Chapter 15

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Climate and Famine in Historic Japan: A Very Long-Term Perspective

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Abstract

This paper sets out a new, revised chronology of famines from the eighth to the nineteenth century. Thanks to the recent publication of a fascinating database on medieval natural disasters compiled by Fujiki (2007), most revisions are made for the twelfth to sixteenth centuries. Unlike previous famine tables (cf. Saito 2002), the new chronological table enables us to examine more critically to what extent global cooling and warming were related with changing frequencies of famines in the Japanese past. One of the major findings from this new dataset is that there was virtually no correlation between the frequencies of famines and the alternating phases of cooling and warming over the so-called Medieval Warm Period and the Little Ice Age that followed. Another major finding, which is in fact a corollary of the first, is that a major reduction in the frequency occurred before the final period of global cooling around 1600. In other words, the real break with the medieval past took place half a century earlier than the start of Tokugawa rule. The paper will touch on possible factors accounting for the changes, and also on some demographic implications of the findings.

Introduction

Famine is a phenomenon of mass starvation caused primarily by a poor harvest, triggered often by any kind of bad weather such as drought, excessive rainfall and cold summer. Thus, scholars since the day of T.R. Malthus have maintained that the frequency of famines was one of the most important determinants of mortality in the past, and hence assumed that there were noticeable correlations between long-run climatic fluctuations and historical population changes (for a demonstration of this relationship, see for example Galloway 1986).

Turning to the relationship between climate and famine, one may expect that the relationship in the past must have been very close. For example, a very long spell of cold years is identified for an age after the ‘Medieval Warm Period’ by palaeo-climatologists; and this period known as the ‘Little Ice Age’ is thought to explain why there were so many severe famines in various parts of the world from late medieval to early modern times. In Japanese history, the Little Ice Age corresponds to the time period from Kamakura to Tokugawa. However, does this thesis really hold for the Japanese case?

What I would like to do in this paper is:

(i) to set out a new, revised chronology of famines from the eighth to the nineteenth century; and
(ii) to examine to what extent global cooling and warming were related with changing frequencies of famines in the Japanese past.

Task one means a reworking of my earlier counts of historic famines (Saito 2002), especially those for earlier centuries. Thanks to a recently published database on climatic disasters in medieval times, we are now in a better position to make a revision for medieval famines. For task two, we can think of there are two separate causal processes between weather change and the incidence of famine. The first is the causal relationship between weather change and harvest, and the second the relationship between harvest and famine. The first relationship will become less straightforward with improved agricultural technologies. With irrigation facilities, for example, drought can no longer be a problem. The second causal relationship may be much less straightforward even when farming methods are rudimentary. Indeed, there is enough evidence to question the conventional wisdom that a serious crop failure did in most cases result in an incidence of mass starvation.

The new famine chronology table is expected to indicate when a major break in the frequency of famines took place in the Japanese past. Conventionally it is thought to have come about with the return of peace around 1600; however, the paper will show that the real break with the medieval past took place half a century earlier, and will touch on the demographic implications of this the finding.¹

**Famine Records**

There are several databooks on historic natural disasters (Ogashima 1894, Nishimura and Yoshikawa 1936), from which it is possible to identify the incidence of a famine and its cause; added to this list recently is a fascinating database compiled by Hisashi Fujiki, a leading medievalist, for the period between 901 and 1650, a period for which records have long been scanty (Fujiki 2007). Based on these materials, I have now identified the total of 281 cases as famine years with the first in AD567 and the last in 1869. In total there are 47 more than my previous count of 234 (Saito 2002).

In order to identify a famine case, it is important to distinguish two sets of mutually related descriptions. One is to separate famine-related deaths from epidemic-related deaths, and the other to separate phenomena associated with ‘hunger,’ ‘starvation’ and ‘crisis’ from those described just as ‘crop failure’ and ‘disastrous harvest’ since, as noted earlier, not all harvest failures resulted in famines.

Then we have to consider the intensity, coverage and duration of the ‘hunger and starvation’ phenomenon. The best measure of the intensity of a famine is probably the death toll or the rate of excess mortality, but given the nature of records we have for earlier centuries it is impossible to make any judgement on this criterion. On the other hand, it is not impossible to determine how geographically widespread the famine was and how long it lasted. Admittedly it is not always an easy task, but as long as data

¹ There are several estimates for population totals in the period before 1721, from which date the statistics compiled by the Tokugawa government is available. For the state of the art in Japan’s medieval demography, see Farris (2006).
permits I give 1 point to a cross-regional/countrywide famine if taking place cross-regionally with the number of provinces recorded as hit by the famine exceeding five or six, and 0.5 to one which was supposed to be confined in one region (but 0 to local famine). First of all, it is important to keep in mind that the mere reference to an unusual weather condition such as ‘extremely hot’ or ‘unprecedented cold’ does not necessarily imply a famine unless the reference was accompanied by descriptions such as ‘everybody starved’ and ‘fields covered by dead bodies.’ Even when starvation did happen, there are a number of cases in which it is difficult to determine whether it was a cross-regional/countrywide famine or one which was confined in one regional. For example, when a very local source of records in the medieval period gives a description of ‘the whole country (zenkoku or tenka) starved,’ caution must be made since sometimes no other records give any hint of mass starvation in other regions. In such a case, I regard the description as an exaggeration and consider that it was just a regional famine.

In most famines, the duration was for one harvest year, starting in late summer or autumn and ending with an increasing death toll in the next spring. Sometimes it continued into the next harvest year with another crop failure, or even with a mildly bad harvest. There are cases where different kinds of records may collectively give us an impression that a certain famine lasted for two years, but a careful reading of the records may often reveal that it was an ordinary famine that occurred in one harvest year: one source referred to situations immediately after the crop failure whereas another paid attention to death tolls that swelled in the next calendar year. I have tried to avoid the over-identification in such cases.

Famines from the Eighth to the Nineteenth Century

Figure 1 shows the distribution of the all 281 cases into centuries. Records for the sixth and seventh centuries are too few, but those for the eighth and ninth centuries are surprisingly complete. Then, there was a long period of data scarcity between the ninth and the fourteenth century. The reason is that a political vacuum created by the disintegration in the beginning of the Heian period of the ancient, Chinese-style ritsuryo state system meant the lack of effective control and record keeping. After the establishment of the first samurai government (called Kamakura bakufu) in 1192, the number of records, both official and private, started to increase gradually, but it was not until the fourteenth century when the data allow us to establish the frequencies of famine on a reasonably secure basis.

From 1300 onwards, therefore, it is possible to show the changing frequencies of famine by half-century (Figure 2), and from 1600, in which the number of written records multiplied under Tokugawa rule, by decade (Figure 3).

It is evident from the three graphs that in ancient times famine was very frequent,

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2 This is because while a local famine’s impact on the nation’s population was not large, the risk of overstating the frequency of famines would increase by counting such a case in as the record of such a local famine was sporadic and its survival purely by chance in the period before the seventeenth century.
and that it became less frequent in the subsequent periods. In the eighth and ninth centuries it took place in every three years. In the medieval period, or more precisely, in the period from c.1300 to c.1550, the frequency declined a little to an order of once in every four years. Then came an unexpected, substantial fall in the number of famine years in the second half of the sixteenth century, as a result of which the seventeenth-century average became a level of every seven years. From the eighteenth century on, the incidence was further reduced: in the eighteenth 10.5 famines occurred, in the nineteenth the total became 5.5, and the twentieth century saw no famine breaking out, be countrywide or regional.

**Figure 1.** The number of famine points by century.

_Sources:_ Famine chronology table compiled by the author from Ogashima (1894), Nishimura and Yoshikawa (1936), and Fujiki (2007).

**Figure 2.** The number of famine points by half-century, 1300-1900.

_Sources:_ The famine chronology.
Climate History

Historians of global climate have paid special attention to the so-called Little Ice Age. There is evidence that there were bitterly cold winters in the thirteenth and also the fourteenth century and similar climatic conditions came back in the late sixteenth and seventeenth centuries (Le Roy Ladurie 1971). For Japan, a variety of data sources have so far been used; from tree rings to diaries kept by samurai, intellectuals and wealthy commoners. The documentary sources of the latter type are particularly rich after the eighteenth century, giving the specialists detailed accounts of monthly or seasonal weather in various parts of the country. However, one drawback with this type of data is that they rarely go back to the early seventeenth century and beyond. In order to take a much longer view, therefore, data of the former kind are valuable. Based on recent surveys of evidence (Batten 2009; Mikami 2008), we may summarise what we found from the famine chronology in relation to the following periodisation of climate history (Table 1).

Table 1. Climate change, drought, cold summer, and the frequency of famines.

<table>
<thead>
<tr>
<th>Period</th>
<th>Climate</th>
<th>Causes of famine</th>
<th>Famine points per century</th>
</tr>
</thead>
<tbody>
<tr>
<td>7-12th</td>
<td>Warm</td>
<td>6 : 4</td>
<td>31*</td>
</tr>
<tr>
<td>13-early 16th</td>
<td>Cold</td>
<td>7 : 3</td>
<td>22</td>
</tr>
<tr>
<td>Late 16-17th</td>
<td>Cooling</td>
<td>5 : 5</td>
<td>12</td>
</tr>
<tr>
<td>18-19th</td>
<td>Warming</td>
<td>0 : 10</td>
<td>8</td>
</tr>
</tbody>
</table>

Sources: The famine chronology table.

Note: * indicates an average calculated by excluding the 7th, 10th and 11th centuries.
It should be noted that of the surveyed data series, the ones covering longer periods are for both winter and spring temperatures while the summer series tend to be shorter; thus, the climate periodisation in Table 1 is made mainly on the information about winter and spring temperatures. This is unfortunate because harvest in rice growing countries is generally more closely related to summer temperatures than to winter or springtime conditions. Also note that in Table 1 the earlier the period the longer its duration becomes, as it is more difficult to identify turning points within a broader periodisation frame. For the first periods of the table, therefore, no attempt is made to distinguish sub-periods in the Medieval Warm Period and also in the first half of the Little Ice Age. True, for the latter three and a half century period, some argue that the fourteenth century can be separated as a relatively short period of sudden cooling from the other periods. However, given the nature of the famine data for the thirteenth and fourteenth centuries, I have not separated them out in this table.

Of the series surveyed, records of freezing dates of a lake in central Japan are particularly interesting and useful as they give us an unbroken series of decadal winter temperature from the mid-fifteenth century onwards. With records of the so-called ‘divine crossing’ on Lake Suwa (omiwatari in Japanese, which is actually a crack on the ice created by the pressure of freezing) palaeo-climatologists Koichiro Takahashi and Junkichi Nemoto constructed the decadal index of warmness over a four-century period (Takahashi and Nemoto 1978). The series is shown graphically in Figure 4. This confirms that in periods before the eighteenth century the decadal difference between the number of warm winters and that of cold winters was in most cases negative, indicating that as in historic Europe, winter temperatures were generally low in medieval Japan too. It is clear from the graph that the period between the 1580s and the 1610s was particularly cold. The seventeenth century saw a mild recovery and there occurred a secular warming tendency since then. It was substantially warmer at the end of the Tokugawa era than in the early to middle periods. According to a recent work, the July temperature in the nineteenth century was about 1°C higher than in the eighteenth (Mikami 1996).

![Figure 4. Changing temperature: warmness index, 1441-1890.](image)

Our interest is in the relationship between climatic changes and the frequency of famines. As the famine data allow us to determine, though not in all cases, whether it was triggered by drought or cold summer/prolonged rain, we can check if global cooling meant that there were more crop failures and, hence, more famines. Table 1 above enable us to examine these relationships by periodisation in climate history over the whole period, and Table 2 below by half-century from 1441-1890.

**Table 2.** The warmness index, drought, cold summer, and the frequency of famines by half-century.

<table>
<thead>
<tr>
<th>Period</th>
<th>Warmness Index</th>
<th>Drought vs. Cold Summer</th>
<th>Famine Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Late 15th</td>
<td>-7</td>
<td>8 : 2</td>
<td>11.5</td>
</tr>
<tr>
<td>Early 16th</td>
<td>-3</td>
<td>7 : 3</td>
<td>17</td>
</tr>
<tr>
<td>Late 16th</td>
<td>-7</td>
<td>6 : 4</td>
<td>7</td>
</tr>
<tr>
<td>Early 17th</td>
<td>-10</td>
<td>4 : 6</td>
<td>7.5</td>
</tr>
<tr>
<td>Late 17th</td>
<td>-5</td>
<td>3 : 7</td>
<td>7</td>
</tr>
<tr>
<td>Early 18th</td>
<td>4</td>
<td>0 : 10</td>
<td>3</td>
</tr>
<tr>
<td>Late 18th</td>
<td>1</td>
<td>0 : 10</td>
<td>7.5</td>
</tr>
<tr>
<td>Early 19th</td>
<td>1</td>
<td>0 : 10</td>
<td>5</td>
</tr>
<tr>
<td>Late 19th</td>
<td>0</td>
<td>0 : 10</td>
<td>0.5</td>
</tr>
</tbody>
</table>

_Sources:_ Takahashi and Nemoto (1978, 184-185), and the famine chronology table.

The two tables suggest, first, that drought became less problematic over the long run. Second, its relationship with global cooling and warming was more complex than one may have imagined. Third, on the other hand, both tables unambiguously show that medieval famines were not caused by global cooling in the Little Ice Age. This was particularly the case in the period from 1550 to 1650: famines were less—rather than more—frequent compared with other centuries in the same Age.

This finding may not be particularly surprising if due attention is paid to the fact that what is crucially important for the growth processes of rice is abundant rainfall in the spring and early summer period and sufficiently high temperature in the high summer season. Indeed, the causes of famine tables above have indicated that earlier famines were more to do with drought which affected the early growth processes, while once it was overcome, cold summer came to the fore affecting the final growth process.

**Discussion**

The evidence we now have in the form of famine chronology seems to suggest that there were two broad tendencies in the history of famines in historic Japan.

The first is a long-run tendency of decline in the frequency of famines. Generally it was a very slow progress. But the progress is likely to have been sustained even in the centuries when the Little Ice Age is believed to have begun: situations in the fourteenth and fifteenth centuries seem to have been somewhat better than in warmer centuries of the ancient period. Then came an unexpected decline in the second half of the sixteenth
century—unexpected because the decline in the famine frequency took place during another phase of global cooling in the Little Ice Age, and also because in Japanese history it was in the middle of a warring state period, not in the post-unification period of returned peace.\(^3\) Given the nature of records we have for the period before Tokugawa, one may question the timing of this decline in the famine frequency. However, a close scrutiny of the chronological data suggests that this is a fairly robust observation. Famines did become less frequent in the middle of the rise of warlords and resultant military confrontations between the warring states.

The second tendency was for drought to become less problematic as a cause of famine. In earlier centuries a majority of famines were triggered by drought, but from about 1550 on the number of famines caused by either extreme warmness or short rainfall started to decline. Crucial for this shift were agrarian changes that took place in rice growing—variety selection, reclamation of lowland river deltas, and other forms of investments in land infrastructures (for a brief account of shifting causes of famine, see Saito 2002, 225-226). Thus, by the end of the eighteenth century almost all famines were those caused by either cold temperature or prolonged rain in the summer, suggesting that summer temperature was still a problem, a big problem for people in the north-eastern region. This too was a gradual process, although it is worth noting that it gained momentum well before the Meiji Restoration.

All these may be taken to imply that towards the end of Tokugawa rule, peasants must have been virtually freed from famine disasters. However, as we all know, there took place two Great Famines in the late Tokugawa period: Tenmei in the 1780s and Tenpo in the 1830s. Both lasted for several years, and although our weighting system cannot measure the magnitude of those famines, levels of crisis mortality must have been substantial.

We have to ask, therefore, first, why there was a sudden decline in the frequency of famines despite disadvantaged climatic conditions in the second half of the sixteenth century, and second, why the country was struck abruptly by two devastating famines despite a general warming trend throughout the late Tokugawa period. It seems certain that climatic variables cannot answer the two questions. This is obvious in the first case. In the latter two cases, cold summer has been blamed for the disasters; however, while coldness of the 1780s was global, abnormally cold weather of the 1840s seems to have been a local phenomenon. Indeed, a comparative analysis of diary data for two places in the period 1714-1864 reveals that even if there were more cool-summer triggered than drought-triggered famines in those places, lean years did not invariably result in mass hunger and starvation (Saito 2002, 228-230).

Perhaps we have to turn to economic and political factors for explanation. It is certain that the disappearance of drought as a cause of famine was an important pre-condition for the decline in the frequency of famines in the eighteenth and nineteenth centuries, and hence that agricultural progress was the key to account for this

\(^3\) This is the observation that I was not quite sure about in the previous article because of the data uncertainties for the late medieval period (Saito 2002).
change. However, it cannot explain why the reduction in the famine frequency became possible in the late sixteenth century since much of the agricultural progress was made in the seventeenth rather than the sixteenth century. What we can say at this stage, therefore, is that unintended consequences of changes in the governance structure made by emerging overlords may have been crucially important to prevent the aggravation of any poor harvest into a famine. What happened during the period of warring states is that a warlord consolidated power over his whole territory, which probably meant greater security for the peasantry who came under his rule.

On the other hand, for the latter half of the Tokugawa regime, it is suggested that some subtle but important shifts are said to have taken place between the ruling and the ruled. One of the shifts was concerned with the issue of who was responsible for disaster prevention and relief, and the eighteenth and early nineteenth centuries saw the bakufu government becoming less keen in such matters while intermediate-level bodies such as the village and regional communities were more involved in decision-making processes, affecting the long-held notion of ‘benevolence’ between the ruling and the ruled. According to this interpretation, the Tenmei and Tenpo famines, especially the former, were aggravated due primarily to a coordination failure between the central and regional authorities created during the transition in governance structure (see Kikuchi 2002). How such changes altered the famine processes in the middle of changes, we have to await future research in the political economy of famine and other disaster management.

Finally, it should be remembered that whatever the causes of famines, their changing frequencies must have had implications for population history. This may sound Malthusian. It is well known that there are now revisionist re-assessments on historic famines as demographic correctives (see for example Watkins and Menken 1985), yet a close examination of Tokugawa data has revealed an unmistakably negative impact of cross-regional famines such as those in the Tenmei and Tenpo periods, although it is thought to have reflected the combined effect of both mortality-enhancing and fertility-reducing influences (Saito 2002, 230-235). Given this effect derived from late-Tokugawa demography and also given the finding from our famine chronology table, we should now think that population growth began in the mid-sixteenth century. It has long been assumed that population did not increase until peace returned at the beginning of the seventeenth century, and Akira Hayami’s thesis of comparatively strong population growth for that century is considered a recent consensus (Hayami 1967; see also Hayami 2001, 43-46.). However, what our finding suggests is that it started half a century earlier before Tokugawa. In order to explore why in the middle of the warring states period and how it began—we need more evidence, both socio-political and demographic, but once we accept that it all started in c.1550 rather than 1600, the implied rate of population increase during the seventeenth century will inevitably be lowered compared with levels Hayami and others have postulated.
References


