Eastward Spread of Wheat into China – New Data and New Issues

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Introduction

It is well known that wheat was originated in the West Asia. It was introduced into China, and eventually became the dominant crop in the dry-land agriculture of Northern China after replacing the major native crops of foxtail millet and broomcorn millet. Yet, neither the time when it arrived in China nor the routes through which it was introduced are made clear. Therefore, these are the major problems we are now dealing with.

It has been widely agreed that the introduction of wheat into China should have occurred before the historical time, because the script “➿” for “wheat” has been identified from records on oracle bones of the Shang Dynasty. Some scholars even believed that the script of “➿” may be a metaphor of the introduction of wheat from outside China, simply because this script means “coming” in both classic and modern Chinese language (He 1985), while, other scholars do not consent to this viewpoint (Luo 1990). Although wheat is commonly documented in pre-Qin literatures, the time and routes of its introduction are not mentioned at all. Therefore, the spread of wheat into China has become a rigorous inquiry for archaeological study.

Hard evidence for confirming the spread of wheat into China should be surely those wheat remains from ancient times. However, wheat remains are readily to decay and not likely to be well preserved in archaeological assemblages because of its organic composition. Also, crop grains as small as wheat seeds are not easily to be identified by the naked eye during excavation. This causes the difficulty for plant evidence collection.

From the beginning of the 21st century, flotation technique has been widely applied by Chinese archaeology as means of obtaining ancient plant remains during routine archaeological excavations. Up to the present, flotation work has been practiced at more than one hundred archaeological sites of diverse time periods, and large amounts of plant remains of high research potential have been found, including wheat remains. These new discoveries provide significant archaeological evidence for a better understanding of the spread of wheat into China, the route and the temporal-spatial background in which the introduction events took place. The present paper is aimed at synthesizing these new data, referring to those data of early wheat remains reported in last century, to explore these issues.

Note that the term of “early wheat remains” used in this paper specifically indicate the data which were dated 3000 BP or earlier.

Previous Wheat Remains

Before flotation technique is used in Chinese archaeology, wheat remains were occasionally reported to be found at some archaeological sites, such as Donghui Mound in Minle County, Gansu (Li Fan et al. 1989), Zhaojialai in Wugong County, Shaanxi (Zhongguo 1988), Diaoyutai in Boxian County, Anhui (Yang 1963), and Shirenzi in Barkol, Wupu Tombs in Hami and the burial site of Lop Nor, Xinjiang (Wang 1983). It must be pointed out that the wheat remains referred to in these archaeological reports were actually discovered by chance, and their taxonomic identification and dates may not be firmly assured and hence remained some contro-
For instance, the wheat remains of the Diaoyutai site had been found inside a pottery li-鬲 tripod, which was firstly classified as a Neolithic pottery, while reclassified later as a pottery of Western Zhou (Yang 1963). Similar problems also occurred at the data of the Shaojialai site. Though the date is correct (contemporary with the Longshan period), taxonomic identification is still questionable. According to the report, the so-called wheat remains are most likely to be the impressions left by the straws tempered within the mud for building the walls (Zhongguo 1988). However, straw remains cannot be easily used as hard evidence for taxonomic identification even when they are in fresh and living state, let alone the dried-out impressions.

The most controversial data are the wheat remains recovered from the Donghui Mound site. They were first collected and studied in 1985 by Li Fan, a famous agronomist in China. The wheat remains, identified as two species of *Triticum aestivum* and *T. compactum*, were subsequently radiocarbon dated to ca. 5000 BP (Li 1989). The taxonomic identification is reliable; but the date is highly suspicious due to the unclear context of dating materials, because Li was not familiar with archaeology and nobody knew how and from what kind of provenance the wheat remains were collected.

By contrast, professional archaeologists dated the Donghui Mound site to the Siba Culture period through a regular archaeological excavation in 1987 (Gansu Sheng and Jilin 1998). The Siba Culture represents an early Bronze Age culture widely distributed along the Hexi Corridor, and dated to 3900–3500 cal. BP, which is about 1000 years later than that given by Li. However, the two samples in the excavation report made the dating issue even more ambiguously complicated. One of them is the charcoal sample unearthed from the second layer of a trench (No. 87MDTG_2) and has been radiocarbon dated to 3770 ± 145 cal. BP (calibrated), and this result falls well in the range of the Siba Culture period as indicated above. The other one, however, is a sample of wheat remains dated to 4230 ± 250 BP without clear provenance, an unacceptable time span for conducting dendro-calibration, coincided with that given by Li Fan.

Recently, experts from home and abroad conducted a joint investigation to the Donghui Mound site. Soil samples collected from which were floated, and barley and wheat remains have been recovered and identified. Fourteen barley and wheat specimens were chosen for AMS radiocarbon dating test. These plant remains were all dated to a period between 3700 and 3300 BP, which exactly is the Siba Culture period (Flad *et al.* forthcoming). This investigation, together with the tests followed up, has made it clear that the wheat evidence from the Donghui Mound site are most likely to be left by the Siba Culture people ca. 3500 BP.

Relatively, the data from the sites in Xinjiang are more reliable. The wheat remains found in these sites were well preserved, thanks to the arid condition of desert environments, which ensured a precise taxonomic identification. The dates of these plant remains were also unquestionable, and all of them were dated to ca. 3500 BP.

**New Data of Wheat Remains by Flotation**

Since the beginning of this century, flotation has been widely applied in Chinese archaeological fieldworks. To date, wheat has been discovered at more than twenty archaeological sites through flotation. Most of them are dated to before 3000 cal. BP and located in the areas along the Yellow River in North China. We divide these areas into three regions, which are the Haidai region, the Central Plains region and the Northwest region, based on ecological characteristics and archaeological classifications (Figure 1).

1. **The Haidai region**

The Haidai region is a spatial concept for archaeological classification in China. In archaeological literature it refers to the distribution areas of the Dawenkou Culture and the Shandong Longshan Culture, including Shandong Province, northern parts of Anhui and Jiangsu Provinces (Luan 1997). The early wheat remains have been identified through flotation from five archaeological sites in this region: Liangchengzhen in Rizhao (Crawford *et al.* 2004), Jiaochangpu in Liaocheng (Zhao 2004), Zhaojiazhuang in Jiaozhou (Wang 2007), Daxinzhuang in Jinan (Chen 2007), and Zhaojiazhuang in Yantai (Jin *et al.* forthcoming).

It is noteworthy that the archaeological wheat evidence from the sites of Liangchengzhen, Jiaochangpu and Zhaojiazhuang were primarily the wheat remains from the Longshan Period, dating to 4600–4000 cal. BP. These data are not only the earliest but also the most reliable wheat evidence found in China at moment, because the sites have been excavated scientifically and multidisciplinary studies were carried out during the...
excavations.

2. The Central Plains region

The Central Plains region is located at the core of the early Chinese civilization areas, encompassing the northern and central parts of Henan Province and southern parts of Shanxi and Hebei Provinces. The Central Plains region covers the major distribution areas of the Henan Longshan Culture. As a part of the archaeological project entitled “Exploration on the Origin of Chinese Civilization” funded by the Ministry of Sciences and Technologies, we have conducted flotation work on many important sites in the Central Plains region. Some of these sites yielded the early wheat remains, such as Wadian in Yuzhou, Erlitou in Yanshi, Wangchenggang in Dengfeng, Huizui in Lingbao, Xinzhai in Xinmi, Shangcheng (the site of an early Shang city) in Yanshi, and the Yin Ruins in Anyang (Zhao 2007; Zhao and Fang 2007). Apart from these sites related to the above project, it is reported that the early wheat remains were found from the Xijincheng site at Jiaozuo (Wang and Wang 2008). Also, the early wheat remains were found and identified from the Zaojiaoshu site in Luoyang in 1990s (Luoyang 2002).

Amongst these discoveries, the wheat evidence found at the Wadian and the Xijincheng sites are the remains from the Longshan Period, dating to 4600–4000 cal. BP. The wheat remains recovered and identified from the sites of Erlitou, Huizui, Xinzhai, Wangchenggang and Zaojiaoshu are the remains of the Erlitou Period, dating to 3600–3400 cal. BP. The wheat evidence from the sites of Erlitou, Wangchenggang and Shangcheng were discovered in the layers and assemblages dating to the Erligang Period 3600–3400 cal. BP, roughly contemporary to the early Shang Dynasty. The continuous temporal sequence of these data suggests that the wheat appeared in the Central Plains region during the time of the Longshan period, contemporaneous with that in the Haidai region, and then it quickly integrated into the local farming system, and became an important crop plant in the core area of ancient Chinese civilization during the period of the Shang Dynasty (Figures 2–4).

3. The Northwest region

Archaeologically, the Northwest region in China refers to the upper Yellow River valley (Shaanxi, Ningxia, the eastern parts of Gansu and Qinghai), the Hexi Corridor (western part of Gansu), and northern part of Xinjiang. This large region covers the very important trade route of the Silk Road of Chinese historical period, and this to some extent suggests a trade significance of this region due to its geographical location. It is in this sense that it may also stand at a key locality for wheat introduction event in the prehistorical social contexts. And, it seems that this indication was partly corroborated by the wheat evidence abundantly found in the Northwest region before the application of flotation in Chinese archaeology.

Recently, new wheat evidence has been reported from the Northwest region, due large part to the application of flotation. For example, the data were already published from the archaeological sites of Zhouyuan in Fufeng, Shaanxi (Zhouyuan 2004), and Fengtai in Huzhu, Qinghai (Zhongguo and Qinghai 2004). In addition, unpublished wheat evidence were also found from other sites, such as those from Gansu Province include Heishuiguo in Zhangye, Huoshagou and Bijiatan in Yumen, and Xishan in Lixian, from Qinghai Province include Ningchang in Datong, etc (Figures 5–7). All these new wheat evidences were dated to about 3500 cal. BP.
Apart from the new data obtained by flotation during the archaeological excavations, a geographical team recently alleged that they have found wheat evidence from the Xishanping site at Tianshui in Gansu Province, and the date they reported is 4700–4350 cal. BP (Li et al. 2007). Similar to the problems we have pointed out in the study of the plant remains at the Donghui Mound site, we still believe the geographers’ report is not unquestionable. From archaeological viewpoint, the context of wheat remains is not clear and the provenance of dating materials is unknown.

Nevertheless, it is noteworthy that the new wheat evidence found in Northwest region by flotation usually comes out in association with barley; the latter is often
more numerous than the former. This is very different from the situation in other regions mentioned above.

Discussion

According to the above descriptions, flotation plays an important role in the present archaeology, and provides significant information for the study on the eastward diffusion of wheat into China.

Up to date, the early wheat remains have been identified at more than thirty archaeological sites in North China, including both the new data obtained by flotation technique in recent years and the previous data collected by chance in the past. Based on the reliable evidence recovered through archaeological excavations and with unquestionable dates, a conclusion can be drawn that wheat was most likely introduced into China at a time period around 4500 cal BP, roughly contemporaneous with the Longshan period in the Haidai region and the Central Plains region, and the Qijia Culture in Northwest region.

Interestingly, all of the earliest wheat evidence found at different regions emerged at nearly the same time span around 4500 cal BP. In other words, wheat occurred simultaneously at different regions in a wide geographical range from the northwestern inland China to the eastern coast, forming a zone which stretches for several thousand kilometers. This leads to such inquiries: how was wheat introduced into China? And, through which route, or routes, was wheat imported into China?

In historical period, particularly since the Qin and Han Dynasties, the Silk Road was the major trade route connecting the East and the West. The Hexi Corridor was an unavoidable passage of the Silk Road, and there was a time that nearly all wheat evidence came out of the northwestern part of China, that lead to the hypothesis that wheat was actually introduced to China through the course of the Silk Road. It spread along the northern edge of Xinjiang, the Hexi Corridor and further eastwards to the Central Plains region and the Haidai region.

Yet, this viewpoint is not supported by archaeological evidence, because the radiocarbon dating results at different localities along this route do not exhibit an earlier date in the west than in the east. Moreover, most of the earliest wheat evidence known to date were discovered in the Haidai region and are more diagnostic and reliable. Therefore, the hypothesis preferring the route of the Silk Road for the introduction of wheat is questionable.

It should be noted that the Silk Road is by no means the only route connecting the East and West in ancient times. There existed other channels; for example, the Eurasian Steppe route and the sea route.

1. The Eurasian Steppe Route

The Eurasian Steppe route started from the southern Siberia and Mongolian Highland, traversed through Central Asia to West Asia, and finally arrived in Europe. There were several very active Bronze Age cultures distributed in the vast Eurasian steppe around the time period when wheat was first introduced into China. For example, the Afanasevo culture, distributed on the southern Siberia and the western part of the Mongolia Highland dating to ca. 5000 cal. BP. Another important Bronze Age culture in the Eurasian steppe is the Andronovo culture, which was indeed an archaeologically complex containing many small local Bronze Age cultures flourished about 4000–3000 cal. BP. These small Bronze Age cultures dispersedly distributed in western Siberia and Central Asia, and the easternmost fringes already reached to the Khangai Mountains of Mongolian Highland.

The Bronze Age cultures in the Eurasian Steppe were similarly characterized by metal production such as copper and bronze (artifacts represented by ornaments and weapons), animal breeding (cattle, sheep and horses), and farming (barley, wheat and millets). They might have a special subsistence pattern combining animal breeding and hoe agriculture. The similarities shared by these Bronze Age cultures in the Eurasian Steppe indicate to some extent an extensive communication between them. These connections gave rise to a channel or a bridge of communication between the two sides of the Eurasian Steppe, i.e., the West Asia and the East Asia.

Simultaneously, there was a special archaeological complex in Northern China, named the Northen Zone (or Northern Frontier), during the period of 5000–3000 cal. BP. Although the distribution areas of this culture varied in terms of size and localities, it was primarily located along the course of the Great Wall, forming a narrow zone, stretching in a northeast-southwest orientation (Yang 2004). It covers administratively northern parts of Hebei, Shanxi and Shaanxi Provinces and southern part of central Inner Mongolia, and encompasses geographically the Yanshan Mountains, the Daihai Lake Basin, the Ordos desert, the Hetao Plains of Yellow River, etc. Also, the Northern Zone is distributed at a transitional ecological zone between semi-dry climate and dry climate ranges in North China, and the typical
subsistence pattern here varied seasonally between animal breeding and hoe agriculture.

Since the Northern Culture was flanked by two profound cultural traditions – the Bronze Age cultures of the Eurasian Steppe in north and the Neolithic/Bronze cultures of the Central Plains region of China in south – its cultural components consisted of the artifacts characterized by typical Eurasian Steppe styles (such as bronze ornaments, bronze daggers and bronze knives with animal heads handled pottery cups with everted rims, etc.) and the artifacts characterized in typical Central Plains styles (such as the pottery vessels painted or with cord markings), apart from its own cultural characteristics (such as the pottery vessels with zigzag lines and appliqué snake patterns).

The bronze artifacts in the Eurasian Steppe styles have been often seen in the Central Plains region, such as the bronze daggers and knives with animal head-shaped pommels, bronze axes with sockets and ornaments of animal pattern. This indicates a possible southward cultural diffusion from the Eurasian Steppe (Lin 1987). Therefore, the Northern Zone might have played an important medium role of cultural contacts, simply due to its middle location between the two cultural areas.

Many scholars have already analyzed the importance of the medium role of the Northern Zone for the early cultural contacts. Their discussions were primarily focused upon the bronze artifacts of the Eurasian Steppe styles. Recently, some scholars began to notice the medium role of cultural contacts, simply due to its middle location between the two cultural areas.

The West Asia is the homeland for the origin of crop wheat and domestic animal sheep, and also the one of the earliest centers for the development of bronze industry. Therefore, it is most likely that these three items, wheat, sheep and bronze, were introduced together as a cultural package into the Eurasian Steppe from the West Asia, and subsequently brought to the Mongolian Highland and then submitted to the Northern Zone in China. As long as the Northern Zone received this cultural package, the transferring route was re-orientated to the south, and finally, the three items reached the Central Plains.

The cultural diffusion and communication between the Northern Zone and the Central Plains region as well as the Haidai region in China was most likely to have occurred through the river valleys between the two areas, such as the Luan River valley in the east, the Sanggan/Yongding River valleys in the middle, and the Yellow River valley located along the two edges of the Hetao Plains in the west, and so forth. These north-south river valleys formed the channels helping the cultural contacts between the Northern Zone and its southern neighbor, i.e., the fertile loess plains and alluvial plains of the middle and lower Yellow River areas. These multiple channels arranged from east to west may be of some help for us to understand the simultaneous occurrence of wheat in the Central Plains and the Haidai regions around 4500 BP.

It should be emphasized that the early contacts of cultures between the West and the East through the Eurasian Steppe route, including the eastward spread of wheat, may have nothing to do with human migrations, also due large part to the Northern Zone. The Northern Zone was a powerful cultural entity, which not only played a medium role of cultural contacts but also stood as a barrier to any large scale migration between the Eurasian Steppe and the middle/lower Yellow River areas.

2. The Sea Route

Apart from the Eurasian Steppe route, there is still another possibility for the eastward spread of wheat. It is the sea route. Wheat might spread into China along the coast areas of South Asia and Southeast Asia. As far as we know, after originated from the West Asia, wheat rapidly spread into Europe to the west, the Niles valley to the south and the Indus valley to the southeast. The plant soon became the major crop in the agriculture of the Indus Civilization. From the Indus valley, wheat might gradually spread along the coast areas of the Indian subcontinent, and reached to Southeast Asia as well as the southern coast area of China, and finally reached the Shandong Peninsular. This hypothesis, to some extent, can explain why most of the earliest wheat evidence so far identified is discovered in the Haidai region, which centers upon the Shandong Peninsular.

The hypothesis of the sea route is not established purely on speculation. In 2002, the early wheat remains were discovered by flotation from the Huangguashan site at Xiapu County, Fujian Province. The site is located on a beach facing Taiwan Strait, and dated to 4000
BP. Archaeologists believe that the cultural assemblage of the Huangguashan site is closely related to the cultures on the islands in Pacific Ocean as well as in Southeast Asia (Jiao and Rowlett 2006). This may be viewed as a source to support the hypothesis of sea route.

In fact, the sea route of cultural diffusion has been discussed by many scholars, e.g., the spread of domestic rice and rice agriculture, the distribution of the shouldered stone artifacts, the origin of bronzes in southwestern part of China, etc. We suggest that the possibility of the diffusion of wheat through the sea route should be added into this discussion as well in the future.

3. The Silk Road

At all events, the possibility that wheat was introduced into China by the route through the Hexi Corridor cannot be rejected. As mentioned above, a geographical team alleged recently that they discovered wheat evidence dated to 4500 BP in the Northwest region. If this date can be confirmed by further archaeological work, we can at least say that wheat emerged in this region simultaneous with the Central Plains and Haidai regions. If this datum works well, wheat is also likely to have been brought into China through northern part of Xinjiang and the Hexi Corridor, i.e., the same pathway as the Silk Road during the historical time.

Because there was not a strong cultural barrier in the Hexi Corridor before 4000 BP, the eastward spread of wheat through the Silk Road might correlate to human migrations. In other words, wheat brought into China by this way was most likely a byproduct of human migration.

Conclusions

As we have seen in the plant evidence obtained through flotation in the past ten years, especially the earliest wheat remains which are closely with the study of the spread and introduction of wheat, we now can conclude that wheat was most likely to have been brought to China around 4500 BP, roughly contemporaneous with the Longshan Culture period in the Central Plains and the Haidai regions. Though the details of the spread routes of wheat cannot be assured, yet, we suggest that wheat might have been brought into China through several different routes:

The first possibility is the Eurasian Steppe route. Sometime between 5000 and 3000 BP, a cultural package containing wheat, sheep and bronze industry spread from their homeland of the West Asia into the vast Eurasian Steppe, where distributed many small Bronze Age cultures linked to each others, and played like a cultural channel to transfer this package further east to the Northern Zone in China, and then the eastward spread direction turned to south, and the package eventually reached to the core area of ancient Chinese civilization, i.e., the Central Plains and Haidai regions. Nevertheless, it is most likely that the Eurasian Steppe had been a main route connecting the West and the East long before the use of the well-known Silk Road.

Another possibility of the eastward spread of wheat is the route along the Silk Road of the historical time, i.e., spread from West Asia to Central Asia, continuously transferred along the northern part of Xinjiang, then passed through the Hexi Corridor, and eventually reached to the Northwest region of China.

And finally, the sea route is also a possibility, as we have seen many examples in the following historical eras.

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Zhao Zhijun
Eastward Spread of Wheat into China – New Data and New Issues


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Zhao Zhijun


Postscript: The present paper is published for the first time. It is written in English by the author himself.