

## PALEOETHNOBOTANY

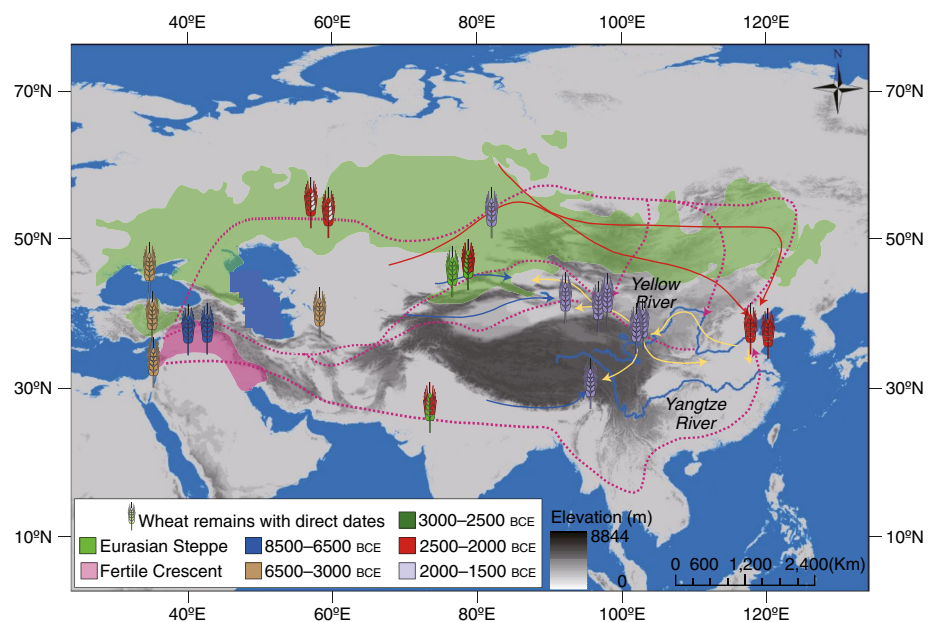
## A new story for wheat into China

New radiocarbon dates of wheat remains from the lower Yellow River valley suggest that the west crop had been introduced to east China around 2600 BCE (Before Common Era), rewriting the history of the spread of wheat into China.

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Wheat, one of the three most important crops on the planet, provides staple food for ~35% of global population. While west Asia is thought to be where wheat was initially domesticated, nowadays China produces the highest wheat yield in the world. This leads to a critical issue that has caused wide debate in archaeology for decades: the timing and route of wheat dispersal into China. In this issue of *Nature Plants*, Long et al. report ten direct dates of carbonized wheat grains unearthed from the Longshan culture (~2600–2000 BCE) sites, in the lower Yellow River region, arguing that wheat had been introduced into China around 2600 BCE — around half a millennium earlier than previous estimates. The researchers also propose a new hypothesis for the early arrival and dispersal of the west-crop in China<sup>1</sup>.

Solid evidence from the Chinese historical documentary records suggests wheat had been introduced to China before 1000 BCE. The script ‘来’ that is recognized as ‘wheat’ was identified from oracle-bone inscriptions unearthed from sites of the Shang Dynasty (circa 1600–1046 BCE). However, these fragmentary records hardly provide any clues to when and how wheat was first introduced to China. To resolve this problem, archaeologists assembled significant amounts of data on wheat remains, including charred grains and rachis from excavations of Neolithic and Bronze-Age sites dated between 8500–1500 BCE, which revealed direct evidence for utilization of wheat in the prehistoric era. The microfossils of annual wheat provide the optimal materials for radiocarbon dating because they circumvent the ‘old wood’ problem associated with fossils of long-lived trees (radiocarbon dates obtained from the heartwood of long-lived trees tend to be much older than the actual falling time due to the potential long growth of trees). Therefore, the pattern for prehistoric spatio-temporal diffusion of wheat across Eurasia, the very critical component of ‘food globalization in prehistory’<sup>2</sup>, can be depicted



**Fig. 1 |** The summary of hypothetical spatial-temporal pictures of wheat dispersal into China. Dotted lines represent potential routes for the earliest diffusion of wheat into China<sup>4</sup>, whereas solid ones illustrate the new hypothesis proposed by Long et al.<sup>1</sup>. Solid red and yellow lines depict dispersal routes for the initial introduction of wheat into east China and its subsequent westward movement, respectively. Blue lines suggest the second wave of wheat dispersal into China.

through comparison of the direct dates of wheat remains discovered from Neolithic and Bronze-Age sites in various corners of the continent.

Based on the current dataset, wheat was domesticated in the Fertile Crescent zone of west Asia around 8500 BCE<sup>3</sup>, and then spread westward to Europe and eastward to China in the subsequent millennia. The eastward diffusion of wheat across Eurasia might have occurred many times, promoted by interactions of contemporaneous cultures in the continent during different periods. Multiple theories regarding the timing and routes of early introduction of wheat to China have been proposed<sup>3–7</sup>, presenting quite different stories. According to the spatio-temporal distribution of prehistoric sites where typical west-Asian elements (like wheat, sheep and metallurgy) were

unearthed, Zhijun Zhao proposed that wheat was introduced to China around 2500 BCE through three possible routes, including the Eurasian Steppe route, the Ancient Silk Road and the sea route<sup>4</sup> (Fig. 1, dotted lines). However, archaeo-botanical studies in recent years support the hypothesis of the Eurasian Steppe route, where wheat was mainly diffused along the Eurasian Steppe, spread to east Kazakhstan in the first half of the third millennium BCE<sup>8</sup>, and then further eastward to China before 2000 BCE (Fig. 1). Although the other two routes cannot yet be ruled out, they are not supported by the most recent data.

Long et al. found that three direct dates of wheat remains unearthed from Zhaojiazhuang and Dinggong sites of the Longshan culture, in Shandong Province, predate 2000 BCE<sup>1</sup>. These remains are

hundreds of years older than those found in northwest and central parts of China<sup>6,7,9</sup>, suggesting that wheat was initially introduced into east China in the third millennium BCE through the Eurasian Steppe route. Compared to previous research which confines the time of first wheat introduction to east China to around 2000 BCE, the work by Long et al. suggests that this date can be further pushed back to ~2600 BCE. Long et al. further proposed that after the first introduction into east China, wheat then spread westward from the lower Yellow River to other parts of China, such as middle and upper Yellow River, Xinjiang and Tibet, prior to the secondary introduction of wheat to China from the central Asia<sup>1</sup>.

Why wheat was introduced into east China earlier than in other regions remains an amazing enigma. Given that wheat did not become a staple crop in this area before 600 CE<sup>10</sup> and the fact that 'exotic' crops might symbolize power and prestige, the findings by Long et al. corroborate the hypothesis that wheat might have been

first transmitted to east China as an exotic good through cultural interactions. The hypothesis raised by Long et al. provides valuable new clues for understanding the history of wheat dispersal in China. The production of food can either empower or constrain human societies. Considering that wheat has much greater yield-potential than traditional crops, such as millet (foxtail and broomcorn millet), a detailed understanding of its dispersal in China bears great importance for our perception of human interactions and socio-political changes in Chinese history.

Nevertheless, other possibilities for dispersal routes in China cannot be immediately excluded. For instance, wheat might first have spread eastward across China along the steppe zone, and then diffused along different north-south passageways, such as the valleys of the Hei River, Luan River and Sanggan River (Fig. 1). The novel story proposed by Long et al. for wheat introduction into China<sup>1</sup> lays the foundation for further exploration into the

journey of the west-crop to the east. Multi-disciplinary research in the near future will be able to provide further clues. □

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#### Competing interests

The author declares no competing interests.