Food globalisation in prehistory: top down or bottom up?

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Introduction: background to the debate

Scholarly interest has been growing in an episode of Old World globalisation of food resources significantly predating the 'Silk Road'. This process was characteristic of cross-continental translocations of starch-based crops mostly during the third and second millennia BC but which might have been initiated in an earlier period (Jones *et al*. 2011). Among these translocations we can include a range of crops originally from Southwest Asia, notably bread wheat and barley, and others originally from northern China, such as broomcorn and foxtail millet (Hunt *et al*. 2008; Motuzaite-Matuzeviciute *et al*. 2013). Parallel patterns of crop movement between North Africa and South Asia have been observed and discussed in some depth (Boivin & Fuller 2009; Fuller *et al.* 2011; Boivin *et al.* 2013). The impetus behind this growth of interest has been the expansion of archaeobotanical research in South and East Asia over the past decade (Fuller 2002; Crawford 2006; Lee *et al*. 2007; Liu *et al*. 2008; Zhao 2010). This paper considers the agents responsible for the food globalisation process during the third and second millennia BC. A key aspect of trans-Eurasian starch-crop movement was that it constituted an addition to agricultural systems, rather than movement to regions devoid of existing starch-based agriculture. Other economic plants, such as grapes, dates and peas, also moved considerable distances in the archaeological record, often to areas previously devoid of those plants. However, the novel starchy crops held a particular significance. In both cases, Southwest Asian wheat and barley and East Asian millets went on to become important staple foods in many of their new destinations.

The pattern of food globalisation and its possible drivers have been previously considered in two papers (Jones *et al.* 2011; Boivin *et al*. 2012). Jones *et al*. (2011) consider three categories of driver: ecological opportunism, economic relations and cultural identity. Boivin *et al.* (2012) responded with an emphasis upon social drivers, highlighting the relationship between prestige, power and the translocation of exotic plants. Drawing from a range of historical examples, including consumption by Roman elites and Egyptian queens, Boivin and colleagues (2012) emphasise the potential role played by one pole of society: rulers, elites and the wealthy in the trans-Eurasian crop exchange. In a separate paper, van der Veen (2010) offers a useful discussion of how improvements and innovations in agriculture arise. In the current paper, we consider existing patterns of archaeological evidence in space and time to explore whether the elite was responsible for cross-continental crop translocation.

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The alternative is that the appearance of novel crops might be better understood in the context of consumption by people occupying lower positions in the social hierarchy.

Here we will briefly re-examine archaeological evidence for the transmission of Southwest Asian crops eastwards towards China, and East Asian millets towards the Middle East and Europe, identifying common themes which suggest new avenues for our understanding of the globalisation of starchy crops in prehistory. We will ultimately take into consideration differences in the archaeological signatures of different possible agents, considering temporal and spatial patterns in archaeological contexts. However, this discussion will begin by considering temporal and spatial examples of long-distance crop translocation between the Old and New World during more recent historical periods, in particular following the European discovery of America and the 'Columbian exchange' (Crosby 2003), looking for patterns which may be comparable to the period of globalisation in prehistory across the Old World.

Historic evidence: the temporal context

The argument developed by Boivin *et al.* (2012) makes significant use of the temporal perspective. They relate the time lag between first introduction of a crop and significant adoption of it to its exotic status in the initial stages. However, such a time lag may apply in the reverse direction. If the rulers and elites were indeed the agents who transmitted crops in the ancient world, knowledge of the new crops might be acquired first by them before it became familiar among the peasants. While in some cases this is attested, it has repeatedly been demonstrated that the farmer, rather than the landowner, leads the decision-making processes around the adoption and adaptation of new crops.

The status of sorghum in the Middle East and North Africa during the Islamic period provides us with an example of relatively swift change. Sorghum appears to have been considered an inferior grain by the wealthy and is not even mentioned in aristocratic cookbooks in the thirteenth century AD, though it was by then a very common crop in many parts of the Islamic world (Watson 1983; van der Veen 2010). Another instance can be observed in the introduction of the sweet potato into south-eastern China in the sixteenth century AD, where by the 1570s it became the poor man's staple. It was not until two decades later that the governor of Fujian province noticed the practice and officially blessed it in the famine year of 1594 (Ho 1959). Such time lags in the elite acknowledgement of new crops could be exacerbated by the perception of them as low status or poor man's foods.

Braudel (1975: 110–11) discusses a number of instances in which novel crops first fed the poor. Boats laden with rice from Alexandria in Egypt were "an expedient to feed the poor" in France in 1694 and 1709. In Venice, rice flour was mixed with millet and other flours to make bread for distribution to the poor "so that they could be satisfied from one meal to the next". Rice, millet, buckwheat and, later, maize were used to make gruel by peasant families, while the rich ate bread made from wheat flour (Braudel 1975: 136–37). This was to some extent equivalent to China's provision of wheat for the poor (Zeng 2005). These examples illustrate that associations with the new foods were initially formed with the poor majority rather than the rich minority. For the latter, necessity and luxury were constant companions. This may better explain the translocation of less ordinary foodstuffs, dairy products, spices,

sugar and alcoholic drink, rather than staple crops that provided calories for the population at large.

Another way of thinking about gradual temporal change is by contrasting the perpetual needs of the poor with the more ephemeral cultural choices of the powerful. The former may endure for centuries, even millennia, whereas the latter, as indeed the word 'choice' implies, are to some extent biographically situated and more open to constant reconfiguration. It is only rarely possible to identify a specific 'choice' event in the archaeological record, where a particular cultural determinant can be linked to a clear outcome such as a processual change, or the adoption of a new technology (van der Veen 2010). The dates available for the Old World food globalisation in prehistory do indicate a process spanning centuries, possibly millennia, and while this does not in itself exclude a cultural choice trigger, it would require a separate and more lengthy driver to sustain it over these much longer periods.

Historic evidence: the spatial context

Patterns occurring in geographical space provide a valuable correlate for a range of causative factors, including large-scale environmental change. They may also provide valuable insights into the dynamics of novel crop adoption. The patterns of early distributions of maize in southern China provide a useful example. This crop was adopted in the upper Yangtze River highland districts in the sixteenth century AD, and had become the poor mountain-dwellers' favourite food by the 1570s (Ho 1959). By the seventeenth century, many poor people in those highland districts depended on maize as their staple food crop. At the time, the lower Yangtze catchments were the heartland of the Chinese economy, supporting a larger and richer population relative to the upper Yangtze. Rice cultivation was predominant and maize remained relatively neglected. It was only during the eighteenth century, when the lower Yangtze basin reached carrying capacity, that the populations there utilised maize as their staple crop, which could be grown on the hills where rice cultivation was becoming difficult (see Figure 1).

Turning from China to Africa and Europe, further examples can be found of the pace and pattern of the adoption of American crops. The provisioning of a subordinate workforce was a key driver for the spread of maize across Africa and of the potato across Europe. During the seventeenth and eighteenth centuries AD, maize became prominent as a food for miners on the African Gold Coast (McCann 2005). Conversely, in France and the Balkans, maize was rarely grown until the eighteenth century, almost two hundred years after the discovery of America. The new crop was rejected in the Balkans, at least, because it brought changes to taxation and seigneurial dues, rather than because it was exotic (Braudel 1975). These examples are comparable to the situation in the poor upper and rich lower Yangtze catchments where maize was welcomed in one region and initially rejected in the other. Potatoes were adopted in a similar way by farm labourers on eighteenth-century English estates in Ireland (McNeill 1948; Donnelly 2002). The principal contribution of the elite to this process was to restrict the amount of land available to labourers for food production, presenting a significant adaptive challenge. As a result, although labour-intensive, the cultivation of high-yielding energy crops from the New World offered an adaptive solution.

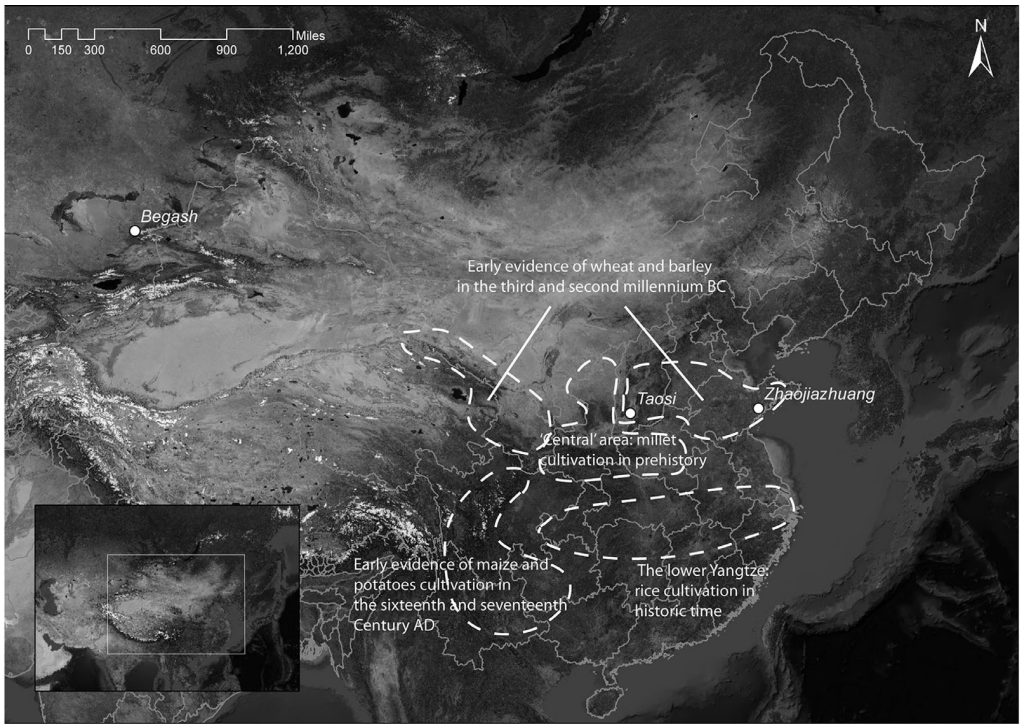

Figure 1. Map of China showing two episodes of introductions of novel crops in prehistoric and historic times. In the north, there is a geographic contrast between a millet-based 'central' area and early evidence of Southwest Asian crops, wheat and barley, in the 'peripheries' during the third and second millennia BC. In the south, the contrast is between the rice-based lower Yangtze and early evidence of New World crops, maize and potato, in the upper Yangtze in the sixteenth and seventeenth centuries AD. Historical evidence and archaeological signatures illustrate similar spatial and temporal patterns in the recent and distant pasts. Other sites mentioned in the text are also shown.

Debate

Patterns occurring in temporal sequence and geographical space provide valuable insights into the driving forces of translocation of novel crops. In all of the above examples, it would seem that the response of the existing agricultural system to the adoption of the novel crop is a key driver. In both temporal and spatial contexts, the conservative food choices of the rich are the reason for the initial rejection, as the new crop brought changes to their taxation, seigneurial dues or divine power. This must have been true in prehistory also. In the following section we shall return to the prehistoric period to re-examine the archaeological evidence for a key process of Old World food globalisation: the introduction of wheat and barley into China.

Temporal and spatial patterns in archaeological contexts

Returning from the more recent history of global crop exchange to the prehistoric period, we now consider both spatial and temporal patterns in the archaeological record. Archaeological remains, particularly 'prestige' evidence, may be spatially concentrated according to where power is concentrated in the cultural landscape. If the known sites and material remains reveal a contrast, suggesting a core and a periphery, then that may serve as a useful correlate through which to interpret archaeobotanical patterns. This evidence has an additional temporal dimension, in that the change in settlement patterns over time can also highlight changes in crop adoption.

The recent syntheses of archaeological surveys in China on both national and regional scales have revealed distribution patterns of early settlements (Shelach 1999; Zhang *et al.* 2010; Liu & Chen 2012; Wagner *et al.* 2012). The earliest sites with millet in northern China before 5000 BC are patchily distributed on foothills at the margins of the loess plateau (Liu *et al.* 2009). The subsequent millennium (5000–4000 BC) features a high concentration of middle Neolithic settlements in an area including today's Shaanxi and Henan provinces, particularly along the valleys of the Wei River and its tributaries (Wagner *et al.* 2012). According to a recent synthesis, the number of settlements had increased from 39 in 5000 BC to some 2000 in 4000 BC in Shaanxi and from 83 to 638 in Henan (Wagner *et al.* 2012). This picture fits the traditional assumption of this area being the 'centre' of Neolithic China and supporting a larger population size than other areas (Chang 1986). The recorded number of sites in this area remained higher throughout the rest of the Neolithic and Bronze Age compared to other regions. Archaeobotanical evidence indicates that the fifth millennium BC settlements in this area, although varying significantly in size, were mostly connected with millet cultivation (Zhao 2007).

In contrast with the settlement density in Shaanxi and Henan, the regions on either side of the 'centre' yielded a much lower density of settlements before 4000 BC. This is true both to the east, in an area including today's Shandong, Hebei and Shanxi provinces, and to the west, in today's eastern Qinghai and Gansu provinces (Wagner *et al.* 2012). For instance, there are only 26 sites in Shanxi and none in Qinghai dated to the fifth millennium BC according to the national surveys (Guojia Wenwuju 1996, 2006). In both these peripheral regions however, there is a substantial subsequent increase in site density between 4000 and 2000 BC (Wagner *et al.* 2012). Archaeobotanical evidence from these two regions indicates

that although millet was present during that period, some of the earliest evidence of wheat and barley were recovered there rather than in the 'centre'.

It is in the two peripheries, rather than the core region of northern China, that the novel Southwest Asian crops, wheat and barley, are first recorded. To date, the oldest direct radiocarbon record of wheat in China is from Shandong province, at Zhaojiazhuang, dated to between 2500 and 2270 cal BC (Jin *et al.* 2008). Other early records of wheat and barley from secure contexts are also emerging in the third and very beginning of the second millennium BC from sites in Shanxi, Qinghai and Gansu provinces (Li *et al.* 2007; Flad *et al.* 2010; Zhao 2011; Betts *et al.* in press). All of these occurrences were in the peripheries. Not until the mid second millennium BC are wheat and barley with secure dates recorded in the 'centre' (Dodson *et al.* 2013).

The spatial contrast and temporal sequence of the introduction of wheat and barley in China somehow echo the recurrence of the adoption of maize and potatoes in Europe and China in the seventeenth century AD.

If elite consumption drove the adoption of novel crops from the west, we might expect to see them first in the more densely settled cultural heartland of Shaanxi and Henan, subsequently spreading to its margins. Evidence currently available suggests the reverse. This pattern may reflect resistance to new agricultural methods in the conservative core of an existing agricultural society. In the course of migrations and the occupation of new lands and environments on the margins, farmers may have been more open to novel strategies.

Some of the earliest records of barley in China come from Taosi (2500–2000 BC) a third millennium BC site in Shanxi province. During its early phase, the site is distinguished by its fortified enclosure and palace architecture. By the final stage of occupation, the site's earthen enclosure had been destroyed, and the palatial area transformed into a space for the production of stone and bone artefacts. The settlement seems to have experienced some political turmoil during its late phase. Many human skeletal remains near the palatial area show evidence of violence (Liu & Chen 2012). The excavator relates such evidence to a peasants' revolt leading to the fall of Taosi (Zhongguo Shehui Kexueyuan *et al.* 2008). The archaeobotanical record of the site records barley grains exclusively from contexts belonging to the final phase when turmoil might have been happening (Zhao 2010). Whatever the precise interpretation of the radical changes to site layout, it seems reasonable to associate the adoption of barley with periods of social upheaval rather than periods of elite stability.

Prehistoric evidence: a broader comparison

The archaeological record allows us to approach this issue from another direction through broad comparison between elite funerary sites and non-elite settlement sites across Eurasia. The former may allow a direct association between foods and elite celebrations. In contrast, the latter may enable observation of everyday consumption by ordinary people. It is certainly the case that a number of the key contexts providing evidence of crop translocation are elite graves. For example, at the elite burial site of Begash in eastern Kazakhstan, broomcorn millet and bread wheat grains were directly dated to the mid third millennium BC, and constitute the earliest record of each of these crops in Central Asia (Frachetti *et al.* 2010). However, the very earliest contexts for exogenous crops in other parts of Eurasia are settlement sites

which often predate the elite graves. This is certainly the case for the earliest millets known in Europe before 5000 BC and the earliest wheat and barley in China before 2000 BC (Hunt *et al*. 2008; Zhao 2011; Motuzaite-Matuzeviciute *et al.* 2013).

Conclusion

The connections between what happened in agricultural fields and what happened to the crops once they left the fields may be complex. Evidence suggests that agricultural innovations in the ancient world were primarily concerned with a need for calorie consumption, and that is the context in which we need to consider how innovations arose and what agents were involved (van der Veen 2010). This is equally true of episodes of food globalisation in the recent and distant pasts. Evidence suggests that various individuals and communities in society have played a role in such processes. The issue of social drivers discussed by Boivin *et al*. (2012) is an important one. In this paper we have followed that debate with a shift of focus. We have emphasised the temporal and spatial context, and the distinction between long-term processes and particular events both in relation to historical evidence and to earlier archaeological signatures. We have also taken issue with the emphasis upon the relationship between prestige, power and 'exotic' crops. Instead, we have emphasised the role played by the primary agents of agricultural production, the ordinary farming communities themselves.

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