Nevertheless, the suggestion has long been that at least two distinct 'breeds' are present, one large and one small (Allchin 1963a: 45; Allchin and Allchin 1974b, 1995). It has been suggested that these two breeds of cattle were (a) longhorned (*acutifrons* or *longifrons*), slender bodied and humped (the zebu) and (b) massive and relatively short with less pronounced hump (Shah 1973; Paddayya 1975). The first variety is perfectly depicted in the rock bruisings at Velpumadugu, 20 km south-east of Bellary in Anatapur District (Rami Reddy 1976). Allchin and Allchin (1974b, 1982, 1995) have suggested that the *acutifrons* type, which is typical of south India in modern times, is clearly depicted already in the Neolithic, that it could represent an indigenous breed domesticated from local wild populations. Indeed, it is conceivable that the trend towards an increasing precentage of 'small' animals with decreasing 'normal' sized bones reported from Utnur (Allchin 1963a: 45) could represent a size reduction trend such as that expected with domestication. However, despite the presence of wild *Bos namadicus* populations on the peninsula in the later Pleistocene (Badam 1988, 1993) the evidence from Neolithic sites has remained inadequate for drawing inferences on the nativity of the species. There is now some emerging evidence to suggest that large, auroch-sized, cattle, perhaps wild, persisted in southern India into the later Holocene, as their bones have been recovered from Banahalli (Joglekar, in press). The above observations should make clear the need for more problem-oriented specialist study on the cattle of the Southern Neolithic and preceding cultures.

Caprines (sheep and/or goat) are also frequently reported from Southern Neolithic sites but in much smaller quantities by comparison to cattle (e.g. Allchin 1960, 1961; Alur 1969, 1971a, 1971b, 1971c, 1976). The presence of primitive hair sheep (replaced by woolly breeds in all parts of the world except south India and parts of subsaharan Africa), argues for its antiquity. As sheep and goats are not generally thought to have been native parts of the wild fauna of peninsular India, and were domesticated in South-West Asia (Mason 1984; Ryder 1984; Davis 1987; Legge 1996; Meadow 1996), the presence of these taxa must represent an introduction by humans, although whether by migration or through trade is unclear. Possible evidence of Caprines ('*Ovis/Capra*') in the Late Pleistocene fauna from Kurnool caves has gained much attention as possibly suggesting a local origin (Murty 1975, 1979: 339; Badam 1984; Sahu 1988: 68-73). There have been additional reports of an unidentified caprine (usually reported as 'Ovis/Capra') from Pleistocene deposits on the Peninsula (Pandey 1980-1; Badam 1988). These reports are problematic as this region is far outside of the wild range of these species, even allowing for Pleistocene climatic differences. The possibility that these few bones derive from a tahr (*Hemitragus*) a closely related genus should be explored (Fuller 1996). Today *Hemitragus hylocrius* persists in the Nilgiri Hills while its sister species *H. jemlahicus* occurs in the Himalayas (Corbett and Hill 1992). This disjunct distribution is reminiscent of numerous tree taxa which are thought to formerly had a distribution between the two regions during glacial periods (see Puri 1960: 62-8). Thus it remains unclear at what period domesticated caprines were introduced to southern India.

Because of the overriding dominance of cattle bones at the sites we feel that there has been a bias towards discussing cattle-pastoralism to the exclusion of other possible components of the Neolithic economy, including sheep-goat herding, and hunting. Understanding the contribution of sheep and goat in shaping the structure of pastoralism is of paramount importance. *Bos*, *Bubalus*, *Capra* and *Ovis* invariably occur at almost all the Chalcolithic sites between central India and the southern Deccan in the time period from 2500 BC onwards, although in varying proportions (see Thomas and Joglekar 1994). The issues relating to the antiquity of sheep/goat herding, and how this developed in southern India, whether through the immigration of pastoral groups or specialization within the existing (agro-)pastoral communities once these animals had been adopted (which they must have been since they are non-native) are to be understood clearly. One approach which has been taken to problem is through the compilation of oral traditions and myths of origin among modern pastoralists in parts of south India, especially by M.L.K. Murty (1985, 1993, 1994; Murty and Sontheimer 1980). These oral traditions record that sheep/goat pastoralism developed as an alternative amongst cattle-keeping groups. The relationship of these folk traditions to the actual cultural-historical situation remains to be established through empirical research.

Although a horse (*Equus*) is reported, the presence of the true domestic horse (*E. callabus*) has been rather controversial. The reported remains, from Hallur (Alur 1971a), are associated with the late Neolithic (probably second half of second millennium BC), and thus the presence of *E. callabus* need not be surprising on chronological grounds, since horses were indisputably present in the north-western subcontinent by the early second millennium BC (Meadow 1996). In part, the concern over the late Neolithic horse in south India has been due to the traditional view of a strong linkage between the 'Megalithic' culture and horse-riding (e.g. Allchin and Allchin 1982: 287). While the symbolic importance of horses in Iron Age burials in southern India is abundantly clear (Leshnik 1974), this does not preclude some presence of the animals at an earlier period. Indeed, as we have suggested elsewhere in this paper, the Megalithic culture should probably be seen as having evolved out of the Southern Neolithic cultures, and thus the widespread importance of the horse in funerary contexts may represent a change in the prestige and symbolic value attached to these animals rather than any real change in their presence.

Some archaeozoological evidence from particular archaeological sites suggests some environmental differences in the past, in particular more tree cover. For example, snails recovered at Piklihal suggest a more forested environment than present (Allchin 1960, 1963: 160). In addition, the jungle bovine, *Bos gaurus*, turns up in bone assemblages into the Early Historic period, such as at Veerapuram in the Kurnool district (Thomas 1984). This bovine is not widely found in this region today, presumably because of anthropogenic pressure, especially through deforestation. However, the affects of human activity are not a straightforward issue of clearance, for grazing often leads to the replacement of grassland with thorny, scrub environments (Sopher 1980), such as the *Acacia-Albizia* vegetational grouping. Further work on the changing wild fauna and its relationship to vegetational change during the Neolithic is needed.

ARCHAEOBOTANY

Although the Southern Neolithic is generally assumed to have incorporated some degree of agriculture, there has long been a lack of hard evidence. Archaeobotany, the study of archaeologically preserved plant remains, has only been sporadically undertaken on Southern Neolithic material, although the situation is now being remedied by the study of systematically collected samples, generally through the technique of flotation (e.g. Venkatasubbaiah and Kajale 1991; Kajale 1998; Fuller et al., n.d.). Even though the database is likely to expand greatly in the coming years, a brief review of what is known today and some of its possible implications for understanding the prehistoric economics and cultural evolution of south India is in order. The first observation of plant remains was by Foote who observed and commented on the impressions of straw preserved in the cinder slags at Budikanama ashmound near Kudatini in Bellary district (Foote 1916: 80). This he identified with 'the great millet (*Holcus sorghum*)', i.e. *Sorghum bicolor*, although it is not clear how he came to this conclusion since the stalks of grassers are more or less indistinguishable. This report must therefore be disregarded since more recent, systematic studies have failed to provide evidence of Sorghum. At the time of Allchin's (1963a) comprehensive discussion of the Neolithic ashmounds he could only conclude that 'There is no definitive evidence for agriculture. . . Certainly the many stone querns and the greatly worn teeth of skeletons suggest that some sort of cereals were being ground for food' (ibid.: 162). As was apparent from the examination of later literary evidence, the most likely types of crops or gathered wild food plants to have flourished in the Deccan were millets and related grasses, as well as numerous leguminous plants (pulses) (Kosambi 1963).

Although some evidence was subsequently reported, there has remained no systematic collection and analysis of archaeobotanical data until the last couple of years, in part through the efforts of the authors. Older published evidence was only sporadically collected and consisted generally of one or a few species of millet, pulse or the occasional fruit or nut (e.g. Rao and Malhotra 1965; Allchin 1969a; Vishnu-Mittre 1971, 1974; Kajale 1989). In some instances casual reports have been made in preliminary excavation write-ups, although the reliability of such information is not certain and should perhaps be regarded with skepticism until more detailed reports are available. Given the dearth of archaeobotanical reports and the complete lack of systematic study, it becomes difficult to accept the summary statement given by Paddayya:

> The rugged nature of the terrain and its general unsuitability for agricultural purposes under dry conditions on account of the thin and stony soil cover make it pretty sure that agriculture could not have been a major component of the Neolithic economy in this part of south India. In this connection, one could cite the rarity of cultivated grains at the Neolithic sites. (Paddayya 1991-2: 595)

First it should be noted the Neolithic/Formative period sites in most parts of the world yield very low densities of charred seeds (Miksicek 1987), which are therefore quite unlikely to be recovered at all without flotation of large quantities of archaeological sediment. Also, the archaeobotanical record of South Asia, clearly shows that it is primarily large cereals (wheat, barley, rice) that are recovered in haphazard, hand-collections (see Weber 1992; Fuller, in Vol. III of this series), and as these are unlikely to have been the predominant crops of the Southern Neolithic the lack of reported crop finds is as one would expect. The suggestion that the soils and dry conditions could not have supported agriculture betrays a modern bias, as this may be true for unirrigated crops like rice or wheat. Millets, however, of which there are several species native to the grasslands of India in addition to those hailing from Africa, are ideally suited to such an environment, as are native tropical pulses (for a review of these species in Fuller, in Vol. III of this series). Thus older suggestions that the Southern Neolithhic was wholely pastoral must be disregarded, and problem-orentied, systematic archaeobotany undertaken, as we hope to have demonstrated in our own investigations (discussed below; Fuller et al., n.d.). Another concern in interpreting the available evidence at the present is the chronological relaionships between sites and samples.

The clearest aspect of the available evidence is the importance of pulses, especially those of tropical origin which are usually grown in the summer (monsoon) season (*kharif*). Most of these species are of South Asian origin, and some can be attributed, with more or less certainty, to more restricted regions of probable domestication on the peninsula. The most widespread pulse on Southern Neolithic sites is horsegram/kulthi [*Macrotyloma uniflorum* (Lam.) Verdc., synonym *Dolichos uniflorum* Lam. Although this species has been generally referred to as *Dolichos biflorus,* this is in fact an invalid name for this crop as the Linnean type was a form of cowpea, for the taxonomy see Verdcourt 1970; Smartt 1990; synopsis in Fuller et al., n.d.] This pulse occurs from the earliest samples, such as the lowest level at Sanganakallu. It has also been recovered from the all regions of the Neolithic thus far sampled. The green gram/mung [*Vigna radiata* (L.) Wilczek, syn. *Phaeseolus radiatus* L.] is also widespread throughout at least the middle and later periods of the Southern Neolithic. The closely related black gram/urid [*Vigna mungo* (L.) Hepper] is less widely represented in Neolithic samples, although it has been found from late(?) Neolithic of Hallur (Kajale 1989) and from the Iron Age (first millennium BC) at Veerapuram, Kurnool district (Kajale 1984). All three species are present also in Chalcolithic Maharashtra (Kajale 1988b, 1991). All of these species are of South Asian origin. As for horsegram no populations of possible wild progenitors have been found, and it is therefore difficult to pinpoint its precise region of origin; perhaps, if the species was native to the plains of India the wild populations are extinct, although more botanical work could be in order. In the past the wild progenitors of green and black gram were considered the same species, *Phaeseolus sublobatus,* although it is now clear that both species derive from morphologically distinct populations (Arora et al. 1973; Smartt 1990). Unfortunately, the geographical distribution of these two distinct progenitors are not as well documented as might be hoped (For an attempt at synthesis see Fuller et al., n.d.; Fuller, in Vol. III of this series). Nevertheless it is clear that the mung progenitor (*V. radiata* ssp. *sublobata*) occurs in the Western Ghats and may occur to the exclusion of wild urid (*V. mungo* ssp. *silvestris*) in the southern portion of that range. Both wild types have been found in the Himalayan foothills. On contextual evidence, the co-occurrence of *V. radiata* with other indigenous species may suggest domestication in the south as do the wild populations in the Western Ghats. However, the sites where it has been recovered so far are presumably outside the ecological range in which the species was first domesticated, thus earlier finds might be expected from Neolithic sites along the Western Ghats.

Two other pulses that were probably later additions have been recovered from Southern Neolithic sites, one of which may have originated in Africa. Pigeon pea/ Tuvar/ Arhar [*Cajanus cajan* (L.) Millsp.] was derived from the wild *Cajanus cajanifolia* (formerly considered a separate genus, *Atylosia*) which is restricted to southern Orissa and Bastar (van der Maeson 1986, 1995). Archaeobotanical finds are few but suggest that the domesticate was diffusing on the peninsula in the mid-second millennium BC, i.e. Late Neolithic/Early Jorwe, including Sanganakallu (Fuller et al., n.d.), Peddamudiyam, Cuddapah district (Venkatasubbaiah and Kajale 1991), and Tuljapur Garhi, Maharashtra (Kajale 1988a). Another pulse widely recovered from second millennium BC sites on the peninsula is hyacinth bean/ sem [*Lablab purpureus* (L.) Sweet]. Although this species shows its highest diversity within South Asia, wild progenitors have not been identified there and the botanical evidence suggest an origin in East Africa (Verdcourt 1970; Smartt 1990). Thus the present evidence suggests that this crop became available through some form of sea trade that reached south India in the second millennium BC.

The staple cereals of the Southern Neolithic were millets, although probably of South Asian origin deriving from grasses native to the grassland communities of peninsular India, rather than African origin as has been claimed in the past. While in the recent past, three millets of African origins [ragi, *Eleusine coracana* (L.) Gaertn.; jowar, *Sorghum bicolor* (L.) Moench.; and bajra, *Pennisetum glaucum* (L.) R. Br] have been very important in south Indian agriculture, their antiquity in the region is still not firmly established. Evidence from Maharashtra and north India suggests that these African taxa had been introduced to South Asia *c.* 2000 BC, but they were not significant in the Southern Neolithic at that time. On the basis of work with which the authors have been involved (Fuller et al., n.d.) Southern Neolithic archaeobotanical assemblages are dominated by a fox-tail millet (*Setaria* sp.), in some cases to be idenfied with the bristly foxtial (*S. verticillata*), although the yellow fox-tail (*S. pumila,* often called *S. glauca* in the past) may also be present. The little millet, or samai, which probably originated on the peninsula and perhaps specifically in the region of northern Andhra/south Orissa/south Madhya Pradesh (De Wet et al. 1983; Hiremath et al. 1990), is also present on several sites. It is also possible that sawa millet [*Echinochloa colona* (L.) Link], another grass that is a natural constituent of the peninsular grasslands is present although definitive identification criteria are still being developed. Present in the Iron Age, and perhaps coming into cultivation during the later second millennium BC, was kodo millet (*Paspalum scrobiculatum* L.), which has been found further north from Jorwe period Daimabad (Vishnu-Mittre et al. 1986) and from the Iron Age site of Veerapuram in Kurnool district (Kajale 1984). Earlier reports of this species, although not definitely cultivated come from the beginning of the second millennium BC at Rojdi in Gujarat (Weber 1991) and Senuwar, Bihar (Saraswat et al.

1995). It should be kept in mind that all of these 'millet' species are better known today are pernicious weeds of cultivation, so careful consideration of their occurrence in the archaeological record needs to be taken in order to decide whether they represented weed or crops in the past. The ubiquity and quantity of millets from recently studied sites (Fuller et al., n.d.) strongly argues for their use as staple grains, especially *Setaria* sp., although it remains ambiguous as to whether these were actually domesticated or extensively gathered in the wild. The high level of purity of the samples, with relatively few other grasses present argues for cultivation.

On the basis of an extensive review of the archaeobotanical record of South Asia (Fuller 1999, in Vol. III of this series), and an ongoing comparative study of modern and archaeological millet specimens, it was concluded that 'the presence of *E. coracana* in south India during the Neolithic period, needs to be regarded with scepticism until more definitive specimens are recovered' (Fuller et al., n.d.). This millet has in some cases been clearly mis-identified, and until clear reliable criteria are published and accepted, published reports that are undocumented by illustration must be regarded with scepticism. Reports of *E. coracana* from the Southern Neolithic period are several, although these reports are problematic, and are not accepted as definitive in the present review. The preliminary reports of finger millet from several Southern Neolithic sites, Paiyampalli (Rao 1968, 1969) and Watgal (Devaraj et al. 1995), have not been affirmed by specialist study and adequate publication. In the case of Neolithic *Eleusine coracana* reported from Hallur (Vishnu-Mittre 1971), the identification has been already criticized (Hilu et al. 1979; also Fuller et al., n.d.). Subsequent sampling from Hallur failed to turn up *Eleusine* (Kajale 1989; this study). Vishnu-Mittre's (1971: 126) discussion of comparative material of other millets he considered, including *Setaria italica, Panicum* spp., and *Paspalum scrobiculatum,* indicates that he examined them as hulled seeds. Since he did not take into consideration the form of the de-hulled caryopses of these other genera, the attribution to *Eleusine* may have been due to a false process of elimination in which *Eleusine* was assumed because it was the only small, free-threshing millet. The published photographs, although inadequate for identification, are more suggestive of *Setaria* or perhaps *Echinochloa.* Thus the reinterpretation of the published photographs from Hallur, suggests that this evidence fits into that recovered from the extensive, systematic sampling carried out by us (Fuller et al., n.d.).

The presence of charred parenchyma fragments in most samples suggests the likelihood of tuber/rhizome use (Fuller et al., n.d.). Parenchyma is the starchy, storage tissue of plants, and is found in particularly large quantities in tuberous organs. Small fragments can be preserved by charring, and in some cases can be identified on the basis of high resolution/high magnification study using a scanning-electron microscope (Hather 1991, 1994a, 1994b). It is likely that parenchyma has been present in samples in the past but simply overlooked because it was not clear what this material was until recent comparative stuides were aimed at identifying root crops. Preliminary evidence from Southern Neolithic sites indicates much larger quantities of parenchyma tissue in earlier levels on sites such as Sanganakallu than are present in samples of later periods. Although the necessary study for identification is ongoing, it should be remembered that there are numerous wild yams (*Dioscorea* spp.) native to southern India which are known ethnographically to be gathered and eaten. In addition ginger, turmeric and their relatives (Zingiberaceae: *Zingiber* spp., *Curcurma* spp.) are also native, edible tubers of the peninsula. We have suggested that, one hypothesis to consider in future work is that the domestication of pulses and tubers occurred when they were brought from the forested, hilly ecological zones on the eastern and western sides of the Peninsula, where pulses occur at the forest margins and wild yams are numerous, into the central Deccan plateau where the climate is somewhat drier and dominated by grasslands. In these grasslands wild millets would have been readily available and these may subsequently have become the focus of cultivation. Later intensification of cereal production decreased the importance of tubers. (Fuller et al., n.d.). This evidence can perhaps be considered in the context of the hypothesis made on theoretical and ecological grounds by Harris (1972, 1973) that tuber crops were of primary importance in the semi-arid tropics and their use may have preceded grain-based agriculture in such environments.

In addition to the staple food stuffs outlined above, Neolithic folk would have utilized gathered fruits, nuts, vegetables and other produce. Unfortunately there is less evidence for these kinds of food, and generally less opportunity for their use to be preserved archaeologically. Nevertheless fruit pits, and nut shell fragments are often charred, and numerous small, unidentifiable fragments of these types of structures are present in samples recovered by us. In addition, one fruit which is widely preserved and recovered archaeologically is *Ziziphus* sp. (probably *Z. mauritania,* syn. *Z. jujuba* auct. pl.*)* the jujube fruit. This was certainly utilized in the Neolithic (Vishnu-Mittre 1971; Kajale 1991). In addition, sampling during the recent excavations at Budihal, as far as they were reported in the preliminary reports of Paddayya (1993a, 1993b), also provided finds of *Cordia* sp. (which could be *Cordia myxa* L., sebesten plum, a native edible fruit), and *Phyllanthus emblica* L., emblic myrobalan, which has edible fruits. Both of these fruits are also found at Chalcolithic sites in Maharashtra, such as Inamgaon (Kajale 1988b), and were no doubt age-old fruits gathered by foragers.

What is most intriguing about the three fruits reported from Budihal, is that they represent the only major plant remains recovered through flotation on the site, with cereals and pulses being absent (Paddayya 1993a, 1993b). This contrasts rather drastically with the situation at hilltop settlement sites in the Bellary district, as discussed above, and from Watgal (Kajale 1998). A plausible reason for the distinctive assemblages on the part of Budihal is that either crops were not being dealt with in the same manner at this site as they were at settlement sites like Sanganakallu or Tekkalakota, but rather cereals and pulses were not being processsed (threshed, winnowed, de-hulled) on or near the site (and thus not providing material for charring and preservation). Alternatively this could suggest that Budihal was itself a seasonal site and agricultural produce was for the most part absent during the season it was occupied. This hypothesis is supported by the fact that most of the three fruit species present have fruiting seasons at variance (winter and/or dry season) with the millets and pulses (i.e. monsoon growing season with post-monsoon harvest). This has potentially a very important bearing on understanding variation in the nature of Neolithic occupations (see below).

Particularly intriguing is the recent report of *Areca* nut fragments from Watgal (Devaraj et al. 1995). This is today a popular stimulant chewed throughout India and South-East Asia. It is unclear whether *Areca catechu* palms are native to the Deccan (in addition to Southeast Asia) or whether this must be seen as an introduced, cultivated species (cf. Uhl and Dransfield 1987). Further research into this problem is warranted. Given that there is as yet no evidence for any other kind of aboriculture (the growing of tree crops), it is plausible to assume that *A. catechu* was available wild. The usual accompaniment, betel leaves, come from *Piper betle* which is not reported in a wild state in south India (Gamble 1921), and therefore must be assumed to have come to India from South-East Asia. The period at which this latter introduction occurred is unclear.

In order to put the Southern Neolithic into its broader geographical and historical context, some comments by way of comparison with the broadly-contemporary Chalcolithic societies of the northern peninsula will be attempted. We draw, in particular, on the evidence from Navdatoli (Vishnu-Mittre 1961), Inamgaon (Kajale 1988b), Daimabad (Kajale 1977; Vishnu-Mittre et al. 1986), Tuljapur Garhi (Kajale 1988a, 1996), Apegaon (Kajale 1979), Kaothe (Kajale 1990) and Adam (Kajale 1994). Leaving aside the few shared fruit species, some of the emerging contrasts between the northern and southern Deccan are intriguing, highlighting interregional agricultural differences that suggest distinctive trajectories of cultural evolution. Most of the available archaeobotanical evidence from the northern peninsula comes from Malwa and Jorwe phase levels, i.e. 1700-1000 BC. Indeed there are very few village sites that can definitely be dated to earlier periods in Maharashtra and central India, with some sites like Daimabad, Kayatha and Savalda going back to *c.* 2000 BC or, the last centuries of the third millennium BC (see Allchin and Allchin 1982; Liversage 1991; Possehl and Rissman 1992). None of these sites is as early as the early Neolithic in south India, and archaeobotanically the Chalcolithic sites consistently showed a mixtures of crop source groups (see Fuller in Vol. III, of this series). The Chalcolithic farming cultures of Maharashtra can be seen as combining the Near Eastern crops from the Harappan Civilization and the pulses and small millets deriving from the Southern Neolithic. The northern Deccan mixed farming economy of the second millennium BC appears therefore to be directly related to the developments in both the southern Deccan and north-western India. The Maharashtra Chalcolithic therefore might be viewed as a product of amalgamation. Thus despite the fact the Allchin (1969a), Hutchinson (1976), and Liversage (1989) grouped the enitre Indian peninsula into an ancient agricultural province, it is now becoming clear that rather different historical trajectories of agricultural evolution occurred in the northern and southern Deccan, and it is quite plausible that a different story still will be found for the eastern edge of the peninsula.

It was often assumed that the domestication of animals and plants represented a great discovery, like a scientific breakthrough (e.g. Vishnu-Mittre 1970; Vishnu-Mittre and Guzder 1975), although it has come to be realized that many, if not all, of the genetic changes in animals and plants that define domestication may have been unconsciously brought about as the result of the nature of interaction between humans and particular species. What is therefore of interest is reconstructing the social and ecological circumstances that led to an increased dependence on harvesting, storing and sowing and thus produced the selective pressures that led to domestication. As more systematic evidence comes to elucidate the animal and plant species utilized and domesticated by the Southern Neolithic folk, research should also turn to addressing the larger processes of domestication and agriculturalization in south India. To what extent were societies native to the tropical moist deciduous forest zones, such as along the eastern fringe of the Western Ghats, or of the Tropical scrub or dry deciduous vegetational zones, or grasslands primary? One major stumbling block to answering this question at present is our poor understanding of what the vegetational communities were like and their distribution in the Neolithic. Once the Southern Neolithic comes into focus we can ask how the processes on the Indian peninsula compare to those in other parts of India and the rest of the world.

THE ENVIRONMENTAL SETTING AND CLIMATE CHANGE: CAUSE FOR CONTROVERSRY

Various suggestions have been made about the state of the natural landscape during the Southern Neolithic and the impact of this culture on the landscape, although there has been little empirical archaeological or palaeoecological work on the subject. More palaeoecological data and modelling is needed. The vast sub-Tropical (savanna) grasslands of India are believed to be largely anthropogenic (Bor 1960: 31-3; Puri 1960; Whyte 1968: 167, 173; Misra 1983). The clearance activities of the Neolithic and the grazing of their herds has been implicated in their formation (Nagaraja Rao and Malhotra 1965: 90; Vishnu-Mittre 1971: 130). However, as the review by Cole (1986) suggests many of the modern regional plant groupings may have a greater 'naturalness' and antiquity than earlier foresters allowed for. Surely the vegetation on the peninsula must have adjusted to global climatic trends, as they affected the Indian ocean monsoon system, which certainly occurred during the course of the Holocene (see Lamb 1977; Bryson and Swain 1981; Grove 1993; Wasson 1995), although it is still far from clear what the local or regional affect would have been, how rapid or intensive changes occurred, and to what extent apparent climatic affects on the vegetation were exaggerated by human impact.

Although it is beyond the scope of this paper to explore these issues in detail, it must be noted that there are difficulties in correlating and interpreting the available evidence and more work is clearly warranted. Pollen evidence from northwestern India (Singh et al. 1974; discussed by Bryson and Swain 1981; Wasson 1995) and the Arabian Sea (Caratini et al. 1991; 1994) could suggest a wetter period with more forest species in peninsular India in the third millennium BC, followed by a period of aridification (for a more detailed critical discussion of these and other sources see Fuller and Madella, in Vol. II of this series; Korisettar and Ramesh in Vol. III of this series; Korisettar and Rajaguru, in press). In addition, alluvial sedimentation changes have also been linked to aridity (Rajaguru and Kale 1985; Mishra 1995; Pappu 1995). Both the sedimentological and palynological evidence, however, could equally well record a period of increased anthropogenic impact brought about by agricultural expansion or intensification (Meher-Homji 1990, 1994a, 1994b, 1996; Subash Chandran 1997; Fuller and Madella, in Vol. II of this series). The suggestion that this hypothetical aridity led to social destabilization and settlement impoverishment, as argued in the context of Chalcolithic Maharashtra (Dhavalikar 1988, 1995), is problematic. One particular problem is that of chronological correlation, as palaeoecologists use uncalibrated radiocarbon ages as standard, while archaeological periodization tends to be based on calendar years (i.e. calibrated). When calibrations are taken into account, including factors like the marine reservoir effect, many of the periods of change documented in individual sequences become quite disjunct chronologically (e.g. Singh et al. 1974 *vs.* Caratini et al.1994, and either of these aridifications with the Late Jorwe transition of Dhavalikar 1988). Thus the equifinality of global and local climatic changes as well as a human degradation of the landscape must be taken seriously.

Looking at the geographic area covered by ashmounds in the southern Deccan, it is observed the ashmound distribution also coincides with the core area of the Western Ghats' rainshadow, a semi-arid scrubland ecosystem, with an average modern rainfall of less than 800 mm (Fig. 13), lying mid-way between deciduous forest ecosystems of the Western and Eastern Ghats (see, e.g. Allchin and Allchin 1997). Much of this semi-arid region today is dominated by savanna grassland of the *Sehimia/Dicanthium* type (Whyte 1968; 1975), although it is not clear to what extent this plant community has been created by the impacts of human activities including agriculture and extensive grazing of domestic herds. It is generally suggested that since Pleistocene times the region has been a good habitat for a variety of herbivorous game animals, and later domestic cattle, sheep and goat (Murty 1975), although it is not clear whether the actual habitats were similar to those encountered today, due to the extensive impact of human activities on the ecosystem (Puri 1960; Mishra 1983; Meher-Homji 1990, 1996). One of the main challenges for future bio-archaeological and palaeoecological research is to better define the nature of the changing environmental conditions on the peninsula during the Holocene.

The potential role of a wetter than present third millennium BC followed by aridification of climate sometime in the early to mid second millennium BC certainly must be taken into consideration, as one working hypothesis (Korisettar and Ramesh, Vol. III of this series), and this fits with the general suggestion that the southern Deccan was somewhat wetter and certainly more heavily forested than today in the early Neolithic (e.g. Allchin 1963a: 160). There are a few pieces of suggestive evidence from fauna (cyclophorid snails, and *Bos gaurus*) mentioned above, and there has been at least one possible contribution from archaeobotany. The evidence of teak (*Tectona grandis*) at Hallur suggests a more forested area near the site, and thus perhaps a more humid climate than at present (Vishnu-Mittre 1971: 129-30; Vishnu-Mittre and Savithri 1990), although this could also indicate nothing more than a shift in the distribution of forest due to human clearance activities, or the seed could have been non-local. A possible additional piece of evidence comes from the analysis of the buried 'soil' at the base of the Kupgal ashmound (Mujumdar

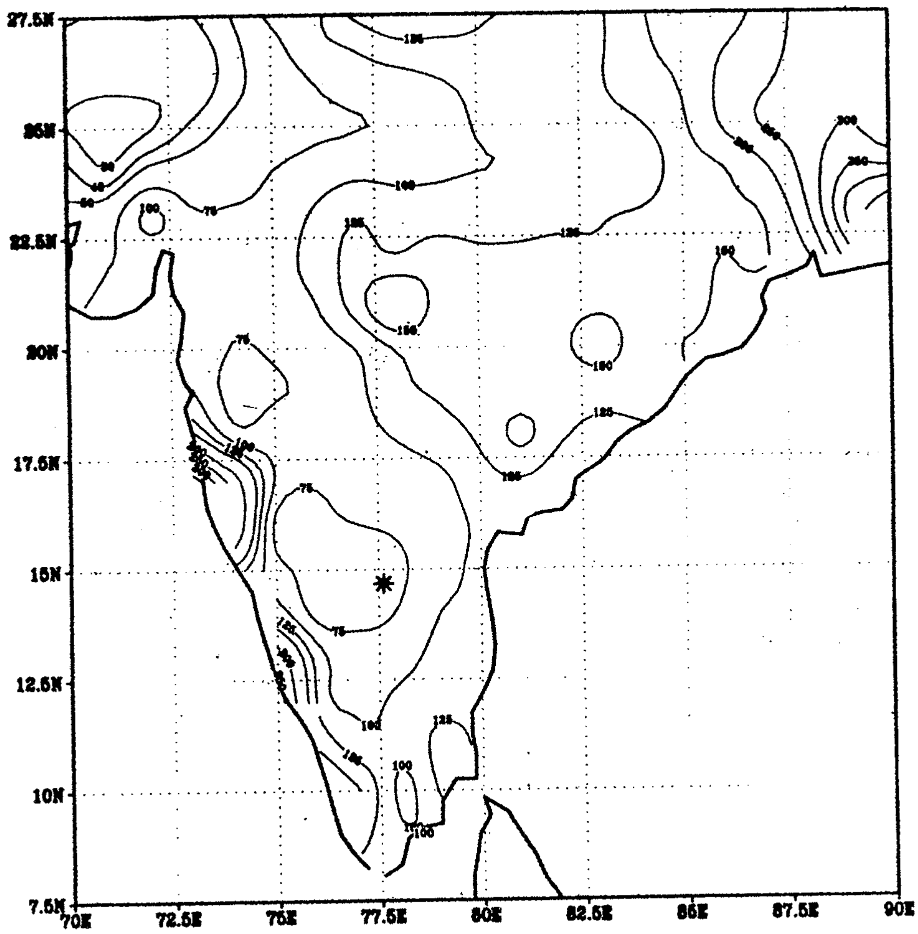

Fig. 13: Variation of annual rainfall over the peninsula, the line around Anantapur (*) covers the area covered by the ashmounds in the southern Deccan with an annual mean rainfall 75 cm (after Gadgil et al. 1999).

and Rajaguru 1966), although the present authors are not convinced that this represents a natural palaeosol rather than an artificial creation (see below). Majumdar and Rajaguru (1966) compared a modern soil with this buried layer and revealed more humus and a higher carbon : nitrogen ratio, and less calcium carbonate than in the modern soils (ibid.: 43). If these are indeed comparable soils, this evidence would suggest a more degraded soil with higher evaporation, which Mujumdar and Rajaguru (1966) would attribute to an increase in aridity during the past four millennia, although these changes would no doubt also have taken place simply with the removal of tree/bush cover of the soil which can be assumed to have taken place during or since the Neolithic. Thus this evidence also can be seen as more indicative of human impacts than of climatic change (if it is accepted as a palaeosol). The whole of the palaeo-environmental evidence for south India raises more questions than it answers at present and makes a strong case for more problem-oriented research in this area.

ETHNOGRAPHY AND ETHNOHISTORY OF PASTORALISM

Given that the evidence suggests that cattle pastoralism was central to the Neolithic economy, it may be worthwhile considering modern pastoral communities in India to assess similarities, differences, and the likelihood of cultural descent. This ethnographic and historical approach was explored by Fürer-Haimendorf (1948, 1953), Allchin (1963a, 1963b), Nagaraja Rao (1965), Naseem Amar (1981) and more recently by Murty (1985, 1993, 1994; Murty and Sontheimer 1980), and Venkatasubbaiah (1992). The use of oral traditions amongst pastoralists and tribal groups must be seen in the context of the increasing use by archaeologists of ethnographic analogies and attempts to get at 'non-Vedic' traditions. In the 1930s and 1940s the reconstruction of culture history of India was based on using Puranic and Sanskrit literature, and this approach gained momentum with the growth of nationalism and declaration of Independence. But in the 1950s, the discovery of Jorwe and a small excavation at Nasik opened up a new chapter in Indian archaeological research, leading to the identification of the Neolithic-Chalcolithic phase in the northern Deccan. During the excavations that followed (between 1950 and 1970) at sites in the Narmada valley and in the northern and southern Deccan, Sankalia began to take a strong interest in looking for modern ethnographic parallels, especially during the Ahar excavations (Nagar 1966; Sankalia 1978). It should be to the credit of Sankalia that ethnoarchaeology of Southern Neolithic was taken up by one of his pupils, M.L.K. Murty, since 1970 (e.g. Leshnik and Sontheimer 1975; Murty and Sontheimer 1980; Zvelebil 1975). Murty's work, however, moved beyond ethnoarchaeology in the strict sense of looking for parallels in material culture by using folk traditions. Ethnohistorical study of pastoral communities such as Kuruvas and Gollas was taken as a means of reconstructing the pastoral way of life during the Mid- to Late-Holocene (Murty 1985, 1993, 1994). The possbile contributions of folk traditions and non-Vedic literature (such as *Cankam*) has been realized but still needs to be compared and integrated with the hard evidence of archaeology.

Selecting the most appropriate ethnographic parallel remains an unresolved challenge. Allchin (1963a), for example, noted apparent similarities between the annual cycle of the Todas, a tribe in the Nilgiri Hills, and the transhumant lifestyle of the Southern Neolithic, including the erection and re-erection of cattle-pens. Indeed, the Toda even possess myths/legends, that include that burning down of the pen in a manner that is reminiscent of the archaeological ashmounds. Paddayya (1993a, 1993b, 1998), on the other hand has drawn comparisons with modern peasant villages (although most of these modern villages must include agricultural population). The Kuruvas and Gollas in Andhra Pradesh and Karnataka are the groups that Murty drew upon in his enquiry into the origins of pastoralism in the region of our study. These communities live in permanent settlements (unlike the Dhangars of Maharashtra) and perform agriculture in a supplementary capacity. In north-eastern parts of Karnataka most shepherd-pastoralists are settled cultivators, and it was observed that size of their population is relatively larger in villages located on rocky soil and without irrigation possibilities. This pattern may explain the settlement pattern observed both in the case of ashmounds and burial complex sites of the Neolithic and Iron Age respectively. It may be that the expansion of agriculture land forced the pastoral communities to the hills and marginal areas of forests facilitating a symbiotic relationship with hunter-gatherers and pastoral communities. However, this suggestion is yet to be confirmed by the chronological pattern of Neolithic site types, and it should be noted that it is contradicted by the ordering of the Allchin's (1968, 1982) three-phase scheme which suggests that pastoralism was first (i.e. ashmound sites) and that fully sedentary sites, now known to have evidence for agriculture, the hilltop sites, are largely later. Oral traditions among contemporary pastoral communities in the Rayalaseema region do indicate the antecedence of cattle pastoralism over sheep-goat pastoralism. The sheep-goat pastoral communities also claim their descent from an ancestral agricultural stock (Murty and Sontheimer 1980; Murty 1989, 1992, 1993). In addition, oral traditions have been interpreted as indicating large scale clearing of forests for agriculture with the coming of iron technology.

The relationship between pastoralism and agriculture in the Southern Neolithic remains to be clearly defined. Pastoral groups are often able to take advantage of a range of 'pasture lands, which from the agriculturalists's point of view are marginal resources' (Leshnik 1972: 150-1; also Harris 1998). Unarable tracts of land around arable tracts can provide good grazing for flocks and herds, as can the stubble of arable fields after harvest. Today, pastoralists and cultivators represent distinct social groups (i.e. separate castes or tribes) but it need not be the case that Neolithic society was so divided. Association and interaction between settled agricultural communities and nomads arise out of the need for grain in exchange of various secondary products of animals. Thus modern pastoralism in southern India, provides a good illustration of the widely accepted anthropological principle that pastoralists rarely exist without contact and dependence upon settled agricultural communities (e.g. Chang and Koster 1986). However, this maxim may not apply to all Neolithic situations, as there appear to be cases in which domesticated animals were herded for subsistence prior to or in the absence of agriculture, for example in the

Sahara during the Mid-Holocene wet phase and on the south-western cape of Africa until the time of European contact in the seventeenth century (Smith 1984; Close 1995; Wetterstrom 1998). In addition, it has been suggested that sheep and goat herding arose in the eastern fertile crescent (i.e. Iran) prior to the presence of cultivation there and that the two economies were only later integrated (Hole 1989; but this model is not accepted by all, see Thorpe 1996: 8; Bar-Yosef and Meadow 1995; Harris 1998). Thus if we hypothesize that herding was practiced in some region(s), early in the Neolithic, in the absence of any agriculture (which is *possible* on current evidence), then modern parallels are likely to be uninformative on ecological matters, since modern pastoralists are essentially specialists within a larger agro-pastoral system. In modern south Indian pastoralism it is generally unwanted males or old and sick females that are slaughtered, although it must be recognized that this is largely a product of the extensive use of milk and the use of cattle for traction. The antiquity of these two 'secondary products revolutions' (sensu Sherratt 1981, 1983) in south India is unclear, although sometime in the second millennium BC for both of them seems likely (Fuller 1996). And this is one area that requires empirical investigation, especially through the age-profile and palaeopathological study of archaeozoological assemblages.

There are also different patterns by which pastoralists can move, including radial, circular and vertical (Palmieri 1982; see also Butzer 1982: Ch. 13). Today, the radial system predominates, in which pastoralists move out from and back to a permanent village, although some groups follow the circular pattern in which annual and seasonal circuits of movement are followed. In radial pastoralism it is often one segment of society (such as men) who move with the herds while other age/gender cohorts (women and children) stay behind in the permanent village and tend agricultural fields. The presence of an infant burial at Utnur implied, however, the women and children (thus whole nuclear families) undertook movement with the herds in the Neolithic (Allchin 1963a). In general the circular pattern of pastoralism would seem to be more congruent with the hypothesis that ashmounds represent temporary encampments (Allchin 1961, 1963a, 1963b; Allchin and Allchin 1968). In the following section we will address some of the problematic issues surrounding the understanding of the ashmounds before providing some working hypotheses relating the ashmound sites to the overall Neolithic settlement pattern.

THE ASHMOUNDS: ISSUES AND EVIDENCE

Perhaps the most unique component of the Neolithic of the southern Deccan are ashmounds. As already noted, these sites represent large heaped accumulations of cattle dung that were episodically burnt often at high temperatures (Fig. 14). This understanding of site formation had already been suggested by Bruce Foote (1887a, 1916), and has been established through the problem-oriented investigations of Zeuner (1959), Allchin (1961, 1963a, 1963b), Mujumdar and Rajaguru (1966), and Paddayya (1973). In the post-Independence period Zeuner (1959) and Allchin (1961, 1963a and 1963b) renewed

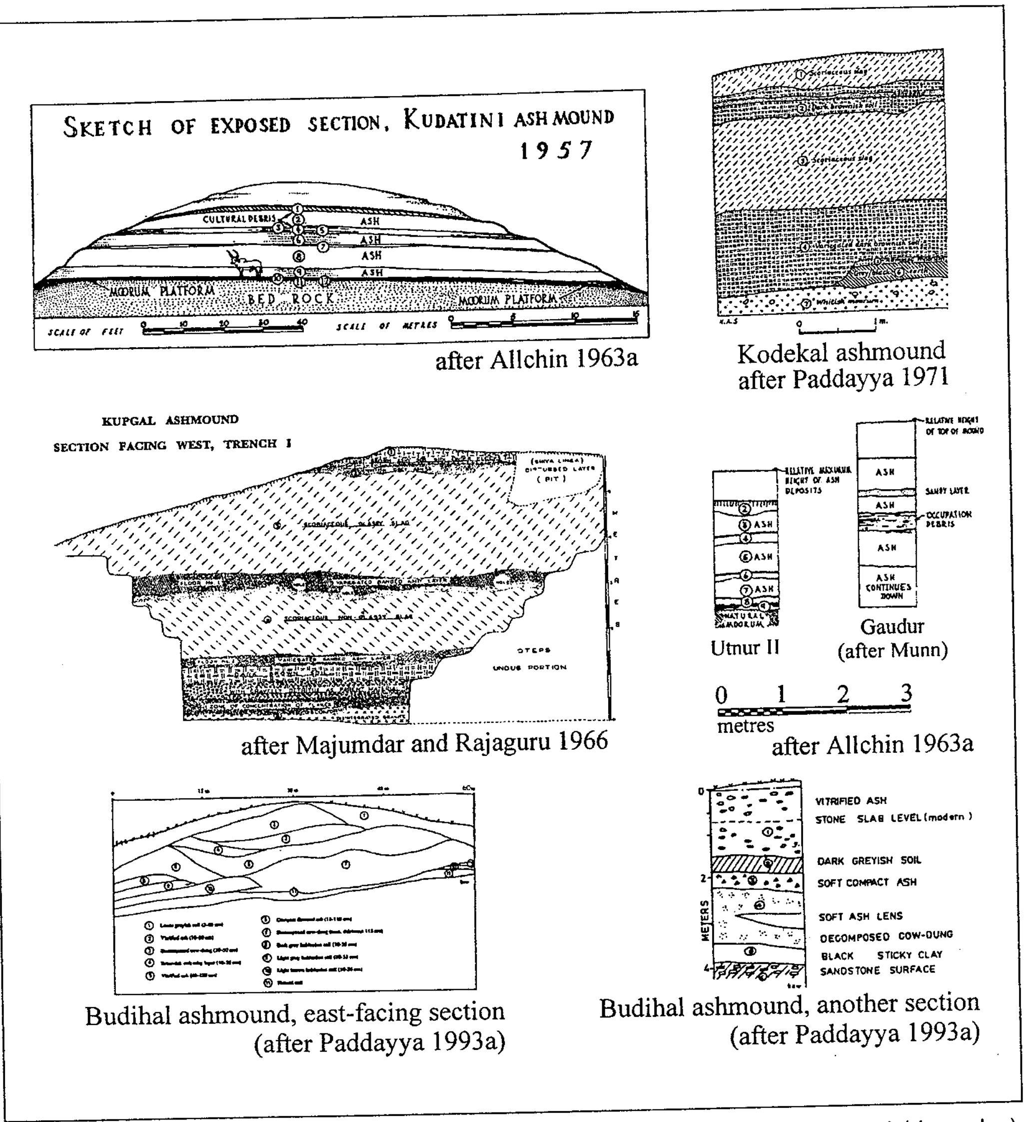

Fig. 14: Stratigraphic profiles of selected ashmounds (after various authors: note variable scales). Note the occurrences of non-dung layers within the mounds and the generally episodic nature of ash layers. Only Budihal shows clear evidence for irregular heaping.

interest in ashmound research and reasserted the Neolithic origins of the ashmounds. In the 1950s Allchin excavated the Utnur ashmound (Allchin 1961). Mujumdar and Rajaguru (1966) excavated the Kupgal ashmound. Paddayya (1973) later took up work at Kodekal, Sundara (1969-70; 1971c) worked at Terdal, and Rami Reddy (1976) at Palavoy. During the 1970s and 1980s a re-examination of the Brahmagiri trenches of Wheeler (Sundara 1985: 43, 1987) and excavation at Hulikallu near Kalyandurg in Anantapur district (Krishna Sastry 1979) are significant. The 1990s have witnessed an invigorated interest in the problem of ashmounds from contemporary methodological perspectives leading to the excavation of Budihal in Gulbarga district, Karnataka (Paddayya 1993a, 1993b, 1998; Paddayya et al. 1995). The renewed interest has been reflected in three review articles on the ashmound problem published during the last fifteen years (Rami Reddy 1990; Sundara 1987; Paddayya 1991-2). A number of issues of debate have arisen through work on the ashmounds, notably the problem of their age, the causes of their formation and the nature of human habitation associated with them.

The bulk of the evidence argues clearly for the Neolithic date of all the explored ashmounds (Allchin 1961, 1963a; Allchin and Allchin 1968; Paddayya 1973, 1991-2, 1993a, 1993b), although two authors have continued to assert an Iron Age associaton. The Iron Age position has been argued by Rami Reddy (1976, 1977, 1978, 1990) on the basis of finds at Palavoy, and Sundara (1971c, 1975: 178) on the basis of work at Terdal in the upper Krishna valley. In asserting Iron Age dates they follow the earlier sug-gestions of Munn (1934), Yazdani (1935-6b) and Woolley (1940). Reddy recovered an iron nail from one of the stratigraphic layers in the excavated trench at Palavoy which he argued dated the entire ashmound tradition to the Iron Age. Resting chronology of a vast area on a single find, that could be intrusive, is insecure as it contradicts most of the available radiocarbon dates and the relative chronology established from stratified sequences of ceramics (such as at Brahmagiri, Maski or Pikhlihal; for other intrusive iron finds in Neolithic levels see Devaraj et al. 1995). Furthermore, all this find may indicate is that some ashmounds persisted into a period when iron became available which could have been as early as *c*. 1300 BC in south India (Chakrabarti 1992). Indeed Sundara's identification of dung ash layers that included some vitrified nodules in the stratigraphic sequence of Brahmagiri, could indicate either that dung burning continued on some scale up to the beginning of the Iron Age or else that deposits from ashmounds were being reused in habitational contexts, perhaps as plastering material (for which the ashmounds are often quarried to this day). It must be noted, however, that Sundara's assertion of the late date of these ash deposits (1100-900 BC) is based on the correlation of the 'Jorwe' type decorated ceramics with the uncalibrated radiocarbon dates for the Jorwe phases in Maharashtra. As noted above, however, in the discussion of ceramics, the evidence from Watgal pushes this decorative style back to 2000-1800 BC in the Raichur Doab of Karnataka. Thus the ash layers at Brahmagiri may be well within the accepted period of the ashmounds.

It is clear that there was a continuing symbolic importance for burnt dung in periods after the heaping and burning of the ashmounds had ended. This is attested, for example, by the 'ash circle graves' of the Raichur and Shorapur Doabs. These mortuary monuments consist of stone-lined graves, which after internment (usually of urn burials), are covered over with ash. Allchin (1963a) has even suggested that this ash was likely to have been brought from nearby ashmounds. Thus while the ashmounds would have continued in many cases to be important places in the cultural landscape, there is no reason to believe that they continued to be formed to any great extent after the early second millennium BC (representing Allchin's Upper Neolithic, or Phase II of Allchin and Allchin 1968, 1982).

In addition there remains no evidence that the ashmounds were in any way involved with metal-working. An argument made by Rami Reddy is especially problematic and misleading: his claim that the ashmounds are partly made up of slag from Iron working (Rami Reddy 1976, 1977, 1978). While iron is one of the chemical constituents of dung, as found in the earlier analyses of Smith (Foote 1996: 95; Allchin 1963a: 81), Zeuner (1959) and Mujumdar and Rajaguru (1966), it does not therefore indicate that the scoiraceous material that is usually part of these mounds is iron slag, as Reddy (1976, 1977, 1990) suggests on the basis of his own chemical analysis (which agrees rather well with the earlier studies). As the chemical analyses clearly indicate the scoriaceous material is some 60 per cent silica, deriving no doubt from the grasses and other plant material browsed by cattle (Zeuner 1959; Allchin 1963a: 80-6). Reddy's claim to have found a piece of iron ore at the Gudekal ashmound is unsubstantiated. The present authors visited that site on two occasions (in 1997 and 1998) and explored the surrounding hills extensively, without finding any unusual geological deposits of ferruginous minerals nor ore. The site, like many others, is placed near the summit of a peak of reddish granite overlooking a dolerite dyke and there is no apparent local source of iron. It can only be assumed that Rami Reddy mistook an unusual piece of scoriaceous dung for iron slag. Thus we are left with no evidence to contradict the Neolithic dating of the ashmound and the cattle dung source of their matrix.

A more problematic issue is the nature of human habitation associated with the ashmounds. This issue has been raised recently by Paddayya (1991-2, 1993a, 1993b; also Devaraj et al. 1995) who critiques the earlier understanding of Allchin (1963a). There are two key elements of Paddayya's critique which must be assessed independently. First, there is his suggestion that ashmounds are invariably associated with Neolithic village sites, and that human habitation is to be found around the perimeter of *all* ashmounds. Second, there is the questioning of the three-phase evolutionary sequence of the Southern Neolithic, that sees only ashmound sites in the first phase with more permanent settlement sites developing only at a later date (Paddayya 1991-2, 1993b). On this latter chronological issue, there is now evidence, especially from the well-dated sequence of habitation deposits at Watgal that full-fledged settlement sites (presumably more or less 'permanent') existed in the early third millennium BC, an era in which Allchin and Allchin had argued saw only ashmound sites (Allchin and Allchin 1982: 287). While this realization requires a new understanding of the Neolithic settlement system and how it changed, it nevertheless remains apparent that there was a proliferation of settlement sites in the second phase of the Neolithic (including Maski, Tekkalakota, Sanganakallu, Piklihal). At sites where cultural activity continued into the Iron Age and Early Historic (e.g. Brahmagiri, Hallur, Maski, T. Narsipur), as well as some well known sites with Upper Neolithic habitation but without the Lower phase, where ashmounds are absent, perhaps suggestive of their predominant association with the Early Phase of the Southern Neolithic. In several Upper Neolithic sites, ash deposits occur in the settlements, but only as a fairly minor component (e.g. Brahmagiri, Sannarasamma hill, Hattibelagallu, Kurugodu). While our observations at Hattibelagallu, Sannarasamma hill (Sanganakallu) and Kurugodu indicate that there were small accumulations of burnt dung of the ashmound sort, these were relatively small and localized while the build-up of habitation refuse was extensive. In addition, all of these sites and others (e.g. Velpumadugu) also contained layers of ashmound type material which may represent the reuse of the ash as a plastering material. Taken together, this suggests that the ashmounds were either spatially distal from major habitation sites during the Upper Neolithic or perhaps that the ashmound phenomenon was in decline. That some ashmounds did continue into the Upper Neolithic is clear nevertheless from material recovered from the upper layers at Kudatini (Allchin 1963a: 57). Some ashmounds may have even persisted into Allchin and Allchin phase III, but more direct dates of the ashmounds are needed.

The other issue of contention, the nature of human occupation associated with the ashmounds, raises important issues which still require further research. Allchin (1963a, 1963b) had suggested that there were two categories of ashmounds:

> In the first group are the sites in or near permanent settlements. Of this kind we may notice the mounds at Kupgal, and at Gadiganur which are found at the foot of hills in the vicinity of habitational deposits producing Neolithic debris. . . .
>
> The second group includes some of the largest mounds. Its members are all located at spots which cannot be associated with any near settlement. The best-explored examples are those of Kudatini and Utnur. (Allchin 1963a: 164)

This understanding of the distribution of the ashmounds was intimately linked with Allchin's understanding of the settlement process and pastoral organization of the Neolithic, for he saw the Neolithic culture as one which included pastoral transhumance, especially of cattle, and for which he sought parallels in various traditional tribal groups of India.

> The suggestion is that both are the products of a single pastoral process by a single group of tribes: that is, that the cattle were sometimes penned at the settlement and sometimes at points removed from the settlement, in areas which must then have been virgin forest, usually within easy reach of a permanent water supply. Such a process can find plentiful parallels among modern pastoral groups in the form of seasonal migrations. (Allchin 1963a: 164-5)

Paddayya (1991-2, 1993a, 1993b), however, has objected to this on the basis of his early seasons of excavation at Budihal and his reliance on different ethnographic parallels, drawn from modern agricultural villages in the region of the ashmounds (Shorapur Doab). Based on his work at Budihal and earlier surface collections he made at a number of ashmound sites, he contended that *all* ashmounds have human habitation around the sides of their bases, and the ashmounds are accumulations of dung at villages. Thus, instead of seeing two categories as Allchin did, Paddayya asserts that there is one basic category, an opinion with which Devaraj et al. (1995) have concurred: 'Whatever their function, ashmounds are almost always associated with habitation sites. Although no ashmound is present at Watgal. . . .' (Devaraj et al. 1995: 72). In our opinion it is premature to arrive at this conclusion, and that in general terms, Allchin's interpretation was sound, although it requires further elaboration and refinement.

Paddayya's interpretation, draws on two main sets of archaeological observations, those from the Budihal excavations and those from his surface collections at several sites, and to some of the latter observations we must object. Paddayya's (1991-2) construal of the surface evidence is in some cases misleading and must be contradicted on the basis of our own examinations of some of the same sites. Paddayya has concluded that,

> . . . the habitation areas (their extent and nature, and quantity of cultural material obtained from them) around the mounds now gain in importance to such an extent that these sites hitherto called ashmounds need to be redesignated as Neolithic pastoral settlements with ash formations resulting from cow-dung accumulations and their periodic burning. (Paddayya: 594)

Paddayya's assertion that there is habitation, by which he seems to mean permanent occupation, associated with all ashmounds, must be treated as a hypothesis. We indeed made a number of observations to test his theory and have found it wanting. First of all there is a category of ashmounds that are atop granitic hills such as on Choudammagudda (adjacent to Sannarasamma hill, Sanganakallu, see also Subbarao 1947), *Narriavula gutta* at Gudekal (or Gudikal near Yemmiganur, Kurnool district, Andhra Pradesh) the eastern most ash mound. At the latter site there is very little occurrence of cutural material, with almost no pottery or lithics to be found on the surface anywhere on the hill (a *very* few pieces were found) let alone archaeological deposits other than the dung ash. We did note, however, some artificial round stone structures with grindstones, below on the ashmound on the hill's northern slope, but this structure was clearly not inhabited ever for an extended period as there was no build-up of archaeological refuse. At Choudammagudda (Subbarao's [1947] 'Saudamma hill'), at Sanganakallu there is a large quantity of Neolithic surface finds and some artifical stone terraces, presumably to level the hilltop for camping, but once again there is no stratigraphic build-up of habitation refuse. This is especially striking in comparison to the adjacent Sannarasamma hill where there is nearly 2 m of stratified archaeological deposit, on a similar type of granitic hilltop. Similar situations probably hold for several other hilltop ashmounds that have been reported, including Kakabalu and perhaps Kurikuppa (Foote 1916: 94; Allchin 1963a: 51). Our own observations at several sites, to some extent following in the footsteps of Allchin and Paddayya, clearly attest to variation in the ashmounds, in terms of size, topographic location, placement in relation to other sites and ashmounds, and the extent of associated non-ashmound archaeological deposits. Some of this variation was already clear from Allchin's (1963a) survey, but has been obscured in Paddayya's (1991-2) more recent review. While most ashmounds are solitary, at some sites there are pairs or clusters of ashmounds, as at Kupgal, Palavoy and Budihal. It is unclear regarding the significance of these multiple mounds: were they built-up simultaneously, as for example by different herding families or clans, or were they created in sequence, representing a longer period of occupations, or more frequent occupations. Ashmounds vary in terms of their topographic locations, whether on the plains (as at Utnur, Budihal), near the base of large hills (as at Palavoy, Kupgal), on low hills (as at Kudatini), on hilltops (Gudekal, Choudammagudda). Some are located on the banks of the streams for instance Kanchagara Belagal on the Hagari, Talmari and Sivapura on the Tungabhadra. Some mounds are isolated, as at Budikanama (Kudatini) and Utnur. At Aija (Ieej), near Utnur, and Budihal excavations have revealed burials in the proximity of an ashmound (Walimbe, in press), which can be added to the child burial from Utnur (Allchin 1961). Although the above examples, represent a haphazard selection of sites they are illustrative of some of the variations in local settlement pattern and highlight the need for systematic consideration of ashmound sites within their local landscape, before a satisfactory understanding of variation can be gained.

It must be kept clearly in mind that Allchin's cattle-camp hypothesis for *some* of the ashmounds, does not imply that there is not human habitation associated with them, as he clearly found evidence for such at Utnur around the periphery of the pen he identified on the basis of post-hole rows and gulleys (Allchin 1961, 1963a: 143-52). Rather, what is at issue is the nature of the habitation (in terms of density of population, duration and cyclicity) that this material represents. Development of more extensive, and stratigraphically thicker settlement around ashmounds may have been a phenomenon associated with longer durations of occupation at sites that served additional functions, as at Budihal and Kupgal which are also factory sites, the former for chert blades, the latter for greenstone axes. However, even at these sites it is difficult to agree with Paddayya (1991-2) that 'most of these sites served as permanent settlements'.

Essentially, Paddayya has asserted that Budihal is representative of all ashmounds. Indeed, his own surface observations at a number of ashmounds, seem to have viewed the meagre surface evidence through the rather opaque, and sometimes misleading, lens of Budihal. As far as Kudatini we agree with Foote (1887a: 273, 1916) and Allchin (1963a: 52-7; Allchin and Allchin 1968, 1982: 123; see also Soundara Rajan 1964).

> Besides these typically neolithic implements. . . . I found nothing, noteworthy—fragments of pottery were very rare and all of coarse quality not referable to any special age. I revisited the mound several times but without making any fresh finds. (Foote 1914: 80)

> When we visited the mound on several occasions in 1957 a careful search of the slopes and immediate surroundings revealed no finds. (Allchin 1963a: 53)

Paddayya (1991-2), however, revisited this site and made an exhaustive collection of artefactual material from the surface, or eroded material from the ashmound section. His claims imply a very different understanding of the site:

> Unlike at other sites where the areas containing occupational deposits are agricultural lands, the deposit around the mound at Kudatini is preserved well since the area is covered with scrub jungle . . . The deposit on the eastern side of the mound covers sloping ground forming part of

the hill-pass. It is 10 to 15 cm thick and has been cut up by rills and the Bellary-Hospet road. It occurs in patches over an area measuring 120 m (north-south) and 100-120 m (east-west). The deposit on the northern side of the mound is better preserved. In fact, it occupies a terrace-like stretch of land measuring 30 to 40 m broad (east-west) and 80-100 m. long (north-south). It measures 30-40 cm thick and is partly concealed by a veneer of colluvial silt washed down from the hills. (Paddayya 1991-2, 585-6)

Our own observations at this site on two occasions in 1997 and 1998, contradict this. We even made small test pits on the north side of the mound on Paddayya's 'terrace-like stretch of land'. Our examination included two small test pits that revealed no preserved archaeological deposits in this area. In this area the coarse schist bedrock occurs at 15-20 cm below the modern colluvial surface. There is no archaeology and certainly no permanent settlement extending beyond the northern edge of the ashmound. The cultural material observed by Paddayya (1991-2) is basically fall-out from the ashmound distributed to the north and east of the mound by recent road cuttings around the mound. The ashy deposit visible as a bank north of the eastbound road that runs along the northern part of the mound, which Paddayya apparently intrepreted as a section through a settlement area, is a remnant of the mound in its original extent. As we understand, the occupation was not around the mound, as described by Paddayya (1991-2), but on the platform itself and the mound developed its present proportions under repeated short occupations by transhumant pastoral groups over a long period of time, as inferred by Allchin (1963a).

There is clearly variation in ashmounds, which must be considered together with the variation in non-ashmound sites, and it may be possible to break this variation into distinct categories in terms of structure, size and position, perhaps reflecting differences in social function. It is important to try to understand the significance of this variation. At sites like Budikanama (Kudatini) and Utnur, and Gudekal the evidence for habitation is extremely sparse and not comparable to Budihal or Palavoy where archaeological deposits have built up near the mounds. Even at these latter ashmounds where there are archaeological deposits it is clear that they are not comparable deposits to those at the deeply stratified deposits encountered at hilltop habitation sites, as at Tekkalakota and Sannarasamma hill (Sanganakallu). In addition there are numerous sites, of this latter category of settlement without any ashmounds. While it is true that there were layers of ash that made up part of the hilltop deposit on the north side of one of the trenches excavated by Ansari and Nagaraja Rao (1969), it is hardly comparable in size, or thickness to that of ashmound sites, especially if it compared to the associated settlement layers: on Sannarasamma hill (Sanganakallu) there is approximately 2 m of habitation deposits over a wide area, while at Budihal the maximum thickness is on the order of 60 cm, similar to the 70 cm recorded by us for the thickness associated with one of the Palavoy mounds.

What is needed, is a taphonomic approach to all Neolithic sites. Paddayya's (1991-2; 1993a; 1993b) work has added an emphasis on horizontal spatial variation within sites to the primarily stratigraphic (vertical, chronological approach) emphasized by previous generations. Important contributions can clearly be made by excavations of extensive areas of Neolithic sites (e.g. Paddayya et al. 1995; Paddayya 1998; Devaraj et al. 1995). However, recognizing that there is horizontal variation, is not enough on its own to understand Neolithic sites, as some attempt must be made to interpret the nature of the various kinds of deposits and their formation processes. As discussed in general terms by Schiffer (1987: 100) it is necessary to try to understand archaeological sites in terms of occupations, i.e. 'the continuous and uninterrupted use of a place by a particular group'. Thus sites need to be classified in terms of duration of occupation and the repetitiveness of similar occupations at the same site. Schiffer suggests that sites might be broken down into visitations (short stays of less than a day), short encampments (on the scale of days to weeks), extended encampments (on the scale of several weeks to months), or continuous, i.e. year-round for more than a single year. Although these ancient scales of use may be our ultimate interest, it is necessary to address the scale and resolution of our archaeological deposits, and the extent to which visible layers represent the agglutination or mixing of ancient occupations of one or more type (for enquiries into this kind of site formation research in India see Wansinder 1995; Petraglia 1995; Panja 1996; while Paddayya and Petraglia 1995 categorize Palaeolithic sites in terms of their taphonomic types, similar rigour does not appear to have been applied to the Neolithic deposits at Budihal). On present evidence our best working hypothesis is that ashmounds represent short encampments in some cases (as at Kudatini, Choudammagudda, Godekal and Utnur) and extended encampments in others (e.g. Budihal, Kupgal, Palavoy). The only candidates for continuous occupations are the non-ashmound settlement sites, including hilltop sites like Sannarasamma hill, Tekkalakota, Velpumadugu, and Piklihal and settlements in the plains like Kurugodu and Watgal.

At several ashmounds, it appears that the ground was artificially levelled prior to the accumulation of dung, as well as at several points during the course of the ash accumulation. At Utnur and Budikanama (Kudatini) ashmounds are situated on artificial platforms. This is a common feature observed by Allchin (1963a: 48, 54, 145) and Paddayya (1991-2) at several of the sites. The landform at Budikanama would have been unsuitable for encampment unless it was levelled since it is made up of tightly folded schist, projecting upwards, rendering the surface uneven and jagged. A 30-50 cm thick gravel platform was created within the saddle of the pass, where both men and beasts could have camped. This was perhaps not made with the initial intention of dumping cow-dung, but as a camping site where herds were also penned and dung began to accumulate. Subsequently the burning of these dung accumulations became regular and probably ritualized. We wonder whether the 'soil' layer reported at the base of Kupgal ashmound might also be artificial rather than *in situ* weathered soil (as reported by Mujumdar and Rajaguru 1966). This would, of course, have important implications for interpreting this deposit in terms of environmental conditions, as Mujumdar and Rajaguru have done, and in assessing the chronological gap between the dolerite flakes they found beneath the layer (see also Chakrabarti 1995: 155, for a summary and interpretation linking the Kupgal soil with the microlithic phase of Sannarasamma hill). The 'gravelly detritus as parent material' recorded beneath this 'dark brown soil' is mysterious as it overlies a layer that is probably granite-derived sandy soil (grüs) and includes dolerite flakes. It is not clear how a layer of coarse pebbles could have accumulated atop a natural, sandy granite derived soil by natural processes, especially as this latter level (and the 70 cm thick dark brown clayey 'soil') are both absent from the section provided by an erosional gulley approximately 50 m. west of the ashmound (and closer to the granite hill from which one might expect colluvial gravels to derive). The examination of the this natural section adjacent to the ashmound strongly suggested that the gravelly layer and the dark brown sediment atop of it were artificial. This takes on importance in the interpretation of the date of the dolerite/greenstone flakes as they simple predate the platform and this particular ashmound and could therefore be early Neolithic in date. Indeed, these flakes resemble debitage from Neolithic celt manufacture.

The ashmounds were not uniform deposits, but accumulated through several processes the most important of which was the accumulation and burning of cattle-dung. The presence of intervening soil layers, powdery ash layers with cultural material at a number of places (Zeuner 1959; Allchin 1963a; Paddayya 1991-2) indicates multiple episodes of burning. Indeed, fine alternating layers of red-brown and ashy grey layers (observed by the authors at Utnur, Kupgal, Kudatini and Palavoy) suggest relatively short and repetitive episode of deposition and burning. These observations are congruent with the suggestion that these sites represent seasonal or annual encampments (Allchin 1963a). Rami Reddy (1976) also makes similar observations at Palavoy suggesting occupation levels within the ashmound. Further in this regard we quote Paddayya (1991-2: 589): 'Since at a number of sites the layer underlying ash levels consists of habitation debris yielding cultural material, it is clear that even the spots subsequently used for heaping up cow-dung were originally part of the general area of occupation.'

One issue has been the extent to which these deposits represent *in situ* burning of accumulated dung or whether dung was heaped. In fact, we would interpret the available evidence as indicating that both processes occurred regularly. The fact that the stratigraphy of the ashmounds is not a 'cake-layer' situation (at least not in all cases), as indicated by Paddayya (1991-2, 1993a, 1993b) further convinces us that the mounds were growing both vertically and horizontally during different occupations. As is evident from Budihal (Paddayya 1998), ashmound I at this site consists of a high mound, and a low mound. The low mound east of the high mound, has produced evidence of stockades/walls for penning. While the high mound probably represents the heaping of dung, as is clear from the horizontally discontinuous lenses in the section at Budihal (Paddayya 1993b), the low mound to the east has been built of by some degree of *in situ* build-up and burning as argued from Utnur evidence by Allchin (1961, 1963a). These are not contradictory alternatives as Paddayya (1991-2, 1993a) implies, but two aspects of the same process. It must be noted, however, that the 'high mound' visible today at Utnur is not equivalent to that at Budihal. As the excavations at Utnur trenches 2 and 3, clearly show that this mound is a secondary, redeposition of the ash and scoriaceous dung deposits atop a natural topsoil that had developed above the archaeological site (Allchin 1960, 1963a: 20-2). These mounds resulted from modern(?) digging, of what may have been a well at the south-west corner of the Utnur site.

The Utnur excavations still provide the clearest example of the continuity and change within an ashmound site. Allchin (1960, 1963a, 1963b) defined seven phases (including his sub-phases) through the Neolithic period of ash-accumulation. During most of these phases (IA, B, C, IIA, B, IIIA, B) there was a basic continuity in the alignment of the post-holes and ditches. Thus there were clear cycles of construction, burning and re-construction that maintained the same basic layout of the site and resulted in the accumulation of dung and ash layers. In general the evidence from other sites suggests similar cyclicity (see Figure 13). In the seventh Neolithic phase (Utnur Period IV), the post stockade phase was replaced by a raised bank of clay capped with hard, vitrified dung ash, forming a rampart of ash. This, Allchin suggested (1963a: 151), indicates that 'the accumulating ash was evidently heaped up around or upon a thorn fence—of which traces remain upon the undisturbed parts of the slope—and contributed towards a wall of dung which, at a certain date, was fired to form an ash wall'. Such vitrified ash enclosures, may also have present at other sites, as indicated by Foote's (1887a, 1916) observations, and his use of the term 'cinder camp'. In the case of Budihal, Paddayya (1998) has suggested that the stone feature he found would have served as the base for a thorn fence also. Taken together this indicates that there were alternate approaching to constructing a pen, and perhaps the thorn and/or ash bank approach represents a later development. It is tempting to see this in relation to possible deforestation processes, although no real evidence is available yet.

Still rather mysterious are the reasons for the heaping and burning of such large quantities of cow-dung, and the same particular localities over an apparently long period of time. Foote attributed it to accidents, and carelessness with fire. Allchin drew on ritual parallel within India and eslewhere to argue that the ash fires represented annual seasonal rites perhaps of purification. He also suggested that the penning of large numbers of cattle (estimated to be between 540 and 800 head of cattle) from the size of the Utnur pen (Allchin 1963a: 156, 163) could have occurred at festivals similar to modern south India cattle fairs (ibid.: 175-7). Paddayya, on the other hand, is more prone to see the dung burning as simply a way of disposing of a unnecessary resource (an assumption based on his view of the Neolithic economy as non-agricultural, a view contradicted now by a wealth of archaeobotanical evidence, see above and Fuller et al., n.d.; Kajale 1998). What seems clear is that most of the dung produced during the earlier Neolithic, at least in the core region, was allowed to accumulate and intentionally burnt. That this burning may have served multiple purposes, including pen sanitation is likely. However, the spatially delimited nature and vertical build-up of the ashmound strongly suggests that these places became important in their own right, and took on symbolic significance in the larger landscape. Within this context, it seems likely that the burning also came to have ritual meaning. Some of the ethnographic and historical parallels discussed by Allchin (1963a) and Murty (1989) provide possible interpretations of the meaning of such rituals, although it must be kept in mind that none of them provides a direct parallel for the Neolithic practice.

This ashmound tradition, must be seen within the context of a system of agriculture and pastoralism in which dung was not the valued resource that it is today. While dung and dung ash were almost certainly used as plastering material in settlements, it seems unlikely that they were used in agriculture. This does not imply, as Paddayya has suggested (1993a, 1993b), that cultivation was unimportant, but rather that the intensity of cultivation and the nature of the crops did not require manuring. Indeed, the native millets are well suited to the dry and sandy soils of the northern Karnataka Doabs and the Rayalaseema and would have benefited in some areas from the naturally fertile black, regur soils. The fertility of these soils may have been maintained in part by cropping high proportions of the leguminous crops, perhaps intermixed with millets, as these pulses can fix nitrogen for the soil.

When the ashmounds come to an end, during the course of the Upper Neolithic (Allchin and Allchin Phase II), it may well have been tied to changes in cultivation that led to the increasing importance of dung as an agricultural resource (see also Allchin 1963a: 177). With the adoption of wheat and barley, winter crops, in the later Neolithic, cultivation came to have two seasons. In addition these new crops may have required a degree of manuring, and some degree of irrigation, to be successful. Thus while dung was probably still being heaped, as it is to this day, rather than being burnt it was being utilized as an agricultural resource. That dung ash remained an important symbolic commodity is indicated by the fact that dung-ash types of deposits continue to appear as thin layers within settlement sites, perhaps as plastering material reused from nearby ashmounds, and later still in the ash-circle graves. The lasting impact of the ashmound tradition on the formation of the agricultural village landscape of northern Karnataka is indicated by the fact that village place names that utilize the root *Budi-* (Dravidian for 'ash') are frequent in this region and preserve in toponymy something of the Neolithic settlement pattern (Allchin 1963a: 89-95; see also Sarma 1979-80). The uniqueness of the ashmound sites is a strong reminder that the Southern Neolithic was a distinctive social and cultural formation, for which there are no direct parallels today although some strands of continuity are apparent.

DISCUSSION: SOUTHERN NEOLITHIC ORIGINS

In the 1940s the known distribution of lithic materials, especially ground-stone axes and shouldered celts was used to postulate the origins of the Southern Neolithic coming from the north-east, ultimately from South-East Asia (Wheeler 1947-8: 295, 1960: 89; Worman 1949: 199). However, a detailed review of the available evidence, augmented by the excavations at Piklihal, led Allchin to critique this, and establish the peninuslar Neolithic as a distinct lithic tradition from that emanating from north-eastern India (Allchin 1957). Allchin (1960, 1963a) instead relied on ceramic typology to make comparison with known archaeological ceramics in Iran, and he attributed the rise of the Southern Neolithic to the migration of folk from West Asia, in particular north-eastern Iran. However, this hypothesis was not without difficulties because it became necessary to exaplain the relationship (or lack thereof) between Southern Neolithic material culture and that of intervening regions of the subcontinent: 'At the date we have established it is necessary that, if our contention that the culture originated in north-east Iran be accepted, the migrant tribes must have passed through the sphere of influence of the Indus cities, and through areas of whatever Chalcolithic cultures flourished at that time in Saurashtra, Maharashtra, etc.' (Allchin 1963a: 160). During the 1960s and 1970s other authors also pointed to connections with and possible origins from the north-west (e.g. Nagaraja Rao 1966; Sarma 1967, 1972 Sundara 1968, 1970, 1971c; Paddayya 1973; Sankalia 1973, 1974, 1977) .

Subsequently, as the archaeological gaps in the northern peninsula and the north-western subcontinent came to be filled in and better dated with the advent of radiocarbon data, Allchin and Allchin (1968, 1974) came to argue for a more indigenous origin of the southern Neolithic. This was supported by limited bone evidence, and their interpretation of rock-art evidence, to suggest a separate domestication of south Indian zebu breeds from wild stock (Allchin and Allchin 1974, 1982, 1995, 1997; Alur 1990). This argument still requires confirmation through systematic archaeozoological investigation and cattle genetic evidence, although some supportive evidence is now emerging (Joglekar, in press). The emerging archaeobotanical evidence, as noted above, argues for plant domestication events in southern India that laid the foundations of agriculture prior to any introduced package of crops. As noted in the discussion of ceramics and chronology (above), the available dating evidence for several ceramic types that are common between the Southern Neolithic and Chalcolithic cultures of the northern peninsula argue for their earlier occurrence in the south rather than the north as previously assumed. Thus there is a wide range of suggestive evidence for the hypothesis that the Southern Neolithic represented a nuclear area in prehistory from which crops and cultural innovations emanated during the third and second millennia BC.

In considering the origins of the Southern Neolithic, it seems in order to briefly mention the available hypotheses that incorporate historical linguistics. Frequently scholars of prehistory attempt to correlate historical linguistics and archaeology to provide grand narratives of the past, almost invariably of a migrationist genre. Southern India, known for its distinctive Dravidian languages, has long provoked speculative, migrationist narratives to explain the 'Dravidian problem', that is the origins of these non-Indo-European languages in India and the relation of their present distribution to that in prehistory. In briefly reviewing some of the hypotheses that have been put forward in regards to this it is not our intention to discuss in any detail the evidence of historical linguistics, nor to explore a historiography of concepts such as 'Dravidian' and 'Indo-Aryan' although such an historical perspective would no doubt be informative. Instead, we would briefly like to lay out some of the proposals that have been put forward so that they can be considered in light of our current understanding of the archaeological evidence and perhaps provide directions for future investigation.

It is clear that there is little agreement in terms of correlating south Indian archaeology with linguistics. Many authors have suggested that the Dravidians arrive as a migrating group who brought with them the tradition of Megalithic burials (Fürer-Haimendorf 1948, 1953; Maoney 1975), while others see the 'Megalithic culture' as representing an 'Aryan' group (Parpola 1973, 1994: 172; congruent with the proposals of Gadgil et al. 1998; Leshnik 1974). Parpola (1994) therefore suggests that Dravidians came into the peninsula *during* the Southern Neolithic, that they were associated with the Chalcolithic phase further north (including the Harappan Civilization) and the spread of copper working. This, however, seems to be an argument made primarily as an adjustment to make Parpola's Dravidian-Harappan hypothesis coherent. As mentioned above the few copper finds from the Southern Neolithic are more suggestive of trade with the north than of migrants. Although new crops do arrive from the north during the Upper Neolithic, these too can be seen in the context of widening trade networks.

Another hypothesis would place the origins of agriculture and the Neolithic in south India with the spread of early Dravidians. This latter hypothesis has enjoyed much publicity in the past decade as an increasing number of Western archaeologists, historical linguists and geneticists have come to propound a general hypothesis of agricultural package-language macrofamily correlation (Renfrew 1987, 1992, 1996; Bellwood 1990, 1996; Cavalli-Sforza 1996; Cavalli-Sforza and S. Cavalli-Sforza 1995; Gadgil et al. 1998). Although this hypothesis is mostly applied to Austroneisans, Indo-Europeans and Nilo-Saharans, the hypothetical 'Elamo-Dravidian' language family (McAlpin 1981) is often listed as another possible example. However, for this hypothesis to be sustained one would expect that the Near Eastern agricultural package arrived with the first agriculturalists. The current archaeobotanical picture on the contrary does not support this but instead provides evidence that indigenous species formed the initial basis of cultivation with extraneous livestock (especially goats) being adopted early on, and Near Eastern crops only somewhat later. Thus, the picture is one of the selective and piecemeal adoption of external elements of agriculture and probably of culture more generally. This picture would imply that the Dravidian languages have deeper origins in south India, or that the process of their spread was considerably more complicated than models have hitherto considered.

CONCLUSION

The origin and development of agriculture in the Southern Neolithic is of especial importance as it lies at the origins of Indian village traditions, at least of the southern peninsular region. The Neolithic and succeeding Iron Age a successful synthesis of a variety of crops from a wide variety of sources. The preliminary evidence from our own work suggests that the earliest crops were indigenous to southern India, although not perhaps to the semi-arid Shorapur-Raichur-Rayalaseema area. In the second and first millennia BC crops from Near Eastern and African origins, were integrated into and in many cases came to dominate local agricultural systems. These legumes domesticated in south India appear to have played an important role in the early agricultural economy of India in general and peninsular India in particular (Fuller 1996; and in Vol. III of this series). The evidence that we now have calls for serious consideration of south India as a possible region of independent, albeit rather late, agricultural origins. These origins laid the foundation from which the village culture of south India developed. That there was general continuity of population in south India from the Neolithic to the Iron Age is increasingly accepted (e.g. Allchin and Allchin 1982, 1997; Parasher-Sen 1993; Devaraj et al. 1995). Also, the traditional dichotomisation of these periods on the basis of ceramic types can no longer be accepted in a simplistic form as discussed above (Devaraj et al. 1995).

Southern Neolithic archaeology has a long history, although problem-oriented work has often been dispersed widely through time, and we are only beginning to develop a blurred picture of the cultural systems and changes of that prehistoric period. Much more bio-archaeological information is needed about subsistence and environmental conditions. A consideration of the rainfall distribution over the entire Deccan and its relation to past vegetational communities needs to be made. Such a consideration must include addressing the problem of 'original' grassland ecosystems, as opposed to anthropogenic/biotic grasslands, and their geographic extents in the past as compared with today. The introduction of non-indigenous crops and livestock must be considered in relation to changing ancient exchange networks, and the possible role of migrating groups, if any. In cases in which adoption of crops from external sources is most likely, as seems likely with the pulse sem (*Lablab purpureus*) and probably wheat and barley from the north, it becomes necessary to ask what social and/or ecological conditions promoted the incorporation of new crop species and in some cases the abandonment of older, traditional crops. Similar issues must be addressed for aspects of material culture, including new pottery types, copper working and iron metallurgy.

The Southern Neolithic provides a glimpse of early agricultural societies which have yet to be systematically compared and contrasted with the numerous 'Neolithic' cultures in other parts of the world. Issues relating to the origins and spread of agriculture in general theoretical terms will doubtless benefit by considering the evidence from south India. However, if we are to more fully understand the evolving social texture of the Neolithic and the societies that succeeded it, more fieldwork and empirical research is necessary. Indeed, excavation and systematic sampling must be considered a priority as the processes of agricultural development and population growth in modern south India threaten the archaeological record with further destruction each passing day. The Southern Neolithic, and its enigmatic ashmounds, clearly represent an important and unique component of India's heritage.

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