Two severe famines (1809-1810, 1814-1815) in Korea during the last stage of the Little Ice Age

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Abstract

From the eruption of an unknown volcano in 1809 until that of Tambora in April 1815, large and small volcanoes erupted in succession, causing various climatic changes around the Earth. During this period, the monsoon climate zone of East Asia, including Korea, had a very dry summer, and the rice yield was very poor, which resulted in two severe famines that lasted until early summer in the following years. During the famines in 1809-1810 and 1814-1815, about 24 percent of the population of Korea (approx. 14 million people) died. The severity of the drought varied widely depending on the region in Korea. Famine was more severe in the southern region, due to the higher degree of drought than in the northern region, resulting in deaths concentrated in southern Chŏlla-do and Kyŏngsang-do provinces. Based on the works of a Korean bureaucrat-scholar, Chŏng Yak-yong, and official documentary data produced by the Chosŏn dynasty, this article shed lights on the famines in southern regions of Korea, caused by the droughts in the last stages of the "Little Ice Age."

Keywords: successive volcanic eruptions, last stages of the "Little Ice Age," monsoon climate zone in East Asia, variation in precipitation, drought, rice farming, 1809-1810 famine, 1814-1815 famine, high mortality

1. Introduction

Western climate academia has conducted numerous discussions on climatic-environmental changes and socio-economic impacts caused by successive eruptions of large and small volcanoes, starting from the unknown volcano in 1809 to Tambora volcano in April 1815. In

particular, Western academia was interested in the climatic and environmental disasters of 1816-1817, known as the "year without summer." Their studies were focused largely on falling temperatures, increasing precipitation, poor harvests, rapid increases in grain prices, and people's protest and social unrest (Post, 1977; Wood, 2014; Brugnara et al., 2015; Raible et al., 2016).

However, the situation in the years 1816-1817 on the Korean peninsula was quite different from Europe and the northeastern United States. In the previous study, this author noted that Korea was significantly different from them, in that it saw moderate crop conditions, stable grain prices, and no peasant riot, though the nation experienced drops in temperature and steep rise in precipitation as Europe and the northeastern United States did (Kim, 2023). This difference was due to the fact that the West was more dependent on the farming of barley, wheat, and potatoes in dry fields (Flückiger et al., 2017; Ljungqvist et al., 2024), while Korea was the land of rice, a representative hydrophilic crop.

Western academia has succeeded in reconstructing the paleoclimate to some extent using numerous natural proxies, early instrumental measurements, and documentary evidences. As climate-related studies from China and Japan were also introduced to Western academic circles, they could have a general understanding of the situation in East Asia. However, few Korean cases have been reported, leaving the Korean situation almost blank (Burgdorf, 2022; White et al., 2018). Hence, this article accentuates the need to unearth climate-related historical data in other areas for clearer understanding of natural disasters and climate change on a global level.

The Chosŏn dynasty of pre-modern Korea (1392-1910) had a tradition of long-term tracking of climate change with great interest in changes in precipitation, which were critical to the growth of rice (based on Ch'ŭgugi (測雨器, rain gauge) records). In the event of a famine, the government investigated the harvest condition in each prefecture to produce the annual crop reports (災實分等狀啓) according to its official manual and determined the size of tax-exempt land for each province. The relief status report (畢賑狀啓) shows the government measures to find out the number of migrants, and secure and distribute relief grains. In this process, the dynasty left behind a large number of documents that chronicled how relief measures were implemented. Korean Confucian intellectuals also recorded the disasters in detail in their

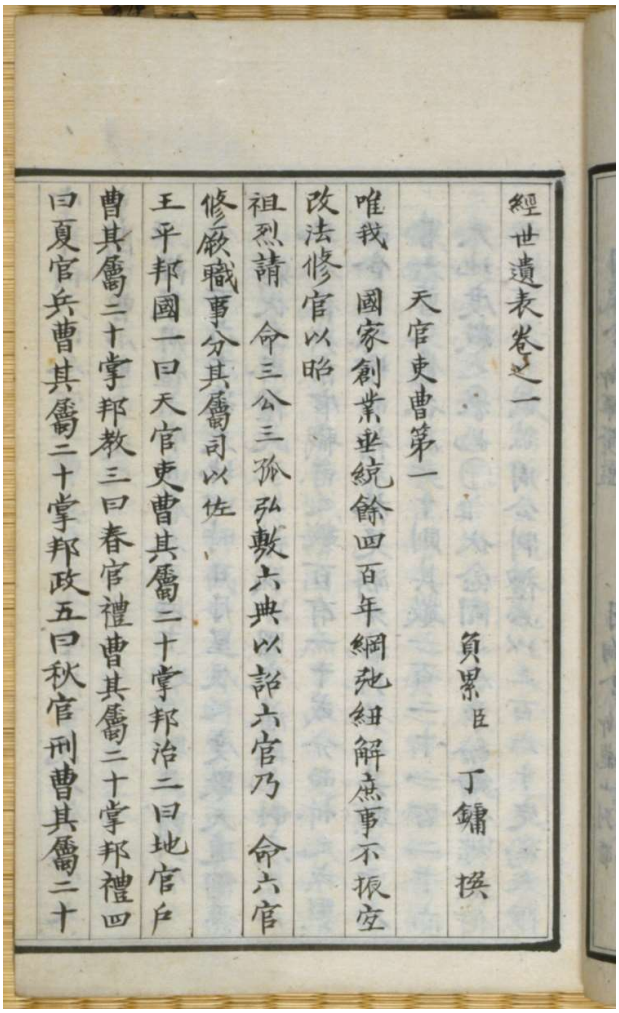
diaries, letters, anthologies, and books on statecraft, and suggested ways to overcome the crisis.

This article took a closer look at the famine situation and the extent of damage in the southern regions of the Korean peninsula, particularly Chŏlla-do and Kyŏngsang-do, where damage was concentrated during the two severe famines of 1809-1810 and 1814-1815. Chapter 1 examined the evidence of climate change, crop conditions, severity of famine and the excessive mortality in Kangjin prefecture and Chŏlla-do province, based on the writings of Chŏng Yak-yong (丁若鏞; 1762-1836), who was in exile in Kangjin at the time.

As a young, promising bureaucrat, affiliated with the Southerner [Namin] faction, Chŏng enjoyed the favor of King Chŏngjo (reign; 1767-1800), the 22nd king of the Chosŏn Dynasty. In order to check the political clout of the ruling Old Doctrine [Noron] faction, which was threatening even the royal authority, King Chŏngjo gave more political power to the opposition Southerners faction. Chŏng was so trusted by King Chŏngjo that in 1795, six years after passing the civil service examination in 1789, he was appointed as king's secretary (upper 3rd rank) at the young age of 33. However, after King Chŏngjo's death in 1800, the Old doctrine faction made a spectacular comeback with the ascension of the 10-year-old monarch King Sunjo (reign; 1800-1834), and the Southerners were executed or exiled in their political downfall (Kim, 2018).

Kangjin prefecture in Chŏlla-do province, where Chŏng was exiled, was one of the prefectures, most seriously victimized by the two severe famines in the 1810s. After experiencing the two consecutive famines in five years, Chŏng recognized the urgent need for sweeping reforms in Chosŏn society. His representative books on statecraft, *Kyŏngse yup'yo* [Design for good government, *KY*] (1817) and *Mongmin shimsŏ* [The Book of governance for the local people] (1818), written during his exile in Kangjin, were the products of his desperate efforts to reform the Chosŏn society during this period. In addition, in his various writings, including poetry and letters, Chŏng vividly described the hard reality of Chosŏn in the 1810s, when natural disasters caused massive migration, spread measles and other epidemics, killed countless people, finally leading to the collapse of the entire economy. In this respect, Chŏng's writings remain proper historical references to the disasters during the last stage of Little Ice Age in Korea.

Picture1. the *Kyŏngse yup'yo* (1817)


經世遺表卷之一

質累臣 丁鏞 撰

天官吏曹第一

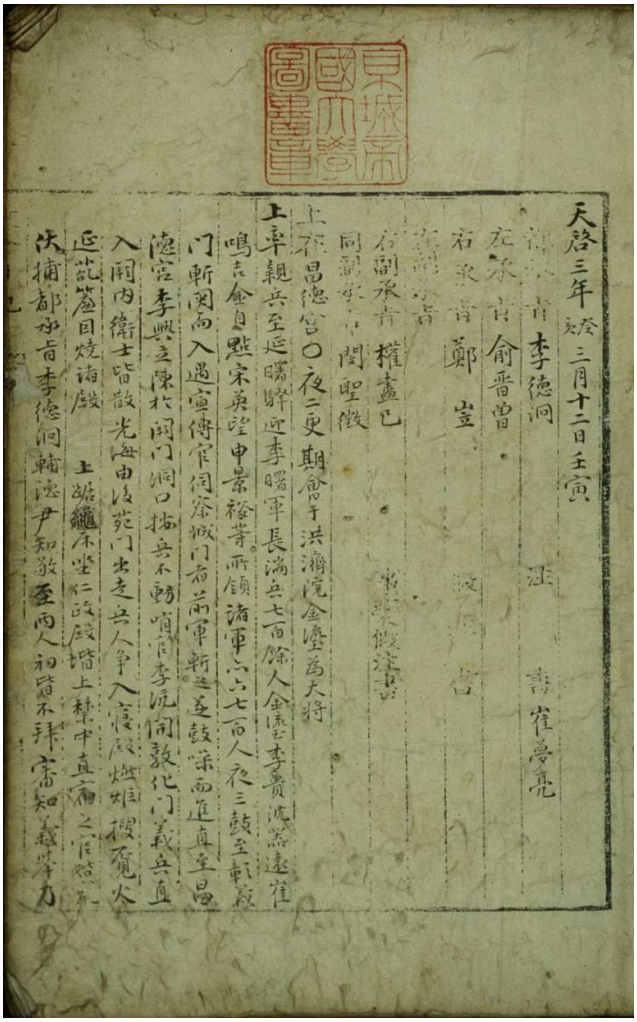
唯我 國家創業垂統餘四百年綱弛紐解庶事不振亟
改法修官以昭 祖烈請 命三公三孤弘敷六典以詔六官乃 命六官
修厥職事分其屬司以佐
王平邦國一曰天官吏曹其屬二十掌邦治二曰地官戶
曹其屬二十掌邦教三曰春官禮曹其屬二十掌邦禮四
曰夏官兵曹其屬二十掌邦政五曰秋官刑曹其屬二十

This picture is from the entry of Chŏng Yak-yong in the *Encyclopedia of Korean Culture*, courtesy of The Academy of Korean Studies.

Chapters 3-4 cited various data compiled and recorded by the Chosŏn government to examine the concrete aspects and extent of damage of the famines in the southern regions of the Korean peninsula, and the impact of the two severe famines on Korean society. The sources utilized in these chapters are *Sŭngjŏngwŏn ilgi* [the Diary of the Royal Secretariat, *SI*], *Chosŏn wangjo sillok* [the Veritable Records of the Chosŏn Dynasty, *CS*] and other government chronicles. The Diary were daily reports of state affairs made by the Royal Secretariat. The Veritable Records of the Chosŏn Dynasty was a collection of historical documents, compiling

various chronological records on the reign of each monarch after his death. In this regard, these two official documents, serving as primary and secondary sources, complement each other's shortcomings and provide us with a variety of information that allows us to understand the history of the Chosŏn Dynasty more richly.

Picture 2. the *Sŭngjŏngwŏn ilgi*



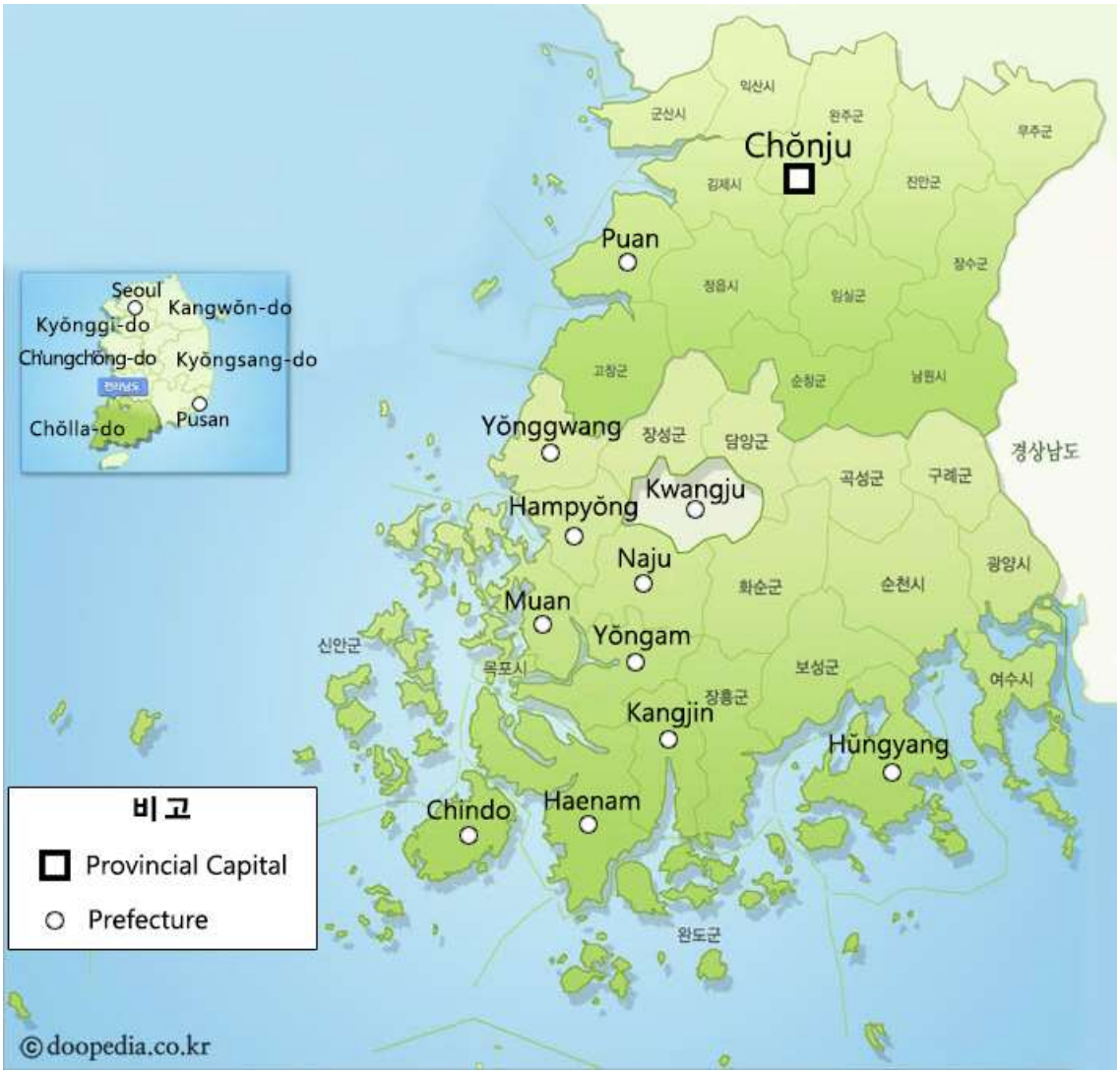
A picture of the Diary from the entry of *Sŭngjŏngwŏn ilgi* in the *Encyclopedia of Korean Culture*.

2. Famines in 1809-1810 and 1814-1815

In the summer of 1809, there was a severe crop failure in Kangjin on the southwestern coast of Chŏlla-do. “The people were in ultimate misery, and public offices were crowded with migrants.” The cause of the short yield of barley in the summer of 1809 and the bad rice harvest the following autumn was a severe drought. There was no rain in Kangjin for six months from early February to early August. It was so dry that bamboo trees did not sprout new shoots and pine trees did not bear pine cones. All water sources dried up, so there were no fish or snails in the springs, and clams disappeared from the sea. Residents were reeling from the lack of potable water. In the absolute shortage of water and grass to feed cows and horses, “people were busy slaughtering cows.”[1]

Figure 1. Administrative units of Chŏlla-do Province

[1] Chŏng Yak-yong. ‘Picking mugwort’ (采蒿) (1809), “Rural Records” (田家紀事), in “Si” [Poetry] of *Tasan simunjip* [Collected Works of Chŏng Yak-yong; *TS*] Vol. 5.



This map was based on the Korean Internet encyclopedia, *doopedia*, and the author of this article marked prefectures and provinces on it

As the drought continued, the barley did not sprout at all, and all autumn crops, including rice, withered and died. Of the total 6,000 kyŏl (29,4000 acres; 1 kyŏl = 4.9 acres) of wet paddies in Kangjin, 4,000 kyŏl remained without transplanted rice, and among the 2,000 kyŏl of paddies where rice was successfully transplanted, 70-90 percent of them ended up with withered crop. Only 1.7-10% (100-600 kyŏl) of all rice paddies in Kangjin saw ripe rice. The situation in Naju, next to Kangjin to the north, was similar to this. Among the 17,000 kyŏl of

paddies managed by the Naju provincial government, rice transplantation was impossible on 13,000 kyŏl. Among the 4,000 kyŏl where rice was transplanted, harvest was impossible at 2,000-3,000 kyŏl, due to various disasters. Rice paddies which produced crop yield accounted for 5.9-11.8% (1,000-2,000 kyŏl) of the total paddies of Naju. “The whole of Chŏlla-do was like that, and so was the entire nation of Chosŏn.”[2]

Under the dark shadow of a lean year looming, even wealthy people began to only eat barley porridge from mid- and late July, 1809. There was absolutely no grain on the market with people resorting to extreme means of survival. “People brought gold and silver to the market to buy grain, but all was in vain. The elderly said in unison they’ve never seen such a bad year in their lives.”[3] Although winter was still far away, some people were already starving to death. On the sea, piracy raged, plundering fish markets and attacking fishing boats and commercial boats, while on land, bandits carrying torches raided the homes of rich people.

As winter approached, the social order collapsed, and everyone began to struggle for survival. Young and healthy men started migration first, and their elderly parents and finally their wives and children followed suit.[4] They met the worst cold snap, about 0.7-0.8°C colder than the average temperature of the LIA (1350-1850) (Brugnara et al., 2015; Raible et al., 2016). To be a migrant in such weather meant death. (Galloway, 1986; Slavin, 2016; Ljungqvist et al., 2021; Ljungqvist et al., 2024) As the migrants wandered around in search of food and lived collectively in outdoor spaces with poor sanitation and little potable water, they were highly vulnerable to various diseases. When famines occurred in pre-industrial ‘grain societies’ around the world during the Little Ice Age, infectious diseases such as dysentery, typhus, smallpox, and measles were common, driving the migrant refugees, whose immune systems were sharply weakened, to death. (Ljungqvist et al., 2024) Around this time, many Korean people also lost their lives to various infectious diseases in the unusually cold winter, and measles posed the

[2] Chŏng YY, ‘Letter to Kim I-jae’ (2) (與金(公厚)履載) (Autumn 1809 (November in solar calendar)), “Writings” (書), in *TS* Vol. 19.

[3] Chŏng YY, ‘Letter to Kim I-jae’ (1) (June 1809 (mid- to late-July in solar calendar)), “Writings”, in *TS* Vol. 19.

[4] Chŏng YY, ‘Letter to Kim I-jae’ (2).

most serious threat to the lives of the migrant people since the spring of 1810.[5]

The number of deaths increased even more in the spring of 1810 following the harsh winter. This was because the immune system of the migrants was seriously weakened due to the food shortage and cold weather. With the deaths from starvation, cold and illness increasing, "the roads and fields were strewn with corpses piled up." In the uninhabited villages, the walls of the houses were torn down, the doors torn off, and the yards outgrown with mugwort.[6]

The great famine of 1809-1810, which began in the summer of 1809 and lasted for 12-13 months until the summer of 1810, reached its peak just before the barley harvest in late June of the following year. By this time, Chŏng Yak-yong, who had been exiled to Kangjin for nine years for political reasons, used to have a bowl of porridge made of the government ration of barley just twice a day in the morning and evening. After eating the porridge, mixed with chaff and sand, he had to "emit belch while feeling dizzy and giddy." He was always hungry, because even the porridge was not always available. Upon hearing that a sack of barley was on sale at the local market, hundreds of people would flock to it. He would sell what he had, but was unable to secure food.[7]

Six years later, in 1814, there was another drought, followed by a severe famine. In that year, there was little rain until late July, so barley farming ended up in utter failure in that summer, with rice transplanting almost impossible. It wasn't until mid- to late-August that the country had enough rainfall, but the late rainy spell caused severe flood damage to the low-lying areas around the river. In addition, frost fell unusually early and the autumn crops suffered severe cold damage.[8] The famine, which lasted for 13 months from July 1814 to the same month of the following year, is called the great famine of 1814-1815. Judging by the changes

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[5] No Sang-ch'u (1746-1829), *No Sang-ch'u ilgi* [No Sang-ch'u's Diary], July 5 (Aug. 9), 1814.

[6] Chŏng YY, 'Condolence for Flies' (弔蠅文) (1810), "Miscellaneous Writings" (雜文) in *TS* Vol. 22; 'To Sim Sangkyu' (寄穉敎[沈象奎]) (1810) and 'An Official in Paji village' (波池吏) (1810), "Si", in *TS* Vol. 5.

[7] Chŏng YY, 'Barley Porridge' (熬麪) (1810), "Si".

[8] *Sŭngjŏngwŏn ilgi* [The Daily Records of the Royal Secretariat], Sept. 17, 14th year of King Sunjo's reign (Oct. 29, 1814). Chosŏn dynasty used the lunar calendar, so this article gives the lunar calendar dates first and indicates their solar dates in parenthesis.

in grain prices in Kyŏngsang-do Province the famine of 1814-1815 was around 1.5-2 times as severe as that of 1809-1810 (Kim, 2023).

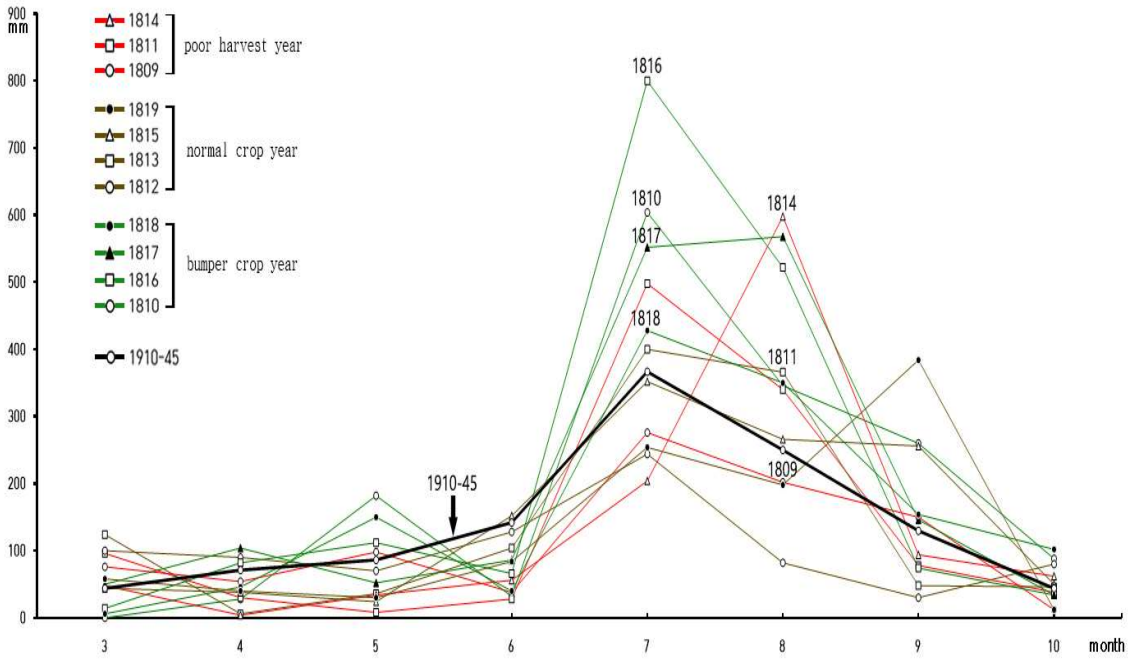
3. Severe droughts and rice crop failure

The unprecedented crop failures of 1809 and 1814 were similar in many ways. Both years began with severe droughts, which led to a poor barley harvest in summer, a rice crop failure in autumn and a severe famine that lasted for 12 to 13 months until early summer of the following year. At the time, the Chosŏn government and intellectuals largely believed the appearance of a comet in 1808 as the cause of the great drought of 1809,[9] but the severe droughts of 1809 and 1814 were directly caused by a series of eruptions of two large and three small volcanoes in the tropics (Kim, 2023). The size of Tambora eruption in April 1815 was very large (VEI 7), and that of the unknown volcano in 1809 was VEI 6. Between the two volcanic eruptions, three volcanoes (VEI 4) made small consecutive eruptions (La Soufrière volcano on Saint Vincent Island in 1812, Suwanose-jima volcano of Japan in 1813 and Mayon volcano of the Philippines in 1814).

In the 1810s, a series of volcanic eruptions sent thick layers of volcanic dust and ash into the stratosphere, severely disturbing the Earth's climate and causing a highly unusual pattern of monsoonal weather in East Asia (Adams et al., 2003; Kim, 2023). During this period, the Korean Peninsula, which is part of the East Asian monsoon climate zone, experienced highly erratic pattern of precipitation, especially in spring and summer. Figure 2 shows the monthly and yearly changes in precipitation in Seoul from 1809 to 1819.

Figure 2. Monthly and yearly changes in precipitation in Seoul from 1809 to 1819

[9] *SI*, Oct. 14, the 9th year of King Sunjo's reign (Nov. 21, 1809).



Source: 'Precipitation in Seoul for the last 140 years' in *Chosŏn hach'ŏn chosasŏ* [Survey on Korean Rivers], The Japanese Government General of Korea. 1929, 139.

In its attempt to transform its agricultural regime as a rice-producing country, Chosŏn Dynasty paid great attention to seasonal rainfall fluctuations since the early 14th century (Kim, 2010). King Sejong (reign; 1418-1450), the fourth king who pushed the farming promotion policy, installed a rain gauge [Ch'ŭgugi] in 1442 to measure rainfall. The rainfall measurement, which was in charge of the Directorate of Astronomy [Kwansanggam, 觀象監], was discontinued after the outbreak of the Japanese invasion of Chosŏn, which is called Imjin War, in 1592. Since Chosŏn dynasty's 21st King Yŏngjo (reign; 1724-1776) ordered the re-installation of rain gauges and measurement of rainfall, the Director of Astronomy reported daily amount of precipitation to the kings until 1907.

The first Japanese director of the Office of Astronomy in colonial Korea, Wada Yuji compiled the data of the Office and other chronological data from the Diary of the Royal Secretariat and other records and estimated the monthly rainfall amount in Seoul for 137 years from 1770 to 1907 by converting the traditional unit into the western metric system

(Wada, 1917). This data was later widely used by the Japanese Government-General of Korea as references to the climate and precipitation in colonial Korea. Figure 2 is the graph the author of this article produced by utilizing Wada's statistics, which was also used for the Survey on Korean Rivers published by the Government-General of Korea in 1929.

According to Figure 2, the average annual precipitation in Seoul from 1910 to 1945 was 1,246.3㎜. In the 1810s, there were seven years of less rainfall (1809, 1811-1815, 1819) than the average of the first half of the 20th century and four years of abundant precipitation (1810, 1816-1818). In the south and central region of the Korea, the more rainfall there was, the better the rice crop was, and the less rainfall there was, the higher the chance of a bad harvest. This is because when the peninsula had abundant rainfall, the precipitation used to be evenly distributed over the year, making it possible to sow, plant, grow, and harvest rice at the appropriate time (Kim, 2023).

Rice farming in Korea was closely related to rainfall, and the precipitation from May to July determined the yields of rice farming. In Korea, May was the time when barley ripened and rice sowing began, and the barley harvest and rice transplanting began almost simultaneously in June. July was the time for rice growth after transplanting. Table 1 shows the average schedule of barley and rice farming in Sŏnsan and Andong, Kyŏngsang-do in the early 19th century (1808-1829).

Table 1. Average timeline of barley and rice farming in Kyŏngsang-do Province in the early 19th century (1808-1829)

Dates	March 15	May 16	June 20	June 26	Oct. 5
Schedule	Spring barley sowing	Preparation of rice seedbed	Autumn barley harvest	Rice transplanting	Rice harvest

Source: Kim, SW, "Two severe famines of Korea (1809-1810, 1814-1815)", 2023.

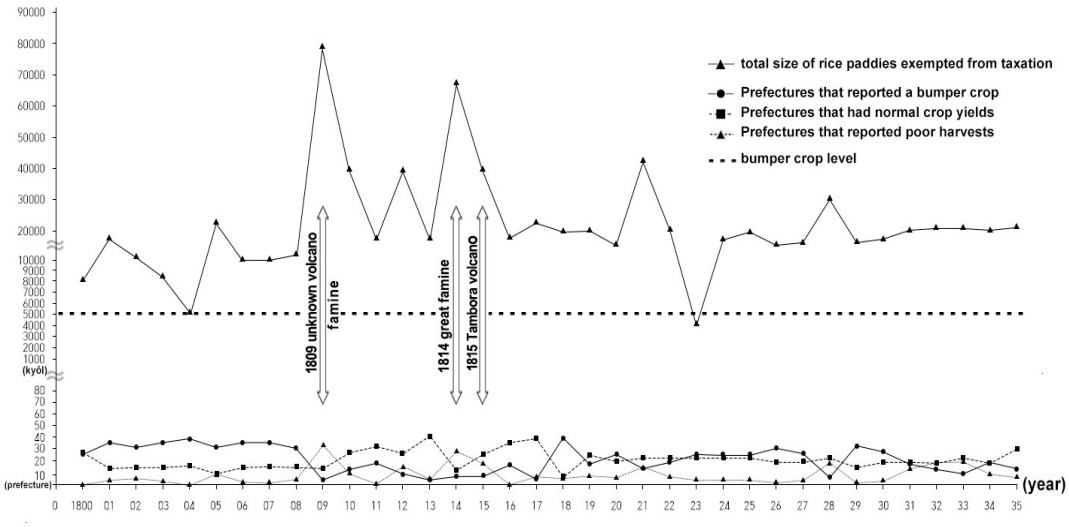
For the preparation of rice seedbeds, precipitation of around 90㎜ was required for a week (Chi et al., 1958), but it was not until early July that Korea was able to secure this amount of precipitation stably in the 19th and 20th century. There was a gap of 10 to 20 days between rice transplanting, which started around late June, and the beginning of the rainy season in early to mid-July. For this reason, Korean farmers paid close attention to the rainfall from June to July, in particular. The rice yield was invariably poor in the years of a drought for more than two consecutive months in May-July period. In the 1810s, there were as many as seven years in which a drought occurred for two consecutive months in the three months of May to July (1809, 1811-1814, 1817, 1819), and especially 1809 and 1814 saw severe drought in June to July.

The year 1809 recorded remarkably small amount of precipitation of 950㎜ (a drop of 23.8% from the average), and the rainfall in June and July decreased by 73.2% (38㎜) and by 24.7% (276㎜) from the average (June 141.9㎜, July 366.7㎜), resulting in the failure of the barley to ripen and a delay in rice sowing and transplanting. The great famine of 1809 occurred under these conditions. In the southwestern region of Chŏlla-do, the drought continued for as long as six months until early August, so the crop failure was much worse than in Seoul. In 1814, precipitation throughout the year was almost normal (-2.1% from the average, 1,220㎜), but there was a severe drought for three consecutive months from May to July (May -60.6%, 34㎜; June -60.5%, 56㎜; July –44.4%, 204㎜). As a result, the country suffered from not only a barley crop failure but also a poor rice yield. Moreover, because the rainy spell did not start until late July, the crop conditions for barley and rice remained worse.

The famine years of 1809 and 1814 were almost identical in that the famine was caused by less rainfall and severe variations in precipitation in June and July. In addition, the lower summer temperature made the growth period of crops 15 to 25 days longer than before. In 1817, the rice harvest in Andong, Kyŏngsang-do was possible 25 days later than usual, and in 1818, it was 15 days later. In addition, as the cold wave arrived earlier that year and damaged the crops that had not yet ripened, further worsening the entire crop failure (Kim, 2023).

In 1809, the southern provinces of Chŏlla-do, Kyŏngsang-do and Ch'ungch'ŏng-do sustained severe damage, and among them, Chŏlla-do suffered the most. Here, 50-60% of the rice paddies remained without rice transplantation until late July, and only 20-30% of them yielded crops. Rice yields in Kangjin and Naju that year remained at 1.7-10% and 5.9-11.8% of the average year.[10] Figure 3 shows the changes in the number of rice paddies exempted from taxation in Chŏlla-do from 1800 to 1834.

Figure 3. Changes in the number of tax-exempted rice paddies in Chŏlla-do Province



Source: *SI*, *The Annual Crop Reports* [災實分等狀啓] in Chŏlla-do in 1800-1835

In 1814, a severe drought all across the country put the entire society of Korea in another state of emergency. Because there was little rain until late July, when all rice transplanting should have been completed, the four provinces of Kyŏnggi-do, Ch'ungch'ŏng-do, Kyŏngsang-do, and Chŏlla-do could not even begin rice planting. At this time, Kyŏngsang-do was most severely affected by drought, with 77.2% (76,959 kyŏl) of the total rice paddies

[10] *SI*, June 14, 9th year of King Sunjo's reign (July 26, 1809); Oct. 15, 9th year of King Sunjo's reign (Nov. 22); Chŏng YY, 'Letter to Kim I-jae' (1·2).

(99,692 kyŏl) classified as damaged paddies (災結).[11] The situation in Chŏlla-do was assessed slightly better than that of Kyŏngsang-do, but deemed not much different from the latter, given the remark of Puan Prefecture Magistrate Yi No-jip, "The crop situation in 1814 was more serious than 1809. It was the biggest famine in a hundred years."[12]

4. Excessive Mortality

The central government's report in June 1810 and September 1815 of the number of starving people and the volume of grain aid in each province shows the areas stricken by famine. Table 2 shows the areas in which the relief project was implemented, the number of starving people, and the volume of grain aid during the great famine of 1809-1810.

Table 2. The number of starving people and volume of grain aid during 1809-1810

Providence	Number of starving people (%)	Grain aid (unit: sŏk) (%)
Kyŏngsang-do	1,729,660 (20.6)	136,809 (25.3)
Chŏlla-do	4,764,457 (56.9)	252,154 (46.7)
Ch'ungch'ŏng-do	1,311,959 (15.7)	105,324 (19.5)
Kyŏnggi-do	574,383 (6.9)	45,297 (8.4)
Total	8,380,459(100.0)	539,575(100.0)

Source: *Chosŏn wangjo sillok*, May 27, 10th year of King Sunjo (June 28, 1810)

According to Table 2, the areas where famine was concentrated were four provinces in

[11] *SI*, Nov. 11, 14th year of King Sunjo's reign (Dec. 22, 1814).

[12] *SI*, Dec. 12, 14th year of King Sunjo's reign (Jan. 21, 1815).

the south of the Korean peninsula, with 8,380,459 starving people; and grain aid of 539,575 sŏk was released for them. It was a severe famine, with around 60% of the entire population of Chosŏn (approximately 14 million) suffering from it. Chŏlla-do had the largest number of starving people, accounting for 56.9% (4,764,457 people), with 46.7% (252,154 sŏk) of the total grain aid allotted for them. Kyŏngsang-do province had the second largest number of starving people (20.6% of the total), with 25.3% of the grain aid set for them, followed by Ch'ungch'ŏng-do (15.7% of starving people, 19.5% of grain aid) and Kyŏnggi-do (6.9% of starving people, 8.4% of grain aid). Table 3 shows the relief project during the great famine of 1814-1815.

Table 3. Number of starving people and volume of grain aid during 1814-1815

Province	Number of starving people (%)	Grain aid (unit: sŏk) (%)
Kyŏngsang-do	2,533,828 (45.8%)	209,188 (47.0%)
Chŏlla-do	2,263,425 (40.9%)	168,054 (37.7%)
Ch'ungch'ŏng-do	535,783 (9.7%)	57,933 (13.0%)
Kyŏnggi-do	146,510 (2.6%)	5,787 (1.3%)
Kangwŏn-do	52,244 (0.9%)	4,364 (1.0%)
Total	5,531,790 (100%)	445,326(100%)

Source: *CS*, July 29, 15th year of King Sunjo (Sept. 2, 1815)

Table 3 indicates that famine occurred in five provinces in the southern and central regions of the peninsula. Among them, famine in Kyŏngsang-do and Chŏlla-do was the most serious. The number of starving people in Kyŏngsang-do and grain aid for them accounted for almost half of the nation's total [45.8%, 47.0%], and Chŏlla-do around 40% [40.9%, 37.7%]. In comparison, the number of starving people in Ch'ungch'ŏng-do, Kyŏnggi-do, and

Kangwŏn-do in the central region and grain aid for them were small [13.2%, 15.3%].

The Chosŏn dynasty conducted nationwide survey of households and population every three years. The number of deaths estimated from the changes in the number of households in the family register was 1,024,198, or 7.8% of the total population (approx. 14 million) during the famine of 1809-1810; and 2,315,014, or 17.8% of the total population during the great famine of 1814-1815. The deaths during the two famines accounted for 24.3% (approx. 3.4 million) of the total population (Kim, 2023).

However, as seen in Table 2 and 3, the entire Korean Peninsula was not equally affected by the famine. While two provinces (Chŏlla-do in 1810 and Kyŏngsang-do in 1815) saw starvation among half of their population, with half of the grain aid released for them, the others (Hwanghae-do, Kangwŏn-do, P'yŏngan-do, and Hamgyŏng-do in 1810; and Hwanghae-do, P'yŏngan-do and Hamgyŏng-do in 1815) had no migrants from famine areas. This suggests that the deaths, 24.3% of the total population, may have been concentrated in Chŏlla-do and Kyŏngsang-do.

Chŏlla-do sustained the most critical damage from the famine in 1809-1810. The 12 prefectures on the southwestern coast of the province had poor harvest for two consecutive years due to a super typhoon and severe flooding in late August 1810, when the great famine of 1809-1810 was being eased. As a result, this region saw more deaths than other regions. By region, large prefectures such as Naju saw a decrease in the number of soldiers by 4,600; medium-sized prefectures like Yŏnggwang and Yŏngam by about 2,000; small prefectures such as Haenam by about 1,600. The number of soldiers in others, Kangjin, Chindo, Muan and Hŭngyang, etc., decreased by about 800-1,000.[13] (Figure 1) As military service was a kind of poll tax levied on each household of commoners, a soldier meant one household. Assuming that a household is composed of 7.95 persons (Michell, 1979-80), it is believed that the population of Naju decreased by 36,570, Yŏnggwang by 15,900, Haenam by 12,720, and Kangjin by 7,155.

Before the great famine, the households in Naju totaled about 16,100, which meant a population of 127,995. However, in late January 1811, the number of households decreased by

[13] *SI*, Oct. 9, 10th year of King Sunjo's reign (Nov. 5, 1810).

28.8% (4,361 households or 36,816 people).[14] The number of deaths in Naju (36,570) estimated on the basis of the decline in the number of soldiers was very close to another number of deaths (36,816) presumed with the decrease of the households. For this reason, it is estimated that during the two consecutive years of 1809 and 1810, close to 30% of the population of Naju died due to famine, cold, epidemics, etc. The situation in 11 other southwestern prefectures of Chŏlla-do is believed to have been not much different from Naju.

The rice harvest in the remaining 42 prefectures in Chŏlla-do in the autumn of 1810 was not bad. According to *The Annual Crop Reports* submitted to the central government by the Chŏlla governor at the end of 1810, 12 prefectures (22.2%) had poor harvests and 28 prefectures (51.9%) had normal crops, and 14 prefectures (25.9%) had good harvests. Rice paddies that suffered damage were about 29.9% (40,000 kyŏl) of the total.[15] In 1810, the ratio of prefectures with poor harvests and rice paddies stricken by a super typhoon accounted for about 20-30 percent of the total in Chŏlla-do. Given this, the death rate in the other 42 prefectures (77.8%) of Chŏlla-do unscathed by the super typhoon and flooding in the late summer of 1810 is believed to be much lower than that of the 12 prefectures in the southwestern coast. Taken overall, the mortality rate in Chŏlla-do is estimated at around 20% percent during the great famine of 1809-1810.

Next, let's estimate the number of deaths among the residents of Chŏlla-do. Table 4 shows the number of households and the actual population by province in the 1798 family register, in addition to the nationwide statistics of households and population.

Table 4. The number of households and population by province in 1798

Region	Households	Actual population (%)
Seoul	44,945	357,312 (2.6)

[14] *SI*, Nov. 27, 11th year of King Sunjo's reign (Jan. 11, 1812).

[15] *SI*, Nov. 18, 10th year of King Sunjo's reign (Dec. 14, 1810).

Kyŏnggi-do	161,772	1,286,087 (9.3)
Kyŏngsang-do	358,893	2,853,199 (20.6)
Chŏlla-do	316,732	2,518,019 (18.2)
C'hungch'ŏng-do	220,693	1,754,509 (12.7)
Kangwŏn-do	80,740	641,883 (4.6)
Hwanghae-do	136,199	1,082,782 (7.8)
P'yŏngan-do	299.441	2,380,556 (17.2)
Hamgyŏng-do	121.769	968,064 (7.0)
Total	1,741,184	13,842,411(100)

Source: *CS*, Dec. 30, 22nd year of King Chŏngjo

According to Table 4, the total population of the nation in 1798 was 13,842,411, down by 187,757 from 14,030,168 in 1807 when the population of the nation was at its peak. Since there was only a slight population increase of about 1.3% over 10 years, the population of 1798 might have been almost the same as that of 1807. Given author's earlier assumption of the decrease of the Chŏlla-do population by about 20% during the great famine of 1809-1810, the death toll of the province would have amounted to 503,604. It was a huge number, accounting for 49.2% of the total deaths (1,024,198 people) during the great famine.

The number of estimated deaths in Chŏlla-do during the famine in 1809-1810, accounting for about half of all deaths nationwide, corresponds with the fact that the number of Chŏlla-do starving people and the volume of grain aid for them accounted for 56.9% and 46.7 % of the nation's total (Table 2). Noting this, the author assumed that the combined number of starving people and the volume of grain aid represented the proportion of deaths by province. Based on Table 2, the number of deaths in Chŏlla-do is estimated to be approximately 51.8% of the total deaths ([56.9%+46.7%] ÷ 2). The death rate in Kyŏngsang-do was 23.0%,

in Ch'ungch'ŏng-do 17.6%, and in Kyŏnggi-do 7.7%. Estimating the mortality rates by province based on Table 4, it might be said that 21.1 % of Chŏlla-do population, 8.3% of Kyŏngsang-do, 10.3% of Ch'ungch'ŏng-do, and 6.1% of Kyŏnggi-do died during the famine.

The number of deaths during the famine of 1814-1815 can be estimated in the same way. It shows that Kyŏngsang-do accounted for 46.4% of the total deaths, the largest portion; followed by Chŏlla-do which accounted for 39.3%; Ch'ungch'ŏng-do with 11.4%; Kyŏnggi-do, 2.0%; and Kangwŏn-do, 1.0% (Table 3). If the total deaths during the great famine (approx. 2.3 million people) is divided by the proportion by region, it is estimated that 1,074,166 people died in Kyŏngsang-do, 909,801 in Chŏlla-do, 263,912 in Ch'ungch'ŏng-do, 46,300 in Kyŏnggi-do, and 23,150 in Kangwŏn-do. The mortality rates by province were 37.6% in Kyŏngsang-do, 36.1% in Chŏlla-do, 15.0% in Ch'ungch'ŏng-do, 3.6% in Kyŏnggi-do, and 3.6% in Kangwŏn-do. Table 5 shows the ratio of deaths by province during the two great famines based on the assumption above.

Table 5. The mortality rate by province during the 1809-1810 and 1814-1815 famines

Region	Number of death			Ratio of nation's total (%)	mortality rate by province (%)
	1810	1815	Total		
Kyŏngsang-do	235,566	1,074,166	1,309,732	39.2	45.9
Chŏlla-do	530,535	909,801	1,440,336	43.1	57.2
Ch'ungch'ŏng-do	180,259	263,912	444,171	13.3	25.3
Kyŏnggi-do	78,863	46,300	125,163	3.7	9.7
Kangwŏn-do	-	23,150	23,150	0.7	3.6
Hwanghae-do	-	-	-	-	-
Pyŏngan-do	-	-	-	-	-
Hamgyŏng-do	-	-	-	-	-
Total	1,025,223	2,317,329	3,342,552	100.0	

As seen in Table 5, Chŏlla-do and Kyŏngsang-do were the most seriously affected by the two great famines. The two regions accounted for 43.1% and 39.2% of the total deaths, exceeding 1.4 million and 1.3 million people, respectively, and the mortality rate of the provinces was around 50% (57.2 percent in Chŏlla-do and 45.9 percent in Kyŏngsang-do). The mortality of the remaining provinces were not that high. As Chŏng Yak-yong testified, "Most of the farmers died during the famines in the years of 1809 and 1814, leaving nine out of ten houses empty, and only one person out of a hundred survived,"[16] the famine of Chŏlla-do was beyond imagination.

5. Conclusion

In the 1810s, Chŏng Yak-yong envisioned a well field system (井田制) as a measure to salvage the people, who were suffering from the two great famines and corrupt royal in-law politics.[17] The well field system was a land reform measure that many Confucian intellectuals in East Asia who admired the ancient Chinese land system suggested as an ideal reform model. This system 1) divided all land into nine sections, 2) reorganized it into eight private fields and one public field, and 3) the owners of the eight private fields paid taxes on the harvest in the public section.

In the 1810s, two great famines occurred consecutively at six-year intervals, turning Chosŏn society into a living hell. About 3.4 million (24.3% of the population) died, and Chŏlla Province, where Chŏng was exiled, profoundly suffered severe damage, with 57.2% of the province's residents (1.44 million people) dying. Most of the victims were poor peasants who owned little land or rented land from landlords. As a result, wastelands were abandoned everywhere after two great famines. Despite this situation, the Chosŏn government forced peasants to pay the previous level of taxes, that is, 30-40% of the total harvest. The

[16] Chŏng YY, 'A Special Study on Land System' (田制別考) 3. "Fish Scale Map Register" (魚鱗圖說), "Taxation reform measures" (地官修制), in *KY* Vol. 9.

[17] Chŏng YY, 'Discussion on well field system' (井田論) (1·2), "Land system" (田制) 1, "Taxation reform measures" in *KY* Vol. 5.

government's rigid tax policy led to crisis of subsistence of the peasants who were in the marginal poverty line due to the seasonal food shortage. This was why Chŏng pinned hopes on the well field system in 1816-1818 as a measure to comprehensively reform Chosŏn society. The system was believed at that time as a reform measure to free peasants from the chronic pressure of high taxes and encourage them to continue farming by lowering tax rates to 1/9 or 11.1% of the total harvest, thereby healing the scars of the great famines.

However, it was difficult to implement the reform because the land survey project, a prerequisite for implementing the system, was ignored by the king and his corrupt in-laws. After they created a political uproar over the land survey, the project was completely put on hold in September, 1820,[18] and the well-field system Chŏng persistently advocated in his works also lost support. Afterwards, Chosŏn society was collapsing with no more reform programs.

The global climate gradually returned to normal, starting from 1819, after a series of large and small volcanic eruptions over a six-year period from 1809 to 1815 (Wanner et al., 2022). In Western Europe, with the exception of the great Irish famine 1845-1852 and the Finnish famine of 1866–1868, there have been no more serious famines posing serious threats to livelihood. (Post, 1977; Ljungqvist, 2024). Meanwhile, Korea was falling deeper and deeper into the quagmire due to the power monopoly by the royal in-laws, as its monarchs, from King Sunjo (1790-1834), Hŏnjong (1834-1849), Chŏljong (1849-1862), and Kojong (1862-1907) to Sunjong (1907-1910), ascended to the throne at early ages (at 10,7,18, 11 and 33) over the 100 years (Im, 2009). This can be confirmed by the fact that even in the mid-1830s, 20 years after the shock of the two great famines and 15 years after the climate returned to normal, wasteland in Chŏlla-do still accounted for around 10% of all rice paddies subject to taxation (Figure 3). While the government was indifferent to its task of land reform, it was almost impossible to make the peasants to actively engage in farming.

It was in 1899, 80 years later, that the Chosŏn Dynasty resumed the land survey project admitting to the need for a reform measure. After many twists and turns, the Kwangmu Land Register (光武量案) was promulgated five years later in 1903, but this was an incomplete one,

[18] *SI*, Aug. 2, 20th year of King Sunjo's reign (Sept. 8, 1820); Aug. 25 (Oct. 1).

with only 65.9% (218 prefectures) of the 331 prefectures across the country having been surveyed. This indicates the poor level of the problem-solving capacities of the Chosŏn Dynasty in the face of Western imperialist powers advancing into Asia since the late 19th century. The fall of the Chosŏn Dynasty and Korea's annexation by Japan in 1910 were inevitable results of the incompetence and irresponsibility of the king and the ruling Old doctrine faction who failed to wisely overcome the shock of two severe famines in the 1810s, and the chronic nepotism of in-law politics (Gao et al., 2017).

ABBREVIATIONS

CS: Chosŏn wangjo sillok

SI: Sŭngjŏngwŏn ilgi

KY: Kyŏngse yup'yo

TS: Tasan simunjip

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