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Besieged Palaeonegritics or Innovative Farmers: Historical Political Ecology of Intensive and Terraced Agriculture in West Africa and Sudan

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Abstract

This paper provides an overview of the historical occurrences of terracing, manuring and other features of intensive agriculture in West Africa and Sudan. The aim is to shed more general light on the political, economic and social contexts of pre-colonial intensive farming in sub-Saharan Africa. A starting point is taken in the recent debate on driving forces behind terracing and irrigation in East Africa. Despite being regularly cited as fact in the literature on terraced agriculture on West Africa, no clear historical evidence is available to show that slave raiding was indeed the determining factor behind the first settlement of these hills and the terracing. The farming systems of the late precolonial period must definitely be seen as an outcome of the political economy of the slave trade period, but the idea that the intensification is the outcome of the retreat of decentralised societies into hills and mountains, is challenged by the fact that intensification also occurred on the plains and in areas dominated by stratified social organisation and predatory states. It seems as if the labour mobilisation required for intensive agriculture was achieved at both ends of this social continuum. Conflicts and defensive strategies, as well as co-operation in the forms of intermarriage, trade, etc., formed part of a long-term process of different groups relating to one another, intensifying their agriculture and developing a geographical division of labour.

Key words

Political ecology, landesque capital, agricultural terracing, West Africa, paleonegritics,

A broad comparative perspective has characterised the new interest in the remains of the terraced and intensive agriculture in Mpumalanga in South Africa. This was also the focus of the workshop *History and Archaeology in Conversation: South Africa meets East Africa* organised by the 500 Years Initiative in Johannesburg in July 2009. Interest has been characterised by a broad comparative perspective. Comparisons with similar cases of ‘islands’ of intensive agriculture have contributed to framing the research and setting a research agenda (Maggs 2008, Delius & Schoeman 2008).

At the heart of the ‘islands’ metaphor (Maggs 1995) lies the question of whether we should understand terracing, manuring, irrigation and other intensive farming practices as exceptions to the general perception of African pre-colonial agriculture as being based mainly on shifting cultivation. Two partly contradictory perspectives dominate the broader literature on such intensive agricultural systems in sub-Saharan Africa. The first is premised on the idea that they form exceptions that need a special explanation. It has generated research based on what has been termed the ‘siege hypothesis’. According to this view, only special circumstances would have forced African farmers to undertake terracing and other labour-intensive farming

practices. Summers' interpretation of the settlements and farming in the Nyanga hills of Zimbabwe is representative of this view. According to Summers, the refugees there 'eked out an existence in the cold and windy uplands for a few generations until the peril was overpast' (Summers 1968:313). The second strand of academic literature highlights such islands of intensive agriculture and their farming practices as important solutions to the problems of low and variable productivity of small-holder farming in Africa, especially in semi-arid areas (Reij et al. 1996). This view is in line with Bill Adams' discussion of how these intensive farming systems may provide lessons for 'a route towards sustainable agriculture in contemporary Africa' (Adams 2004).

These two contrasting perspectives have been at the centre of recent efforts in understanding the broader context of intensive agriculture in eastern and, to a certain extent, southern Africa. However, within sub-Saharan Africa, the largest number of instances of such farming communities is found not in eastern or southern Africa, but in West Africa along the Sahel zone and in Sudan. These cases have only to small extent been referred to in this broader comparative perspective (however, see Grove and Sutton 1989).

The aim of this paper is to provide an overview of the literature on islands of intensive agriculture in West Africa and Sudan in order to shed more general light on the political, economic and social contexts of pre-colonial intensive farming in Africa.¹ A starting point for the survey of the West African cases is the recent debate on driving forces behind terracing and irrigation in East Africa.

Recent Research in Eastern and Southern Africa

Under the heading *History of African Agricultural Technology and Field Systems*, the first comprehensive overview of intensive farming in sub-Saharan Africa was published as a special volume of *Azania* in 1989. John Sutton's contribution to this special volume summarised the state of the art, focussing in particular on the cases in eastern Africa (Sutton 1989). In co-operation with Grove, he also gave an overview of the then-existing knowledge of all sub-Saharan cases (Grove & Sutton 1989). Since then, the knowledge of such areas has increased, and a broader comparative perspective is now possible – especially concerning the two best-known southern African cases. In 2002, Robert Soper published an extensive archaeological investigation of the terraced fields in Nyanga in Zimbabwe (Soper 2002). Tim Maggs' paper 'From Marateng to Marakwet: Islands of Agricultural Intensification in Eastern and Southern Africa' added the case of Bokoni (previously known as Marateng) to this broader understanding of the distribution of such farming systems. Maggs' paper also inspired a Swedish-led project focussing on intensive agriculture in Tanzania, Kenya and Ethiopia (Widgren & Sutton 2004). The addition of the Bokoni case significantly increases the viability of comparative discussion (Delius & Schoeman 2008, Maggs 2008).

Intensive research over the past ten years has provided new empirical material with which to test some of the ideas on the driving forces raised above. Lowe Börjeson was able, in the case of *Iraqw'ar Da'aw* in Tanzania, to turn the siege hypothesis on its head. Instead of interpreting intensive farming as the outcome of population concentrations in a siege

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¹ This paper is based on a literature review for the project Mapping Global Agricultural History (supported by SIDA). Support by the Swedish Research Council of my research has been instrumental in setting up this project, as has the intellectual environment provided by the research network People, Land and Time in Africa, based at Stockholm University.

situation, Börjeson interpreted high population densities as an outcome of intensive agriculture (Börjeson 2004, 2007). Furthermore, in a summary of the results from the same comparative project, it was possible to show how intensive agriculture was a response to a geographical division of labour fuelled by the exchange between different agricultural groups and between agriculturalists and pastoralists (Widgren 2004). Another important understanding resulting from that comparative project was of the role of both co-operation and conflict with neighbouring groups as important parts of the history behind an emerging difference between intensive agriculture on the one hand and specialised pastoralism on the other (Östberg 2004).

More recently, important new results and ideas have emerged from research on the abandoned site in Engaruka (Stump 2006a, 2006b; Westerberg et al. forthcoming) and the living irrigation system at Pokot (Davies 2008, 2009b). These investigations have moved our understanding forward and contributed to this debate in two important ways. First, these investigations are, to a much larger extent, based on archaeological investigations of fields and irrigation structures (rather than on the associated settlements) and can therefore bring forward considerably questions of the dating of different farming practices and of the farmed landscape itself. Moreover, broad interdisciplinary co-operation has made it possible to set the emergence, resilience and final abandonment of Engaruka agriculture within a social, economic and climatic context (Westerberg et al. forthcoming). Through these efforts, it has been possible to construct a broader explanatory framework for the development of intensive agriculture within the east African context.

A first point concerns the role of conflicts between farming communities practising intensive agriculture and the neighbouring pastoralists groups. The French geographer Pierre Gourou emphasised conflict between pastoralists and agriculturalists and more specifically the role of the Maasai in creating a siege situation for the Iraqw in Tanzania as a cause of the Iraqw's intensive agriculture (Gourou 1991:50). Östberg instead emphasised co-operation in combination with hostilities between the pastoral Pokot and the agricultural Marakwet as factors contributing to the development of irrigated agriculture in Marakwet (Östberg 2004). As Håkansson has shown in a series of papers, regional exchange systems characterised the pre-colonial economy in eastern Africa (see e.g. Håkansson 2004 and references therein). The relation between investments in land and these regional exchanges systems have also been treated by Håkansson & Widgren (2007) The demand for agricultural products from the pastoralists fuelled the exchange, while recurring cattle raids against the agriculturalists made them more inclined to build wealth through investments in agriculture rather than through livestock. Davies expanded the idea of informal exchange as a factor behind intensification and connected that factor to the wider issues of the origin of agriculture in Africa. According to such a dialectical view, conflicts and specifically raiding 'has been instrumental in ensuring the economic symbiosis between agriculturalists and pastoralists' (Davies forthcoming). Thus, both co-operation and conflicts served to create conditions for an increased division of labour and increased differences in the landscape.

A second point concerns the question of labour mobilisation, central to understanding agricultural systems with a high degree of investment in the land. Terraces, irrigation furrows and anthropogenic soils can be seen as an investment of capital in the land. The term *landesque capital* is used to describe 'any investment in land with an anticipated life well beyond that of the present crop, or crop cycle' (Blaikie & Brookfield 1987:9; for a discussion of the term see Widgren 2007). The question then becomes: is a *landesque-capital* intensive agriculture dependent on a hierarchical political organisation for its labour mobilisation, or

can labour be similarly mobilised in an egalitarian structure (Davies 2009a)? Watson's recently published study of the Konso in Ethiopia, with its theoretically informed empirical approach, sets an example and paves the way for a synthesis (Watson 2009). Also in this field, it is thus now possible to forward a more dialectical view, where both the egalitarian aspects and more exploitative labour relations can be seen to have formed the Konso and similar capital-intensive landscapes.

Research History in West Africa

The most comprehensive overview of intensive terraced agriculture in West Africa and Sudan is the work *Les Montagnards 'Paléonigritiques'* by the French geographer Jean Claude Froelich (1968). This publication provides a broad geographical overview and the first comprehensive map of such areas. While commendable for its geographical coverage and description of farming practices, it is theoretically weak and fails to provide an alternative to the then-dominant view of a kind of cultural diffusionism (see the critiques by Bloch 1971 and Tambo 1978). The idea of a palaeonegritic people, which is the basis of Froelich's approach, played an important role in the work of German ethnologists such as Baumann and Westermann and the French geographer Richard-Molard. They argued that the hill farmers were the remnants of a '*paléonigritique*' population that had dominated large parts of Africa prior to the Muslim expansions.

The characteristics of these palaeonegritic people, now dwelling in the hills, were as follows, according to Baumann and Westermann (here quoted from Tambo 1978):

[P]atriarchical family and important role of the elders; sense of community and collective life; cult of the ancestors; intensive agriculture, worked by men; nudity, penis sheaths, leaf coverings for women; no circumcision, mutilation of teeth, scarification; round huts with conical roofs, beds of planks or shelves, granaries on piles; esteemed smiths and a ritual role for iron objects; simple weapons such as bows and arrows, with iron tips; a non-hereditary gerontocracy, with the chief-priest as the head of the earth cult; and myths of origin associated with natural objects like rocks or caves. (Tambo 1978:212)

Although Froelich is critical of the palaeonegritic approach, he continues to use the term. His confusion of analysing, on the one hand, an assumed common cultural background and, on the other hand, farming practices led him to exclude from his investigation many other groups practising intensive agriculture, such as the Bamileke of the mountains of Cameroon and the Chagga of Kilimanjaro, because of their different cultural traits (Froelich 1968:25). He also tried to distinguish between real and false mountain dwellers ('*vrais et faux montagnards*', Froelich 1968:68ff).

Closely connected to the palaeonegritic view is the explanation of the settlement of these hills as the result of a refugee situation, following the establishment of the Islamic states in the medieval period. The contradiction between, on the one hand, the hill dwellers without a clear centralised political leadership and, on the other hand, the slave-raiding Muslim states is generally put forward as an explanation of settlement in the hills and the subsequent terracing in diverse social environments from Dogon in Mali to the Nuba hills in Sudan (see e.g. Andel 1998:2–5).

Fig 1. Areas of intensive and terraced agriculture in West Africa and Sudan. The map is based on Froelich (1968) and Grove and Sutton (1989), but for most areas it also builds on the more detailed maps in sources referred to in the text.

Hill farmers in West Africa and the Sudan

The number of areas with intensive and terraced farming in the hilly areas of West Africa and the Sudan is large (see the map, Fig. 1) and definitely larger than the comparable cases in eastern and southern Africa. However, the literature for West Africa is much more diverse. With few exceptions (e.g. Fricke 1996, Hahn 1996), since the work of Froelich (1968), a common explanatory framework for discussions or comparative perspectives on farming practices including terracing has not been available as it has been for eastern Africa. One explanation for this might be linguistic barriers (much of the literature is French, with some in German). Below is a preliminary list of the known cases I have been able to find in the current literature. It should be mentioned from the outset that a large part of this literature moves in a shady ethnographic present. Thus, farming practices mentioned may have been already abandoned. Likewise, in many of these works, the historical perspective often only serves as a brief introduction to the text, and the literature deals explicitly with the age of terracing and farming practices in only a few instances.

Dogon (Mali)

The Dogon, in the Bandiagara escarpment, practise intensive cultivation of millet, sorghum, beans and sorghum on small manured fields. The manure is based on ashes, plant remains and dung from sheep and goats. Cattle are not common and not kept close to houses (Palau Marti 1957; Beek 1993). During the 20th century, locally developed systems of irrigation were documented. According to some sources, irrigation was being practised in the 19th century before the French incursion (Krings 1988). The Dogon arrived to the area at the time of the end of the Mali Empire (late 15th century). They are believed to have displaced the Tellem. The pressure on habitation in the escarpment increased in the following centuries and apparently reached a peak during the 16th and 19th centuries because of slave raiding (Beek

1992, 1993; see also Mayor et al. 2005).

Houndé (Burkina Faso)

Savonnet (1960) describes a farming system practised by the Bwaba-Bobo-Oulé in the Houndé region in present Burkina Faso. It is a system based on two or three types of fields that are used with decreasing intensity according to distance from the settlement site. The most intensively used system can be compared to the *tapades* of Fouta Djallon in Guinea (see below), using both composting and manuring. The system is discussed and set in context by Raulin (1984), based on Savonnet (1960). It also appears as an area with terracing on the map by Grove and Sutton (1989). Savonnet also provides pictures of terracing and terraced fields. However, as argued by Dittmer (1958) and from Savonnet's description, this area differs from many of the other 'hill farming' areas in that the same farming system occurred in hilly terrain as well as on the plains. Its main characteristics, the zonation of three types of fields with the innermost managed both by composting and manuring, resembles the ring cultivation on some of the plains in West Africa (see below). The terracing appears to be only an adjustment of different types of terrain.

Kassena (Burkina Faso/Ghana)

Kassena are an ethnic group in southern Burkina Faso and northern Ghana. They practice permanent agriculture on terraced fields. The two types of most intensively used fields closest to settlement receive manure from a large stock of stalled cattle. In addition, there are more remote bush fields cleared for each season (Zwernemann 1963; Hahn 1997, 1998, 2000). Hahn interprets the history of the Kassena as very much dependent on their location between the kingdoms of Mossi in the north and Dagomba in the south, both exercising strong power until the end of the 19th century, and both raiding for slaves. The hilly terrain provided security from horse-mounted warriors (Hahn 1997).

Atakora (Togo and Benin)

Atakora is the name of a mountain range on the border between Togo and Benin. The farming practices of the Kabré, along with other ethnic groups inhabiting this mountain range, include stall-fed small and large livestock. Manure is mixed in pits with ashes and household refuse. On the slopes, fields are terraced, and on the plains, ridges are used for drainage (Dresch 1952; Froelich 1968:110–124).

Kamuku (Nigeria)

The area designated as Kamuku on the map (Fig. 1) refers to three occurrences of terraced agriculture on the map of Grove and Sutton (1989): Keie, Kamuku and Achipawa in Nigeria. Detailed references are lacking.

Jos (Nigeria)

Intensive and terraced agriculture among the Kofyar on the Jos Plateau is documented and analysed in detail by Netting (1973). Other instances of terraced farming at Bachit, Jere, Lere, Ampan, Amper and Angas on the Jos Plateau are mapped by Grove and Sutton (1989). The detailed analysis of labour and land productivity of the manured and terraced fields in Kofyar and their extensively cultivated bush fields lends support to the idea of a highly productive type of agriculture on the terraced fields. The yield per acre of the terraced and manured fields is calculated to be 25 percent above that of the unmanured bush fields (Netting 1973:200f). However, it seems that labour productivity might be higher in the extensively used fields.

Eggon (Nigeria)

Eggon are an ethnic group that practise intensive terraced agriculture south of the Jos Plateau in Nigeria. Terraced fields were cultivated permanently and manured with household refuse and dung from goats and sheep. The most intensively cultivated fields close to settlements were used for rice, beans, maize, sweet potatoes, cocoyams and okra, while the main cereal crops were cultivated on larger fields in the hills (Dorward 1987).

Nsukka and Maku (Nigeria)

Terraced agriculture on the Nsukka-Okigwi Plateau of Nigeria has been described by Floyd (1964) with a detailed distribution map. He argues that terracing was formerly more widespread in the area. His description of the terracing and the crop calendar is detailed, and it should be noted that this occurrence of terracing, in contrast to others in this overview, is in a zone of high rainfall, where root crops (yam, cassava, cocoyam) dominate, and the only cereal is maize.

Tangale Waja (Nigeria)

Between the Jos Plateau in the west and the Mandara mountains in the east, several other occurrences of terraced farming are documented. An interdisciplinary project based in Frankfurt has produced several contributions on the function and origin of terracing in the area (Fricke 1996a, 1996b; Gebauer 1996; Heinrich 1996). Of special interest is the attempt at dating terracing based on linguistic evidence. The Tangale Waja uplands where intensive and terraced farming are practised are inhabited by several small different language groups. Kleinewillinghöfer considers, on the basis of an analysis of the words for '(terraced) farm, plot' and 'farming terrace, terrace wall', that it is unlikely that any of the groups 'can be regarded as the one having started terrace farming' (Kleinewillinghöfer 1996:117). He concludes that one has to assume that 'terracing of the slopes is older in this area than most (if not all) of the languages that are spoken here today' (Kleinewillinghöfer 1996:121).

Mandara (Nigeria and Cameroon)

Of all the different instances of terraced farming in West Africa, the Mandara Mountains on the border between Nigeria and Cameroon are by far the best researched. Research has focussed on different themes and on different ethnic groups (see e.g. Campbell & Riddell 1984; Riddell & Campbell 1986; Hallaire 1991; Beek 1992; MacEachern 1993, 2001, 2003; Andel 1998; Müller-Kosack 1996; Beek & Avontuur 2005). A comprehensive bibliography for the Mandara Mountains can be accessed on the Internet.² I will not attempt to summarise all of that research here, but will focus on one important contribution concerning the dating.

Scott MacEachern has carried out archaeological field-work in the northern Mandara Mountains. He finds that 'linguistic data indicate that the Mandara massif has been occupied for at least 700 to 1000 years by people speaking the languages ancestral to those spoken there today' (MacEachern 2003:5). However, his detailed archaeological survey failed to give any clear evidence of 'intensive occupation for more than a few hundred years' (MacEachern loc. cit.). He accordingly argues that the terracing must be seen as having 'existed only for some hundreds of years' (MacEachern 2003:321). This conclusion is based on the lack of archaeological sites before 1400–1500 (MacEachern 2003:149). He also argues:

If the present very high density of occupation had been the norm in the northern Mandara Mountains for a long time we should expect to find

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² <http://www.mandaras.info/Bibliography.html> accessed on Dec 21st 2009.

terrace walls crammed with stone, ceramic and metal artefacts and internal drainages filled with the same types of material. What we do find is a relatively meagre scattering of material, nearly all of which looks fairly recent. (MacEachern 2003:322).

MacEachern's conclusion from this seemingly contradictory evidence is that the language groups currently inhabiting the area were already there before the immigration. Settlement intensification and terracing during the past 500 years and the present linguistic situation have resulted from an ethnogenesis through assimilation of incoming groups.

Guere (Chad)

Froehlich reports large areas of abandoned terraces and settlements in Diongor. The whole mountain had once been covered with terraces wherever possible, and even the steepest slopes were managed (Froelich 1968:65). Furthermore, he describes the agriculture practised by the so-called Hadjerais ('*montagnards*' in Arabic) in the area: small gardens manured with dung from sheep, goats and horses (Froelich 1968:151).

Jebel Marra (Sudan)

The extent of terracing in the Jebel Marra massif can be assessed from the maps in Lebon and Robertson (1961) and Hale (1964). They note that some areas of terracing were permanent, while large areas of terracing were used only in rotation. It is not clear if this indicates a process of extensification of a formerly more intensive farming situation, or if fallowing was also a part of the agricultural system in previous times. The role of trees, and especially the nitrogen-fixing *Acacia Albida* in the humanised landscapes of the Jebbel Marra highlands, is described by Mieke (1996). Ahmed has analysed the vegetation in the area from the point of view of human influence (Ahmed 1982, 1988). He proposes that a 'long period of extensive terrace building and bush-fallowing for at least 1000 years' is the explanation for the present scarcity of woody vegetation (Ahmed 1988:12). According to Musa, findings of agricultural tools from the period 700–1000 AD indicate that the inhabitants of the hills were sedentary agriculturalists at that time, though it is not clear to what extent this refers to the cultivation of the hillsides or of the plains (Musa 1993:84). Häser has made a comprehensive archaeological recording of settlement remains from different periods in the hills, based on aerial photography. In her overview of previous literature, she is sceptical of Musa's and Ahmed's dating to the first millennium AD, since they are not supported by strong archaeological evidence (Häser 2000:129). On the basis of Häser's classification of settlement types and their hypothetical dating, it can be concluded that settlements connected to the terracing existed in the pre-Islamic period (pre-1650) (Häser 2000:245). A conservative estimate of the age of terracing in Jebel Marra based on Häser's work is thus that terracing has existed there for at least 400 years.

Nuba Hills (Sudan)

According to the map provided by Lebon (1959), terracing in the Nuba hills is much more scattered than that in Jebel Marra. Nadel (1947) describes three types of farm land cultivated by the Nuba: 'house farms', 'hillside farms' and 'far farms' (Nadel 1947:16). The first two are terraced, and 'house farms' are manured with household refuse and goat and cattle dung. Bedigian and Harlan (1983) also describe ridging along contours and mulching with straw. Formerly a local dwarf-type breed of cattle was a characteristic of the hills farms, which, according to Ewald (1990), can also be taken as an indication that the Nuba have kept cattle for a long time. In her history of the area in the period 1700–1885 AD, Ewald bases her description of the agricultural system largely on Nadel and later sources referring to the mid

20th century. However, she considers that this provides some information on the basic conditions of the hills that goes back at least to the 18th century.

Some Conclusions

From the readings referred to above some common traits can be identified. The hill environments often provided not only shelter from invasions, but also good conditions for agriculture. Soils are often of volcanic origin or are for other reasons more fertile than on the surrounding plains. Several sources of water are evident, and it has also been argued that the hills receive higher precipitation and that the rains are also more regular (Dresch 1952:6; Froelich 1968:60; Netting 1973:226; Beek & Avontuur 2005:72). It has also been argued that the hills provided healthier environments (Eggon in Nigeria: Dorward 1987:204). As Straube argues, it was rather the extraordinarily bad conditions for agriculture on the great plains of the continent that led to a concentration of farmers in hilly areas (Straube 1967:209). The argument that the hills, from an agricultural viewpoint, offered fewer possibilities than the plains (which is one part of the siege hypothesis) can thus be questioned. However, as Netting points out, a more detailed analysis of labour productivity versus land productivity needs to be taken into account (Netting 1973:43).

The ethnic diversity of the communities of hill farmers is stressed by many authors. Rather than cultural homogeneity (which was the basis of the palaeonegritic idea), the great linguistic diversity in many of these hills often points to a history of several waves of immigration.

In many of these areas, it is observed that men take greater part in agricultural work than do men working in the less intensive agriculture of the surrounding areas (see Baumann 1928). Furthermore, the specific role of smiths has sometimes been emphasised. Although this cannot be seen as a universal feature of hill-farming communities, for some areas, the existence of a separate group of smiths has been seen as an important prerequisite for intensive agriculture in which both men and women are active (Amborn 1988). A similar observation is made for Houndé by Weingarten (1991).

Surprisingly, little explicit historical and archaeological evidence is available in relation to the question of the dating of farming practices, soil and water conservation, tools and the terraced landscapes. Most discussions of dating are only based on the oral history of immigration to the area and are focussed on slave raiding as an important period of the migration to the hills. Evidence of settlement and farming practices in the hills before the era of the slave trade is missing in the literature. In the absence of more detailed historical and archaeological studies of the chronology of terracing and other farming practices associated with this labour-intensive agriculture, any judgement of the situation of these areas in, for example, 1500 AD must be conjectural. On the basis of evidence from the Mandara Mountains and the Tangale Waja uplands, it seems probable that in 1500 and well before, many of these hills were indeed settled and farmed. Further, evidence suggests that they offered some environmental advantages over the surrounding savannah lowlands. Higher precipitation and, often, good volcanic soils offered possibilities for those who were ready to embark on labour-intensive agriculture. Terracing, mulching, manuring and other intensive farming practices in these areas might therefore have their origin in times well before slave raiding, although the extent of terracing at that time cannot be established.

So far, the dialectic view of the role of conflicts versus co-operation, which was developed on the basis of the examples from eastern Africa, seems valid also for the role of slave raiding in the examples discussed here. Applying these interpretations to the problem of the hill farmers

in West Africa and the Sudan zone, one might suggest a process whereby slave raiding accentuated an already existing labour division between groups occupying the hills and groups in the surrounding savannahs.

The Political Economy of Intensive Cultivation on the Plains of West Africa

The West African context urges us to pause and think about what John Sutton termed the ‘tyranny of the monuments’ (Sutton 1989:112). Lowe Börjeson used the term in a broad sense as a ‘metaphor for the tendency to focus on conspicuous aspects of intensive farming systems’ (Börjeson 2007: 264). While a previous research tradition focussed on the cultural traits and tried to distinguish between real palaeonegritics and other intensive farmers, a similar tendency in more recent research is to focus on particular features, in this case the physical and tangible evidence of intensive agriculture, such as terracing and irrigation furrows. But a broader approach to the history of agricultural landscapes must also analyse other signs of labour-intensive agriculture such as anthropogenic soils and managed trees and parklands (cf. Fairhead & Scoones 2005; Fairhead 2008).

Many of the characteristics of intensive agriculture were evident in both hill agriculture and on many of the plains of West Africa. Kunz Dittmer described how among different decentralised groups (*Altnigritiern*) in southern Burkina Faso and northern Ghana (Kassena, Builsa, Nankana, Nuna, Bobo, Dagari and Lobi), all settlements are surrounded by permanently cultivated fields. Those who live in hilly country have terraced fields, while both on terraced land and on the plains, the fields are fertilised by the spreading of dung from small and large livestock, by livestock brought in to graze the stubble, and through human faeces. Dittmer considers this close integration between livestock and arable farming to be of a considerable age (Dittmer 1958). These observations are in contrast to what has been documented for other terraced farming communities, where there is a clear contrast in farming practices between manured fields in the hills and the shifting cultivation on ‘bush farms’ on the plains (Kofyar: Netting 1968:200ff; Nuba: Nadel 1947:18ff).

Outside the context of decentralised societies (or palaeonegritic and pagan groups) there is also in West Africa ample evidence of intensification connected to labour-intensive practices and investment in soils and landscapes. We have good reason to believe that these emerged well before colonial times. The chronology here is vague, but for the sake of clarity I should say that in the following, I am focussing on what we can assume was present at least in 1800 AD.

Serer

Paul Pélissier describes in detail the basis of the Serer farming system in Senegal, from the perspective of what was there before the great groundnut expansion in the early 20th century. On the small, permanently cultivated infield, millet was grown. The high productivity of this infield was based on a long history of managing the soils and an intimate integration of cultivation and cattle keeping. Through elaborate methods of stubble grazing and folding on the infields during the night, the fields were manured (Pélissier 1966:236, 258–259). The role of trees, especially *Acacia Albida*, in capturing nitrogen and increasing productivity of soils is also noted (Pélissier 1966:261–262). Birgitte Reinwald argues that this type of farming system may have its roots in the 13th century, when the Serer first settled in the area (Reinwald 1997).

Fouta Djallon

The labour-intensive farming practices in the Fouta Djallon highlands in Guinea have been highlighted in recent research on sustainable locally developed farming practices (Brookfield 2001:97–99; Boiro et al. 2003). The *tapades* are intensively cultivated infield areas, which are continually improved by manuring and mulching (see also Richard-Molard 1944). Some of the present core areas of *tapades* are aged over 100 years. Of course, this does not date the farming system, as such, but the preconditions for this close integration of livestock and permanent agriculture go back to the immigration and sedentarisation of Fulbe cattle herders. This was followed by their integration with the existing Djallonke farmers between the 13th and 16th centuries and the subsequent takeover by the Fulbe and their establishment of a theocratic state in 1725. Given the specific characteristics of the Fouta Djallon kingdom from the late 18th century, it is tempting to see a connection between this very labour-intensive and highly productive farming practice and the fact that the expansive Fouta Djallon rulers turned the former inhabitants into slaves.

Hausa

Farming in the closely settled zones around the Hausa capitals is well described from the mid 19th century. Barth travelled in the 1850s through intensively cultivated fields of millet, sorghum, cotton and indigo (Barth 1859). From later evidence we know that manuring, stubble grazing, intercropping, ridging and irrigation were part of the system (Raynaut 1989; Swindell & Iliya 1989). To what extent such farming practices were present at the beginning of the 19th century has not yet been proven. The answer might lie in new methods of investigating the age of anthropogenic soils in such areas (Adderley et al. 2004 and personal communication).

The intensive farming, mulching and manuring that occurred in these areas and more generally in the semi-arid belt from Senegal to Nigeria (e.g. Mossi in Burkina Faso) led to the development of what has been characterised as ring cultivation or the infield–outfield system (Fussel 1992; Prudencio 1993). It is striking that this type of labour-intensive farming occurs in a zone where there were ‘predatory’ slave-raiding and slave-using states in the 18th and 19th centuries. We know that slaves played an important role in agricultural labour and that plantations with slave labour were in existence (Lovejoy 1986). However, to my knowledge, the possible role of slave labour as a force behind this intensification has not been explored in more detail.

When the perspective is broadened from looking only at terraced agriculture in hilly areas, it thus becomes evident that different labour-intensive farming practices, leading to investments in land, were practiced in both hills and plains in West Africa during the 19th century and earlier. A previous approach focussed on intensification as an outcome of the retreat of decentralised societies into hills and mountains, but this view is clearly challenged by the fact that intensification also occurred on the plains and in areas dominated by stratified social organisation and predatory states. It seems as if the labour mobilisation required for intensive agriculture was achieved at both ends of this social continuum. This idea supports the notion of complexity in the relationships between intensification of agriculture and structures of power (Widgren 2004:16).

Slave Trade and Decentralised Societies: Consequences for Farming

It is important to understand intensification of agriculture in the period 1500 to 1800 AD in West Africa in the context of the broader political and economic framework surrounding the

growing trade in slaves and other goods. Walter Hawthorne's book *Planting Rice and Harvesting Slaves* (2003) is one of the few recent investigations detailing the agricultural consequences of these political and economic changes. The Balanta along the Guinea (Bissau) coast were a decentralised society who totally changed their settlement pattern and agricultural system in the 16th century, when it turned to intensive paddy rice farming. This farming system had existed further north along the coast in the Senegambia well before the arrival of Europeans. Rice cultivation in mangroves could only be undertaken with iron-edged tools, and the people cultivating rice in Senegambia traded their iron with the Mandinka further inland. This had not been an option for the Balanta. Only when iron trade with the Portuguese became possible did they turn to paddy rice farming. This is seen as one of the responses of decentralised societies to the slave trade (cf. Klein 2001). We can thus conclude that agricultural intensification occurred in three different ecological and social contexts in West Africa: the decentralised societies in the hills, Muslim states on the plains and among decentralised groups along the coast.

According to Hawthorne, in the face of slave raiding, decentralised societies had three ways of coping. One was to retreat to easily defended areas (be they forests or hills) and to develop the amalgamation and fortification of previously scattered settlements. A second coping strategy was to 'engage with the broad markets and to gain access to valuable Atlantic imports' (Hawthorne 2003:206). This is the context in which the establishment of the labour-intensive rice cultivation of the Balanta should be seen. The Balanta also followed a third alternative and engaged themselves to a certain extent in the slave trade, albeit on a different level to the slave-trading states. Scott MacEachern has also argued for such a dialectical view of the emergence of intensive agriculture in the Mandara Mountains. He shows how relations between the Wandala state and Mandara hill farmers were based on interdependence, since both groups controlled vital resources. 'Each group had to be able to exploit the other in order to exist, but too much exploitation would cause conflict and might end the relationship' (MacEachern 1993).

It is thus possible to argue that in accordance with the siege hypothesis, conflicts over resources and the role of slave raiding were instrumental in developing this kind of geographical division of labour. However, the metaphor of a siege simplifies the relationship that existed between hierarchical and slave-trading societies and the decentralised farming communities – be they on terraced hills or along the rice-producing coast. The outcome was instead a dialectic of conflict and co-operation. As discussed above, this line of argument has been pursued by Östberg (2004) and Davies (forthcoming) in understanding the relationships between agriculturalists and pastoralists in eastern Africa. Conflicts and defensive strategies, as well as co-operation in the forms of intermarriage, trade, etc., formed part of this long-term process of different groups relating to one another, intensifying their agriculture and thereby a geographical division of labour.

Discussion

Despite being regularly cited as fact in the literature on terraced agriculture on West Africa, no clear historical evidence is available to show that slave raiding was indeed the determining factor behind the first settlement of these hills and the development of terracing and intensive agriculture. I find it most probable that the hills were occupied and farmed well before slave raiding. However, it is clear that the farming landscapes that we can see today in these areas cannot be seen in isolation from the turbulent and dynamic political and economic situation in the period 1500 to 1800 AD. During the period of the slave trade, there were clear tendencies towards an intensification of agriculture. This was occurring from the lowlands to the hilled

and terraced areas of West Africa and the Sudan, in both decentralised and hierarchical societies.

Walter Hawthorne's re-evaluation of the emergence of Balanta rice cultivation also warns against use of the 'ethnographic present' as a key to pre-colonial farming practices in Africa. Many historical studies equate linguistic groups and their present (or early 20th century) farming systems with what was evident before. Decentralised societies particularly have been seen as 'fixed, rigid and unchanging – "holdovers" from some distant past' (Hawthorne 2003:35). However, investigations into the agricultural history of sub-Saharan Africa through the co-operation of the disciplines of linguistics, archaeology, oral history and palaeoecology are still in their infancy, and much guesswork remains.

While many aspects of the agrarian landscape may have long continuity, it is abundantly evident that the past five hundred years of agrarian history in sub-Saharan Africa must be seen through the lens of political and economic development instead of as merely reflecting the choices and adaptations of subsistence farmers.

References

- Adams, W.M. 2004 'When Islands Expand: Intensification and Sustainability', in Widgren, M. and Sutton, J. (eds), *Islands of Intensive Agriculture in Eastern Africa*. Oxford: James Currey.
- Adderley, W.P., Simpson, I.A., Kirscht, H., Adam, M., Spencer, J.Q. and Sanderson, D.C.W. 2004. 'Enhancing Ethno-pedology: Integrated Approaches to Kanuri and Shuwa Arab Definitions in the Kala-Balge Region, Northeast Nigeria'. *Catena* 58:41–64.
- Ahmed, A.A. 1982. 'Land Use History of Jebel Marra, Sudan, as Related to the Present Distribution of Woody Vegetation'. *Geojournal* 6:5–15.
- Ahmed, A.A. 1988. 'Vegetation, Soil, and Land-use Changes in Jebel Marra and Other Mountains in the Republic of the Sudan'. *Mountain Research and Development* 8:235–241.
- Amborn, H. 1988. 'Bauern und Handwerker in Süd-Äthiopien. Eine Neuinterpretation'. *Paideuma* 34:31–48.
- Andel, A. van. 1998. *Changing Security: Livelihood in the Mandara Mountains Region in North Cameroon*. Leiden: African Studies Centre.
- Barth, H. 1859. *Travels and Discoveries in North and Central Africa*. New York: Harper and Brothers.
- Baumann, H. 1928. 'The Division of Work According to Sex in African Hoe Culture'. *Africa: Journal of the International African Institute* 1:289–319.
- Bedigian, D. and Harlan, J. 1983. 'Nuba Agriculture and Ethnobotany, with Particular Reference to Sesame and Sorghum'. *Economic Botany* 37:384–395.
- Beek, W.E.A. van. 1992. 'Slave Raiders and "Their People without History"', in Abbink, J., Wolf, Eric R. and Vermeulen, H. (eds), *History and Culture: Essays on the Work of Eric R. Wolf*. Amsterdam: Het Spinhuis.
- Beek, W.E.A. van. 1993. 'Processes and Limitations of Dogon Agricultural Knowledge', in M. Hobart (ed), *An Anthropological Critique of Development: The Growth of Ignorance*. London: Routledge.
- Beek, W.E.A. van and Avontuur, S. 2005. 'The Making of an Environment: Ecological History of the Kapsiki/Higi of North Cameroon and North-Eastern Nigeria', in Gausset, Q., Whyte, M., and Birch-Thomsen, T. (eds), *Beyond Territory and Scarcity: Exploring Conflicts over Natural Resource Management*. Uppsala: Nordiska Afrikainstitutet. 70-89.

- Blaikie, P. and Brookfield, H.C. 1987. *Land Degradation and Society*. London and New York: Methuen.
- Bloch, M. 1971. 'Les Montagnards Paleonigritiques. Froelich, Jc'. *International Journal of Comparative Sociology* 12:150–151.
- Boiro, I., Barry, A.K., Diallo, A. 2003. 'Guinée' in Brookfield, H.C., Parsons, H. and Brookfield, M. (eds), *Agrodiversity Learning from Farmers Across the World*. Tokyo: United Nations University Press. 110-113.
- Börjeson, L. 2004. *A History under Siege. Intensive Agriculture in the Mbulu Highlands, Tanzania. 19th century to the present*. Stockholm University: Stockholm.
- Börjeson, L. 2007. 'Boserup Backwards? Agricultural intensification as 'its own driving force' in the Mbulu Highlands, Tanzania'. *Geografiska Annaler: Series B, Human Geography*, 89:203–217
- Brookfield, H. 2001. *Exploring Agrodiversity*. Columbia University Press, New York, New York, USA.
- Campbell, D.J. and J.C. Riddell 1984. 'Social and economic change and the intensity of land use in the Mandara mountains of North Cameroon'. *Tijdschrift voor Econ. en Soc.Geografie*, 75:335–343.
- Davies, M. 2008 'The irrigation system of the Pokot, northwest Kenya'. *Azania* 43:50–76.
- Davies, M.I.J. 2009a. 'Wittfogel's dilemma: heterarchy and ethnographic approaches to irrigation management in Eastern Africa and Mesopotamia'. *World Archaeology* 41(1):16–35.
- Davies, M.I.J. 2009b. An applied archaeological and anthropological study of intensive agriculture in the Northern Cherangani Hills, Northwest Kenya PhD thesis, Univ. of Oxford.
- Davies, M.I.J. Economic specialisation, resource variability, and the origins of intensive agriculture in Eastern Africa. Manuscript.
- Delius, P. and Schoeman, M.H. 2008. 'Revisiting Bokoni: populating the stone ruins of the Mpumalanga Escarpment'. In Swanepoel, N., Esterhuysen, A., Bonner, P. (eds) *Five Hundred Years Rediscovered: Southern African precedents and prospects*, 500 Years Initiative 2007 Conference Proceedings, Johannesburg: Wits University Press. 135–167.
- Dittmer, K. 1958. 'Ackerbau und Viehzucht bei Altnigritiern und Fulbe des Obervolta-Gebietes'. *Paideuma* 67:429-462
- Dorward, D. 1987. 'The Impact of Colonialism on a Nigerian Hill-Farming Society - A Case-Study of Innovation Among The Eggon.' *International Journal of African Historical Studies*, 20:201-224.
- Dresch, J. 1952. 'Paysan montagnards du Dahomey at du Cameroun. Les vrais paysan noirs'. *Bulletin de l'Association de géographes français*. 222/3:1-9
- Ewald, J. 1990. *Soldiers, traders, and slaves: state formation and economic transformation in the Greater Nile Valley, 1700-1885*. Madison, Wis.: University of Wisconsin Press
- Fairhead, J. and Scoones, I. 2005. 'Local knowledge and the social shaping of soil investments: critical perspectives on the assessment of soil degradation in Africa'. *Land use policy* 22:33–41
- Fairhead, J., 2008. 'Amazonian Dark Earths in Africa?' In W. Woods ed. *Terra Preta Nova: A Tribute to Wim Sombroek*. Berlin: Springer-Verlag
- Floyd B. 1964. 'Terrace Agriculture in Eastern Nigeria: The Case of Maku'. *Nigerian Geographical Journal*, 7:91-108
- Fricke, W. 1996a. 'Regional Distribution of Terrace Farming on Different Scales: West Africa - Burkina Faso - Nigeria.' *Berichte des Sonderforschungsbereichs* 268, 8, Frankfurt a. Main.87-91.

- Fricke, W. 1996b. 'The example of the Nigerian Savanna' *Berichte des Sonderforschungsbereichs* 268, 8, 95-100. Frankfurt a. Main.
- Froelich, J. C. 1968. *Les Montagnards "Paléonigritiques"* Paris: ORSTOM
- Fussel, L.K. 1992. 'Semi-arid cereal and grazing systems of West Africa' In C.J. Pearson ed *Field crop ecosystems*. Amsterdam, Elsevier, 485–518.
- Gebauer, T. 1996. 'Facettes of terrace-building in the culture of the Pero, Longuda and Tula People in North-Eastern Nigeria'. *Berichte des Sonderforschungsbereichs* 268, 8. Frankfurt a. Main. 125-127.
- Gourou, P. 1991. *L'Afrique tropicale, nain ou géant agricole?* Paris: Flammarion
- Grove, A.T. and Sutton, J.E.G. 1989. 'Agricultural terracing south of the Sahara'. *Azania* 24:114-122
- Hahn, H.P. 1996. 'Ethnological approach of terrace farming'. *Berichte des Sonderforschungsbereichs* 268, 8, Frankfurt a. Main. 93-94.
- Hahn, H.P. 1997. 'Terrassenfelddbau bei den Ost-Kassena in Burkina Faso'. *Sociologus* 47:1-23
- Hahn, H.P. 1998. 'La culture en terrasses chez les Kassena du Burkina Faso: une étude de cas'. In Renard, G. et al. (eds) *Soil fertility management in West African Land Use Systems*., Weikersheim: Margraf. 475-480
- Hahn, H.P. 2000. 'Raumkonzepte bei den Kassena (Burkina Faso)' *Anthropos* 95:129-148
- Håkansson, N. T. 2004. 'The Human Ecology of the Ivory Trade', *Human Ecology* 32, 561–91.
- Håkansson, N.T. and Widgren, M. 2007. 'Labour and landscapes: The political economy of landesque capital in 19th century Tanganyika'. . *Geografiska Annaler: Series B, Human Geography*, 89:233-248.
- Hale, G.A. 1964. 'Terrasseagerbrug i Jebel Marra, Darfur, Sudan'. *Kulturgeografi*, 87:187-204
- Hallaire, A. 1991. *Paysans montagnards du Nord-Cameroun: les monts Mandara*. Paris: Orstom
- Häser, J. 2000. *Siedlungsarchäologie in der Jebel Marra-Region Darfur/Sudan: Archäologischer Einsatz von Fernerkundungsdaten im Sahelgebiet*. Rahden/Westf.: Verlag Marie Leidorf GmbH
- Hawthorne, W. 2003. *Planting Rice and Harvesting Slaves: Transformations along the Guinea-Bissau Coast, 1400-1900*. Portsmouth: Heinemann.
- Heinrich, J. 1996. Geocological arguments for field terracing in parts of the Southern Gongola basin, Tangale-Waja region, NE-Nigeria. *Berichte des Sonderforschungsbereichs* 268, 8. Frankfurt a. Main. 101-111
- Klein, Martin A. 2001. 'The slave trade and decentralized societies'. *Journal of African History*, 42:49-65.
- Kleinewillinghöfer, Ulrich 1996. ' "Terraces" and "Terraced Farms" in the languages of the Tangale-Waja uplands. In *Berichte des Sonderforschungsbereichs* 268, 8. Frankfurt A.M. 113-123
- Krings, T. 1988. 'Die bedeutung des Bewässerungsfelddbaus für die Subsistenzsicherung bei den Dogon Republik Mali'. *Die Erde*, 119:185– 92.
- Lebon, J.H.G. 1959. 'Land Use Mapping in Sudan' *Economic Geography*, 35: 60-70.
- Lebon, J.H.G. and Robertson, V.C. 1961. 'The Jebel Marra, Darfur and its region'. *Geographical Journal*, 127:30-49.

- Lovejoy, Paul E. 1986. 'Problems of slave control in the Sokoto Caliphate'. In Curtin, Philip D.; Lovejoy, Paul E. *Africans in bondage : studies in slavery and the slave trade : essays in honor of Philip D. Curtin on the occasion of the twenty-fifth anniversary of African Studies at the University of Wisconsin* [Madison] : African Studies Program, University of Wisconsin--Madison, 235-272.
- MacEachern, A.S. 1993. 'Selling the iron for their shackles, Wandala-montagnard interactions in northern Cameroon' *Journal of African History* 34:247-270.
- MacEachern, A.S. 2001. 'State formation and enslavement in northern Cameroon and northeastern Nigeria'. In C. DeCorse (ed) *West Africa during the slave trade: archaeological and historical perspectives*, 131-151. Leicester University Press, Leicester.
- MacEachern, A.S. 2003. Du kunde: Processes of montagnard ethnogenesis in the northern Mandara mountains of Cameroon. Mandaras publishing. Electronic publication. Based on PhD Thesis, University of Calgary, 1990. http://www.mandaras.info/MandarasPublishing/MacEachern_DuKunde_PhD.pdf accessed Dec 21st 2009
- Maggs, T. 1995. 'From Marateng to Marakwet: islands of agricultural intensification in Eastern and Southern Africa'. Abstracts for 10th Congress of the Pan African Association for Prehistory. Harare: University of Zimbabwe and National Museums and Monuments of Zimbabwe.
- Maggs, T. 2008. 'The Mpumalanga Escarpment settlements: some answers, many questions'. In Swanepoel, N., Esterhuysen, A., Bonner, P. (eds) *Five Hundred Years Rediscovered: Southern African precedents and prospects*, 500 Years Initiative 2007 Conference Proceedings, Johannesburg: Wits University Press. 169-181.
- Mayor, A., Huysecom, E., Gallay, A., Rasse, M. and Ballouche, A. 2005. 'Population dynamics and Paleoclimate over the past 3000 years in the Dogon Country, Mali.' *Journal of Anthropological Archaeology*, 24, 25-61.
- Miehe, S. 1986. 'Acacia Albida and other multipurpose trees on the Fur farmlands in the Jebel Marra Highlands, Western Darfur, Sudan'. *Agroforestry Systems* 4:89-119.
- Müller-Kosack, G., 1996, 'The Dughwe in NE-Nigeria. Montagnards interacting with the seasons', *Berichte des Sonderforschungsbereiches* 268, Band 8, Frankfurt. 137-170.
- Musa, I. 1993. 'Traditional Iron Technology and Settlement Patterns in Central Darfur'. In M. Levy, Thomas Evan and Holl, Augustin (ed) *Spatial boundaries and social dynamics: case studies from food-producing societies*. Ann Arbor: International Monographs in Prehistory. 83-94.
- Nadel, S. F. 1947. *The Nuba: an anthropological study of the hill tribes in Kordofan*. London: Oxford University Press
- Netting, R. M. 1973[1968]. *Hill farmers of Nigeria: cultural ecology of the Kofyar of the Jos Plateau*. 3. pr., Seattle: University of Washington Press
- Östberg, W. 2004. 'The expansion of Marakwet hill-furrow irrigation in Kenya'. In Widgren and Sutton 2004.
- Palau Marti, M. 1957. *Les Dogon*. 1. éd. Paris: Presses univ. de France
- Pélissier, P. 1966. *Les paysans du Sénégal: les civilisations agraires du Cayor à la Casamance*. Saint-Yrieix:
- Prudencio, C. Y. 1993. 'Ring management of soils and crops in the West African semi-arid tropics: The case of the mosi farming system in Burkina Faso'. *Agriculture, Ecosystems and Environment* 47:237 - 264
- Raulin, Henri 1984. 'Techniques agraires et instruments aratoires au sud du Sahara'. *Cahiers ORSTOM .Série Sciences Humaines*, 20: 339-358
- Raynaut, C. 1989. La culture irriguée en pays haoussa nigérien. Aspects historiques, sociaux et techniques. *Etudes Rurales* 115-116:105-128

- Reij, C., Scoones, I. and Toulmin, C. (ed.) 1996. *Sustaining the soil: indigenous soil and water conservation in Africa*. London: Earthscan
- Reinwald, B. 1997. '“Though the earth does not lie”. Agricultural transitions in Siin Senegal under colonial rule'. *Paideuma* 43:143-169.
- Richard-Molard, J. 1944. Essai sur la vie paysanne au Fouta-Dialon. *Revue de Géographie Alpine*, 32:135-239
- Riddell, J.C. and D.J. Campbell. 1986. 'Agricultural intensification and rural development: the Mandara mountains of North Cameroon'. *African Studies Review*, 29:89–106.
- Savonnet, G. 1960. 'Un système de culture perfectionné, pratiqué par les Bwaba – Bobo-Oulé de la région de Houndé Haute Volta' *Études Voltaïques*, Memoire No 1, 19-52
- Soper, R. 2002. *Nyanga: Ancient fields, settlements and agricultural history in Zimbabwe*. London.
- Straube, H. 1967. 'Der agrarische intensivierungskomplex in Nordost-Afrika'. *Paideuma* 13:198-222
- Stump, D. 2006a. 'The development and expansion of the field and irrigation system at Engaruka, Tanzania'. *Azania* 41:69-94
- Stump, D. 2006b. Towards an applied archaeology of east African intensive agricultural systems. PhD The Institute of Archaeology University College London
- Summers, R. 1958. *Inyanga. Prehistoric Settlements in Southern Rhodesia*. Cambridge University Press.
- Sutton, J.E.G. 1989. 'Towards a history of cultivating the fields'. *Azania* 24:99-113
- Swindell, K. and Iliya M.A. 1989. 'Field systems, cultivation techniques and non-farm incomes in Hausaland'. *Azania* 24:28-37
- Tambo, D. C. 1978. 'The “Hill Refuges” of the Jos Plateau: A Historiographical Examination' *History in Africa*, 5:201-223
- Watson, E. E. 2009. *Living terraces in Ethiopia: Konso landscape, culture and development*. Woodbridge, UK: James Currey
- Weingarten, S. 1991 'Zur Arbeitsteilung bei den Bwaba in der Region von Houndé in Burkina Faso'. *Paideuma*. Volume 37 1991. pp. 189-203.
- Westerberg, L.O., Holmgren, K., Börjeson, L., Håkansson, T., Laulumaa, V., Ryner, M., Öberg, H. (forthcoming). 'The development of the ancient irrigation system at Engaruka, Northern Tanzania. Physical and societal factors'. Accepted for publication in *The Geographical Journal*.
- Widgren, M. and Sutton, J. eds 2004. *Islands of intensive agriculture in Eastern Africa*. Oxford: James Currey
- Widgren, M. 2004. 'Towards a historical geography of intensive farming in eastern Africa'. In Widgren and Sutton 2004
- Widgren, M. 2007. Pre-colonial landesque capital: a global perspective. In Hornborg, A., Martinez-Alier, J. and McNeill, J.R. (eds), *Rethinking Environmental History: World-System History and Global Environmental Change*. AltaMira Press, Walnut Creek.
- Zwernemann, J. 1963. 'Feldtypen und Speichertypen bei den Kassena in Obervolta'. *Zeitschrift für Ethnologie* 88:310-317.