit of weight presently equal to 500 grams. During the Ming (1368–1644) and Qing Dynasties (1644–1912), one jin was approximately equal to 596.8 grams.

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