

## Ashmounds and hilltop villages: the search for early agriculture in southern India

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*Archaeological research on the origins and early development of agriculture in Asia has largely focused on the continent's western and eastern margins, with much less attention paid to the vast intervening regions of Central and South Asia. Now a bioarchaeological research project led by a new member of the Institute's staff is discovering how and when cultivation and pastoralism began in southern India.*

Large heaps of ash are dotted across the landscape of southern India (Fig. 1), spanning an area roughly the size of the whole of Ireland. These mysterious ashmounds, which are associated with fragments of pottery, stone tools and animal bones, puzzled many nineteenth-century British administrators. The new archaeological research reported here shows how these sites provide important clues to the lifeways of the earliest farmers and herders in southern India. Other ancient sites of human habitation, usually located on the tops of dramatic granite hills, share the landscape with the ashmounds. My investigation of ancient plant remains from these hilltop sites, as well as observations on the ashmounds, is helping us to understand the beginnings of agriculture in southern India (Fig. 2).

#### The ashmounds and the villages

This research project, which is raising new questions about, and bringing new methods to bear on, the prehistoric archaeology of southern India, is not the first occasion on which a member of staff of the Institute of Archaeology has worked in the region. Although many important observations on the ashmounds were made by the nineteenth-century Scottish geologist, Robert Bruce Foote, scientific methods were first

used to establish their origin in the 1950s by Frederick Zeuner, who was then Professor of Environmental Archaeology at the Institute.<sup>1</sup> Zeuner collected samples of ash from the mounds, including the sites of Kuppal (Figs 1, 2) and Kudatini (Figs 2, 7), and also fragments of slag-like material present in them. He subjected the samples to chemical analysis and microscopic examination and found that they resembled experimentally burnt cattle dung. The microscopic evidence showed that the ash included large quantities of silica (natural glass) derived from grass cells (known to specialists as phytoliths) which one would expect to find in the dung of grazing animals. The slag-like chunks of material came from dung that was burned at such high temperatures (1000°C or more) that the silica in these plant cells actually melted and fused. Also in the 1950s, excavations by the British archaeologist Raymond Allchin at one of the ashmounds (Utnur, Fig. 2) revealed that the layers of dung had accumulated in an area that had been enclosed by a large stockade, and in some layers cattle hoofprints were preserved in the cement-like ashy mud. Thus, the mounds appear to have been places where cattle were penned, where the dung was allowed to accumulate, and where it was episodically burned, perhaps ritually, as part of seasonal festivals.<sup>2</sup>

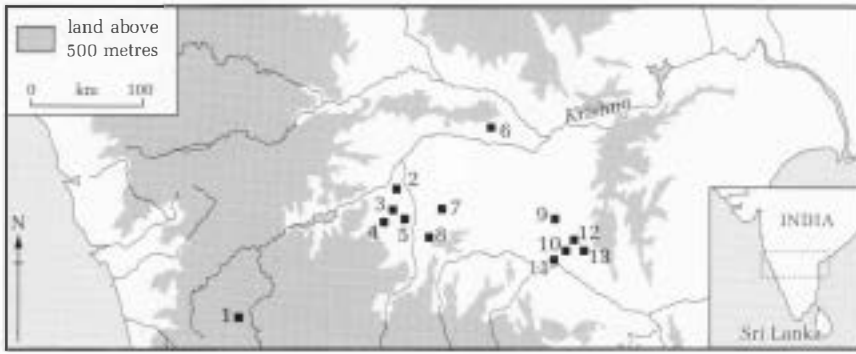
The pottery and stone tools from the mounds link them to the hilltop habitation sites. Radiocarbon dates place early sites of this culture at 2800 BC, with most sites beginning by about 2200 BC, during the southern Indian Neolithic period. By 1200–1000 BC most of them had been abandoned and societies had changed to become more hierarchical. The hilltop sites and some of the ashmounds are clustered in what may have been interlinked communities (Fig. 3). But whereas the hilltop sites may have been villages inhabited throughout the year, the ashmounds appear to have been seasonal sites where cattle were penned. Although some of the mounds are located near the hilltop villages, and probably represent sites at which the population came together at certain times of the year, others are isolated and distant from the villages and they probably represent encampments of pastoral groups who followed cyclical patterns of movement during the year. The ashmounds, and the bones of domesticated animals found there (mostly cattle, but also sheep and goat), indicate that herding was important in the economy, but it has been unclear what plant foods the people used and whether cultivation formed the economic basis of the hilltop villages.

#### Evidence of native and introduced crops

To answer these questions, I have been collaborating with Indian archaeologists from Karnatak University.<sup>3</sup> We have undertaken sampling at five of the hilltop sites with the specific aim of recovering the small remains of plants that were missed by previous generations of archaeologists, and we have also sampled seven other contemporary sites in adjacent regions. We have recovered substantial quantities of charred plant remains from the bulk samples of archaeological sediment by flotation (a method of using water to separate the light charred plant remains



Figure 1 Ashmound at Kuppal near Sanganakallu village, Karnataka State. The mound is approximately 50 m long and 5.5 m high.



**Figure 2** Neolithic sites in the states of Karnataka and Andhra Pradesh sampled for plant remains since 1997. (1) Hallur, (2) Tekkalakota, (3) Kurugodu, (4) Kudatini, (5) Sanganakallu and Hiregudda, (6) Utnur, (7) Hattibelagallu, (8) Velpumadugu, (9) Singanpalle, (10) Rupangudi, (11) Hanumantaraopeta, (12) Injedu, (13) Peddamudiyam.

from the heavier sediment, Fig. 4). In order to obtain a large sample of ancient plant material from a range of sites, flotation was carried out on soil samples taken from new test excavations and from re-cleared profiles of old excavations.

The remains of crops that were recovered include species introduced from outside southern India and some others that were probably domesticated within the region. Of particular interest are two pulses (plants of the pea and bean family), mung bean (*Vigna radiata*, which is used in Britain for beansprouts) and horsegram (*Macrotyloma uniflorum*), and two small millet-grasses that are native to southern India, known as browntop millet (*Bracharia ramosa*) and bristly foxtail grass (*Setaria verticillata*).<sup>4</sup> These pulses and

millet appear to have been the staple crops at all the sites – a finding that represents the first direct archaeological evidence for the early use of these species in the region where that may have been domesticated. All these species are summer crops naturally adapted to growing and producing seed during the annual monsoons. We also recovered from our samples some charred fragments of parenchyma (starchy storage tissue that occurs in roots and tubers), which suggests that some (as yet unidentified) tuberous foods were also cultivated or gathered as wild plants. Tubers may have been available through much of the year but are likely to have been most important as a food source in the winter (December–February) and in the dry season (March–June).

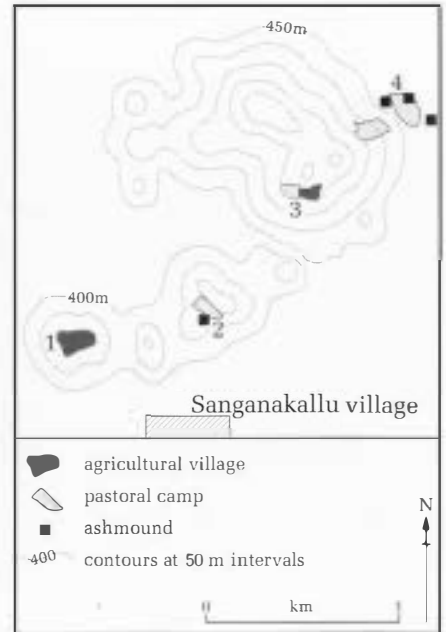
In addition to the two millets and two pulses that appear to have been the staple foods of this part of southern India, we have found evidence of several other crops that originated elsewhere in the world. At some but not all the sites we have studied, there is evidence of wheat and barley, both of which originated in Southwest Asia and spread gradually eastwards into India. Although both were cultivated in Pakistan as early as 6000 BC, they did not penetrate India until after 3000 BC. Our evidence suggests that they reached southern India by about 2200 BC, but they do not appear to have been cultivated widely, perhaps only by select communities. Wheat and barley are conventionally grown in the dry winter months in India, in contrast to the summer-monsoon crops. Therefore, their cultivation is likely to have required some form of irrigation, which implies that some communities in southern India undertook new forms of labour to increase agricultural production during the Neolithic period. Several crops from other regions were also adopted by some communities. They include pigeon pea (*Cajanus cajan*, which almost certainly originated to the northeast in the Indian state of Orissa), pearl millet (*Pennisetum glaucum*) and hyacinth bean (*Lablab purpureus*). Both of the latter originated in Africa and must have reached India as a result of some form of early long-distance contact. Taken as a whole, the evidence indicates that the Neolithic people of southern India grew native plants as well as crops that they acquired through trade with other regions.



**Figure 3** View southwest across a landscape of granitic hills and intervening plains in eastern Karnataka as seen from the hilltop of Hiregudda. The archaeological village site of Sanganakallu is visible on the central hilltop.



**Figure 4** Flotation being carried out with buckets and 0.5 mm-mesh sieves at the site of Hallur on the banks of the Tungabhadra River. Professor Korrisettar of Karnatak University at left (white hat).



**Figure 5** Distribution of archaeological sites of agricultural villages, pastoral camps and ashmounds in the Sanganakallu area, eastern Karnataka. (1) Sanganakallu, (2) Choudammagudda, (3) Hiregudda, (4) Kupgal.



**Figure 6** Elliptical hollow in granite boulder (above, with geological hammer for scale) and broken grindstone (below, with 50 cm scale) used for grinding or pounding seed foods at the hilltop settlement of Sanganakallu.

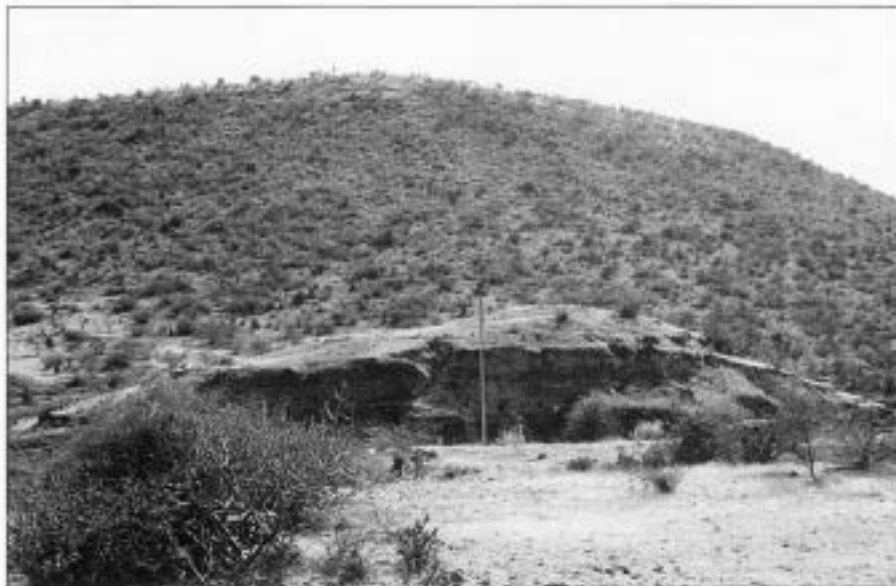
### The Neolithic landscape and economy

With this basic knowledge of southern Indian Neolithic agriculture, and its seasonal context, we can begin to understand how the ashmound sites and the hilltop villages were linked in the Neolithic landscape and through annual cycles. They can be interpreted as groups of related sites, such as those around the village of Sanganakallu (Fig. 5). In this group of sites there are two hilltop settlements (Fig. 3), both of which have produced evidence for monsoon and winter crops. These sites also have evidence for the processing of seed foods, in the form of many often large grinding or pounding hollows formed in the granite boulders around the sites, as well as separate grinding stones found on the sites (Fig. 6). These locations are likely to have been sites where crops that were grown on the surrounding plains were routinely processed, and they may have been inhabited all year round.

In this group of sites near Sanganakallu village there are also two ashmound sites, one of which is a small hilltop mound on a peak between the two hilltop settlements (Fig. 5) and the other consists of a group of three substantial mounds at Kupgal (Figs 1, 5). The archaeology associated with these ashmounds suggests shorter periods of habitation and much less, or no, processing of seed foods. They are likely to represent seasonal camps where cattle were penned (and dung accumulated) and some people camped near them. It is likely that such seasonal gatherings occurred during the period of harvest after the monsoon (October–November), when additional labour may have been needed to help with the harvests, and cattle could be grazed on the stubble of recently harvested fields. Conversely, the herds would

have been kept away from the fields during the growing season when they might have damaged crops. As is often the case, the harvest season was probably a time of festivals and the apparently ritual burning of dung at some of the ashmounds (those near to the hilltop sites) is likely to have taken place during this period. Indeed, the modern southern Indian harvest festival of Pongal, although now associated with the rice harvest in January, may have inherited elements from the Neolithic, as it includes bull chasing, ritual fires (which often include dung), and in some areas the driving of cattle across smouldering fires.<sup>5</sup>

In the winter months as the dry season (which begins in February) approached, most of each cattle herd probably dispersed with its masters into the wider territories around the villages. It is during this period that small-scale cultivation of wheat and barley would have been carried out and, as the dry season progressed, an increasing number of wild fruits and tubers would have become available for collection by both the village cultivators and the pastoralists. At some stage during the dry season, the pastoralists seem to have camped at isolated points on the landscape where their cattle were again penned, the dung accumulated and ritual burning took place. The remnants of these dispersed camps can be found in many isolated ashmounds, distant from any permanent Neolithic villages (e.g. at Kudatini; Figs 2, 7). These camps were located at natural boundaries between clusters of villages and ashmounds, such as the one near Sanganakallu (Fig. 5).



**Figure 7** An isolated ashmound, approximately 45 m long and 7 m high, at Kudatini, eastern Karnataka.

Thus, the isolated ashmound sites may have played an important role in interactions between adjacent group territories.

### Conclusion

Southern India is a region where the beginnings of agriculture have remained mysterious. Our continuing research promises to elucidate the nature of early agriculture there and to suggest how these early food-producing societies were organized. In our future work we aim to investigate how food production began, including both plant cultivation and animal herding, and what changes took place in the natural environment. The abundance of the remains of native plants in the earliest levels so far sampled indicates that indigenous crops played an important role in the local development of agriculture, a conclusion that counters the widely held view that the beginnings of agriculture in most parts of the world resulted from dispersal from one of a few primary centres. Agriculture appears to have begun in southern India during a period when monsoon rainfall was declining, and the effects of this on vegetation and human communities may be important for understanding the transition from hunting and gathering to agriculture – a process that transformed the cultural and natural landscape from one used by hunter-gatherers in the late Palaeolithic period to one transformed in the Neolithic through the practices of village agriculturalists.

### Notes

1. F. E. Zeuner, "On the origin of the cinder mounds of the Bellary district, India," *Bulletin of the Institute of Archaeology* 2, 37–44, 1959.
2. See F. R. Allchin, *Neolithic cattle keepers of south India: a study of Deccan ash-mounds* (Cambridge: Cambridge University

Press, 1963); and R. Korisettar, P. C. Venkatasubbaiah, D. Q. Fuller, "Brahmagiri and beyond: the archaeology of the southern Neolithic", in *Indian archaeology in retrospect*, volume I: *prehistory*, S. Settar & R. Korisettar (eds), 151–356. (New Delhi: Manohar, 2000).

3. My principal collaborators in this project are Professor Ravi Korisettar and Dr P. C. Venkatasubbaiah of the Department of Ancient History and Archaeology, Karnataka University, Karnataka.
4. For background on the botany and agriculture of the pulses see J. Smartt, *Grain legumes* (Cambridge: Cambridge University Press, 1990). For background on the millets see J. M. J. de Wet, "Minor cereals". In *Evolution of crop plants*, 2nd edn, J. Smartt & N. Simmonds (eds), 202–8 (London: Longman, 1995) and M. Kimata, E. G. Ashok, A. Seetharam, "Domestication, cultivation and utilization of two small millets, *Brachiaria ramosa* and *Setaria glauca* (Poaceae), in South India", *Economic Botany* 54, 217–27, 2000. For a review of native and introduced crops and archaeological evidence for their use in South Asia see D. Q. Fuller, "Fifty years of archaeobotanical studies in India: laying a solid foundation". In *Indian archaeology in retrospect*, volume III: *archaeology and interactive disciplines*, S. Settar & R. Korisettar (eds), 247–363 (New Delhi: Manohar, 2000).
5. Modern festivals in various parts of India are discussed by Allchin (n. 2, above) in relation to the Neolithic ashmounds. A general overview of Pongal and other Indian fire festivals in comparative context can be found in James Frazer's *The golden bough*, 3rd edn, part v, *Spirits of the corn and the wild*, volume II, 56, and part VII, *Balder the beautiful. The fire festivals of Europe and the doctrine of the external soul*, volume II, 1–3 (London, Macmillan, 1912–1913).