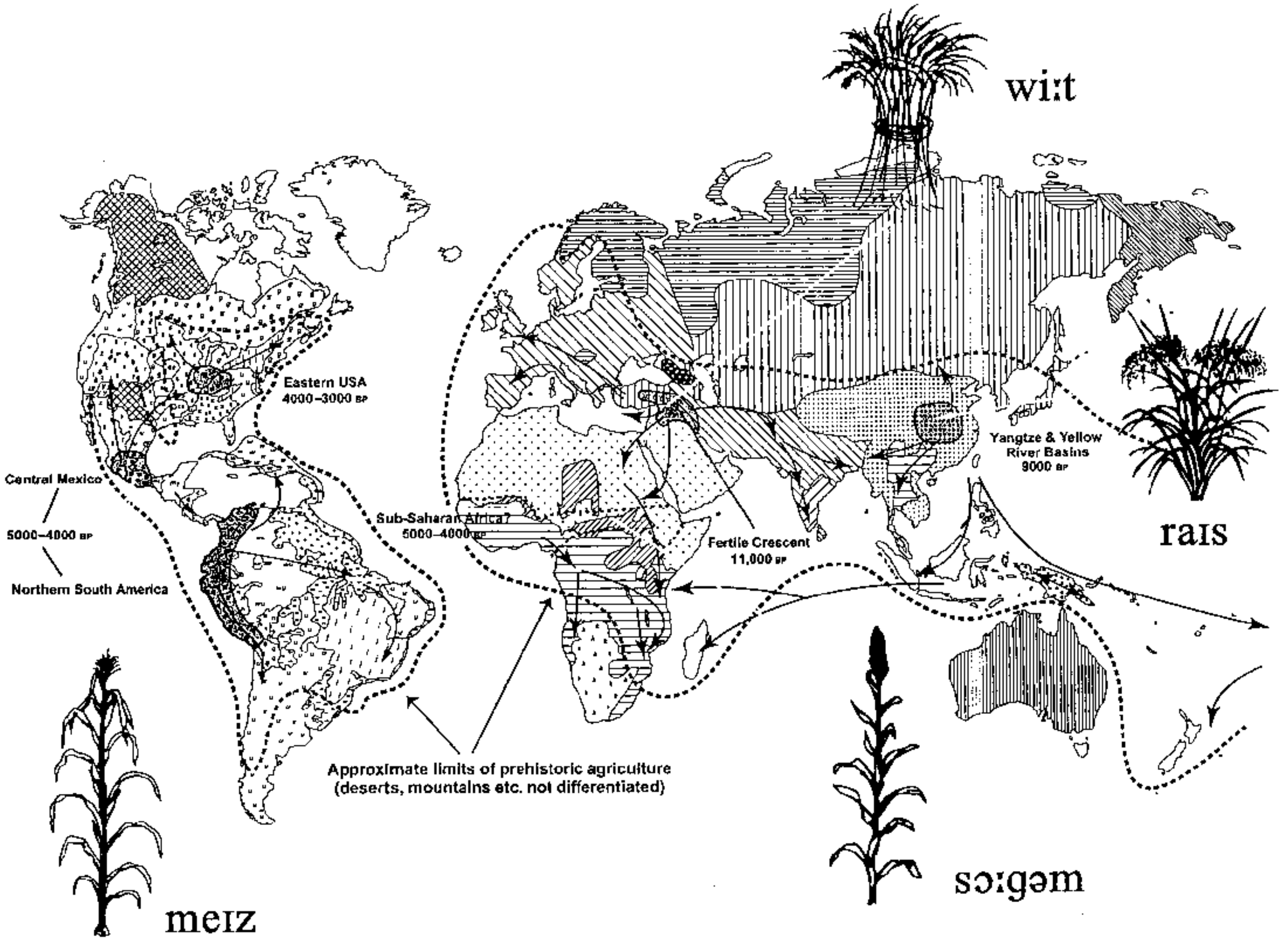
Examining the farming / language dispersal hypothesis

Edited by Peter Bellwood & Colin Renfrew



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Chapter 16

An Agricultural Perspective on Dravidian Historical Linguistics: Archaeological Crop Packages, Livestock and Dravidian Crop Vocabulary

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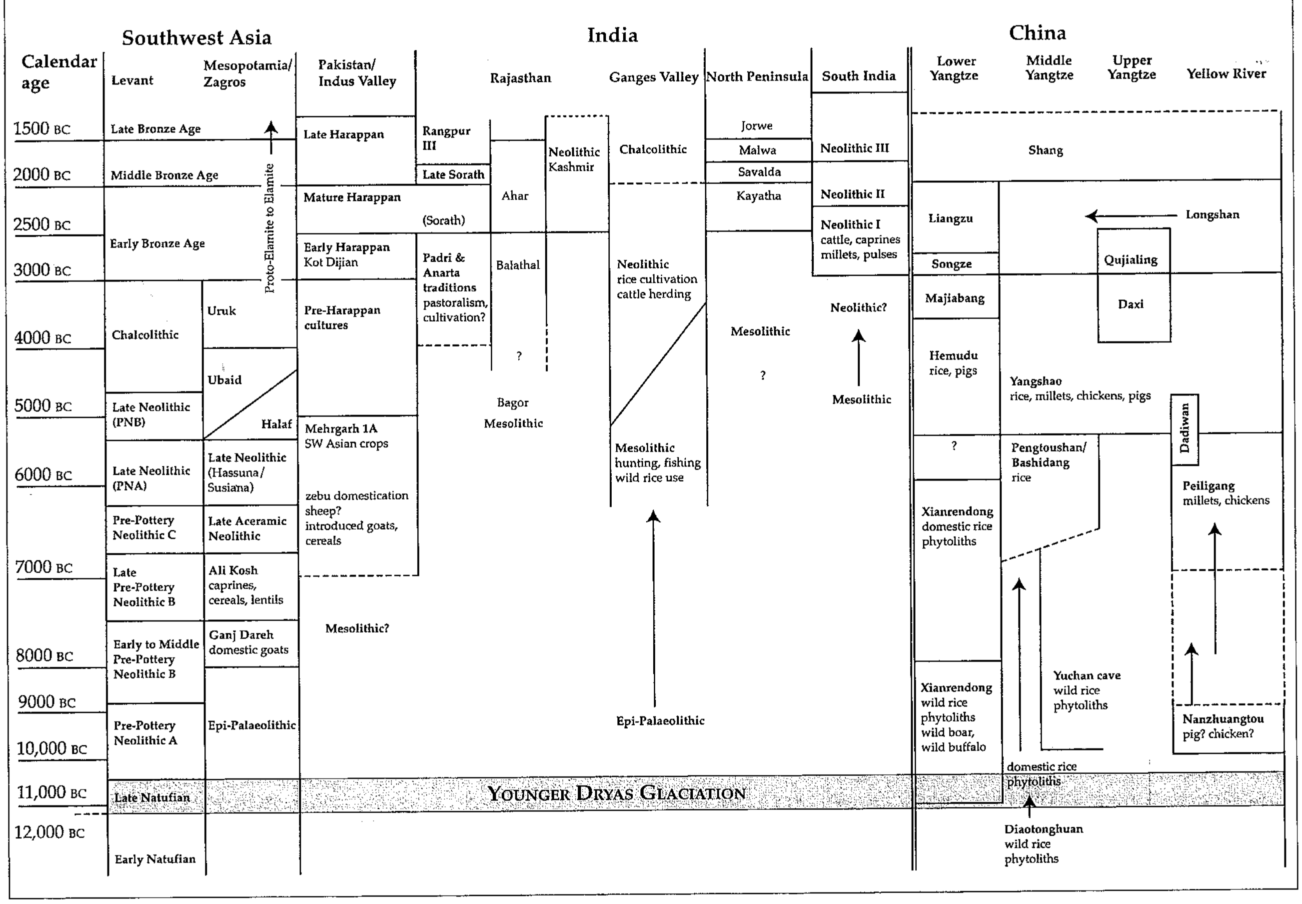
The Indian subcontinent is diverse both linguistically and agriculturally. Linguistically, the Indo-European, Austro-Asiatic, Dravidian and Tibeto-Burman languages are present in the subcontinent as well as a few unclassified languages (e.g. Parpola 1994; Tikkanen 1999). Subtracting crops introduced from the New World during the colonial period, one is still left with a staggering diversity of cereal species, pulse species, tubers, oilseeds and fruits which derive from origins in Africa, Southwest Asia, Central Asia, China, Southeast Asia and of course South Asia itself (see Fuller 2002; Fuller & Madella 2001). There has been something of a tacit acceptance that South Asian agriculture is derivative and secondary, either based on introduced taxa and systems or else on some local species inspired by the introduction of agriculture (e.g. Hutchinson 1976; MacNeish 1992; Harlan 1995). Within the context of the Renfrew/Bellwood hypothesis, the three major language groups of central and peninsular India have all been attributed to such language-farming dispersals, including Indo-European, Dravidian and Austro-Asiatic (the Munda sub-family) (e.g. Renfrew 1992; 1996; Bellwood 1996). These hypotheses, however, have not been considered in detail in relation to either the archaeological, archaeobotanical or linguistic evidence relating directly to early agriculture in South Asia. The present paper will do this, with a particular emphasis on peninsular India and Dravidian languages, by drawing upon the now considerable and growing data base of archaeobotanical data (Fuller 1999; 2002), as well as archaeozoological data (e.g. Thomas & Joglekar 1994; Meadow 1996).

The Neolithic cultures recognized in South Asia are generally later than those known from the Southwest Asian centre of origin or from China (Table 16.1). For the Neolithic of southern India, immigrant origins have been postulated from either the northeast or northwest. In the 1940s the known distribution of lithic materials, especially ground-stone axes and shouldered celts, was used to postulate general origins of India's Neolithic coming from the northeast, ultimately from Southeast Asia (Wheeler 1948, 295; 1959, 89; Worman 1949, 199). A detailed review of the available evidence, however, led Allchin to critique this, and establish the peninsular Neolithic as a tradition distinct from that emanating from northeastern India (Allchin 1957). Allchin (1960; 1963) discussed possible parallels for southern Neolithic pottery in Iran, implying either migration or diffusion from the northwest. He noted, however, that the lack of systematic archaeology in the intervening regions, especially the northern Peninsula, made this hypothesis vulnerable to revision (Allchin 1963, 160). Subsequent research favours independence since the Neolithic begins earlier here than in the northern Peninsula (Shinde 1994; Allchin & Allchin 1997; Korisettar *et al.* 2001). Indeed, an independent centre of plant domestication on the Indian Peninsula, and probably more than one in the subcontinent, is now suggested by botanical and archaeological evidence (Fuller 1999; 2001; 2002; Fuller *et al.* 2001).

Similarly, the distributions of Dravidian and Munda languages have suggested immigrations into India. While some authors have assumed that all language families came from the northwest, with Munda as a relict of early peopling (e.g. Gadgil *et al.* 1998), Munda is usually derived from the northeast due to its relationship to the largely Southeast Asian Austro-Asiatic family (e.g. Higham 1995; this volume; Bellwood 1996; Blust 1996). The presence of Brahui, a Dravidian language in Pakistan, and the

Table 16.1. *Comparative chronology of Neolithic/Chalcolithic cultures of South Asia and main sequences in Southwest Asia and China. There remains poor internal chronological evidence for the Mesolithic of South Asia and the beginnings of Neolithic sequences.*



possibility of a relationship with ancient Elamite, have pointed towards a northwestern introduction for Dravidian languages (e.g. McAlpin 1981; Fairservis & Southworth 1989; Parpola 1994). While some authors have argued for the introduction of Dravidian languages later than the Neolithic, for example with the 'megalithic' burial traditions of the first millennium BC (Fürer-Haimendorf 1948; 1953; Maloney 1975), recent opinions tend to push this family back to the beginnings of agriculture (Renfrew 1992; 1996; Bellwood 1996; Cavalli-Sforza & Cavalli-Sforza 1995; Gadgil *et al.* 1998). Parpola (1994, 174) associates Dravidian speakers with the 'Chalcolithic phase' of the northern Peninsula (as well as the Harappan civilization) and therefore suggests an immigration into the Peninsula between 1700–1000 BC (i.e. *during* the latter half of the southern Neolithic tradition of Karnataka).

The current paper will develop an alternative model by building on empirical archaeological evidence and the linguistics of particular crops and agricultural terms. While most previous hypotheses have been based on broad-brush generalizations, such as geographical distributions of languages and chronological priority of archaeological cultures, this paper will start with empirical building blocks and smaller linguistic inferences. A starting point for understanding the origins of agriculture in South Asia is determining where particular species of crops (and livestock) are likely have originally been wild and domesticated. The available archaeological evidence for the presence of these species in different regions during different periods can then be considered to provide a geographical and chronological framework for the dispersal of these species, and to outline the existence of agricultural packages of different regions and different periods. There is now a sizeable data base of sites with archaeobotanical evidence, with just over 100 sites reviewed by Fuller (2002), as well as additional recent evidence.

With these outlined archaeo-agricultural packages as a starting point, I will then turn to the linguistic data for key species to see how far back they can be reconstructed for sub-groupings within the

Dravidian family, and how these might relate to geographical groupings. On the basis of the available evidence I will argue that much of the modern distribution and the diversification within the Dravidian languages, including South, South-Central and Central Dravidian subfamilies, can be argued to go back to the beginnings of food production but that the evidence suggests that the proto-Dravidians (including the North Dravidian Branch) were already in place on the Indian Peninsula as seed-using foragers and differentiating when agriculture began. Also a few implications for the prehistory of other language groups, such as Munda, will be outlined.

Crop packages of early South Asia

Before engaging with linguistic data, we can outline the picture of early regional agricultures provided by botanical and archaeological evidence. Over recent decades there has been an increasing quantity of archaeobotanical research with more widespread use of systematic flotation sampling (Kajale 1991; Fuller 2002). The archaeobotanical record is biased toward cereals and pulses, and it is therefore these staple categories for which we have the best sense of their ancient distribution. While the evidence on wild progenitors often requires further research, a rather dispersed literature provides insights into likely regions of origin (Fuller 1999; 2002). A synthetic map of early agricultural traditions in South Asia is given in Figure 16.1.

In northwestern South Asia, the dominant crops were derived from Near Eastern Neolithic founders (*sensu* Zohary 1996; Zohary & Hopf 2000). A fairly complete Southwest Asian agricultural package was well-established and presumably widespread by the time of Harappan urbanism (Meadow 1996; 1998; Fuller & Madella 2001), including wheats, barley, lentils, chickpeas/gram, peas, grass pea, and flax/linseed. It remains to be clarified whether these crops came to South Asia together at the period of agricultural beginnings, represented by the site of Mehrgarh where systematic flotation samples were not available (Costantini 1983), or whether the pulses and flax diffused separately over a much longer period, as might be suggested by the evidence from Miri Qalat (Tengberg 1999). These crops spread to some regions east of the Indus Valley in pre-Harappan times, before the end of the fourth millennium BC, as suggested by the emerging evidence from Ahar culture sites such as Balathal (cf. Kajale 1996a; Misra *et al.* 1997). They spread into the Ganges Valley during the Harappan phase, i.e. 2500–2000 BC and their further diffusion into central or peninsular India may have occurred after the mid-third millennium BC, as stray finds from the site of Kayatha suggest.

In the northern Deccan Chalcolithic (Maharashtra) of the early second millennium BC, wheats, barley and southwest Asian pulses were important crops, while only wheats and barley made a limited impact on the Neolithic of the Southern Deccan, perhaps as early 2200 BC. In both South India and the Ganges Valley the early finds of the Southwest Asian (and Harappan) package of winter crops suggest that these species were added to existing agricultural systems based on other monsoonal crops, and did not get agriculture started.

In southern India, the archaeobotanical evidence (Fuller 1999; Fuller *et al.* 2001) indicates that a basic set of native staples occurred throughout the Southern Deccan (Table 16.2). Evidence from 11 sites indicates the predominance of mungbean (*Vigna radiata*), probably deriving from wild progenitor populations in the transitional vegetation zones east of the Western Ghats; horsegram (*Macrotyloma uniflorum*), presumably a savanna native in the Deccan (as well as elsewhere in India?); as well as browntop millet (*Brachiaria ramosa*) and bristley foxtail (*Setaria verticillata*), both grasses of uncommon but localized occurrence on wetter soils in the semi-arid Deccan savanna zones. There is also parenchyma tissue from all sampled sites and nearly all contexts, which suggests tuber use, possibly wild(?) yams. A wild *Cucumis* species was also utilized, although cucurbitaceous vegetables were probably of no great significance. In addition, a range of wild fruits, available during the dry season, are in evidence. Other millets of peninsular Indian origin have also been recovered in small quantities, although they may not have been cultivars, including little millet (*Panicum sumatrense*), kodo millet (*Paspalum scrobiculatum* L.), sawa millet (*Echinochloa colona* (L.) Link), and yellow foxtail millet (*Setaria pumila* (Poir.) Roem & Schultz, syn. *S. glauca* auct. pl.).

During the course of the South Deccan Neolithic and the North Deccan Chalcolithic a number of other crops originating elsewhere were added to the subsistence system (Table 16.3). Crops of African origin had arrived in India, although they had not apparently become of widespread importance, including sorghum, pearl millet, hyacinth bean and cowpea. To a more limited extent, some of these crops were also taken up in northwestern India. They apparently arrived in a piecemeal fashion, during the same general phase that wheats and barley were taken up in the

Table 16.2. *Early Neolithic food plants of South India, and their native habitat.*

Early Neolithic, Southern Deccan		
Ashmoud Tradition Phase I: 2800–2200 BC (& earlier?)		
Inferred basic package		
Mungbean	*Vigna radiata*	wet(–dry) deciduous forests
Horsegram	*Macrotyloma uniflorum*	Peninsula: savanna
Browntop millet	*Brachiaria ramosa*	Peninsula: savanna
Bristley Foxtail	*Setaria verticillata*	Peninsula: savanna
Wild(?) yams	*Dioscorea* sp.	wet(–dry) deciduous forests

Available wild fruits: Deccan Neolithic/Chalcolithic		
Jujube	*Ziziphus mauritania*	dry deciduous/savanna
Sebestan plum	*Cordia dichotoma*	wet deciduous
Emblic myrobalan	*Phyllanthus emblica*	wet deciduous
Cuddapah almond	*Buchnania lanzan*	dry deciduous
Indian jambos	*Syzigium cumini*	wet deciduous
Figs	*Ficus* spp.	various

Table 16.3. *Food plants added to subsistence in peninsular India during the Neolithic/Chalcolithic, and their regions of origin.*

Middle Neolithic, Southern Deccan: Additional Crops		
Ashmoud Tradition Phase II: 2200–1800 BC		
Hyacinth bean	*Lablab purpureus*	Africa
Pearl millet	*Pennisetum glaucum*	Africa
Wheat	*Triticum* spp.	Southwest Asia, via Indus Valley
Barley	*Hordeum vulgare*	Southwest Asia, via Indus Valley
Grasspea?	*Lathyrus sativus*	Southwest Asia, via Indus Valley
Late Neolithic, Southern Deccan: Additional Crops		
Ashmoud Tradition Phase III: 1800–1000 BC		
Pigeonpea	*Cajanus cajan*	eastern Peninsula: Orissa
Hyacinth bean	*Lablab purpureus*	Africa
Cotton	*Gossypium* cf. *arboreum*	Peninsula? or Indus Valley
Linseed/flax	*Linum usitatissimum*	Southwest Asia,via Indus Valley
Finger millet? Present only at end of phase?	*Eleusine coacana*	Africa

Malwa-Jorwe Chalcolithic, Northern Deccan		
1700–1000 BC		
Mungbean	*Vigna radiata*	Peninsula: wet(–dry) deciduous
Urd	*Vigna mungo*	Peninsula: Wet(–dry) deciduous
Horsegram	*Macrotyloma uniflorum*	Peninsula: savanna
Browntop millet?	*Brachiaria ramosa*	Peninsula: savanna
Bristley Foxtail?	*Setaria verticillata*	Peninsula: savanna
Little millet?	*Panicum sumatrense*	Peninsula: savanna
Wheat	*Triticum* spp.	Southwest Asia, via Indus Valley
Grasspea	*Lathyrus sativus*	Southwest Asia, via Indus Valley
Pea	*Pisum sativum*	Southwest Asia, via Indus Valley
Lentil	*Lens culinaris*	Southwest Asia, via Indus Valley
Chickpea	*Cicer arietinum*	Southwest Asia, via Indus Valley
Hyacinth bean	*Lablab purpureus*	Africa
Cow pea	*Vigna unguiculata*	Africa
Pearl millet	*Pennisetum glaucum*	Africa
Great millet	*Sorghum bicolor*	Africa

Southern Deccan. Additional crops from elsewhere in India are also first documented during this period, including pigeonpea, a native of Bastar and Orissa.

The situation in Gangetic India also indicates that possible native domesticates were being cultivated when the Southwest Asian crops were introduced. Recent sampling at Senuwar (Saraswat in press; see also, Saraswat 1992; Saraswat & Chanchala 1995) indicates that, during the first phase of this Neolithic site, wheat, barley, lentils and peas arrived later than rice (*Oryza sativa*) and yellow foxtail (*Setaria pumila*). This implies that a rice-millet cultivation system was already established before other crops were introduced from the west. Evidence from the upper and middle Ganges, as at Senuwar, indicates that some crops of African origin were adopted early in the second millennium BC, including hyacinth bean, cowpea and sorghum, while evidence for pearl millet and finger millet is absent before the late second millennium BC (Fuller in press).

An important set of crops native to northern India, but still fairly poorly documented, are cucurbitaceous vegetables including cucumbers (*Cucumis sativus*), snake gourd (*Trichosanthes cucumerina*) and ivy gourd (*Coccinia grandis*). Although *Cucumis* sp. seeds have been reported fairly widely, specific identity remains elusive, with melons, cucmbers and wild species all possibilities. *C. grandis* has been recovered from Hulas in the upper Ganges basin at 1800–1300 BC.

The origins of Indian rice remain problematic, but a domestication event in north India is certainly possible. Rice was domesticated at least once in south China (Lu 1999; Anping 1998; Zhao 1998; Cohen 1998), probably along with chickens (West & Zhou 1988) and pigs (see Smith 1995). Some would tie it to a hypothetical 'Austric' package (*sensu* Blust 1996)

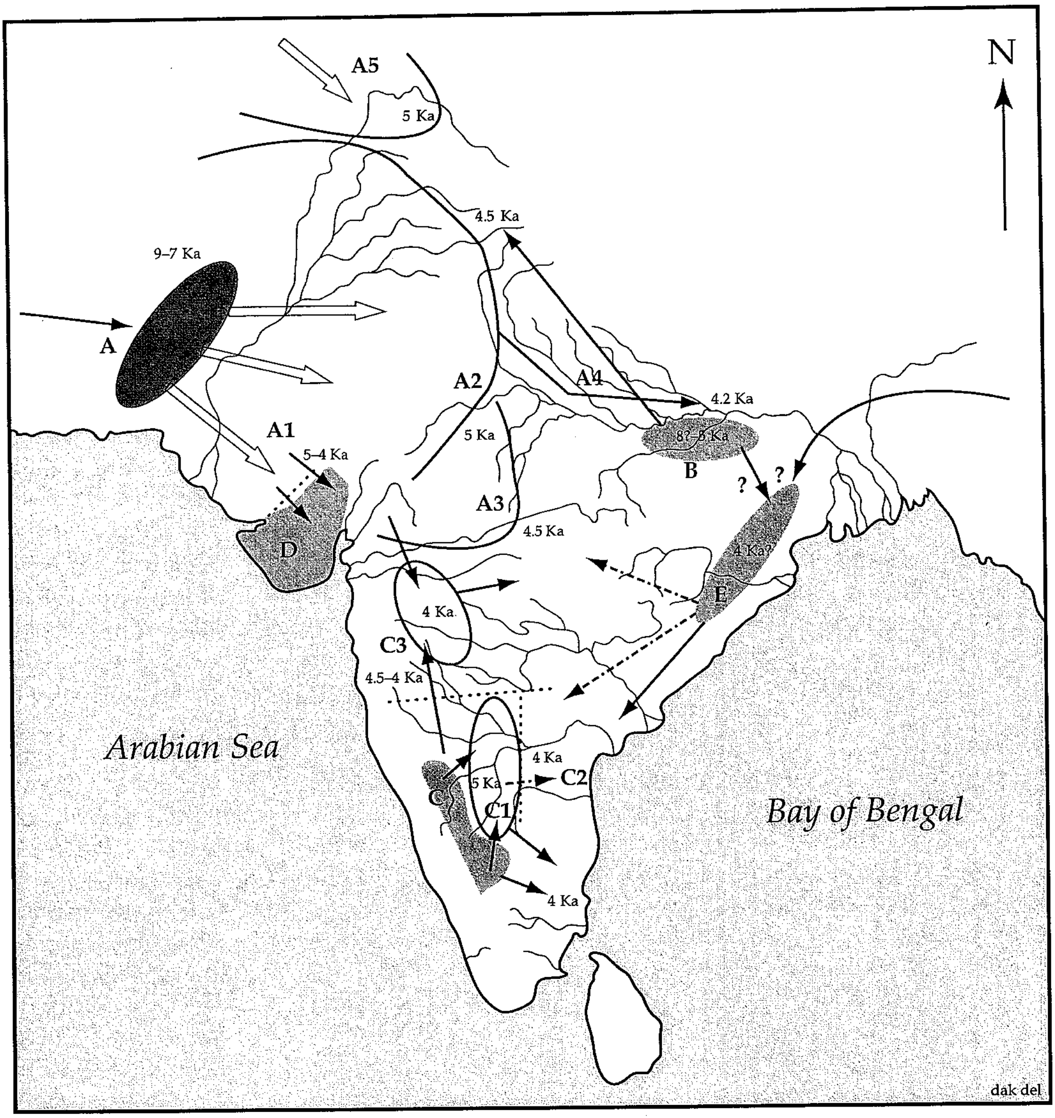


Figure 16.1. *A synthetic view of early agricultural origins and dispersals in South Asia. Regions of probable local domestications shaded. Dispersals indicated by arrows and prehistoric agricultural frontiers indicated by lines (solid = 'moving'; dotted = 'static'). Approximate minimum ages for frontiers and dispersals indicated in 1000s of years before present (calibrated). Important 'events' indicated by letters and numbers: A) early zone of agro-pastoralism of Southwest Asian origin, with some local domestications (zebu cattle, cotton, sheep?); A1) possible dispersal of pastoralism without Southwest Asian cultivars, pastoralism may spread further east and south; A2) frontier of Southwest Asian package with Early Harappan societies and Balathal/Ahar culture; A3) subsequent frontier with Kayatha culture; A4) dispersal of Southwest Asian crops and livestock into Gangetic plain, with existing cultivation system(s); A5) agriculture of Southwest Asian crops of the northern Neolithic may derive from Central Asia; B) middle Ganges centre of domestication, possibly of* indica *rice, also yellow foxtail(?), various cucurbits, horsegram (?) with possible dispersal west and south/east; C) southern domestication centre of small millets and pulses; C1) ashmound tradition, combining south Indian crop domesticates with domestic fauna, possibly introduced from north; C2) eastwards dispersal (diffusion) of Southern Neolithic agro-pastoralism into non-ashmound tradition; C3) northwards dispersal of South Indian crops, combined with Southwest Asian crops and livestock in Chalcolithic Maharshtra; D) Saurashtra where introduced livestock combine with millet cultivation (by the third millennium), possible native millet domestications; E) Orissa Neolithic, where rice could have been domesticated(?) along with pigeonpea and tuber crops (?) — this Neolithic is poorly documented and dated, and could derive from northeastern immigrants.*

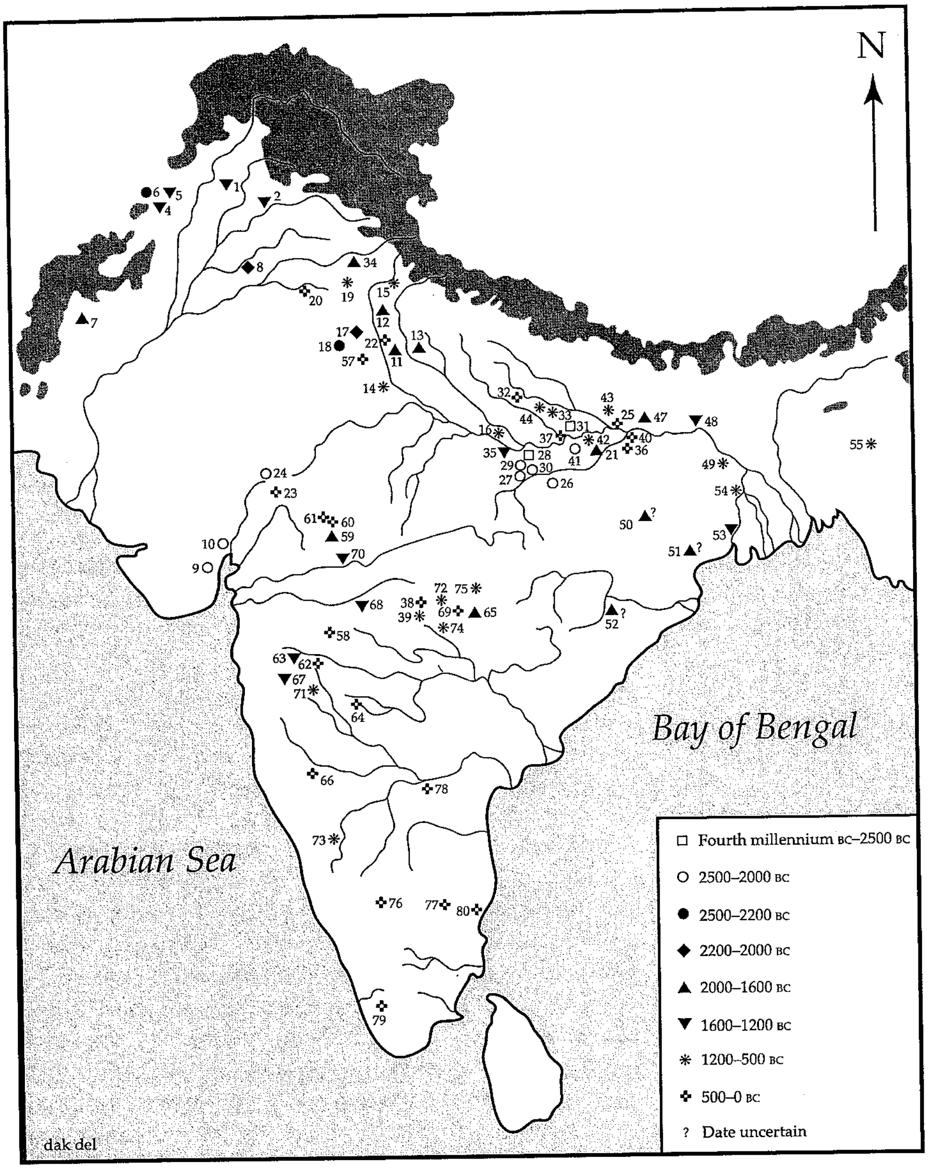


Figure 16.2. *Archaeological evidence for rice in South Asia indicated by chronological phase. (After Fuller 2002.)*

that dispersed by migration into northeastern India with the Austro-Asiatic (Munda) languages (e.g. Higham 1995; this volume; Glover & Higham 1996; Bellwood 1996). The current genetic evidence, however, is clear in indicating a minimum of two domestications for *Oryza sativa* (Sato *et al.* 1990; Sano & Morishima 1992; Chen *et al.* 1993; 1994; Wan & Ikehashi 1997), with the second domestication of *indica* cultivars conceivably in the Gangetic basin. Unfortunately, despite some suggestive early dates from contexts containing rice, which many accept as indicating the domestication of rice in the Vindhya Plateau of north-central India *c.* 6000–5000 BC (Sharma *et al.* 1980; Saraswat 1992; Mehra 1997), the dating of the evidence is highly problematic (cf. Allchin & Allchin 1982; Sharma & Sharma 1987; Possehl & Rissman 1992; Glover & Higham 1996), with the mid-fourth to early third millennium BC representing a conservative estimate for evidence of rice use (but not necessarily cultivation) based on impressions in pottery from Chopanimando and subsequent Neolithic sites (Fuller 2002; cf. Chakrabarti 1999, 207). Systematic sampling and direct AMS dates are needed. In addition late Mesolithic (early third or fourth millennium BC) evidence from Damdama suggests wild rice use, together with other wild grasses (cf. *Eleusine indica, Dactylocitnum* sp.: Kajale 1990) by a society that may have been sedentary, although engaged in hunting (Chattopadyaya 1996). The subcontinental record for rice indicates diffusion of this species from the Ganges region starting in the late third millennium (Fig. 16.2).

Leaving aside the problem of rice, there are other crops clearly of Chinese (or perhaps Central Asian) origin that made their appearance in South Asia before 2000 BC. These include at least one of the 'Chinese' millets, common foxtail millet (*Setaria italica* (L.) Beauv.), with much more limited evidence for proso millet (*Panicum miliaceum* L.) and hemp (*Cannabis sativus* L.). Although it is clear that the two millets were important in early north Chinese agriculture, it seems likely that *S. italica*, and perhaps *P. miliaceum* as well, was domesticated more than once in Eurasia, with southeastern Europe and/or the Caucasus as possible regions (cf. Burkill 1953; Prasada Rao *et al.* 1987; Marnival 1992; Zohary & Hopf 2000). The *S. italica* cultivated in India today seems to derive in part from both Chinese and European genetic stock (Li *et al.* 1998). These crops are likely to have reached South Asia from the north or northwest via central Asia, perhaps as early as the Harappan period, although with clearest evidence from the Late Harappan (after 2000 BC). It should be noted, however, that the evidence suggests that each of these three species is likely to have followed its own course of diffusion. *S. italica* appears to have arrived first, as it is reported from Gujarat from the mid-third millennium BC (Weber 1991), whereas *P. miliaceum* appears in Baluchistan and Afghanistan only from sometime in the early second millennium BC (Costantini 1979; Willcox 1991). Thus, these species from Central Asia appear to have played a relatively minor role in the overall patterns of agriculture in early South Asia.

One of the more intriguing patterns is that of Gujarat, which despite being a region generally included in the Harappan civilization (see e.g. Possehl 1980; 1997; Kenoyer 1998; Chakrabarti 1999), shows a very different agricultural system from the Indus Valley (see Weber 1991; 1998; 1999; Reddy 1991; 1994; Chanchala 1994; Kajale 1996b; Fuller 2002). In part this can be attributed to local ecology since Gujarat lacks a perennial major river and instead must rely on monsoon rains — to which the summer-cultivated millets are better suited. Although the earliest archaeobotanical samples date back only to *c.* 2600 BC, sedentary sites with ceramics such as Padri suggest that cultivation was established by the end of the fourth millennium BC (Shinde 1998; cf. Possehl 1999). Although sites such as Rojdi and Kuntasi which date to the Mature Harappan phase have extremely limited evidence for wheat and barley in a few samples, the ubiquitous and dominant species are tropical millets, including indisputable identification of the native Indian little millet (*Panicum sumatrense*) which appears to dominate published sites, contrasting with the contemporaneous millets from elsewhere on the subcontinent. In addition there is evidence for foxtail millets, probably including *S. verticillata* and *S. pumila,* while *S. italica,* presumably introduced (from Central Asia?) had reached Gujarat by the mid-third millennium BC. While African finger millet (*Eleusine coracana*) has also been reported, details of identification are still awaited (see Fuller 2002; in press).

The fact that these small millets were being cultivated in this region by the middle of the third millennium BC suggests that they were domesticated, perhaps locally. Horsegram may also have been domesticated locally before 3000 BC, and the Southwest Asian winter pulses are in evidence in small quantities before 2000 BC. In general, despite the clear influence of Indus Valley material culture in Gujarat during the third millennium BC (the so-called Sorath Harappan), there appears to be a distinctly native cropping system.

Livestock origins and dispersals

Livestock have long played an important role in South Asian subsistence systems, and, as with crops, different regions of origin can be postulated. Sheep and goat were clearly domesticated in Southwest Asia by the time of the middle Pre-Pottery Neolithic B (Smith 1995; Bar-Yosef & Meadow 1995; Harris 1998; Zeder & Hesse 2000). Genetic and archaeozoological data point to the Zagros mountains of northern Iran for goat domestication (Zeder & Hesse 2000), and both species were present as domesticates by *c.* 6000 BC at Mehrgarh (Meadow 1996), with the possibility for separate sheep domestication still open (Meadow 1984; 1989; cf. Hiendleder *et al.* 1998). The dispersal of goats (and sheep?) together with wheat and barley (and winter pulses?) from the Fertile Crescent to Baluchistan does not appear to have included domestic cattle, and perhaps preceded their Southwest Asian domestication. In Baluchistan, as the bone evidence from Mehrgarh indicates, humped zebu cattle were independently domesticated (Meadow 1996; MacHugh *et al.* 1997; Bradley *et al.* 1998; Grigson 1985).

From Baluchistan, it is likely that pastoralism spread eastwards. Despite some claims for additional zebu domestications (e.g. Allchin & Allchin 1974; Alur 1990) and some suggestive proxy genetic indicators (Naik 1978), there are no clear archaeozoological or genetic sequence data in support (Pushpendra *et al.* in press). Nevertheless, the presence of large *Bos* bones, which suggest the existence of wild cattle populations in the Neolithic/Chalcolithic period in both Gujarat and South India (Thomas *et al.* 1997), makes additional zebu domestication(s) plausible. The evidence from Gangetic India is problematic, with the identification by Sharma *et al.* (1980) called into question by more recent research on Mesolithic fauna from Damdama, indicating an entirely wild fauna into the (mid?) third millennium BC (Thomas *et al.* 1995a).

Taking a more minimalist view, however, we can assume that cattle dispersed into India from Pakistan. The earliest established dates for the presence of cattle beyond Baluchistan and east of the Indus Valley are *c.* 4000 BC from northern Gujarat, where recent AMS collagen dates from Loteshwar (Patel 1999) confirm the earlier evidence from Bagor, and perhaps Adamgarh, for sheep/goat and cattle

Table 16.4. *Finds of* Gallus *bones in South Asian archaeological sites, with probable dates cal.* BC. *Those at right occur within the native range of* Gallus spp. *those at top within the range of Red Junglefowl, the ancestor of domestic chicken. Those at left occur outside the modern natural range and are likely domestic chickens. Peninsular finds, at lower right, show general consistency suggesting introduction in the mid-second millennium* BC. *(Data from Sahu 1988; Kane 1989; Venkatasubbaiah* et al. *1992; Joglekar & Thomas 1993; Thomas* et al. *1995a,b.)*

		Areas with wild *Gallus*	
	Areas with wild *Gallus gallus*	**Kashmir** Gufkral I (*c.* 2300 BC)	**Ganges** Damdama (4000–2000 BC) Mahadaha (2500-1000 BC) Bharatapur (2nd mill. BC?) Narhan (*c.* 1400–800 BC)
Areas without wild *Gallus*			
Indus (2500–2000 BC) Harappa Mohenjodaro Kalibangan II Rupar	**Rajasthan** Ahar IC (2100–2000 BC) **Gujarat** Rojdi (2500–2000 BC) Surkotada (2400–2000 BC) Shikarpur (2500–2000 BC)	**Northern Deccan** Daimabad V (1500–1100 BC) Nevasa (1500–1200 BC) Inamgaon (1700–1000 BC) Walki (1500–1000 BC) Thuljapur Garhi (1500–1000 BC)	**Southern Neolithic** Kodekal (1600–900? BC) Paiyampalli (1700–900 BC) Hallur (1400–1100? BC) Hanumantaraopeta (1500–1000? BC) Peddamudiyam (1500–1000? BC)

in Mesolithic contexts (Thomas & Joglekar 1994). A domestic fauna was well-established in Saurashtra by *c.* 3000 BC with the Padri culture (Joglekar 1997). Further east, across the Aravalli hills, the beginnings of the Ahar culture of Rajasthan can now be pushed back into the fourth millennium BC, with cattle and sheep/goat pastoralism (Thomas & Joglekar 1996) and presumably winter crop cultivation (cf. Kajale 1996a). The earliest evidence from the Peninsula remains the ashmounds of Karnataka from *c.* 2800 BC, with a noticeable gap in contemporary or earlier evidence in the intervening region of Maharashtra (Thomas & Joglekar 1994; Joglekar 1999; Korisettar *et al.* 2002; Joglekar in press).

The prehistory of the other animal domesticates in South Asia remains problematic. Archaeozoological evidence for buffalo, pigs and chickens is complicated by problems of identification, since populations of wild relatives still occur in the subcontinent (Meadow 1996). In the case of pigs, usually listed as domestic (cf. Thomas & Joglekar 1994), clear osteological criteria for domestic status are lacking. In the case of water buffaloes, differentiation of wild/domestic is not possible and for many bones it is problematic to separate them from cattle (but see Thomas *et al.* 1995b). Even when water buffalo are clearly present, the generally low frequencies may indicate that they were merely hunted, as Meadow (1998) has suggested for the Harappan period. The reasonably large proportion of buffalo bones in relation to definite cattle bones at Harappan Dholavira might suggest that both species were herded (Patel & Meadow 1997), and buffaloes have similarly been suggested to have been herded at Shikarpur, another Harappan site in Gujarat (Thomas *et al.* 1995b). While water buffalo are also considered an early domesticate in China, present (but domesticated?) during the Hemudu phase (Smith 1995), additional domestication event(s) in South Asia remain a possibility.

The situation with chickens is similarly problematic in terms of determining domestic status and geographical origins. Wild *Gallus* spp. are well-known in South Asia, such as *G. sonnerati* in the Peninsula, while the wild progenitors of domestic chickens are distributed across north and northeast India. In addition, there are several other gallinaceous birds native to South Asia (Johnsgard 1986). Distinguishing chickens from these may prove complicated, just as MacDonald (1992) has shown to be the case in Africa. In China, the widespread occurrence of *Gallus*-type bones by the sixth–fifth millennia BC would seem to argue for husbandry/domestication (West & Zhou 1988). If we take a similar view of the numerous *Gallus* reports from South Asia, which are by and large restricted to agricultural periods (Table 16.4), we can suggest the pattern of chicken dispersal. In western regions (Gujarat and the Indus Valley), where the wild progenitor is absent today (although this need not have been in the case in prehistory), several finds point to chicken-keeping by the Mature Harappan phase. Similarly, most finds from north India also come from the second half of the third millennium BC, probably including Mesolithic Damdama, where chickens occur in reasonably large quantities during the later levels (Thomas *et al.* 1995a). Could this indicate emerging chicken husbandry amongst hunters, who were probably sedentary (cf. Chattopadyaya 1996) and using wild(?) rice (Kajale 1990)? In Peninsular India, despite the poor dating of some sites, most *Gallus* finds date from the mid- to late second millennium BC and are often absent in earlier levels of the same sites. This would seem to indicate that chickens dispersed southwards as domesticates in the mid-second millennium, a hypothesis congruent with the Dravidian linguistic evidence (see below).

Dravidian historical linguistics and other languages

The four major Dravidian subgroups seem well-established (Fig. 16.3), although controversy surrounds the placement of Brahui (Fig. 16.4). While the location of Brahui has often been taken to indicate a dispersal of early Dravidian speakers from the northwest, with subsequent language shift to Indo-European languages, an alternative hypothesis suggests that the ancestral Brahui migrated westward more recently from a North Dravidian area in central India (Elfenbein 1987; 1998; Parpola 1994, 161).

A number of lines of evidence point to a more widespread distribution of Dravidian cultural groups in the past, with subsequent conversion to Indo-European languages (see Fig. 16.3; Trautman 1979; Fairservis & Southworth 1989; Parpola 1994). Southworth (1979), for example has traced village place-name endings typical of South India throughout Maharashtra and the Saurashtra Peninsula, and perhaps even Sindh (Fairservis & Southworth 1989; Southworth 1979; 1988; 1992). In these regions cross-cousin marriages are either typical or practised by some cultural/caste groups, as discussed by Trautman (1979; 1981). This implies that this characteristically Dravidian cultural practice has persisted in areas where Indo-Aryan languages are now spoken, although there appears to be no evidence that cross-cousin marriages were ever practised in Gangetic India. The practice of cross-cousin marriages within the North Dravidian sub-family remains problematic, with the practice only recorded amongst the Kuruk. It is worth considering that this practice of kin-group endogamy may have important implications for modelling the process of the dispersal of agriculture in peninsular India by comparison to other regions such as Europe where models assume exogamy between agriculturalists and hunter-gatherers (e.g. Zvelebil 1996).

The Munda language family includes a number of relatively small and often isolated languages in two main sub-groups (Bhattacharya 1975; Zide &

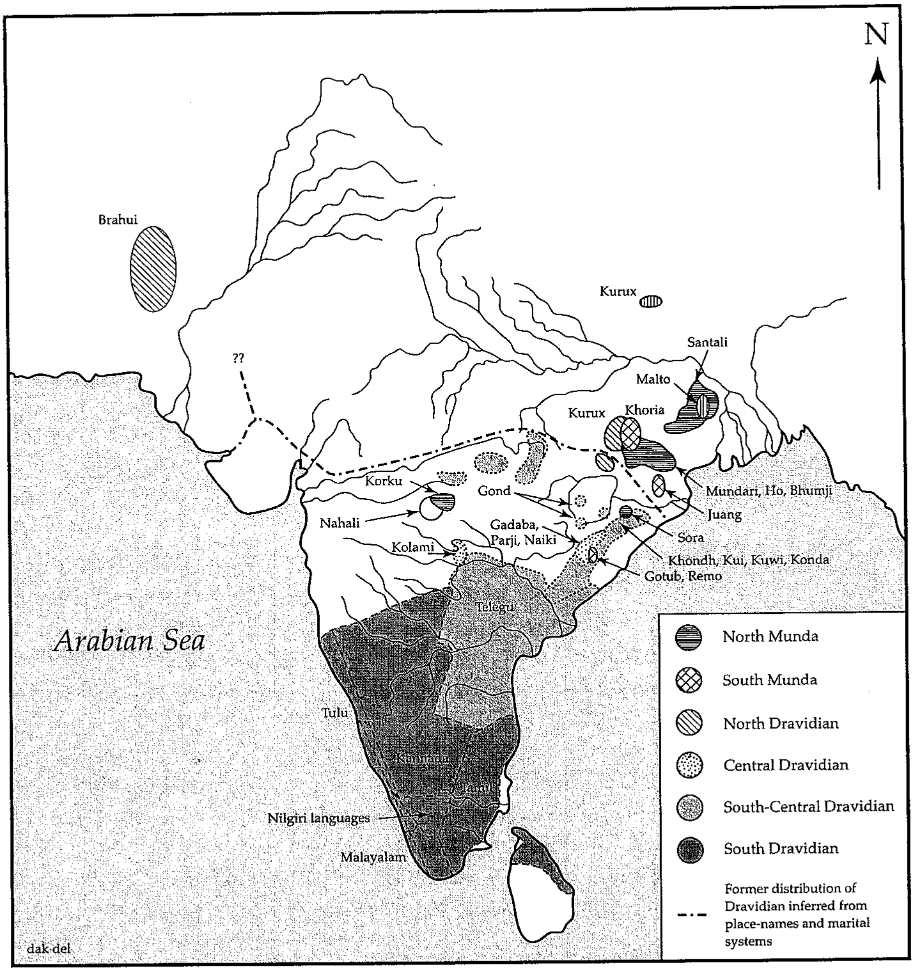


Figure 16.3. *Distribution of Dravidian languages, broken into sub-families, Munda languages, divided into North and South subfamilies, and Nahali (based on Bhattacharya 1975; Zide & Zide 1976; Singh 1994; Tikkanen 1999; Steever 1998a). Dashed-and-dotted line indicates general frontier region of former Dravidian linguistic/cultural influence as indicated by the occurrence of Dravidian kinship terminology/marital systems and Dravidian place-names (see Fairservis & Southworth 1989).*

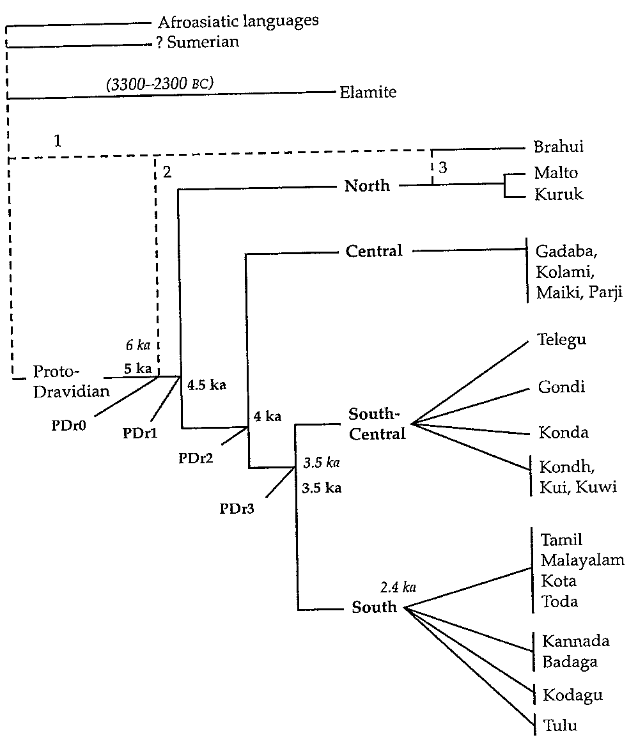


Figure 16.4. *Phyletic diagram of Dravidian languages incorporating various proto-language hypotheses, sub-grouping hypotheses, and date suggestions from linguistics/ glottochronology. Divergence dates indicated in thousands of years (ka) after Zvelebil (1970, 18) in italics and after Southworth (1995) in bold. Subgroupings follow Steever 1998 and Zvelebil 1990. Proto-language node numbers follow Southworth. Three hypotheses for the placement of Brahui indicated by boxed numbers: 1) after McAlpin 1981; 2) after Southworth 1995; Fairservis & Southworth 1989; 3) conventional, e.g. Zvelebil 1990; Steever 1998. Possible extra Dravidian relationships indicated by dashed lines (see Blazek 1999).*

Zide 1976): South Munda, including the Sora and Kharia languages, and North Munda, including Santali of northern Orissa and Bihar, and the grouping of Mundari, Ho and Bhumji, further south. The isolated Korku in Madhya Pradesh is also grouped more distantly with the northern group. This disjunct location of the Korkus suggests that the Mundaric dispersal westward preceded the northward expansion of Gondi (south-central Dravidian) speakers. Nahali, further west still, includes Munda elements but is now generally excluded from this group (Bhattacharya 1975; Tikkanen 1999). A few studies provide evidence for the agricultural vocabulary of ancient Munda groups as well as the influence of their language on other groups in India (e.g. Zide & Zide 1976; Kuiper 1948; Masica 1979).

Beyond the modern languages, there is possible evidence for an extinct pre-Indo-European language group in Gangetic India (Deshpande 1995). Early texts indicate that Indo-Aryan speakers picked up retroflexion as they moved eastward in north India. While Dravidian languages are largely retroflex, Deshpande entertains the possibility that this was due to the influence of other languages. Of particular significance is the evidence for agricultural and botanical terminology borrowed into Indo-Aryan, and to a lesser extent Dravidian, which appears to be neither Dravidian nor Munda (Masica 1979; Fairservis & Southworth 1989, 137). As will be argued below, this evidence for an extinct North Indian agricultural language is compatible with our current understanding of early North Indian agriculture.

Historical linguistics of indigenous and introduced crop staples

While Dravidian etymological data fit the archaeological picture for early Indian agriculture outlined above, some provisos are needed. Various crops have been reconstructed to various proto-languages within the Dravidian family (e.g. Southworth 1976; 1979; 1988; 1995), but such reconstructions inevitably rely on recorded vocabulary. A perusal of the *Dravidian Etymological Dictionary* (Burrow & Emeneau 1984, abbreviated hereafter *DEDR*) makes it clear that, in many cases, the palaeolinguistic level to which a word can be reconstructed could reflect lack of recording, especially in North Dravidian and often Central Dravidian. For example, in the case of wheat, no word for this species is provided by the dictionary for any of the North or Central Dravidian language sub-families, even though wheat is grown in some of these regions. Nevertheless, I will suggest that the available linguistic evidence is congruent with the archaeological evidence outlined above.

There are some well-recorded Dravidian etyma for a South Indian Neolithic native crop package (Table 16.5). The two pulse taxa which can be traced furthest back in the Dravidian phylogeny are mung-bean and horsegram, both of which reconstruct to proto South-Central Dravidian (Southworth 1976; 1979; 1988; 1995). In addition, there are words for urd and pigeonpea, both recorded early from peninsular sites, and for wild fruits. The ancestors of the Central, South and South-Central (SC) Dravidian branches may well have been in place on the Penin-

Table 16.5. *Linguistic evidence for crops, excluding millets, and wild fruits of the early peninsular Neolithic. Proto-linguistic reconstructions given after Southworth (1988) when possible, with* DEDR *entry numbers from Burrow & Emeneau (1984). When no reconstruction has been published, words in representative languages are provided after Burrow & Emeneau. Italicized etyma in quotations are taken from the* Madras Flora *(Gamble 1921; 1935; Fischer 1928) or Watt's* Dictionary of the Economic Products of India.[1] *Additional names from Jain & Mudgal 1999.*[2] *Additional names from Haines (1921–25).*

	South Dravidian	South-Central Dravidian	Central Dravidian	North Dravidian
Horsegram	PDr-2 **kol(ut)* [→ OIA *kulatthika*, Pmunda **kodaXj*] (*DEDR* 2153)			No data
Mungbean	PDr-2 **payaru* (*DEDR* 3941), cf. 'green' (*DEDR* 3821) ?→ S/SC 'dhal' (*DEDR* 3978), Ta. *paruppu*			No data
Urd	*DEDR* 690: Ta. *uruntu*, Ma. *urunnu*, Ka. *urdu*, *uddu*, Tu. *urdu*, Te. *uddulu*, Kol. *urunde*, Nk, *urnda* [→ Pkt. *udidi*]			No data
Urd	N/A	PDr-2 **minimu* [→ Skt. *malada*] *DEDR* 4862: Pa. *midi*, Ga. *mindi*, Te. *minimu*		
Wild forest date	PDr.1 **kiintu* (*DEDR* 2617)			
Jujube	*DEDR* 475: Ta. *iratti*, Ma. *ilantà*, Ka. *era*, *elaci*, Te. *regu*, Kol. *renga*, Nk. *rega*, Ga. *ren*, Go. *renga*, Pa. *rega*, Malto *ilkru*			
Sebestan plum	*DEDR* 3627: Ta. *naruvili*, *naruli*, Ma. *naruvari*, Te. *nekkera* *DEDR* 5408: Ta. *viracu*, Ma. *virisu*, Te. *virigi*		No data	No data
Indian jambos	*DEDR* 2914: Ta. *naval*, Ma. *naval*. *DEDR* 2917: Ma. *naral*, Ka. *neral*, Tu. *nerulu*, Te. *neredu*, Pa. *nadi*, Ga. *nendi*, Konda *nerre*			No data
Cuddapah almond	Ta. *'Morala'*, Ma. *'Munga pera'*, Ka. *'Nurkul'*, *'murkalu'*	*DEDR* 2628: Kol. *sire*, Kui *sreko*, Kuwi *reko*, Nk, *sire*, Pa. *cir*, Pe. *reka*, Ma.Go. *'reka'* [1], Go. *'edka'* [1], *'Saraka, herka'*, Te. *'morli'* (cf. Mah. *'Chironji'*, Or. *'Charu'*, Korku *'Taro'*, Sant. *'Tarop'*)		No data
Emblic myrobalan	PDr.2 **nelli* [including Parji, but in Konda, Kui, Kuwi = 'tamarind'] [?→ Skt. *Amalaka*, *amlika* 'Emblic' and 'Tamrind'.] (*DEDR* 3755). Also, Go. *'Isurkaya'* [1]			No data
Emblic myrobalan	N/A	Te. *usirika*, Kol. *usurka*, Go. *Usirka*, Konda *usirka*, Pe. *hurka*, Kui *jurka*, Kui *jura*, Kuwi *juro* (*DEDR* 574)		N/A

sula when agriculture began, so that these widespread subfamilies might trace their geographical dominance in part at least to their locally-developed agricultural economy.

Unfortunately, good linguistic data are not available for the native small millets, although one might suggest equivalent antiquity. For most of these millets there are no entries in the *Dravidian Etymological Dictionary*, and we must rely on the vernacular names given by botanists (e.g. Watt 1889–93; Fischer 1928; Gamble 1921; 1935). This means that such names may not be recorded with linguistic accuracy (in this paper they are placed in quotation marks), but unlike the linguistic sources we can be confident of their botanical accuracy. For *S. verticillata*, for example, we have different compound grass names recorded for Tamil and Kannada only. It is possible that the South Dravidian *navane*, which is taken to refer to *Setaria italica* today, may in the past have referred to *S. verticillata* as grasses in this genus are largely the same and one can envisage the more productive *S. italica* being rapidly adopted to replace the indigenous and less productive variety of foxtail. While *navane* (*DEDR* 3614) also refers to rice in several languages, all are from regions where rice has become particularly important in recent times. The archaeobotanical record would argue that this represents semantic shift. In the case of *Brachiaria ramosa*, we have a few vernacular names that clearly link this species with other small millets, suggesting that it also acquired its name secondarily. This would appear to be the case for the name *Pedda sama* (Te.), reported from the Eastern Ghats, where *B. ramosa* is generally cropped along with *samai* (*Panicum sumatrense*) (De Wet *et al.* 1983; cf. Kimata *et al.* 2000).

Brachiaria ramosa, like several other millet species, can be referred to with an apparently widespread *'ragu'* morpheme, a root for several small millet species in Dravidian languages (see Table 16.6). While the best-known crop name derived from this root today is *ragi*, finger millet, the archaeological evidence suggests this is a relative latecomer which must have taken over the name from one or more native millet species. Southworth could only recon-

Table 16.6. *Some linguistic evidence for the native millets. Italicized etyma in quotations are taken from the* Madras Flora *(Gamble 1921; 1935; Fischer 1928) or Watt's* Dictionary of the Economic Products of India.[1] *Additional names from Jain & Mudgal 1999.*[2] *Additional names from Haines (1921–25).*[3] Korali *is recorded by de Wet* et al. *1979 for* Setaria pumila.

	South Dravidian	**South-Central Dravidian**	**Central Dravidian**	**North Dravidian**
Setaria millets (including *S. italica, S. pumila,* perhaps *S. verticillata*)	*DEDR* 3614. Ta. Navarai (rice), Ma. Navira (*Paspalum scrobiculatum?*), Tu. *Navara* (a kind of grain), Ka. *'Navane'* (*Setaria italica*), Te. *Nivari* (rice) [→ Skt. *nivara* (wild rice)]		?	?
	DEDR 2163: Ta. *kural*, Ko. *koyl*, Ka. *korale*, To. *korralu*, Te. *'koralu, korali'*[3] Go. *Kohala, kosra* [Ma.Go. *ko'la* (*Panicum sumatrense* and/or *P. miliaceum*), Ko.Go. *korra* (*Eleusine coracana*)], Kui *kueri*, Pa. *koyla* [→ Skt. *khangu*; cf. Pmunda **hoxy*]			No data
A general millet term, with variants or derivatives referring to *Panicum, Brachiaria ramosa, Setaria, Paspalum scrobiculatum*	*'ragu'* (root) [from PDr. **iraki*] (*DEDR* 812, 525, cf. 379, 5260): Ka. *'kadu baragu'* (*B. ramosa*), *'kari baragu'* (*S. italica*), *'baragu'* (*P. miliaceum*), *'Haraku arikel'* (*P. scrobiculatum*), Te. *'varagulu, wuragi'* (*P. miliaceum*), *'Arugu, arikelu'* (*P. scrobiculatum*), Ta. *'Varagu, karu varagu'* (*P. scrobiculatum*), *'kalvaragu, kapai'* (*E. coracana*) → *DEDR* 5287: 'rice grain', Ta. *raki*, Ma. *varru*, Kol. *val*, Nk. *val(ku)*. [?→ Pmunda *e-rig*]. Differs from Sant. *'mota gundli'* = *B. ramosa*[2]			
Uncertain original millet, compare with *Panicum sumatrense* and *Echinochloa colona* (below).	*DEDR* 3265: Ta. *tinai* (*Setaria*), *camai* (*P. sumatrense*), Ma. *tina*, Ka. *tene-gida* (*Setaria*), Ko. *ten* (ear of grain). Cf. Skt. *China* (*P. miliaceum*)	? (see below)	No data	No data
Panicum sumatrense ('little millet'). ? = *DEDR* 3265	Ta. *'shamai, samai, chamai'*, Te. *'nella-shama, nella-shamalu, nalla-chamalu, saumai'*, Cf. Mah. *'Warai'*. Cf. Sant. *'gundli'*[2]		No data	No data
Echinochloa colona ssp. Frumentacea ('sawa millet'). ? = *DEDR* 3265	Ka. *'same, save'*, Te. *'bonta-shama, sawa, bonta chamalu, chamalu, chama'* (→ Skt. *Shyamaka*, Or. *Samu*). Cf. Mah. *'Bavto'*		No data	No data

struct *ragi* back to proto-South/SC Dravidian, but he also proposed a more general proto-Dravidian etymon, **iraki*, referring to some sort of food. Could this have been an early term for a millet, such as *B. ramosa*, or a more general millet-grass term? This root seems to have evolved into a wide range of grain-related words, via some semantic shifts, even referring to rice grains (*DEDR* 5287) in some Central and South Dravidian languages. The widespread similarity in the use of *ragi* in most modern languages, including Indo-Aryan languages, to refer to finger millet (*Eleusine coracana*) may represent some form of emergent standardization. Given the great difficulty that even trained botanists have in distinguishing some of the millets, and as is evident from vernacular names, there has surely has been much sharing and semantic shifting of millet terms between similar species in the past (for instance, the *samai, savai, sawa* names for *Panicum sumatrense* and *Echinochloa colona*, two species readily confused).

In contrast to the South Indian Neolithic crop package and the native fruits, species which were introduced later tend to reconstruct to later proto-languages, usually proto-South/SC Dravidian (PDr.3; see Table 16.7). Crops which Southworth has reconstructed for this stage include wheat, pearl millet, flax/linseed, cotton and finger millet. He has suggested that sorghum may date back to the previous stage (PDr.2), although his reconstruction appears to privilege the Tamil etymon as being more conservative whereas the possibility that this etymon is derived from borrowing from the Sanskrit *yavanala-*, itself derived by compounding a term for barley might indicate that the apparent cognation between central, south-central and south Dravidian derives from early borrowing between these languages. It is also possible that this term derives originally from some other millet as is apparently the case in Kuwi. For pigeonpea there are two distinct terms, one of which appears to go back to proto-South/Central, whereas the other is only proto-South/SC, but perhaps borrowed at this stage into (or from) Central Dravidian. A similar situation seems to hold with chickens in which proto-S/SC and Central have dif-

Table 16.7. *Linguistic evidence for crops and chickens added during the peninsular Neolithic/Chalcolithic. Proto-linguistic reconstructions given after Southworth (1988) when possible, with* DEDR *entry numbers from Burrow & Emeneau (1984). When no reconstruction has been published words in representative languages are provided after Burrow & Emeneau. Italicized etyma in quotations are taken from the* Madras Flora *(Gamble 1921; 1935; Fischer 1928) or Watt's* Dictionary of the Economic Products of India.

	South Dravidian	**South-Central Dravidian**	**Central Dravidian**	**North Dravidian**
Wheat	PDr-3 **koo-tumpai* [=OIA *godhuma*]		No data	*Xolum*, separate borrowing from OIA *godhuma*?
Barley	*DEDR* 1106: Ko. *kaj*, To. *koj*, Ta. *'ganji'* (cf. Pkt. *gajja*)	No data	No data	No data
Pearl millet	PDr-3 **kampu* (*DEDR* 1242) (cf. Skt. *kambu*)		No data	No data
Sorghum	PDr-2 **connel* (*DEDR* 2896). Ta. *colam, connal* (also maize), Ma. *colam*, To. *swi lm* (maize), Ka. *jola*, Kod. *jola*, To., *jola*, Te. *jonna*, Kol. *sonna*, Kol. *sonna*, Pa. *jenna*, Ga. *jonel*, Goo. *Jonnang*, Kuwi *Ka'wa zona* (millet), Nk. *sonna* [?= Skt. *yavanala-*]			No data
Finger millet (see also, *Brachiaria ramosa* in Table 16.6, above)	PDr-3 **iraki*, borrowed from 'raki'/'ragu millets'? [from PDr-1 **iraki* 'food'] (*DEDR* 812, 525) [→ Skt. *raga, ragi*; → *DEDR* 5287 'rice grains']		?	No data
Hyacinth bean	*DEDR* 262: Ta. *avarai*, Ka. *avare, amare* [?→ skt. *saimbya*]	*eikkudu* (Te.) *'jata'* (Go.)	No data	No data
Pigeonpea	*DEDR* 1213: *kanti* (Ta.), *kandulu* (Te.), *kandi* (Go.)		*DEDR* 1934: *ken* (Konda, Pe.), *kaãnga* (Kui), *kayu* (Kuwi) [→ *kanga* (Mah.); ?→ *DEDR* 1213]. *Kandi* (Konda) [from Go.?]	No data
	DEDR 3353: *tuvarai* (Ta.), *tovari* (Ka.), *togari* (Te.), *turi* (Go.), *togar* (Kol.), *togari* (Nk.) [→ Skt. *tubarika*]			No data
Peas	Ta. *'patanie'*, Ka. *'batgadle'*, Te. *'patanlu'* (cf. Mah. *'Vatana, patana'*, Guj. *'watana'*) [not from OIA **matara*]		No data	No data
Lentils	Ta. *'Misurpurpur'*, Te. *'Misur-pappu, chiri sanagalu'*, Ka. *'Massur, chanangi'* (from Skt. *Masura*)		No data	No data
Grasspea	No data, but Mah. *'Lakh'*, Guj. *'Lang'* [not from Skt. *Khesari*]		No data	No data
Chickpea	*DEDR* 1120: Ta. *katalai*, Ma. *Katala*, Ko. *kacl*, Ka. *kadale*, Kod. *kadale*, Tu. *Kadale* [? = Skt. *cana(ka)-*]	Te. *'sannagalu, harimandhakam'*	No data	No data
Flax/linseed	PDr-3 **akace* [=OIA *atasi-*] (*DEDR* 3)		No data	No data
Cotton	PDr-3 **tuu*...[from PDr-2 **tuu-* 'feather, down'] (*DEDR* 3393) [→ Skt. *Tula*]		'feather, down'	No data
	DEDR 3976: Ta./Ma. *parutti*, Ka. *parti*, Kod. *parati*, Tu. *pati*, Te. *piratti*, Go. *parti*, Kui *parti*, Kuwi *pratti*		No data	No data
Chicken	*DEDR* 2248: *kori* (Ta., Ma, Ka.), *kodi* (Te.), *gogori* (Go.) [→ *gogori* (Nk.)]		*DEDR* 2160: *korr* (Pa.), *kor* (Nk.), *Koru* (Konda), *Koju* (Kui) [→ *korr* (Go.)]	*DEDR* 2013: *xer* (Kur.), *qeru* (Malt.)

ferent terms, but with clear borrowings between these branches. In general, the evidence for these species suggests that they were added very shortly after the divergence between Central and South/SC Dravidian, when these language groups were still in quite close contact. Based on archaeological evidence for the taxa involved, we would seem to be looking at the middle Neolithic and the pre-to-early Malwa societies of the northern Peninsula (2200–1700 BC). For some of the winter pulses that were well-established in Chalcolithic Maharashtra, notably peas and grasspeas, non-Sanskrit names persist in Maharati and Gujarati. Were these derived from pre-existing Dravidian names?

There remain additional suggested cognates amongst Dravidian languages that could refer to cultivars from an earlier stage in the language (Southworth 1988; 1992; 1995), although one might suggest that this indicates knowledge of wild progenitors instead. Amongst those discussed by Southworth (1992) are sesame (PDr-1 **el*) and date (PDr-1 **cintu*, *DEDR* 2617), which Southworth (1992) suggests may have given its name to Sindh, and possibly two words for rice. The two former species are known earliest in the northwest, with date stones dating back to the fifth millennium at Mehrgarh and sesame to the Mature Harappan (Fuller & Madella 2001; Tengberg 1999). Both could have been known in wild form on the Peninsula; wild *Sesamum mulayanum* occurs here, in addition to Punjab (Ilhenfeldt & Grabow-Seidensticker 1979; Patil 1999; Hiremath & Patil 1999; probably syn. *S. orientale* var. *malabaricum* of Bedigian & Harlan 1986), and the wild forest date (*Phoenix sylvestris*) can also be found (Barrow 1999).

The situation with rice is more problematic. Southworth maintains that familiarity with rice may derive from early Dravidian societies in Gujarat, on the periphery of the Harappan, 'which knew the use of rice' (Southworth 1992, 82), referring to chaff tempered potsherds reported from Rangpur and Lothal. Unfortunately, this is unconvincing evidence for serious rice cultivation, although some knowledge of rice is indicated. Systematic archaeobotany indicates emphatically that rice was not a staple food for most of the populations in these regions. Despite systematic sampling on sites in Gujarat, Rajasthan and the northern Deccan, rice is absent prior to the late second millennium BC, in contrast to the vast quantities of other cereals (Weber 1991; Reddy 1994; Kajale 1996a,b; Chanchala 1994). The recovery of three grains of rice from Jorwe period Inamgaon (in contrast to over 10,000 barley: see Kajale 1988), and a few negligible (and not clearly domesticated) grains from Neolithic Hallur (Fuller 1999), clearly point to the *absence* of widespread or significant rice cultivation systems in Gujarat/Peninsular India during the third–second millennia BC. It thus seems likely that rice, which has become culturally salient probably since the first millennium BC, has co-opted words that earlier referred to other cereals or had more general meanings. This is clearly the case with proto-Dravidian **vancik*/ *manci* (*DEDR* 5265, 4639) as indicated by Southworth (1992), and presumably **ari* (*DEDR* 215), which although often used in many languages to refer to rice grains can in some languages be used for any husked grain. Mahdi (1998, 398) has suggested that an early Dravidian reflex **u-rigi* may be the source for the Sanskrit *vrihi*. Might this derive from an earlier millet term such as **iraki*?

A number of terms reconstructed for proto-Dravidian that were considered agricultural by Southworth (1976) and McAlpin (1981, 133) read in fact like a range of activities that we would expect to *precede* agriculture. These operations would have been part of the behavioural repertoire of wild-grain-using (Mesolithic?) hunter-gatherers as much as for cultivators, and include skills that *must have preceded* domestication (see e.g. Harris 1984; 1996a; Hillman & Davis 1990; Willcox 1992; 1999). These include words for digging (or tilling) (*DEDR* 688 **ur-*), reaping (*DEDR* 2119 **koy-*), seed or sowing [but not necessarily sowing; the Malto derivative is glossed simply 'seed'] (*DEDR* 5401 *vit(t)*), as well as several terms relating to the processing of seed crops, such as words for winnowing (*DEDR* 2019 **KeR-*, *DEDR* 3435 **tel-*), threshing floor (*DEDR* 2119 **kal*), to parch or roast grains (*DEDR* 4537 **por(i)-*) and chaff or husks (*DEDR* 4491, 4562 **poll-*, **pot-*; and *DEDR* 637, **um*). The last of these etyma is connected by McAlpin (1981, 96) to ancient Elamite *umi* ('to grind [grain]'). We might also point to an etymon for a grain-based porridge, usually made from *Eleusine* or rice but presumably of more generic origin, that goes back to PDr-1 (*DEDR* 174). Given that wild grasses (wild cereals) were utilized by Levantine foragers as early as 19,500 bp (Kislev *et al.* 1992) and have been inferred to have been used by Aboriginal Australians perhaps back to 30,000 bp (Cane 1989), we cannot assume that such activities are 'Neolithic'.

In addition, the Dravidian languages and hypothetical Elamo-Dravidian appear to have cognate words for sheep, goat and cattle, but only in restricted languages specifying herding. We can consider the possibility that livestock diffused among hunter-foragers prior to the development of cultivation, as can be suggested to have occurred in parts of Gujarat and Rajasthan by the late fifth millennium BC. Thus, in general we should probably see the proto-Dravidians as wild-grain-using foragers who might have become widespread already from Gujarat to the Peninsula without agriculture, although they may have been quick to adopt some livestock.

Linguistic evidence congruent with an early North Indian (Gangetic) agricultural complex comes from a range of agricultural terms found in Sanskrit, and sometimes in Dravidian languages, which appear to derive from extinct languages of unknown affiliation (see Masica 1979). These terms include cereals and pulses of Near Eastern origin, established in Rajasthan by *c.* 3000 BC and in the Ganges Valley by 2500–2200 BC, as well as several other crop plants which may be of Indian origin, such as cucurbits

Table 16.8. *Words of neither Dravidian nor Indo-European origin in Indo-Aryan, suggesting the former presence of extinct agricultural languages in North India. (After Masica 1979.)*

English	Botanical Latin	Indo-Aryan	Comments on origin
Southwest Asian Package			
Wheat	*Triticum* spp.	Skt. *godhuma*, cf. PDr-3 **koo-tumpai*, Br. *xolum*	Southwest Asian origin, established early in Northwest India, staples of Harappan Indus Valley. In Ganges by 2200 BC.
Grasspea	*Lathyrus sativus*	**k(h)esari*	"
Chickpea	*Cicer arietinum*	Skt. *cana(ka)-*	"
Pea	*Pisum sativum*	**mattara*	"
Lentil	*Lens culinaris*	Skt. *masura(ka)-*	"
Flax/linseed	*Linum usitatissimum*	Skt. *atasi-*, cf. PDr-3 **akace*	"
Potential North or Northwest Indian Natives			
Rice	*Oryza sativa*	Skt. *sali-*	North Indian domestication(?)
Foxtail millet	*Setaria* sp.	Skt. *kangu*, cf. Pmunda **(h)oxy*, also cf. *DEDR* 2163	*S. pumila* at Senuwar, *c.* 2500 BC
Mung	*Vigna radiata*	Skt. *mudga*	Multiple origins in India?
Urd	*Vigna mungo*	**udidda*	Multiple origins in India?
Cucumber	*Cucumis sativus*	Skt. *ksiraka*	North Indian origin, *Cucumis* sp. Finds back to *c.* 2500 BC
Bitter gourd	*Momordica charantia*	Skt. *karavella*	North Indian origin
Ivy gourd	*Coccinia grandis*	Skt. *kunduru*	North Indian origin, early find *c.* 1800 BC upper Ganges.
Luffa/Sponge gourd	*Luffa acutangula*	**tori*	North Indian origin
Okra	*Abelmoschus esculenta*	Skt. *bhinda-*	Several wild spp. In India
Indian Jambos	*Syzygium cumini*	Skt. *jambu-*	Wild throughout monsoonal India(?)
Jujube	*Ziziphus mauritania*	Skt. *badara-*	Wild throughout India(?)
Wild(?) date	*Phoenix sylvestris*	Skt. *kharjura-*	Wild throughout India
Cotton	*Gossypium arboreum*	Skt. *karpasa*	Domesticated in Baluchistan(?), at Mehrgarh by 5000 BC
Sesame	*Sesamum indicum*	Skt. *tila-*	Wild in Punjab and western Peninsula, earliest finds Harappan, middle Ganges *c.* 1500 BC
Related Terminology			
Bread		Skt. *rotika*	
Sow		Skt. *vap-*	
Chaff, straw		Skt. *busa-*	
Winnowing basket		Skt. *surpa-*	
Plough		Skt. *langala*, cf. N.Munda, Pmunda?, AA??	Early Harappan ardmarks (Kalibangan)
Sheep		Skt. *bhedra-*, cf. Pmunda **medra*	From Southwest Asia (and Baluchistan?)

(Table 16.8). This evidence also fits our archaeological picture of a separate early agricultural complex emanating from Gangetic India, which added Southwest Asian crops to its repertoire during the second half of the third millennium BC. The agricultural populations of this lost-language group came into contact with Peninsular Dravidians after the separation of Central Dravidian and during the same general period as the early borrowings between Central and proto-South/SC Dravidian, i.e. late third to early second millennium BC. They may also have interacted with proto-Munda speakers in eastern India (see below).

Proto-Munda agriculture: some considerations

A reconstructed proto-Munda agricultural vocabulary provides some intriguing hypotheses and problematic questions for future research (Zide & Zide 1976). At present we have no direct archaeobotanical evidence for the development of cultivation and agricultural systems in Orissa or eastern India where most Munda-speaking groups are found today. Terms for mortar and pestle reconstruct clearly for *proto*-South Munda, with likely cognates amongst Mon-Khmer languages. While this implies use of grain foods, such as millets or rice, they need not have been cultivated.

There are a number of potential wild food resources, namely fruits, which also reconstruct for proto-Munda, although most of these species were at some point brought into arboricultural cultivation in eastern India, including mangoes, wild dates, wild figs, Indian jambos (*Syzigium cumini*), as well as the tuber tumeric, and characteristic vegetation species, including two words for bamboo and one for the sal tree (*Shorea robusta*). The reconstructed etymon for tamarind is potentially problematic, if we accept the assumption of most botanists that this species is a native of Africa (e.g. Purseglove 1968; Rehm & Espig 1991, 221; although this assumption deserves a systematic botanical re-assessment). Nevertheless, semantic shift between species with similar tasting fruits (cf. Emeneau 1997), as suggested for the Dravidian and Sanskrit words for tamarind and emblic myrobalan, might be at work here. The word for tamarind might also have been adapted from the words for northern Southeast Asian native tree-legumes with sour edible fruits: *Dialium indum* L. and *Parkia speciosa* Hassk. (cf. Yaacob & Subhadrabandhu 1995). The only hard evidence for tamarind is wood charcoal throughout the sequence at Narhan (middle Ganges) starting *c.* 1300 BC (Saraswat *et al.* 1994). The fact that South and North Munda subfamilies do not share a clear root for rice, although both have rice roots that point to connections with other Austroasiatic languages, may suggest that although rice was known from the beginning it may not have been a dominant crop in their subsistence and thus rice vocabulary attrition occurred. Indeed, if early Mundaric groups were hill cultivators, rice may have been merely one of many cereals (treated more like a millet) that they used in a mixed millet, rain-fed system. Although some scholars, like Mahdi (1998) have suggested proto-Austroasiatic roots for rice, a recent tabulation of data by Blench (in press) indicates that there is no coherent rice vocabulary that can be traced across Austro-Asiatic sub-groups.

The presence of three proto-Munda roots for different millets, as well as several additional terms in some subfamilies, suggest that mixed millet cultivation was important to these peoples. The compilation of Zide & Zide (1976) suggests *Setaria italica* as a confident gloss for **(h)oxy* (cf. Skt. *kangu*), *Panicum sumatrense* or *Echinochloa colona* for **iri/ *e-rig*, and *Pennisetum* or *Sorghum* as possible identifications for **gan-gay*. As I have already indicated, identifying particular millets with particular words may be problematic and Zide & Zide (1976, 1311) suggest that some words have shifted meanings with changes in staple foodstuffs. It remains to be established how early *S. italica* reached India, but other *Setaria* spp. are probably equally likely to be the source of a reconstructible early word, such as *S. pumila*, now documented for the Middle Ganges by *c.* 2500 BC and presumably cultivated (Saraswat in press).

Some pulses of South Asian origin also feature in the proto-Munda vocabulary. There is a reconstructed root for black gram (*Vigna mungo*), probably native to the northern Peninsula or central India (Fuller 1999; 2002). The reconstructed root for horsegram, proto-Munda **kodaxj*, may be seen as borrowed from indigenous Central/SC Dravidians (PDr2 **kolut*). Another 'red pulse' might be *Cajanus cajan*, a native of the Orissan region. Archaeologically, this species occurs outside its wild range in Peninsular India by 1800–1500 BC, during the proposed period of early divergence and interaction between Central and South/SC Dravidian languages. Interactions with Dravidian and North Munda cultural groups are also indicated by other linguistic borrowings (Zide 1991).

Thus, proto-Munda speakers had probably reached eastern India by sometime in the first half of the second millennium BC. Although still very poorly dated, the emergence of the Neolithic culture of Orissa, as represented for example by the site of Kuchai, might date to this general period.

The presence of roots for a number of livestock terms, including chicken, suggests that proto-Munda speakers brought some domestic animals with them and may already have had draught animals. While a good root for pig is available for proto-South Munda it remains uncertain whether pigs were part of proto-Munda subsistence. The presence in proto-Munda of a word for goat presents no problem if we assume that the proto-Munda arrival was later than the spread of Southwest Asian agro-pastoralism across India, this presumably reaching the lower Ganges by the second half of the third millennium BC. Words for cattle are inherently more problematic due to the potential for confusing mithan, zebu and perhaps water buffalo. Zide & Zide (1976) suggest that water buffalo terms are cognate across the Munda sub-families. In addition, they reconstruct a proto-Munda term that may refer to draught cattle. Another word that refers to cattle is present for proto-South Munda. This suggests that buffalo, but perhaps not zebu, belonged to the proto-Munda repertoire and may have been used for ploughing. The widespread Indian word for plough in Indo-Aryan and Dravidian languages has long been regarded as a loan from proto-Munda, although it is only documented in Korku and North Munda (Kuiper 1948; Masica 1979; Southworth 1979; Burrow & Emeneau 1984). Could this have come from the hypothetical and now extinct Gangetic language family?

Discussion: testing alternative models

In this paper I have attempted to build a new model for the dispersal of Dravidian languages and subsistence systems in India as an alternative to those current in the literature. This new model relies heavily on recent archaeobotanical evidence and finds general congruence with our patchy understanding of Dravidian plant-name etymologies and evidence for word-borrowing with early Munda speakers. As maintained by Rouse (1986), inferences about prehistory can be strengthened by approaching them through multiple working hypotheses, and indeed the model proposed here should be seen as another hypothesis to be tested alongside others. Thus it is perhaps worth concluding by reiterating the main points of the present model and how they differ in their archaeological and linguistic expectations from existing hypotheses.

The existing model differs in terms of assumptions about the mode of subsistence of the proto-Dravidians. While most authors have pointed to Dravidians as fundamentally agriculturalist (e.g. Southworth 1976; McAlpin 1981; Parpola 1994), the reconstructed vocabularies point towards some of the practices that must have preceded agriculture amongst hunter-gatherer groups with traditions of wild seed (especially grass) and tuber use. Thus, the present model predicts that early Dravidians were essentially 'Mesolithic', but with the technology for threshing/de-husking, grinding and some degree of storage. This implies that in locating a proto-Dravidian homeland we need not be looking for an agricultural society, although these societies may already have had some domestic fauna. This differs from other models which have implied the need to find agricultural proto-Dravidians and have thus been drawn towards the Indo-Iranian borderlands.

Different models also differ in their reconstruction of the nature and biological basis of the first agricultural systems amongst Dravidian speakers. The present model suggests that the first agricultural systems amongst Dravidian groups, after some of the main language sub-families had already diverged, were based on suites of species domesticated within savanna environments of South Asia, in particular tropical pulses and small millets. Evidence for different early packages of such crops come from the Southern Neolithic and from the Saurashtra Peninsula (Gujarat), which might suggest two centres of plant domestication within Dravidian-speaking societies. Other hypotheses, whether Elamo-Dravidian (McAlpin 1981) is accepted or not, look to the northwest and thus necessarily imply that the earliest agriculture should have been based on the Southwest Asian suite of wheat, barley, winter pulses and flax, along with sheep and goats. Such agriculture was winter/spring in seasonality and is more likely to have been floodplain based within South Asia (east of the Indus) where winter rains are unavailable, whereas the native crops of the new model would have been rain-fed by the monsoons and not restricted to river valleys. The crops of South India fit linguistically with species that were probably known before the divergence of the Central Dravidian languages, whereas for other models we must assume the pre-existing knowledge of the Southwest Asian crops was lost, and is thus linguistically irretrievable. Given the preponderance of the Southwest Asian crops in the Indian archaeological record, the only region where one might argue for such a process of loss is Saurashtra, where wheat and barley appear by and large absent during the Harappan period.

The models differ fundamentally in predictions about the directions of the dispersal of Dravidian languages as well as the timing. My model sees proto-Dravidian somewhere within the core range of modern Dravidians, whereas others look outside South Asia, normally towards Elamite Iran. Whereas these other models see a fairly straightforward progressive movement eastward and southward with different language branches hiving off sequentially, starting in Baluchistan with Brahui, the present model implies more of a mosaic of differentiating and interacting language groups largely within peninsular India and Gujarat. The main directions of dispersal would have been out from the Deccan towards its peripheries and zones of isolation, such as the isolated hill regions (Nilgiris, Eastern Ghats, Satpuras), towards the hill zones of Orissa and Bihar, and at least one group to the northwest via Gujarat and Sindh (Brahui). Whereas the present model places the earliest differentiation only just prior to agriculture, probably sometime in the mid-Holocene (*c.* 4000 BC?), and thus agrees in general with glottochronology, an agricultural dispersal model from the northwest might imply a separation of Brahui considerably prior to this time (*c.* 6000 BC) with the establishment of the other Northern Dravidian languages (in Central India?) perhaps within the subsequent millennium. While the new model would place some important movements and differentiation into the poorly understood later Mesolithic of peninsular India and Gujarat, other models would look only at Neolithic (i.e. ceramic) societies. These better-documented periods, however, offer at best inconsistent evidence for a sequential dispersal from northwest to the Peninsula. The new model would predict processes of differentiation, spread and interaction between cultural groups during the Neolithic / Chalcolithic phases of the Deccan, and such processes are indeed suggested in the archaeological record.

There is much research to be done on the prehistory of India, in archaeology, historical linguistics, and indeed genetics (but see Kivisild this volume). There are many gaps to fill in the evidence. As the etymological tables indicate there is much linguistic recording of plant names that is needed, especially in consultation with a millet-savvy botanist. In addition, archaeological research needs to aim at establishing a better chronological framework for the Mesolithic and earliest Neolithic periods of India, as well as systematic recovery of subsistence data from these phases. The Neolithic of Orissa is particularly enigmatic, and the unresolved issues of the emergence of Neolithic societies in the Middle Ganges require renewed fieldwork. In addition, model-building of the impacts of Dravidian cross-cousin marriage on the diffusion of crops and language spread might prove fruitful. It is hoped at least that some of the issues have been constructively raised to suggest alternative perspectives to explore.

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Abbreviations

DEDR *Dravidian Etymological Dictionary*, Revised edition (Burrow & Emenaeau 1984)

Language abbreviations follow the above source: Br. (Brahui), Ga. (Gadba), Go. (Gondi), Ka. (Kannada), Ko. (Kota), Kod. (Kodagu), Kol. (Kolami), Kur. (Kurux, Oraon), Ma. (Malayalam), Malt. (Malto), Nk. (Naiki), Pa. (Parji), Ta. (Tamil), Te. (Telegu), To. (Toda), Tu. (Tulu), Skt. (Sanskrit), Pkt. (Prakrit), OIA (Old Indo-Aryan), Guj. (Gujarati), Mar. (Marathi).

PDr-0, PDr-1, PDr-2, PDr-3 are abbreviations for internal nodes in the reconstructed Dravidian Language tree following Southworth (see Fig. 16.4).

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