Chapter 13
Amazonian Dark Earths in Africa?

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13.1 Introduction

During the last 20 years, research on Amazonian soils has been central to a complete reappraisal of the region's social and natural history. Patches of dark and highly fertile soils have been found to occur throughout Amazonia, known as Amazonian Dark Earths (ADE) and sometimes distinguished as *terra preta* (Black Earths) and *terra mulata* (Brown Earths). The former are usually described as the legacy of the former settlement sites (middens) of pre-Colombian farmers, and the latter as a legacy of their agricultural practices. The ability of these soils to support intensive agriculture has undermined environmentally-determinist views of Amazonian history which until recently asserted that the inherently infertile soils could not support populous settled farming.

The importance of ADE is not restricted to their historical significance. First, these soils are sought after by today's farmers (Woods and McCann 1999; German 2003; Fraser et al., this volume). Second, the development of new techniques to establish them rapidly could help intensify modern farming in Amazonia and beyond. Third, because the secret to these soils is at least partially due to the high proportion of charred carbon they contain, farming technologies based on ADE have the potential to sequester enormous quantities of carbon, suggesting a 'win-win' opportunity, improving sustainable agriculture whilst mitigating climate change.

Unfolding research concerning the qualities of ADE has, however, been confined to Amazonia, or at least the neotropics of South and Central America (e.g. Graham 2006). Sillitoe (2006) has argued that the new research on ADE might offer useful technology to import into Africa and some research has been initiated on biochar technologies in Kenya. Yet this paper considers whether soils similar to ADE already exist, but unappreciated, in Africa, just as they had been unappreciated in Amazonia for so many decades. Could ADE research and technology be interesting not because it offers a new technology for transfer to Africa, but for the insights it offers to help understand the nature of existing African agricultural practices? And could African practices relating to former settlements and anthropogenic soil enrichment help us understand dark earths in the Amazon?

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To address these questions, this chapter offers preliminary evidence concerning the existence of dark earth analogues in one part of West Africa and uses this to probe the historical and ecological arguments that have to date been used to draw strong contrasts and distinctions between Amazonian and African agro-ecological practices – contrasts that have to date restricted interest in anthropogenic dark earths to the neotropics.

We begin by outlining why the soils and broader historical ecology of humid West Africa offer broad parallels to Amazonia, and then outline some of the hypotheses forwarded which differentiate the historical agro-ecology of Amazonia from Africa and which restrict the ADE phenomena to Amazonia. We then present preliminary evidence from West Africa of 'African Dark Earths', and show why the social and ecological conditions leading to their establishment should force us to question the strong distinctions being made between African and Amazonian conditions.

13.2 Amazonian Dark Earths

Amazonian black earths contrast strongly with the soils that they develop in. They have about three times the soil organic matter (SOM), and more importantly, the component of SOM consisting of charred residues from incomplete combustion (carbons and charcoal) is 70 times greater (Glaser et al. 2004). This is chemically stable and resistant to microbial degradation and can thus remain stable in the soil for centuries. Current research indicates that it is – at least in part – 'biochar' which gives the soil its black colour, and improves soils structure, aggregation, water infiltration and retention, and nutrient storage capacity (Lehmann et al. 2003a).

The formation of black earth is not well understood. It does not form simply through wild fires and normal shifting cultivation. Several other factors appear to be at play combining intensive nutrient deposition and charring, which together initiate a particular set of biological and chemical processes. First, Amazonian farming practices appear to have incorporated biochar into the soil from slow burning fire hearths, and from the regular burning of trash cleared from gardens, and then mixing with soil. Second, farming practices appear to transform the soil fauna, and in particular the balance between arthropods other than ants (caterpillars, millipedes, springtails, and mites) and a community dominated by ants and worms (annelids). The latter build up in more regularly farmed soils, and worm and ant communities together ingest, powder, and defecate forms of biochar, mix it with mineral soil and homogenise the soil profile in burrowing (e.g. Ponge et al. 2006). With more organic matter to feed worms, this process is accelerated, generating a positive-feedback loop. Third, black earths have higher nutrient levels, with higher levels of phosphorus derived from excrements and bone residues and reduced acidity, and nitrates building up within an increasingly productive ecosystem (again through positive feedback – with better vegetation growth producing more pyrogenic carbon when burnt, and delivering more soil nutrient storage, leading to even better growth). Whilst oxisols and ultisols need fallows of about 8–10 years, *terra preta* farming can

be sustained with fallows as short as 6 months (German 2004; Lehmann et al. 2003a, b). Whilst appreciation of ADEs has led to research on the processes that form them (e.g. Hecht 2003), a full understanding of the farming practices that lead to ADE formation still remain an outstanding research agenda (Glaser et al. 2004).

Indigenous farming practices were massively disrupted following European contact and colonialism. With huge population loss, the earlier, relatively settled, and populous agricultural existence ceded to hunting, gathering, and small scale agriculture. Although Balée (1992) characterises this as 'devolution', Rival (2006) makes the point that such a stark contrast may mask more complex balance of mobility and stability even in pre-Columbian times. Nevertheless, whilst ADEs are found in Amazonia today, the practices that led to their establishment are (generally) not. It is likely that the majority of ADE were created within an Amerindian semi-permanent farming system in which fertility was sustained by frequent infield burning and fallow burning, composting, and mulching. Patches of various sizes were fairly permanent, inside which there was a rotation of cultivated fields with managed fallows and fruit orchards (Denevan 2006). Just how intentional the formation of ADEs was, in this period, has been the subject of some debate over the extent to which they were deliberate investments or unintentional outcomes (German 2004),

13.3 Amazonia and Africa

There are several important similarities between the lowland humid tropics of Central and West Africa and those of the Amazon with respect to factors relevant to the dark earth phenomenon. First, the soil context is similar. About 80% of the tropical soils of the Amazon basin are Oxisols, Ferralsols (including 'laterites'), and Ultisols which are highly weathered and leached, with extremely low nutrient reserves, nutrient storage capacity (CEC), and phosphorus availability. Most nutrients in their ecosystems exist in the standing vegetation, which is released to crops during shifting cultivation, and builds up again in its long fallows. The soils of the lowland humid tropics of Africa are in these respects broadly similar to those in Amazonia. A map of the global distribution of Ferralsols (WRB and FAO/UNESCO soil map of the world) makes this clear, showing how Ferralsols are restricted to tropical regions mainly of South and Central America and Central and humid West Africa.[1]

Second, inhabitants of both Amazonia and West Africa have lived for several thousand years in nucleated villages (within a wide variety of wider polities) with subsistence focused on farming, the nurturing and collection of plant foods, hunting, fishing, and trade. Prior to 1492, farming in the West African humid forest zone was more focused on rice, yams, and oil palm, but this was subsequently transformed by the introduction of the staples of the neotropics (cassava, sweet potatoes, groundnuts, maize, and beans).

[1] http://www.fao.org/AG/agl/agll/wrb/wrbmaps/htm/ferralso.htm

Third, evidence is emerging that climatic changes during these periods contributed to shaping the nature and extent of forests in both West Africa and Amazonia, meaning that the impact of agro-ecological practices has interplayed with a continually transforming forest. This makes it difficult to speak of the legacy of agro-ecological practices alone, as their legacy plays into broader ecological dynamics, including periods of forest transgression into savanna and of savanna transgression into forest (Maley 2002; Salzmann and Hoelzmann 2005).

Fourth, large areas of the West African humid tropics have, as in Amazonia, seen population collapse with large tracts of forests covering formerly farmed lands. Thus, large regions of Liberian forest have regrown following depopulation between the seventeenth and twentieth centuries (Fairhead and Leach 1998). In 1951, for example, an American forester observing these forests, Karl Mayer, described the country as an 'over used, worn out country of great antiquity'. The same is true for large tracts of the Congolese forests of Central Africa, and of the humid forests of Nigeria, Ghana, Cote d'Ivoire, Sierra Leone, and Guinea-Conakry which were encountered and reserved during the colonial period. A key difference, however, is that there are many other regions in humid tropical Central and West Africa where the farming worlds have not been disrupted in this way.

Several arguments exist that make strong distinctions between African and Amazonian agro-ecological history. The first concerns the availability of iron and especially iron axes. Amazonian agriculturalists prior to the conquest used stone axes, which, it has been argued, could not sustain shifting cultivation with short cropping periods and long fallows. This form of extensive farming required the more efficient iron or steel axes that became available post-conquest, and which African farmers had long had access too, with their iron age dating from about 2400–2800 BP (Vansina 2006; Denevan 1992). Given that the farming and livelihood practices that led to the creation of Amazonian black earths were probably more focused and intensive gardening, and not extensive shifting cultivation; an argument can be made for Amazonian exceptionalism. Yet one can ask whether, despite the earlier iron age in Africa, was (and is) African farming everywhere characterised simply by extensive shifting cultivation? Or were there also agro-ecological systems (or even parts of agro-ecological systems) which were also more intensive, and less reliant on the efficiencies of iron technology? Iron was not universally available nor was it cheap. Whilst an earlier African iron age enabled African farmers to practice extensive shifting cultivation many centuries earlier than in Amazonia, whether they did (or do) or not is a rather different question. Even where extensive farming is a possibility, intensive practices can be attractive for a wide variety of reasons, not least the availability of soils of old middens that can sustain it, the existence of crops and cultigens for which it is suitable, and the everyday convenience it can offer, but extending to their suitability under wider conditions such as high population density, political centralisation, states of siege, gender relations, and shortages of male labour for fallow clearance.

A second contrast that is at times drawn between African and Amazonian agro-ecological conditions concerns the use of domestic animals, for which there is a long history in West Africa, but not in Amazonia. It might be argued that in Amazonia it was the riverine and lacustrine environments which were the major sources of protein, with fish, aquatic mammals, and turtles providing the bulk of the catch, whereas in West Africa, terrestrial protein was more significant. Yet one can overdraw this contrast. Fishing in small as well as large inland water bodies has long been highly important to subsistence in the humid zones of West and Central Africa, just as hunting terrestrial animals has been important for peoples of the neotropics. African trade in dried and smoked fish from the coast and major rivers enables fish to be a principle source of protein even when where local fishing activity is limited. Moreover, whilst cattle and ruminants have historically been numerous in African savanna regions, this is not the case in all places and at all times in its humid forest regions. So, whilst some analysts might consider the importance of aquatic resources to influence settlement locations, and to facilitate chemical additions to the soils (directly via bones, and indirectly through faeces) in the Amazonian (Neves et al. 2003), these are not Amazonian specific.

The particular combinations of land use and ecological ingredients that lead to the formation of ADE are not yet known with precision. As indicated above, it is quite probable that among them will be interactions between biochar and the microbial (bacterial) and soil fauna (e.g. worm, termite, ant) communities involved in nutrient cycling and organic matter turnover (e.g. Woods and McCann 1999). For example, O'Neill et al. (2006) found that the bacteria obtained from *terra preta* soils were more closely associated with each other than with bacterial isolates from adjacent soils within the same site, indicating their suspected role in ADE ecology. It is quite possible that such soil ecological ingredients to ADE formation are specific to Amazonia. It is more probable, however, that they are not, and that similar anthropogenic soil ecosystems around dark earths would have evolved elsewhere, or have travelled along with crops. Moreover, given that ADE is less a single thing and rather more a 'family' of diverse soil types (including *terra preta* and *terra mulata* of different origins), the association of African dark earths with different, perhaps analogous soil ecosystems ought not, perhaps, to ostracise them from 'the family'.

13.4 African Dark Earths?

13.4.1 Suggestive Evidence from Guinea

Our observations on anthropogenic soils took place within the context of anthropological fieldwork in West Africa, among Kuranko and Kissi speaking farmers in Kissidougou Prefecture of the Republic of Guinea (e.g. Leach and Fairhead 1995;

Fairhead and Leach 1996) and then in a wider review of West African forest history (Fairhead and Leach 1998). Our fieldwork covered 2 years (1991–1993) with subsequent visits in 1994, 1996, 1999, and 2003. Research focused on agro-ecological practices and vegetation history.

Kissidougou lies within a semi-humid zone with rainfall levels in excess of 1,600 mm per annum, but with a pronounced dry season. The prefecture has a largely savanna landscape, but around each of its 800 or so villages there is usually an island of high semi-deciduous forest covering some tens to hundreds of hectares. Walking through any village's landscape also takes one past the sites of long-abandoned villages, hamlets, or farm camps. The soils of these ruins (*tombon* in Kuranko) are known as *tombondu* (*du* = soil/land). They are particularly appreciated for farming, enriched as they have been over long years of habitation from the ash of wood fires; the excreta of people, domestic animals, and poultry; and the residues of processed harvests, fish and purchased dried fish (*bonga*), gathered products (palm, kola and *Carapa procera* nuts), and cooking. In the village where we lived, a balance had to be struck between the use of these lands for farming, and for the tree crops (especially Cola nuts) and their shade trees growing there. Thus, some of these ruins are protected, whether for the tree crops, the graves, or the memories and ancestral worship sites they house.

Existing villages have rather a distinctive layout. The houses are built in a central clearing, and behind each, in a concentric circle are small kitchen gardens (used for tobacco, vegetables, and other high value crops), with these gardens soon fading into forest gardens in which fruit, nut, and other trees are encouraged to grow. The belt of forest surrounding each village is usually anthropogenic, having been established by transplanting and nurturing seedlings or cuttings of forest species (e.g. *Ceiba pentandra*), controlling fire, and nurturing regeneration. As they develop, and through history, these peri-village forest islands have become useful for many and evolving reasons. In pre-Columbian times, they served as vegetation fortifications, and more recently have been more useful as fruit and nut plantations, as a source of privacy for men's and women's private social associations, and as a source of privacy for morning ablutions. In recently abandoned villages, these different areas can usually be discerned, but once they are farmed, the whole site becomes *tombondu*.

Most villagers explain clearly how habitation and associated intensive gardening near houses transforms their soils, making them more workable and productive. Whist 'new' savanna land (*du kura*) which has never been cultivated is said to be hard and impervious, the regular gardening and rubbish accumulation and tree crop agro-forestry behind houses transforms these soils.

The use of soil mounding and raised beds and the incorporation of burnt resides and unburnt residues (of weeds, crops and everyday wastes) year after year is said to 'open' the hard 'new' savanna land characteristic of a new settlement, to let water in, and to make the soil oily (*tulu*), 'mature', and 'ripe' (*mo)*. The soils become softer and easier to hoe and weed, have good infiltration, and because they enable deeper rooting and remain damp for longer, they allow crops to resist dry

periods better. Farmers find that the soil of old habitation sites maintains these qualities long after the site is abandoned.

Soils of former village sites are clear analogues of Amazonian *terra preta*. Pottery is found in the soils (though not in all), and the soils are much darker than those surrounding them. There are, however, also clear analogues of Amazonian t*erra mulata*. Farmers suggest that land farmed regularly in ways that mimics kitchen gardening 'will become like an abandoned site' (*a di ke tombondu di*), using the concept of a ruined village as a powerful metaphor for the result of soil change. For example planting crops such as cassava, groundnuts, fonio, maize, and okra in rotation in 'new' savanna, and using mounding techniques can begin to ripen the soil after 3 or 4 years, if the mounding is well done.

Soil ripening is not just a transformation in the soil, but also a categorical change in people's relationship with that place. In effect, through this work – including the sweat that farmers drain off their faces with a powerful gesture during preparation of land, the blood spilt from the cuts and grazes of farming, and through the defecation in the areas at the back of the house – new land is 'initiated' into a mature and productively fertile status, of which its oiliness is a physical embodiment. This transformation parallels that of a girl's initiation and excision, when she is considered to become more purely female and to acquire fertility as a mature woman, with oiliness again being the physical embodiment of this transformed state and accentuated in the festivities as initiated women are oiled. Moreover, land that is transformed from new land to ripened garden acquires an explicit association with female reproductive roles; a garden is *nako* 'mother's business'. People claim enduring rights to land of their ancestral villages, and to land that they improve through intensive rotational mounding. *tombondu*, whether 'real' (the land of an old settlement) or metaphorical (actively ripened to be like such land), is thus distinct not only as a land type, but also tenurially. It can be claimed by the patrilineal descent group whose members lived or worked there. This contrasts with unimproved land which is tenured at the village level.

Farms which become 'like *tombondu*' need to be fallowed after 4–6 years of cultivation, but the fallow vegetation will be a succession to forest, not savanna. After about a decade, farmers return to cultivate these improved places and cycle from one such improved area to another, leaving most of the rest of the land unfarmed. There are several reasons why these soils acquire a forest, not grassy vegetation. First, tree seeds germinate and establish well on these soils which are less prone to drought. Second, for the same reasons, dry season fires are less intense. And, third, the grasses that do germinate are more palatable to wild herbivores, which reduce fuel for the wild fires that pass. These improved soils are thus more than simply improved soils, as the vegetation associated with them recursively transforms the soils beneath them.

When discussing these soils with villagers, one informant likened their farming activity to that of termites, which also transform the soils and whose mounds (settlements, villages), once ruined, are prized for their fertility and support forest vegetation. Inhabitants also distinguished the land of a spirit 'village' that they

entered only with extreme caution. Spirits live in more or less the same ways as people, and their villages and farming are understood to have similar effects on soil and vegetation as people. Thus a pervasive assumption in this region is that it is settlement itself (of people, animals, spirits) which transforms initially infertile soils and brings them into fertility.

At a second fieldwork site, about 40 km further south and further towards the more humid forest zone, the vegetation was not one of forest-savanna transition, but currently of forest and forest fallow land. Farmers speak Kissia, a very different language, and organise their farming in very different ways. Yet here, again, people appreciated the same important legacy of former inhabitation sites on their soils. The village we resided in had at least 12 ruined village sites in its territory. The sought-after soil of these former villages is called '*pulo ce pomdo*' (*pulo* = soil/earth; *ce pomdo* = village-old). Not all of these were intensively farmed. Descendants of those who lived in at least five of them retained tree crop (cola, coffee) plantations on them, along with shade trees, although used parts of them also for some gardens. The other ruined sites – some much older and others having been inhabited by other peoples – had since been reconverted to farm land. In this village, however, all families practice shifting cultivation on contiguous land, shifting each year on a 10 year cycle that covers the whole village territory. The old village sites are recognised by all for their quality, and each 10 years, when they are cultivated again, specific families have rights to return to them.

This is a region where statues are made from soft stone and these are at times dug up when farming in these old village sites. The statues are also called *pomdo*, after the ruined villages in which they are found. When they are dug up, they are themselves considered a portent of agricultural fertility.

We conducted short comparative studies in five other villages in other parts of Kissidougou prefecture, and combined the use of comparative air photography and oral history to ascertain how the balance had changed between the more intensive forms of cultivation focused on use of these soils (for 5–10 years, before fallowing), and other forms of shifting cultivation (principally of rice, but with maize and other intercrops). We reported on the findings elsewhere (Fairhead and Leach, 1996), but to summarise, the use of more intensive soil-ripening practices has increased since the mid-twentieth century, as has the use of former village sites for intensive farming, and this is largely because of changing patterns of gendered resource use. In the less densely populated areas, intensively cultivated *tombondu*-like sites used to be more limited to the proximity of settlements, but have now come to occupy larger areas of the landscape. Farming used to be more dominated by rice-focused shifting cultivation, involving large extended family and work-party organisation. Yet, with male out-migration combined with wider social changes that reduced 'household' size, there has been a shift to crops cultivated more independently by women who lack the male labour required for field clearance. They focus more on intensive gardening practices and on crops that they can exert greater control over (groundnut, cassava, fonio [*Digitaria exilis*], okra). The balance between garden-focused farming and shifting cultivation has also been influenced by general land availability. In some villages, there is insufficient

land for continued shifting cultivation, with some families being especially affected.

13.4.2 Wider Perspectives

The findings from these study villages can help us reflect on arguments that distinguish Amazonian and African agro-ecological legacies. Firstly, farming in all our study sites balances shifting cultivation with more intensive gardening practices focusing on anthropogenic soils. Arguments differentiating Amazonia and Africa at the scale of 'differential iron age' are too broad-brush to capture the everyday mix of activities, land and soil-scapes that characterise farming communities. Many factors play into the balance of intensivity in every place. Secondly, both study sites rely on fish as well as the meat of hunted and domestic animals. This was more the case in the Kissi village which bordered a river and managed an elaborate fish trap. Moreover, they no longer had cattle (and former grazing lands have ceded to forest fallows in the past 50 years). Fish is a more 'everyday' food, and is regulated and controlled by women. And women in both sites regularly purchased dried and smoked fish from local markets. Again, it would be incorrect to contrast strongly these livelihood and agro-ecological practices with those in Amazonia. Indeed, there is a great deal in common.

The extent to which the soils of ruined settlements are analogous to (or the same as) *terra preta* of Amazonia, and the extent to which the improved soils 'like *tombondu*' are also 'like' *terra mulata* is a research question that needs to be examined – with attention to the many dimensions of Amazonian soils.

There has been virtually no research on African anthropogenic soils and on the legacy of past inhabitation and soil investments in these regions. Many researchers have appreciated the huge variety of 'fertilizing' practices developed by African farmers. Yet, whilst they are appreciative of temporarily improved fertility, this is represented either as a transient improved state, or as requiring the continuous import of fertility (as in infields). There has been almost no attention to the durable transformations to the soil that current research on Amazonian Dark Earths (ADE) reveals can occur – transformations which take the soil to a qualitatively different state.

There are some exceptions. Mitja (1990) and Mitja and Puig (1991) describe how in humid savannas in Cote d'Ivoire, farmers improve savanna land on slopes. Sites initially covered with low woody savanna, come to acquire, after 7 years of farming and a long fallow of 10–40 years, vegetation with a more closed, denser tree cover, and fertile soils with favourable infiltration characteristics, and with more surface pores from worm and termite activity. Similarly, Mondjannagni (1969) shows the establishment of forest thicket in earlier baobab-rich savannas, achieved through weeding and burning practices. In Togo, Guelly and colleagues show how farmers deflect ecological successions to create a forest formation in grassland savannas – creating anthropogenic forest fallows (Guelly et al. 1993), but do not comment on the underlying soils.

Such research as there is in West Africa which focuses on the logic of farming practices does highlight how farming can effect durable transformations on the soil. We can see this in the metaphors which speak of such transformations. Thus, as we indicated earlier, Kuranko farmers speak of soils 'ripening', and the vocabulary indicating a shift from dry to oily soils parallels representations of women coming into fertility and the transformations of a girl into a woman. Brouwers (1993) describes how farmers in Benin speak of 'waking soils up'. As we encountered earlier, such metaphors of qualitative transformation can be important to tenurial claims (and linked ancestral reverence).

Importantly, these processes of fertility improvement should not be understood simply within a 'zero sum' calculus of nutrient balance in which some land is being sacrificed at the expense of others. First, there is more to fertility than nutrient balance. There are changes here in soil structure, edaphic qualities, organic matter status, and fauna and flora influence. More significantly, farming techniques appear to be 'ratcheting up' biomass and its turnover, and it is plausible that the higher biomass turnover and increase in the organic energy available to soil organisms in upgraded lands (and associated increase and transformation of soil fauna, flora, and pH) might actually improve soil nutrient status in durable ways. We can hypothesise, for example, the potential increased activity of nitrogen fixing termites (Lilburn et al. 2001; Gomathi et al. 2005) and partly linked this, of plant symbionts enabling to nutrient availability, such as enhanced P delivery via enhanced mycorrhiza Andrianjaka et al. 2007; Diaye et al. 2003), and of access to nutrient-rich subterranean water via tree roots, and termite hydrological effects (Faillat 1990; Laperre 1971; Lobry de Bruyn and Conacher 1990; Lal 1987). Whether through improved infiltration and termite and fungal activity, or through the links with deep rooting plants, the agro-ecosystem gains access to nutrients from a much larger volume of soil. Once lands have been 'woken up', the resultant agro-ecological processes are likely to have a positive influence on the wider landscape (whether in acting as a source of nutrients, soil organisms or seeds).

Whilst these remain hypotheses, we should note that farmers discern soil quality and transformation through phenomena directly linked to the activity of termites, fungi and hydrology. Thus, farmers throughout much of Africa deliberately select land with many and large termite mounds. This is the case in the most famous of African 'biochar' farming practices, the *chitemene* in Zambia (Mielke and Mielke 1982). It is also the case in Guinea (Fairhead and Leach 1996). In Benin, Iroko (citing Quénum 1980) notes how an abundance of termite mounds is taken to indicate good soils for cereal farming, and an abundance of large mounds is considered a prerequisite for high fertility-demanding yam cultivation (Iroko 1982). Citing Mercier, Iroko goes on to note that this does not only concern agricultural aspects of fertility, but also ritual ones. Many agro-pastoralist Fulbe of Benin choose their encampments in areas with many termite mounds, 'signalling the presence of the goddess of fertility, of fecundity and of abundance' (Iroko 1982:54). Among Kissi farmers we worked with, the fungi species that grow on termite mounds are considered to signify fertility and prosperity. *Hol yio* (literally, mushroom of winged termites) is almost always found in twinned pairs, adding to its portent of fertility.

Methods to influence termite activity have been observed throughout Africa (although rather obscurely), whether in Zai farming in Burkina Faso, (Mando et al. 1993), in Sudan (Tothill 1948), or in Sierra Leone. Such termite management is often indirect (through manipulating the ecological conditions in which certain termites thrive), but it can also be direct, as when Guinean farmers speak of certain trees and fruits which they consider 'seed' termite mounds (Fairhead and Leach 2000). Both Mondjannagni (1975) and Iroko (1982) indicate that specific termite species are introduced in West Africa, stressing that this is a specialist and generally secret endeavour.

13.5 Misrecognition

Attention to anthropogenic soils in Africa has been obscured in many ways. As in Amazonia prior to the 1980s, many 'upgraded' anthropogenic soils appear to have been misrecognised as natural. A most extreme example comes from Benin where soil scientists have attempted to identify 'natural fertility' by assessing the nutrient availability in sacred groves, assuming these to be exemplars of the most natural soils. Yet evidence is reasonably strong that these groves exist over anthropogenic soils (and, indeed, they may be anthropogenic groves). Researchers come out with an inflated understanding of natural, and thus an inflated understanding of degradation of neighbouring unimproved, soils (e.g. Djegui 1995; see Fairhead and Leach 1998).

A preliminary review of colonial and post-colonial agricultural and social research reveals exemplars of soils which appear to resemble ADE, but which have been understood as natural. To take one example, Morgan and Moss (1977) describe in Nigeria patches of dark earths associated with forest vegetation in the forest-savanna transition region. They observed that the soil substrate across the sharp border between forest and savanna transition did not change, although the character of the soil under forest was radically different from that under savanna. They understood the soil and vegetation as having 'co-developed', although without human agency.

Archaeologists have observed the durable nature of anthropogenic soil transformations, and the improved productivity of past settlement sites centuries after they were abandoned. To date, these observations have not emerged from the forest region, but relate more to savanna ecosystems where such transformations are more easily visible (Keay 1947; Walker and Noy-Meir 1982; Blackmore et al. 1990). Such observations have also not been linked with research into the logic of farming practices.

Zech et al. (1990) note in passing that the existence of 'humus rich soils similar to *terra preta* have been found … around former settlements in Liberia and Benin'. They are, however, unable to give greater detail. Yet this paper has indicated that there are indeed strong reasons to speak of 'African Dark Earths', given that African farming practices have long been shaped by soil transformations wrought by former settlements or by mimicking them in a way very similar to *terra preta* and *terra mulata*.

13.6 Conclusion

The cases presented here call into question the arguments which have been forwarded to differentiate strongly Amazonian and African dark earths. Once we overcome this obstacle, close observation of extant African farming practices, and an understanding of their logic may help to discern other processes (or at least to develop hypotheses about them) involved in the durable transformation of soils which may well be of interest to Amazonian researchers. As with ADE, the extent to which these soil transformations are purposeful investments will need to be considered. However intentional or not, here we have indicated that this kind of transformation is also more deeply encoded in cultural perspectives on the relation between people and land.

This chapter has to be seen as provisional, and as a call for research. Before 'importing' the findings and technologies emerging from research on Amazonian Dark Earths into Africa, there is an urgent need for soil scientists to consider whether there are already 'African dark earths' similar to those of the Amazon. ADE research in Amazonia is leading to new collaborations between agronomists, ecologists and archaeologists. A similar engagement has yet to be established in West Africa, and across the African/South American divide and is long overdue. We have developed this chapter on the assumption that African 'black earths' would be found. Of course, if they are not, that in itself would be interesting – and what that would this tell us about Amazonian Dark Earths?

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