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Foothills and intermountain basins: Does China's Fertile Arc have 'Hilly Flanks'?

Xiaolin Ren [a, b], Ximena Lemoine [c], Duowen Mo [a, b, d, **], Tristram R. Kidder [c], Yuanyuan Guo [e], Zhen Qin [c], Xinyi Liu [c, *]

[a] *College of Urban and Environmental Sciences, Peking University, Beijing, China*
[b] *Key Laboratory for Earth Surface Processes of the Ministry of Education, Peking University, Beijing, China*
[c] *Department of Anthropology, Washington University in St. Louis, USA*
[d] *Institute of Geographical Sciences, Henan Academy of Sciences, Zhengzhou China*
[e] *College of Resources and Environment, Linyi University, Linyi, China*

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ABSTRACT

In 2009, Liu and colleagues considered the parallels in topographic context between early farming sites in Southwest Asia and those in North China associated with millet cultivation. This paper extends the geography of this conceptual framework by moving south of the Qinling Mountains-Huai River divide, incorporating sites in South China that are associated with the beginnings of rice exploitation. We highlight the continuous mountain chains running from the Greater Khingan range in the northeast to the Nanling Mountains in the south that give form to China's Fertile Arc. Key sites in the northern part of the Arc are situated along China's 'Hilly Flanks' while southern sites are located in a diverse array of landforms including piedmont plains and intermountain basins. A parallel can be drawn in the context of early land choice ecological opportunism between the Fertile Crescent and China's Fertile Arc.

1. Introduction

In the context of Old World agriculture, the foothill chains along the various river catchments across Eurasia have repeatedly proven key to the locations of early farming sites (Fig. 1). These sites demonstrate a conceptual connection between the "Hilly Flanks" of the Southwest Asian Fertile Crescent (SWAFC), the Inner Asian Mountain Corridor, and north China's Foothill Arc (cf. Braidwood and Braidwood, 1953; Liu et al., 2009; Frachetti, 2012). Early settlements in each of those regions appear along elevated locations at the edge of river catchments, sometimes at a considerable distance from the valley bottom below.

Intellectual implementation of this concept can be traced to V. Gordon Childe (1936) and his suggestion of seasonal water-use enabling human settlement. In the 1960s, pioneering studies brought to light the role of geology, hydrology and ecology in constraining early farmers. Braidwood and Braidwood (1953) and Braidwood et al. (1969) emphasized the role of the "Hilly Flanks" of the Fertile Crescent along the Taurus-Zagros Arc (TZA), in the context of the natural abundance of wild ancestral plants that later became domesticates. Shortly after, Claudio Vita-Finzi (1969a) outlined the importance of fluvial geology and the subsequent down-cutting of alluvial fans, particularly along the Jordan Valley. Vita-Finzi (1969b) suggested that early communities probably took advantage of their local environments in what he calls ecological opportunism. In the decades that followed, Andrew Sherratt (1980, 1997, 2007) focused on the context of the diversity of early agriculture, particularly in the Levant and Anatolia. He noted a recurrence of early sites located at "spatially limited but highly productive environments" along the hilly flanks of the TZA and the Levantine Corridor.

There are two crucial components to this settlement system. One is a water source that is dependable and can be controlled by small family units, despite it requiring effort and ingenuity. The second component is that in those foothill locations – at least in Southwest Asia – cereals would not grow naturally and would have to be re-sown every season; this process would create ecological/anthropogenic circumstances in which domesticated cereal varieties would rapidly predominate (Sherratt, 2007).

* Corresponding author.
** Corresponding author. College of Urban and Environmental Sciences, Peking University, Beijing, China.
E-mail addresses: liuxinyi@wustl.edu (X. Liu), dmo@urban.pku.edu.cn (D. Mo).

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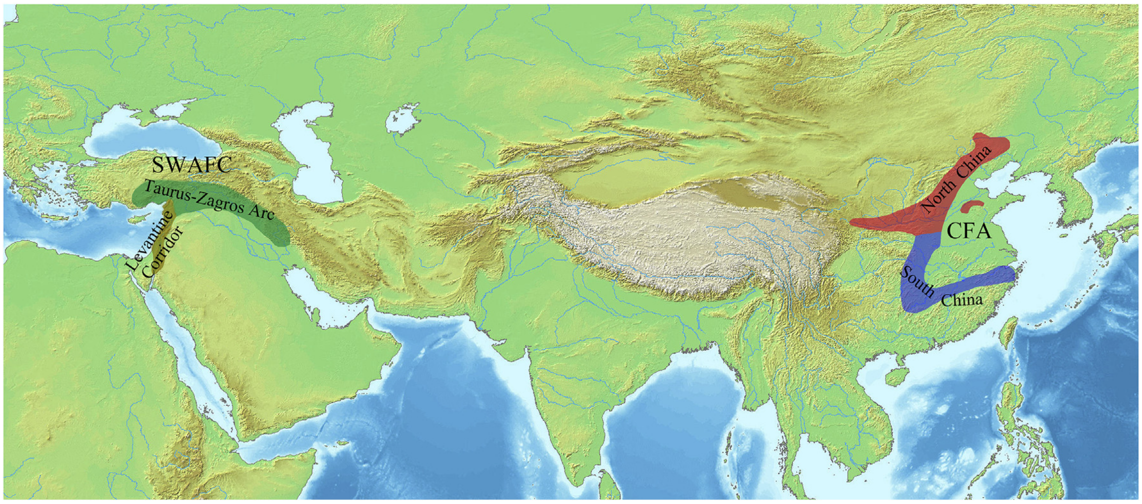

Fig. 1. Map of Eurasia highlighting Southwest Asian Fertile Crescent and China's Fertile Arc.

Beyond the Fertile Crescent, various authors have highlighted that early farming sites in other parts of Eurasia have also been concentrated around similar landscapes. The earliest village sites in southeast Iran and Baluchistan, for example, are similarly located on alluvial fans (Prickett, 1986; Petrie and Thomas, 2012). In central Asia, Michael Frachetti (2012) highlighted the role of the Inner Asian Mountain Corridor in the early spread of crops and pastoralism, and in north China, Liu et al. (2009) have noted a similar pattern of recurrent landscapes along the foothills elevated above the bottom of river valleys in the Yellow River (*Huang He*) valley. In this paper, we aim to extend the scope of the 2009 article to the south, looking at both sides of the Qinling Mountains-Huai River Line. In light of the flood of new information that has transformed our knowledge of the subject in the last decade, we ask if there are "Hilly Flanks" to China's Fertile Arc (CFA), where early communities may have taken advantage of their local environments in a kind of ecological opportunism in foraging and farming various plant foods. Before drawing the comparison between the two Fertile Crescents, we will start with early farming sites in China.

2. Foothills and the diverse origins of farming in China

Various authors have drawn attention to the location of early sites in north China that are closer to the mountains than the valley bottom (Ho, 1969; Li and Lu, 1981; Tong, 1984; Liu et al., 2009). In the same year that Braidwood et al. (1969) published the hypothesis of the "Hilly Flanks" of the Fertile Crescent, Ho wrote:

"The beginnings of Chinese agriculture had nothing directly to do with the great flood plain of the lower Yellow River; that irrigation did not begin in China until Chinese agriculture was four millennia old; and that the earliest Chinese agricultural crops are botanically quite different from those cropping systems based on a common core of wheat and barley." (1969: 2).

Our knowledge of the subject has been transformed dramatically since 1969. One of the causes behind this intellectual development is the application of flotation and various other archaeological sciences in Chinese archaeology (e.g. Zhao, 2005, 2011; Jones and Liu, 2009). These studies have revealed diverse origins and an early spread of farming within the context of contrasting geographical and ecological extremes in China. China's vast landmass ranges from tropical in the south, sub-arctic in the north, and alpine in the west. Seventy percent of this landmass is composed of mountains, plateaus and hills, and in a substantial part of the country – particularly the continental interior – the availability of water is critical. Early Holocene sites are largely concentrated in the areas to the east of this mountain and plateau system (Fig. 2). This is likely because of the enhanced summer monsoon during the Holocene, which brings moisture from the Pacific Ocean onto much of southern and eastern China and has a powerful ameliorative effect on the intrinsic aridity of the continental interior. Recent essays have helpfully placed subsistence transitions within the context of this geological and ecological mosaic, particularly in the north (e.g. Dong et al., 2012; Wagner et al., 2013; Zhuang and Kidder, 2014; Zhuang, 2015). Likewise, on a global scale, scholars have drawn our attention to the climatic context of north China and southwest Asia and the possible interaction between them (e.g. Bar-Yosef, 2011; Jones et al., 2011).

3. To the east of the plateau, north of the Qinling Mountains—Huai River line

3.1. The beginning of farming in the north

Recent archaeobotanical and archaeogenetic research makes it clear that the two East Asian millets – broomcorn (*Panicum miliaceum*) and foxtail millet (*Setaria italica*) – originated in North China (Lee et al., 2007; Lu et al., 2009; Hunt et al., 2011; Zhao, 2011; Yang et al., 2012; Liu et al., 2013). Stable isotope studies have documented that they were used as staple calorie sources in this region from about 8000 years ago (Barton et al., 2009; Liu et al., 2012, 2015c), and they continued to be staple grains throughout historical periods (Bray, 1984). It remains the case that our knowledge, however, about how the domesticated forms of these two species evolved from their wild ancestors is still limited (Liu et al., 2015b). Indeed, the wild progenitor for broomcorn millet remains unknown.

A few micro-botanical and macro-botanical reports allude to the origin of millet use in the early Holocene between 12,000 and 8000 years ago. These come from a range of sites in Hebei and Beijing including Nanzhuangtou, Donghulin and Cishan (Fig. 2). In the case of foxtail millet, processing of *Setaria italica* and/or *S. viridis* at the site of Donghulin (about 9500 years ago) and Nanzhuangtou (about 11,500 years ago) has been inferred from starch grain studies (Yang et al., 2012). Charred grains of foxtail millet were also recovered from Donghulin, but there is no direct radiocarbon date associated