New evidence for the origins of sedentism and rice domestication in the Lower Yangzi River, China

Leping Jiang¹ & Li Liu²

A newly discovered site at Shangshan in the Lower Yangzi River region has revealed the oldest open-air sedentary village and domesticated rice in south China.

Keywords: China, sedentism, early pottery, rice domestication

The Shangshan site

Shangshan is located at Qu’nan’cun in Pujiang county, Zhejiang province. It is situated on a flat basin in the upper Puyang River, a tributary of the Qiantang River (Figure 1). The site, 50m above sea level, appears to be one of many small mounds in the basin, about 3-5m higher than the surrounding ground; most of these mounds, however, have been levelled to make agricultural lands in recent decades. Archaeologists of the Zhejiang Institute of Archaeology discovered the Shangshan site during a survey project in 2000.

Archaeologists excavated an area of 600m² in 2001. The cultural deposits are about 80-100cm in thickness. The Neolithic occupation, divided into five strata and measuring up to 60cm in thickness, is superpositioned by a Shang-Zhong stratum (second–first millennium BC) and a ploughed layer. Four AMS carbon¹⁴ dates obtained from charred plants tempered in the Neolithic pottery point to a period around 10,000 cal. BP (Table 1).

The site appears to have been a sedentary village. Within the excavated area there were several dwellings and more than twenty ash pits, round or nearly square in shape. The dwelling remains are composed of rows of trenches or postholes. The earliest building, Building F2, was unearthed from the lowest strata. It was a trench-style structure, composed of a foundation surrounded by a U-shaped trench on the eastern, northern and western sides. The better-preserved western trench measures 8.5m long, 1m wide, and 10-26cm deep. The trenches on the three sides were filled with soil in different colours. This type of structure seems to be unique in the region.

Building F1, found in an upper stratum of the Neolithic period, is a structure of 14m long and 6m wide, oriented along a north-west–south-east axis. There are three parallel rows of postholes, which are 27-50cm in diameter and 70-90cm in depth. In each row the distance between postholes is about 1.6m, while the distance between rows is 3m (Figure 2). Some of the postholes are constructed with small stones on the side or base. Such a structural plan

¹ Zhejiang Institute of Archaeology, China
² La Trobe University, Australia (Email: L.Liu@latrobe.edu.au)

Received: 20 May 2005; Accepted: 14 July 2005

355
Figure 1. Map of the Lower Yangzi region and location of major sites discussed in the text.

Table 1. Carbon 14 dates from the Shangshan site

<table>
<thead>
<tr>
<th>Sample#</th>
<th>Context of sample</th>
<th>Material dated</th>
<th>$^{14}$C Date BP (T$_{1/2} = 5568$)</th>
<th>Cal. BC Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>$1\sigma$ (68.2%)</td>
<td>$2\sigma$ (95.4%)</td>
</tr>
<tr>
<td>BA02235</td>
<td>House F2</td>
<td>Pottery temper</td>
<td>8740 ± 110</td>
<td>7960 (68.2%)</td>
</tr>
<tr>
<td>BA02236</td>
<td>Pit H31</td>
<td>Pottery temper</td>
<td>9610 ± 160</td>
<td>7600</td>
</tr>
<tr>
<td>BA02237</td>
<td>Stratum ⑥</td>
<td>Pottery temper</td>
<td>8620 ± 160</td>
<td>9220 (67.1%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8790</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7950 (67.2%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7520</td>
</tr>
<tr>
<td>BK02238</td>
<td>Stratum ③</td>
<td>Pottery temper</td>
<td>8050 ± 110</td>
<td>7180 (3.5%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7150</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7140 (61.6%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6800</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6790 (3.1%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6750</td>
</tr>
</tbody>
</table>
seems to resemble the well-preserved pile-dwellings found at the Hemudu site (Zhejiang Institute of Archaeology 2003), some 150km north-east of but 2000 years later than Shangshan.

The Shangshan material assemblage includes stone balls, chipped stone tools, large grinding slabs, rectangular-shaped stone pestle, and red pottery tempered with charred plants. Due to the acid soil conditions, most organic material has not been preserved.

The stone tool assemblage shows a transition from Palaeolithic to Neolithic technologies. More than 100 stone balls, similar in size and shape, were uncovered. They are made of river pebbles, 5-10cm in diameter; while most show chipped and worn surfaces, some still have a cortex. There are many chipped stone core and flake tools, showing continuity of Palaeolithic traditions. Grinding slabs are 30-50cm in width, with a concave surface, while pestles are made of pebbles, often showing a convex surface on one side. These slab-and-pestle sets may have been used together for processing food. Some perforated pebble disks, which probably served as digging stick weights (Song & Zhou 1994), are made by hammer-dressing technique and worked from both sides. The Neolithic technology is indicated by the presence of a few finely polished stone axes and adzes, and whetstones (Figure 3).

Pottery appears to have been fired at a low temperature. The fabrics are yellowish in colour, walls are thick, in some cases more than 2cm in thickness, and the exterior surfaces seem to be covered with red slip. Most pottery vessels are tempered with charred plants, but a few with sand. Some potsherds show layers in cross-section, revealing that slab-modelling technique was employed. Based on preliminary analysis, 85 per cent of pottery vessels are flat-bottomed in shape, while a few are round-bottomed and short ring-bottomed. The basin is the dominant vessel form, with 30-50cm in rim diameter, 9.5-12.5cm in height, and 10.5-24cm in base diameter; a ring-shaped loop is often attached on the middle of
the exterior vessel wall (Figure 4). Other pottery forms include *fu* cooking vessels and *guan* jars. Most vessels have plain surfaces, but a few are decorated with cord-marks and stamped patterns. Cord-marks normally occur on the areas of loop, handle or concave spots on vessel surface, which seem to be left out after the larger part of the vessel was wiped to make a smooth surface. The stamped patterns appear on basin rims.

Pottery pastes are tempered with charred plants including rice husks. Many plant remains in potsherds contain fan-shaped phytoliths from rice stalks (Figure 5). A preliminary observation of the charred rice husks in pottery fabrics suggests that the rice is shorter in length but greater in width than wild rice (Figure 6), suggesting that the Shangshan rice was probably already in an early stage of domestication.

All previously discovered early Holocene sites, which yielded pottery or rice remains dating to 10,000 years ago, are cave sites, such as Yuchanyan in Hunan (Yuan 2002), Xianrendong and Diaotonghuan in Jiangxi (Zhang 2002), and Zengpiyan in Guangxi (Institute of Archaeology, CASS 2003). The Shangshan site is situated in the middle of a flat basin, suggesting a new strategy of sedentary adaptation.

The material assemblage from Shangshan is also very similar to those from other early Holocene sites in China, including slab-mould techniques in pottery production, simply formed and low temperature-fired pottery, perforated pebble disks, chipped stone tools, and combinations of stone slabs and pestles. These material remains suggest a subsistence mode relating to gathering and incipient agriculture.

However, Shangshan shows cultural elements more advanced than those cave sites. The construction of pile-dwellings established this long-lasting architectural tradition in the
Lower Yangzi River region. The finely polished woodworking tools provide the earliest evidence for ground stone tool technology associated with the development of sedentism in open-air sites. The pottery tempered with charred plants is the earliest example of this technology, as parallel examples did not occur until some 1000 years later at Pengtoushan in the middle Yangzi River region (Pei 1998).
Conclusion

The Yangzi River valley has been recognised as the area where rice was first domesticated. In the 1970s, with the discoveries of several rice-producing Neolithic sites dated to c. 7000 BP, such as Hemudu, Luojiangao, Caoxieshan and Songze, many archaeologists suggested that rice domestication first occurred in the Lower Yangzi River valley (Yan 1982). In the 1990s, however, new finds of early rice remains dated to 10 000-8000 BP from Yuchanyan, Pengtoushan and Bashidang in Hunan led archaeologists to switch their attentions to the
Leping Jiang & Li Liu

Middle Yangzi River region for the origins of rice domestication (Higham & Lu 1998; Pei 1998; Zhao 1998). The recent discovery of 10,000 year old rice remains at Shangshan has renewed speculation about the area of earliest rice domestication. It is likely, based on current evidence, that rice was first domesticated in a broad area including both lower and middle Yangzi River regions, and the beginning of rice cultivation was closely associated with the emergence of sedentary villages with construction of various types of dwellings.

Acknowledgements

We thank the Institute for Advanced Studies at La Trobe University for its generous support which made this collaborative project possible.

References
