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Timing of Shangshan Culture and the Process of Rice Domestication

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Phytolith remains of rice (Oryzasativa) recovered from the Shangshan site in the Lower Yangtze of China have previously been recognized as the earliest example of rice cultivation. However, due to the poor preservation of macro-plant fossils, many radiocarbon dates were derived from undifferentiated organic materials in pottery sherds. These materials remain a source of debate because of potential contamination by old carbon. Direct dating of the rice remains might serve to clarify their age. Here, we first validate the reliability of phytolith dating in the study region through a comparison with dates obtained from other material from the same layer or context. Our phytolith data indicate that rice remains retrieved from early stages of the Shangshan and Hehuashan sites have ages of ca. 9400 and ca. 9000 cal yr BP, respectively. The rice bulliform phytoliths indicate they are closer to modern domesticated species, suggesting that rice domestication may have begun at Shangshan nearly 10,000 years ago. The evidence also indicates that barn yard grass (Echinochloaspp.) was a major subsistence resource, alongside smaller quantities of acorn (Lithocarpus/Quercus sensu lato) and water chestnuts (Trapa). The early managed wetland environments might be initially harvested for multiple grain species including barn yard grasses and rice.