Some Thoughts on a 'Useable' African Archaeology: Settlement, Population and Intensive Farming among the Pokot of Northwest Kenya

Matthew I. J. Davies

African Archaeological Review

ISSN 0263-0338
Volume 29
Number 4

Afr Archaeol Rev (2012) 29:319-353
DOI 10.1007/s10437-012-9118-8

Springer

Afr Archaeol Rev (2012) 29:319–353
DOI 10.1007/s10437-012-9118-8

ORIGINAL ARTICLE

Some Thoughts on a 'Useable' African Archaeology: Settlement, Population and Intensive Farming among the Pokot of Northwest Kenya

Matthew I. J. Davies

Published online: 4 October 2012

Abstract The desirability of a 'useable' African past which engages with the social and economic conditions of the present has been expressed many times but has yet to be fully realised. This paper presents new archaeological data on long-term settlement, demography and land-use in the Pokot region of northwest Kenya which engages with a number of present-day socio-economic and development concerns.

Résumé L'attrait d'un passé africain 'utile', engagé dans les conditions sociales et économiques du présent, a été exprimé à plusieurs reprises, mais n'a pas été atteint. Cet article présente de nouvelles données archéologiques sur l'habitat à long terme, la démographie et l'utilisation des terres dans la région Pokot du nord-ouest du Kenya en intégrant une série de préoccupations socio-économiques actuelles.

Keywords Kenya · Intensive agriculture · Applied archaeology · Economy · Ecology · Settlement patterns · Population

Introduction

It seems clichéd to reiterate the great social and economic problems facing Africa and the need for a 'useable' African archaeology that engages with those issues. This point has been made in many forms over the years (Lane 2003, 2010a; Mapunda 1991; Musonda 1990; Phillipson 2003; Shepherd 2002; Sowunmi 1998; Stump 2006), most recently by various contributors to the special edition on African Heritage in this journal (Sulas *et al.* 2011). The quest for a useable or 'useful' archaeology is also more than

M. I. J. Davies
Fellow in East African Archaeology, British Institute in Eastern Africa, Nairobi, Kenya

M. I. J. Davies (✉)
McDonald Institute for Archaeological Research, University of Cambridge, Downing Street, Cambridge CB2 3ER, UK
e-mail: md564@cam.ac.uk

just an African concern as attested by the growing global literature on the possible (negative and positive) 'uses' of archaeology (*i.e.*, Dawdy 2009 and responses).

Many commentators have spoken of an engaging and relevant African archaeology with implicit reference to nation building, identity and a renewed pride in Africa's past and present achievements (Lane 2003 and quotes therein). Such focus can certainly be important and I do not wish to detract from this endeavour (although see Dawdy 2009 for critique). However, there are alternative ways in which African archaeology can contribute to Africa's present. In particular, a small group of researchers have recently begun talking of a more practically engaged archaeology that aims to partake directly in the resolution of the social, economic and environmental problems facing the continent. Such research talks of an 'applied' archaeology (Hayashida 2005; Stump 2006, 2010) and is often aligned with the tenets of a more globally oriented 'Historical Ecology' (Balée 1998, 2006; Balée & Erickson 2006; Crumley 1994; Davies 2010a; Lane 2010b). I do not wish to discuss the details of these positions here; instead, the reader is referred to the cited works. In this paper, I wish to provide a practical example of how archaeological techniques may be applied to socio-environmental issues based on a case study of intensive farming in the Pokot region of northwest Kenya.

Useable Socio-Environmental Archaeology in Africa?

Recently, Arazi (2011) has pointed out how archaeological impact assessments and cultural resource management in Africa is commonly subsumed as part of much broader social and environmental impact assessments, where the assessment is often carried out by non-specialists and the archaeology glossed-over or largely ignored. This neglect naturally reflects the prioritising of solid economic development by African governments and developers and it is hard to deny that archaeology/heritage seems relatively irrelevant in the face of such momentum. For right or wrong, identity building and pride in the past come off second best to industry, infrastructure and food security. However, archaeologists may be missing a trick here because archaeological data often pertain very strongly to issues of ongoing land-use, environment/resource management, sustainability/resilience and demography. Instead of arguing for an archaeology separate from normal social and environmental impact assessments, we might rather argue for a more central role for archaeology within assessment of Africa's present human and natural geography. Such emphasis might act to re-prioritise and popularise archaeological data and techniques, and create space for a more 'humanistic' appreciation of Africa's past. But, most importantly, it should also lead to more effective assessments of African communities, environments and resources viewed as products of a long-term history. In this context, archaeology should be both useful and relevant to Africa's present and future (Dawdy 2009:140-141; Lane 2010a:16)

With such an agenda in mind, I would suggest that there are at least five possible and mutually compatible elements to a 'useable' archaeology of African communities, resources and environments. These possible elements are summarised in Table 1. This list is not exhaustive nor do I wish to make the development of an applied archaeology seem easy or straight forward. Applied archaeology, like applied social anthropology, will be fraught with pitfalls and practical problems, not to mention deep moral dilemmas concerning the reliability of archaeological data and the

Table. 1 Possible elements in an applied archaeology

1. Long-term analysis of the human-environment dynamic	a. Analysis of changing land-use patterns; identification and dating of landscape features such as field boundaries, agricultural terraces, irrigation channels, wells, *etc.*
	b. Analysis of ongoing long-term demographic trends; settlement patterns, population sizes and population densities, *etc.*
	c. Analysis of anthropogenically modified soils and vegetation (including improvement and degradation)
	d. Analysis of past crop/animal varieties, combinations and novel management strategies
	e. Analysis of ongoing regional networks of production, exchange and support acting within and beyond the community level
	f. Analysis of cultural systems of access to land (tenure) and inheritance
	g. Analysis of ongoing climatic trends and reciprocal human impacts/responses
	h. Assessment of past vulnerability to climate change
2. Assessment of environmental narratives	a. Challenging current (and past) environmental narratives (especially those used in development discourse) using archaeological data
	b. Providing long-term environmental data-sets to compliment or critique short-term experimental data
	c. Developing critical approaches based on long-term data to widely used concepts of adaptation/maladaptation, sustainability, resilience, optimality, 'pristine/natural' environments, stasis/equilibrium *etc.*
3. Rehabilitation and IK	a. Rehabilitation of past land management strategies
	b. Archaeological analysis of past or ongoing environmental practices/technologies and knowledge and their assessment as possible solutions to modern problems
	c. Recovery of past indigenous knowledge (IK) as novel contributions to stores of environmental knowledge
4. Recursivity and scale in socionatural systems	a. General elucidation of long-term continuity and change in socionatural systems with reference to concepts of non-equilibrium, sustainability and resilience
	b. Analysis of the temporal and spatial scales of socionatural phenomena especially quantification of rates of change (constant, accelerating, decelerating, scalar) and modes of fluctuation (*i.e.*, linear, scalar, cyclical)
5. Memory and risk management	a. Analysis of community inscription of environmental risks through heritage and memory making
	b. Analogous analysis of community impacts and responses to environmental risk in the past as 'lessons' for future risk impacts and management

This table attempts to synthesise aspects of a wide range of work including Balée 2006, 1998; Balée and Erickson 2006; Costanza *et al.* 2007; Crumley 1994; Davies and Nkirote in press; Hayashida 2005; Redman 2005; Stump 2010; and van der Leeuw and Redman 2002.

application of externally derived (and potentially generalising) knowledge to local communities. However, these challenges do not mean that such an archaeology

should not be attempted and this paper primarily aims to demonstrate potential and stimulate further debate.

The following case study of population, settlement and land-use among the Pokot demonstrates the application of a number of these interrelated elements. In particular, the empirical data provide an account that addresses points 1a, 1b, 1e, 1f and 1g. The discussion sections use these empirical data to consider a range of possible development applications, specifically addressing overly simplistic environmental narratives (2a) and widely used concepts such as sustainability (2c), the rehabilitation of past land management strategies (3a), and the assessment of past/ongoing environmental practices as possible solutions to modern problems (3b). These issues are addressed in the context of ongoing small-scale development efforts within the present study region; although it is hoped that the ideas presented will find broader relevance. In addition, while the data presented are yet to be properly integrated within a real development initiative, I hope that the detailed suggestions contained herein will mark the first step towards such an engagement.

Intensive Farming Among the Pokot (1a)

The Pokot are a Kalenjin-speaking people who inhabit parts of Pokot, Baringo and Marakwet Districts of Kenya's Rift Valley Province and parts of Karamoja in eastern Uganda. They are essentially acephalous with a social structure based on a clan and lineage system of kinship and initiation into named sequences of age-sets. They number somewhere in the region of 150,000 to 250,000 (Raymond 2005; Schladt 1997) and are often divided into two groups (Beech 1911:15; Peristiany 1951:188). A minority, perhaps one third, engage in a specialised pastoral lifestyle and inhabit the semi-arid lowlands to the north and east (Dietz 1987:79). The other two-thirds live higher in the Cherangani and Seker Hills and practise a mixture of agriculture and stock-keeping. The focus of this study is the agricultural section of the Pokot who inhabit the north-central Cherangani Hills, specifically the large, low-lying valley known as the Tamkal or Wei wei Valley centred on the village of Tamkal (UTM 36 N 775177E 151899 N; see Fig. 1) (see also Davies 2008, 2009b). The broader Pokot region has and remains prone to food insecurity (Dietz 1987).

The Pokot have long been recognised as specialised intensive cultivators (Beech 1911) and similar agricultural production occasionally has been referred to as a possible model for sustainable rural development (Adams 2004:140; Adams & Anderson 1988:533; Widgren 2000, 2004). Foremost among the agricultural techniques employed is the use of an extensive network of irrigation canals that I have described in detail elsewhere (Davies 2008, 2010a). These canals total some 70 km in length and can be arranged into a basic chronology of construction based on oral histories and the ages of associated circumcision sets, and this was tested by radiometric means (Davies 2008, 2010a).

The irrigation channel data shows that Pokot agriculture has moved across the landscape through time. Farming began in the north of the region some 200 years ago and gradually spread southwards into the hills with subsequent abandonment of the initial northern irrigation channels. There was no single major phase of construction; rather the system is in an ongoing process of construction and abandonment. These

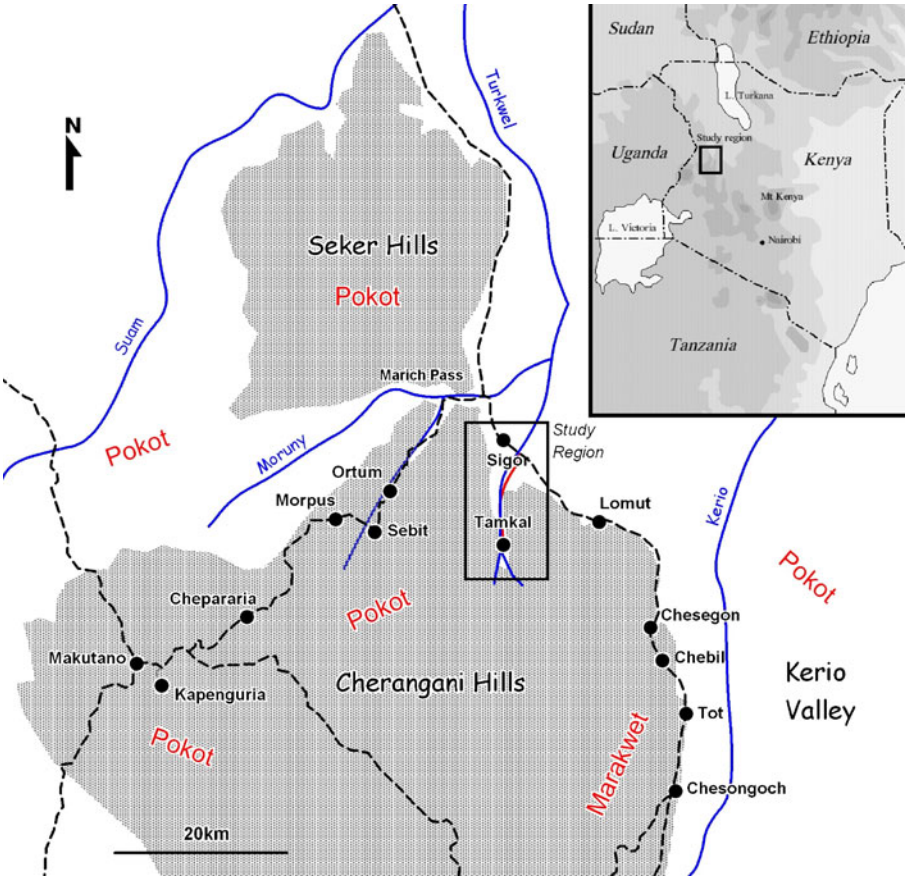

Fig. 1 The study region

data are initially perplexing because common notions of agricultural intensification based on population pressure (Boserup 1965; Brookfield 1986; Turner & Doolittle 1978) would seem to negate the possibility of intensification (irrigation) and expansion (movement) occurring in tandem (*cf.* Börjeson 2005). This therefore raises a number of interesting questions concerning the drivers of these processes and related demographics. Were the processes of movement and intensification coupled with population growth or decline, and with increasing or decreasing population density? Did they result from human drivers such as increased demands on production or anthropogenic soil degradation, or were natural drivers such as climatic change more influential? Such questions seem even more pertinent when framed in terms of sustainable development and effective land/resource management, as is discussed below.

In the next section of this paper, I present a range of archaeological data concerning changing settlement patterns and population densities associated with the Pokot irrigation system. These data strongly support the chronology derived from the irrigation system and add further information about demographic trends and dating. These in turn allow us to refine our understanding of the factors influencing

Pokot agriculture, and therefore to engage more fully with the issue of Pokot farming and possible regional development.

Settlement Patterns Among the Agricultural Pokot (1b)

A Relative Chronology for Pokot Settlement

To understand how Pokot settlement patterns have changed through time I begin with a relative chronology based on the distribution of past and present settlement across the study region. Thirteen transect surveys, each comprising a single hill-spur,[1] were walked equidistant along the Wei wei Valley and all past and present habitations were recorded, as well as information on various surface features and artefacts (Fig. 2).

The Pokot construct their homesteads by cutting large flat platforms out of the hillside, making abandoned platforms easily locatable. The ratios of currently inhabited to abandoned houses as well as the distribution of certain surface features each provide some indication of the relative chronology of settlement. Current house types also provide some indication of the relative age of settlement in any region.

Ratios of Abandoned to Modern Houses

Moving from one transect to the next northwards along the valley, the number of contemporary houses declines while the number of abandoned households increases (Table 2).

These settlement data therefore demonstrate a depopulation of the north of the study area as represented by a high frequency of abandoned houses relative to modern houses. This conclusion results in two possible scenarios, either that the whole valley was settled concurrently with a subsequent depopulation of the northern region, or that the north of the region was settled first and there has been a subsequent shift of population southwards. These competing scenarios are addressed by data on population densities, surface features, house types and radiometric dates.

House and Population Densities by Transect

The area covered by each transect was defined and calculated using a MapInfo derived Digital Elevation Model (DEM)[2] and the figures for house and population densities for each transect are given in Table 3. Absolute house densities are based on the total number of house platforms, both inhabited and abandoned, along each transect and should indicate the maximum density of habitation along each transect at any time in the past.

[1] Each transect encompassed a single hill-spur (*korok*) separated by seasonal or perennial streams, which was walked by intensively 'zig-zagging' back and forth and recording with GPS (Davies 2009b; *cf.* Conant 1965).

[2] The DEM was created using a MapInfo 7.8 GIS package and constructed from a digitised 1:50,000 contour map using the kriging method of interpolation with 5-m grid squares.

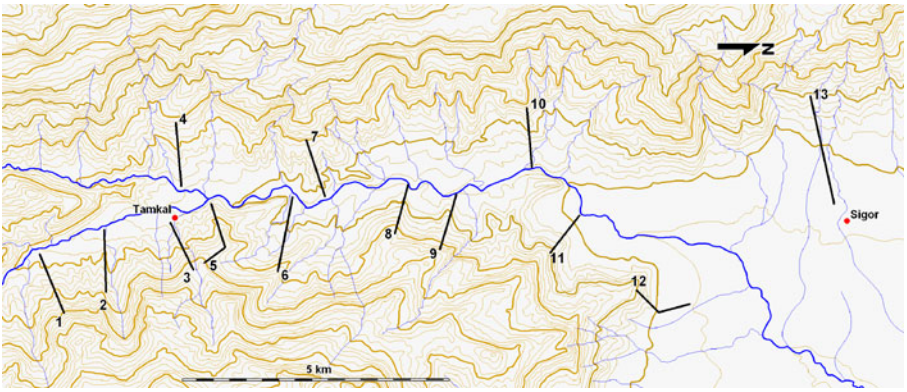

Fig. 2 Survey transects

The data presented in Table 3 and Fig. 3 demonstrate that the absolute house density (and by association population density) across all transects is relatively constant. There is a minor trend towards increased densities at the southern end of the valley; the southernmost six transects (1–6) possess a mean absolute house density of 131.31±25.90 while the seven northern transects (7–13) have a mean of 105.66±9.99. However, at one standard deviation, there is an overlap between densities along the southern six and northern seven transects and this minor difference might be explained by the higher visibility of modern settlements in the south.

These data do not indicate any significant overall change in population densities in terms of increasing or decreasing density of settlement with all regions of the valley supporting similar densities at some time in the past. They do, however, indicate a depopulation of the northern part of the valley as attested by the widespread presence of abandoned homesteads. This depopulation of the north of the region suggests a general

Table 2 Numbers of contemporary and abandoned houses by transect

Transect	Current houses	Abandoned houses	Total houses	Abandoned/modern houses ratio	Abandoned as % of total houses
1	42	13	55	0.31	23.64
2	53	16	69	0.30	23.19
3	24	17	41	0.71	41.46
4	37	12	49	0.32	24.49
5	19	38	57	2.00	66.67
6	25	16	41	0.64	39.02
7	12	20	32	1.67	62.5
8	4	28	32	7.00	87.5
9	9	17	26	1.89	65.38
10	6	31	37	5.17	83.78
11	12	24	36	2.00	66.67
12	3	18	21	6.00	85.71
13	7	17	24	2.43	70.83
Total	253	267	520	1.06	51.35

Table 3 Area, absolute house density, and approximate population density estimate per transect

Transect	Total number of houses	Transect Area (km^2)	Absolute house density (houses/km^2)	Approx. population density (people/km^2)
1	55	0.41	134.15	282
2	69	0.38	181.58	381
3	41	0.29	141.38	297
4	49	0.46	106.52	224
5	57	0.49	116.33	244
6	41	0.38	107.89	227
7	32	0.34	94.12	197
8	32	0.26	123.08	259
9	26	0.25	104.00	218
10	37	0.33	112.12	235
11	36	0.34	105.88	223
12	21	0.23	91.30	192
13	24	0.22	109.09	229

Population densities and absolute house densities are directly proportional. Population densities are given for wider comparative purposes (see Davies 2009b and 2010b for a fuller discussion of how these are calculated)

maintenance of total population size with initial settlement in the north and a gradual shift of population southwards.

Distribution of House Types as Chronological Indicator

Three different types of house exist in the study area (Fig. 4). The most common (78 %) of those are circular thatched huts made with walls of wattle and daub. These are said

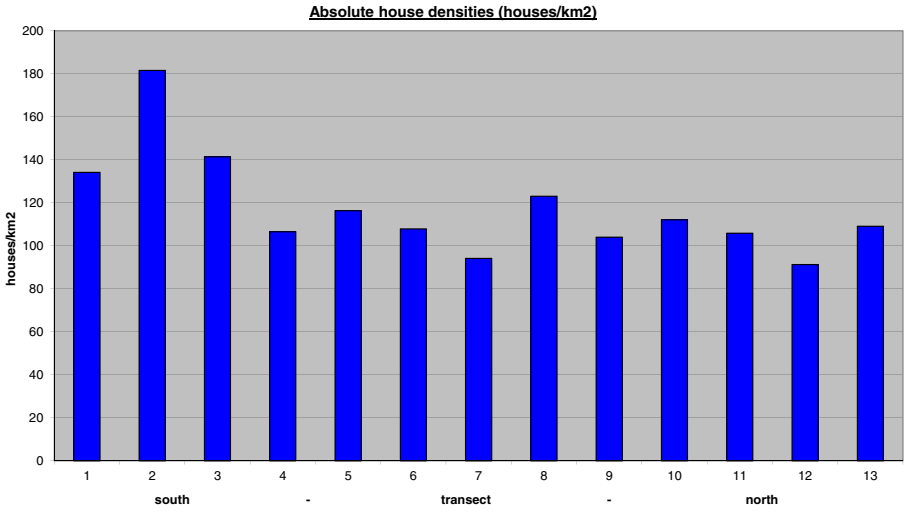

Fig. 3 Absolute house densities by transect

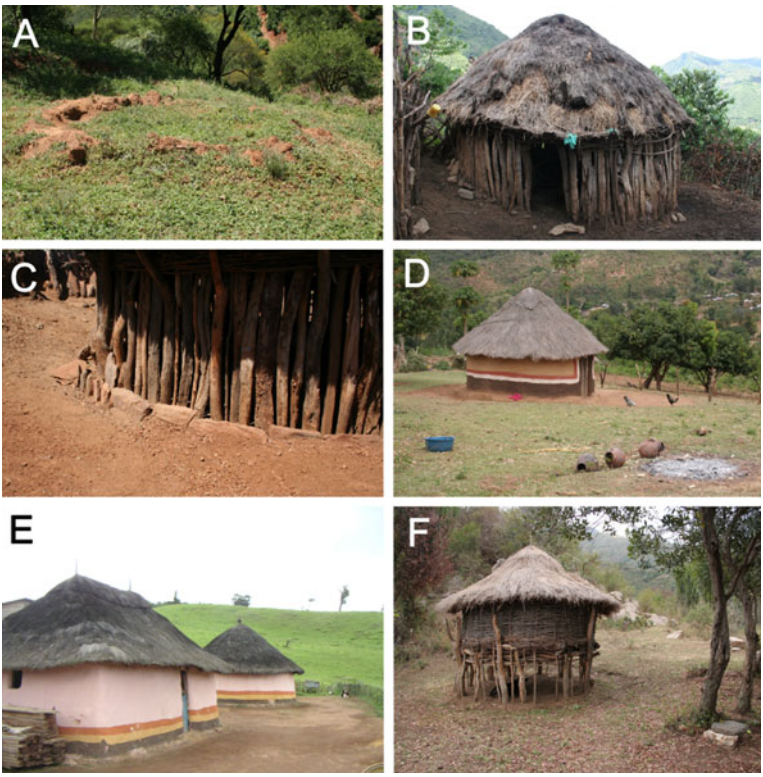

Fig. 4 Various house types (**a** remains of an abandoned house, **b** post and mud house, **c** kerb stones, **d** wattle and daub house, **e** rectangular house, **f** granary)

to be relatively recent, originating in the early colonial period. The second type (16.5 %) are rectangular houses with thatch or tin roofs. This style of house was introduced in the early 1980s as has been discussed by Moore (1986:140–145) for the neighbouring Marakwet. The third and least common type (5.5 %) are circular post and mud huts. These are said to be the oldest, 'original' style of Pokot house. A basic relative chronology of house types can therefore be constructed in which post and mud huts are the oldest, followed by wattle and daub huts and then rectangular huts, which are unlikely to predate the 1970s. Table 4 demonstrates a significant lack of rectangular houses in the north and a higher number of the older post and mud houses. To the south, there is good evidence for continuing settlement evidenced by higher proportions of modern rectangular houses. The distribution of house types therefore also supports an initial settlement in the north of the region and a gradual shift of population to the south accompanied by depopulation in the north.

Distribution of Surface Features as Chronological Indicator

Surface features found on abandoned house platforms fall into five main categories: recent (wattle and daub) walls, hearthstones, kerbstones, grindstones and rouletted ceramics (Table 5; Fig. 5).

Table 4 Percentages of different house types per transect. Figures in brackets give the actual number of houses recorded

Transect	Total houses inhabited	Post and mud (old) as % total	Wattle and daub as % total	Rectangular (recent) as % total
1	42	7 (3)	71 (30)	21 (9)
2	53	4 (2)	74 (39)	23 (12)
3	24	0 (0)	67 (16)	33 (8)
4	37	5 (2)	84 (31)	11 (4)
5	19	0 (0)	100 (19)	0 (0)
6	25	0 (0)	84 (21)	16 (4)
7	12	8 (1)	92 (11)	0 (0)
8	4	25 (1)	50 (2)	25 (1)
9	9	33 (3)	56 (5)	11 (1)
10	6	17 (1)	83 (5)	0 (0)
11	12	8 (1)	75 (9)	17 (2)
12	3	0 (0)	100 (3)	0 (0)
13	7	0 (0)	86 (6)	14 (1)
Total	253	5.5 (14)	78 (197)	16.5 (42)

Each category of surface feature again indicates the relative age of the abandoned house platform and hence their distribution attests to the order in

Table 5 Percentage of abandoned house platform surface features per transect

Transect	Total abandoned platforms	Recent walls as % total	Hearth-stones as % total	Kerb stones as % total	Grindstones as % total	Rouletted ceramics as % total
1	13	15 (2)	15 (2)	0 (0)	0 (0)	0 (0)
2	16	19 (3)	0 (0)	0 (0)	0 (0)	0 (0)
3	17	12 (2)	29 (5)	12 (2)	0 (0)	0 (0)
4	12	25 (3)	8 (1)	8 (1)	8 (1)	0 (0)
5	38	16 (6)	34 (13)	8 (3)	3 (1)	3 (1)
6	16	12.5 (2)	25 (4)	0 (0)	0 (0)	6 (1)
7	20	15 (3)	45 (9)	45 (9)	0 (0)	0 (0)
8	28	4 (1)	96 (27)	25 (7)	14 (4)	0 (0)
9	17	6 (1)	76 (13)	65 (11)	53 (9)	12 (2)
10	31	(0) 0	52 (16)	35 (11)	3 (1)	3 (1)
11	24	4 (1)	92 (22)	54 (13)	33 (8)	13 (3)
12	18	0 (0)	33 (6)	22 (4)	11 (2)	0 (0)
13	17	6 (1)	41 (7)	35 (6)	29 (5)	12 (2)
Totals	267	9 (25)	47 (125)	20 (54)	12 (31)	2 (7)

Figures in brackets give the actual number of features recorded

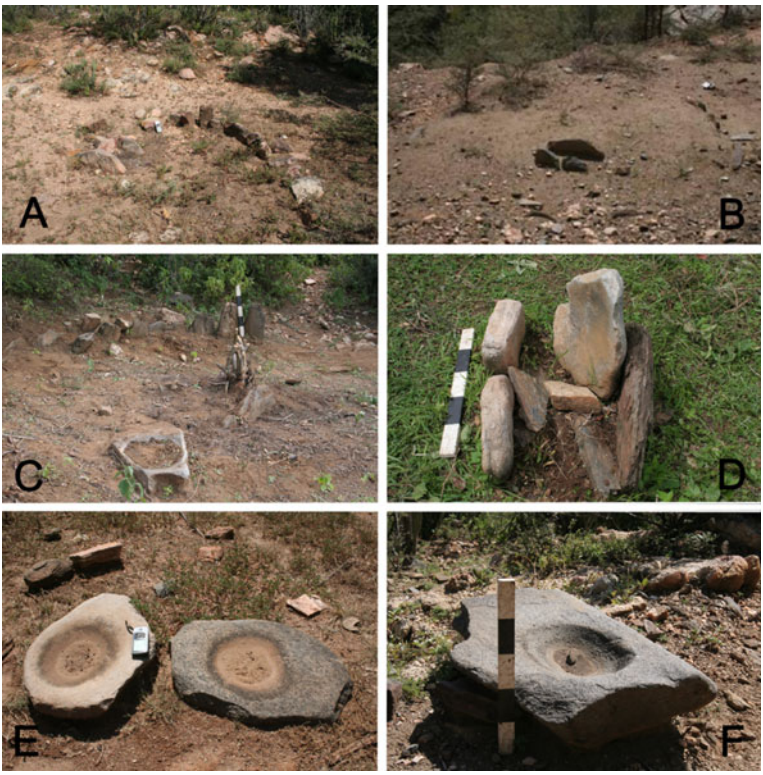

Fig. 5 Surface features on abandoned house platforms (**a**–**c** abandoned houses showing kerb and hearth stones, **d** hearth stones, **e**–**f** grindstones)

which the valley has been settled. Kerbstones represent the older post-and-mud style of building. Grindstones are less common today and a high percentage of grindstones therefore likely represent an older phase of settlement. In addition, rouletted ceramics are older and distinct from contemporary Pokot ceramics, which are exclusively undecorated (see below). The presence of recent walls indicates a wattle and daub style of house and a much more recent abandonment within in the last 10 years.

Table 5 shows a high percentage of hearthstones, kerbstones, grindstones and rouletted ceramics on northern transects and recent walls along southern transects. Taken as a whole, these relative chronological data again strongly support the contention that settlement began in the north and has gradually shifted southwards accompanied by abandonment in the north. This trend is placed on a securer chronological footing through test excavation and radiometric dating.

Excavation and an Absolute Chronology for Pokot Settlement

During the settlement survey, a number of archaeological sites were identified for test excavation. The site types resolve themselves into three basic classes;

abandoned hillside house platforms, open-air scatters, and rock-shelters.[3] I deal here with data from the test excavation of three abandoned hillside homesteads and one open-air scatter spaced roughly equidistant along the valley (Fig. 6). Details of rockshelter excavations will be presented in another article.

EH01 (WWV588) (UTM 36N 775955E 151222N)

This abandoned homestead is situated in the southeast of the valley along Transect 2. A single 1×1-m excavation Unit was opened over the doorway of the east house (Fig. 7). At a depth of only 5 cm, a compacted earth floor was encountered inside the house and rotting wooden posts were found *in situ*. Within the surface of the compacted floor were a number of thick undiagnostic body sherds of a modern Pokot type. As expected, this site is relatively recent in nature, abandoned approximately 50 years ago and likely first inhabited not significantly prior to this.

AH29 (WWV232) (GKJF3) (UTM 36N 774950E 152638N)

This homestead is situated just to the north of Tamkal village, in the southern half of the study area and along Transect 5. A 3×1-m excavation uncovered kerbstones and, adjacent to the hearthstones, a thin ashy smear (context 2) below which was a more compact and sterile deposit with a high component of gravel (context 3). To the southern end of the Unit, a compacted deposit with clay inclusions was uncovered below the loose surface material (context 4) (Figs. 8 and 9). Embedded within this were a number of undiagnostic body sherds similar to those found at EH01 and again indistinguishable from more recent Pokot ceramics.

A ceramic sherd from context 4 was submitted for thermoluminescence dating at the Oxford Luminescence Dating Laboratory and produced a preliminary date of 100–150 years before 2008 (*c*. AD 1858–1908) (Schwenninger, personal communication). This date is highly consistent with those from other sites being around 50–80 years older than EH01, though more recent than sites to the north as shown below. This date would also suggest settlement in the vicinity of Tamkal around AD 1900, a date consistent with the irrigation channel chronology derived from oral histories, which places the earliest furrows in this region to between 1895 and 1930 (Davies 2008).

AH93 (WWV389) (GKJF7) (UTM 36N 775070E 156205N)

This two-platform homestead is situated towards the mid-point of the study area, along Transect 8. Abandoned homesteads abound in the immediate vicinity and AH93 was chosen because a large ashy waste deposit was clearly visible. Unit 1 (T01) was placed so as to sample the ashy waste deposit (Fig. 10). The surface

[3] All archaeological sites encountered in the Wei wei Valley were allocated a unique two-part code; a regional code 'WWV' (Wei wei Valley) with a unique number; and a description code 'AH' (abandoned homestead), 'EH' (excavated homestead), 'S' (scatter), or 'C' (cave or rockshelter) with a unique number. Thus '(WWV232) AH29' represents Wei wei Valley site 232, abandoned homestead 29. At a later stage significant sites were allocated a Kenyan national sites and monuments code based on the SASES system (given in brackets).

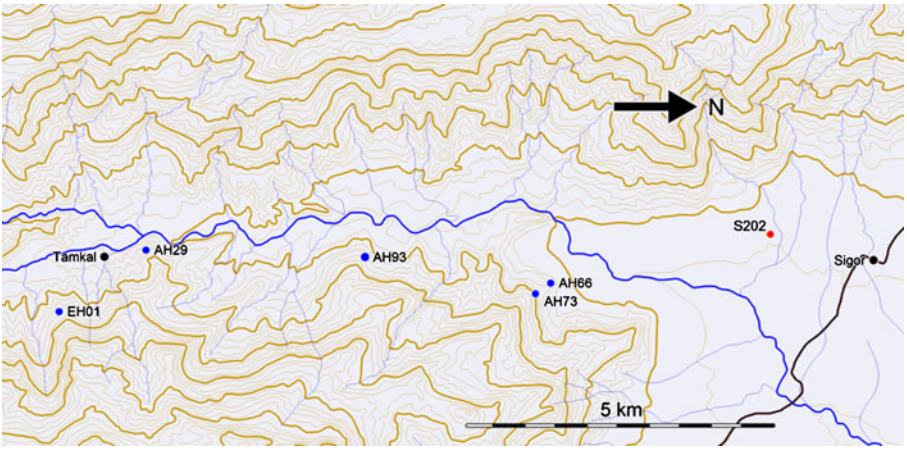

Fig. 6 Excavated sites

context (1) consisted of light grey, ashy sediment with few finds. Beneath this was a relatively sterile context (2) approximately 40 cm in thickness, and below this a second ashy context with charcoal concentrations (3) and a number of both modern and thin-black ceramics, somewhat distinct from modern Pokot ceramics (Fig. 11).

Unit 2 (T02) was opened to the edge of the homestead compound. The first context (1) contained a number of recent ceramic fragments while below this a second, more compacted context produced a number of recent body and thin black-body sherds. At a depth of around 40 cm, a number of flat stones were encountered that might represent the level of the cut of the original house platform and below this was decaying bedrock. Both units provide good evidence for two separate occupation horizons at AH93. The most recent occupation seems to have had ceramics of a modern Pokot type, while the second had a component of modern-type ceramics but also a high proportion of a thin-black type.

The two occupation horizons and the presence of pre-modern thin-black ceramics present good evidence for occupation in this part of the valley prior to that in the region of AH29 and EH01. Charcoal from contexts 1 and 3, Unit 1, were submitted for dating to the Oxford Radiocarbon Accelerator Unit. Context 1 produced a modern (post-1950) date (OxA-18866) while context 3, produced an older date of 188±23 bp (OxA-18867). When calibrated to two sigma, this date has a wide calendrical range with high possibilities of falling in the late seventeenth century, the mid- to late eighteenth century and the mid-twentieth century[4] (Table 6). A twentieth-century date should, however, be rejected as too recent given evidence from the other settlements. The late seventeenth-century date, on the other hand, seems a little early, particularly given that rouletted ceramics, characteristic of earlier sites (see below), have not been found at AH93. I would thus favour a mid- to late-eighteenth-century date (falling between 1731 and 1809 cal AD) for the initial occupation of AH93. This gives AH93 a total occupation period (with two distinct phases) beginning no earlier than 1730 AD and ending no later than 1960 AD (Fig. 12).

[4] All radiocarbon dates have been calibrated using OxCal v4.0.5 (Bronk Ramsey 2007) and the northern hemisphere IntCal04 atmospheric curve (Reimer *et al.* 2004).

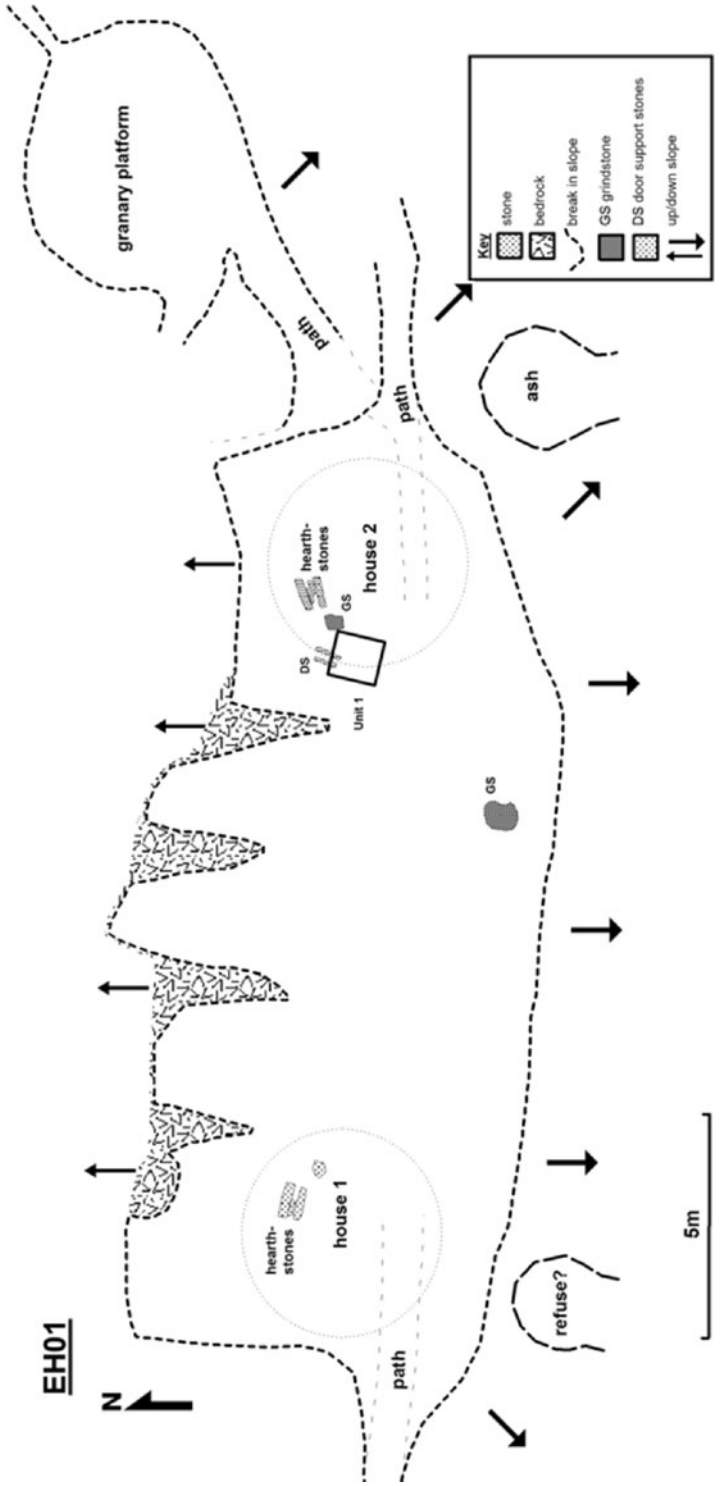

Fig. 7 Plan of EHO1 showing location of excavation Unit

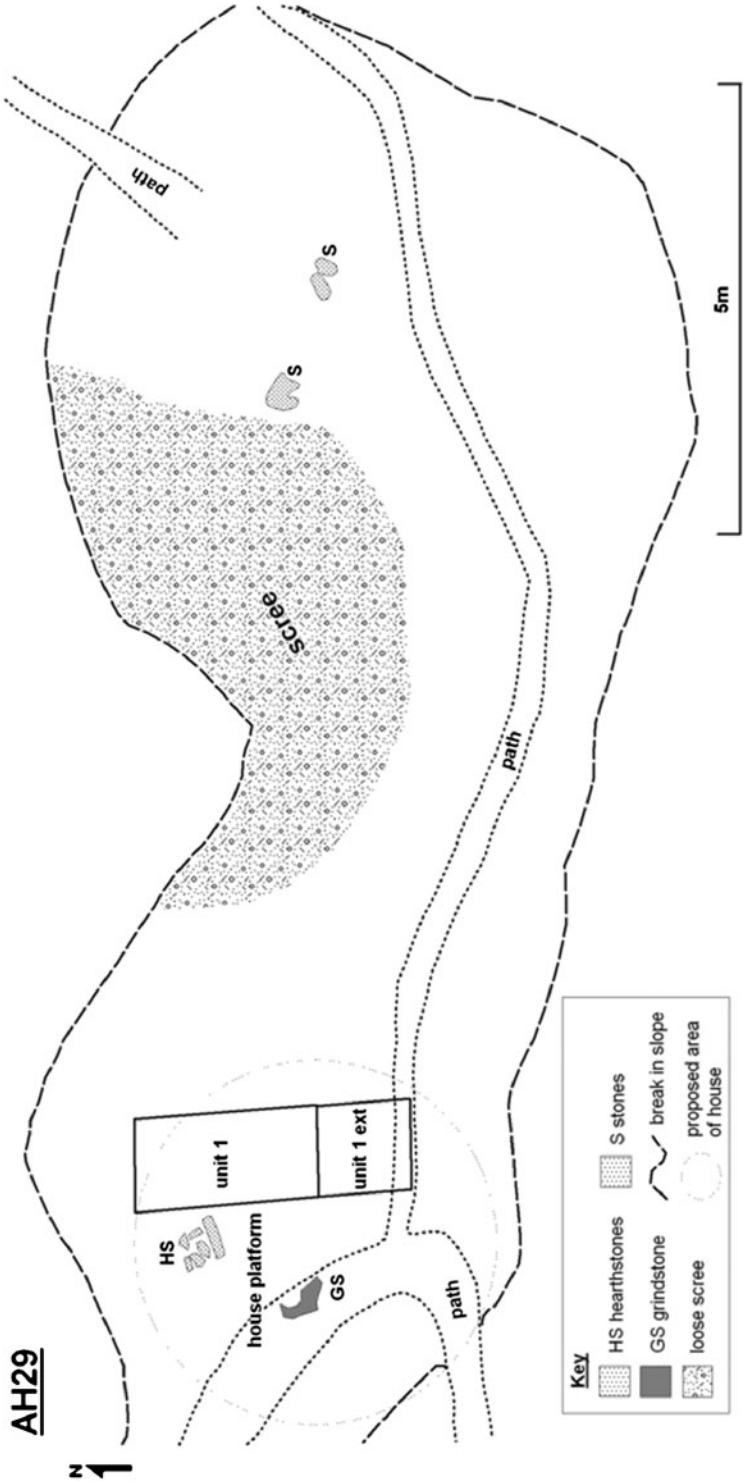

Fig. 8 Plan of AH29 showing location of excavation Units

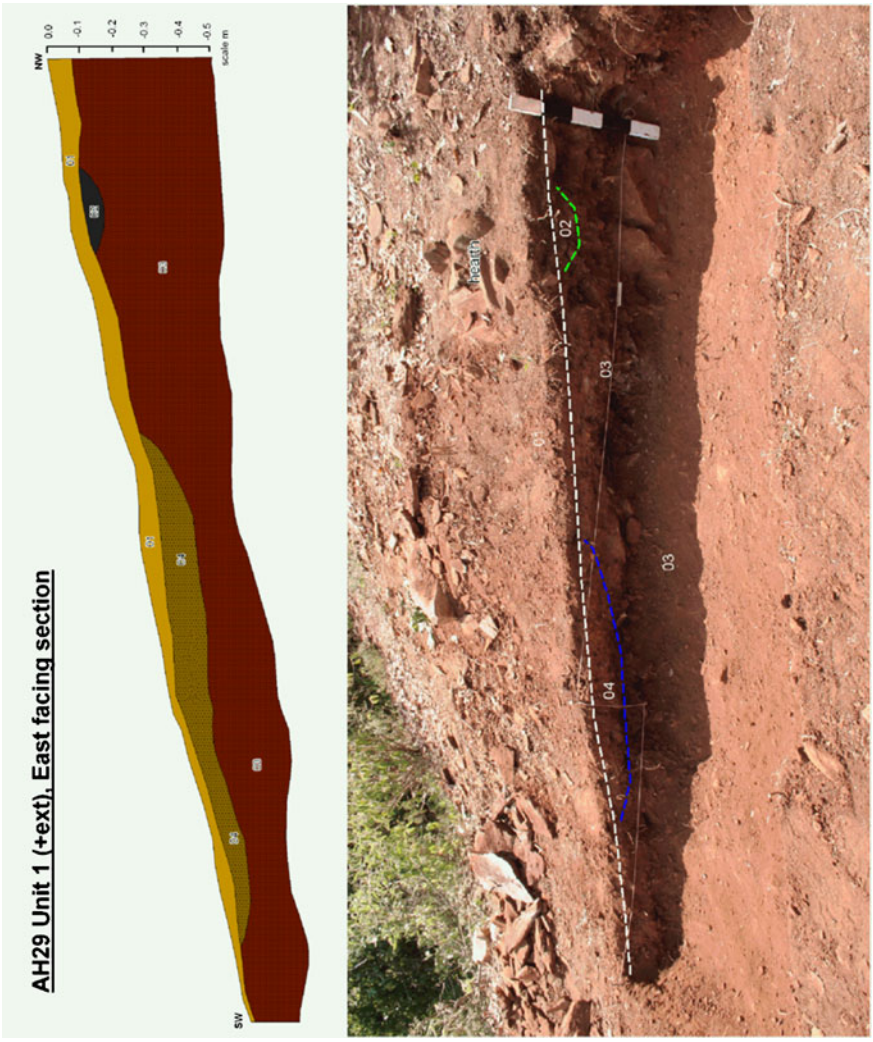

Fig. 9 East-facing section of Unit 1, AH29

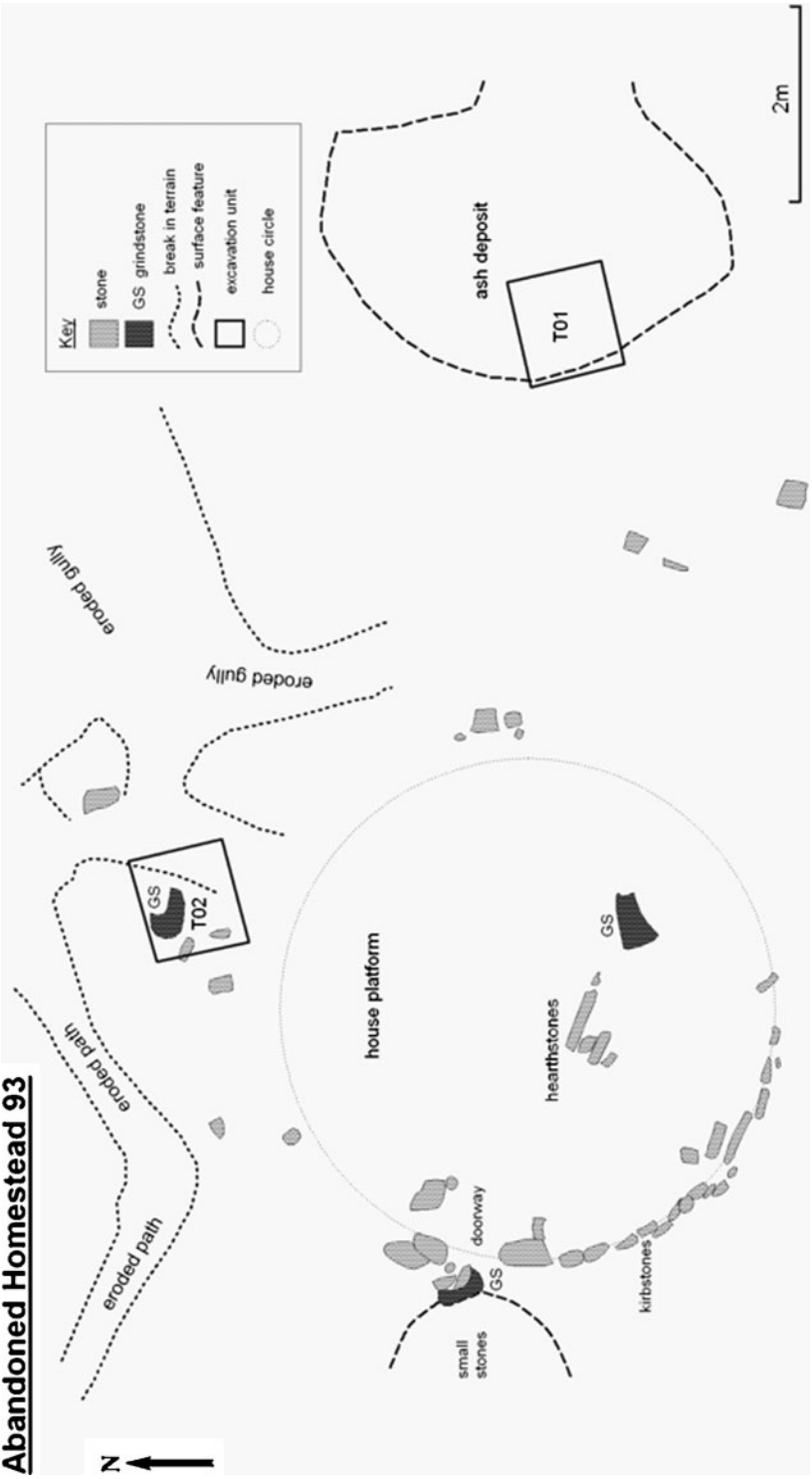

Fig. 10 Plan of AH93 showing excavation Units T01 and T02

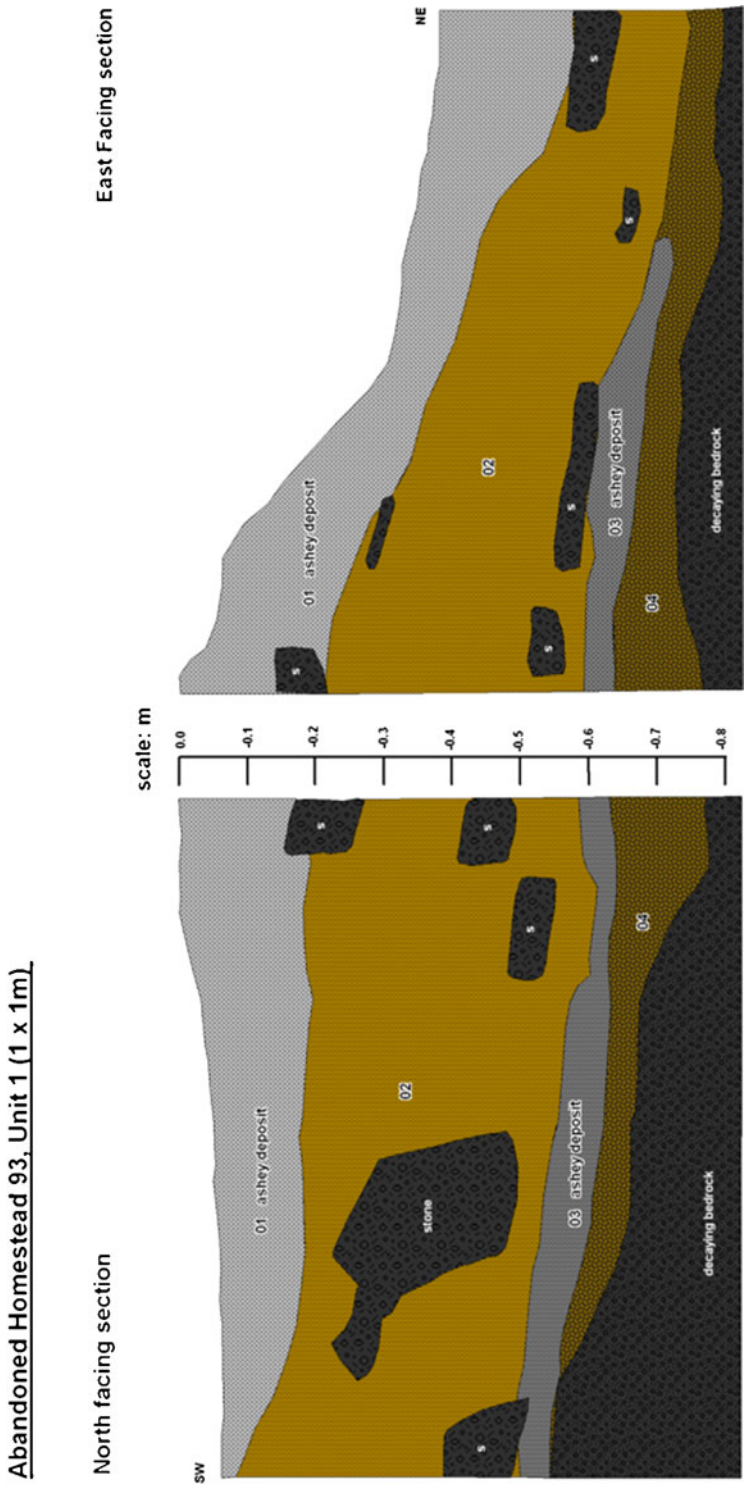

Fig. 11 Sections of Unit 1 (T01), AH93, showing contexts 1–4

Table 6 Summary of absolute dates for excavated hillside settlements

Site	Unit/ context	Location	Dating method	Lab. no.	Date bp	Date calibrated to 2σ	Preferred date
EHO1	Unit 1, context 1	south	oral histories	N/A	N/A	N/A	*c.* 1950
AH29	Unit 1, context 4	central	TL	N/A	Approx. 50–100	N/A	*c.* 1858–1908
AH93	Unit 1, context 3	north-central	14 C	OxA-18867	188±23	1658–1686 (20 %) 1731–1809 (55 %) 1927–1954 (20 %)	1731–1809
S202	Unit 1, context 1	north	14 C	OxA-18868	240±24	1630–1680 (60 %) 1760–1800 (30 %) 1940–1960 (6 %)	*c.* 1630–1680

S202 (WWV542) (GKJF6) (Ortuso Village) (UTM 36N 774572E 162635N)

S202/Ortuso Village is the largest of four open-air scatter sites found in the north of the region (Davies 2009b). These sites are characterised by large quantities of

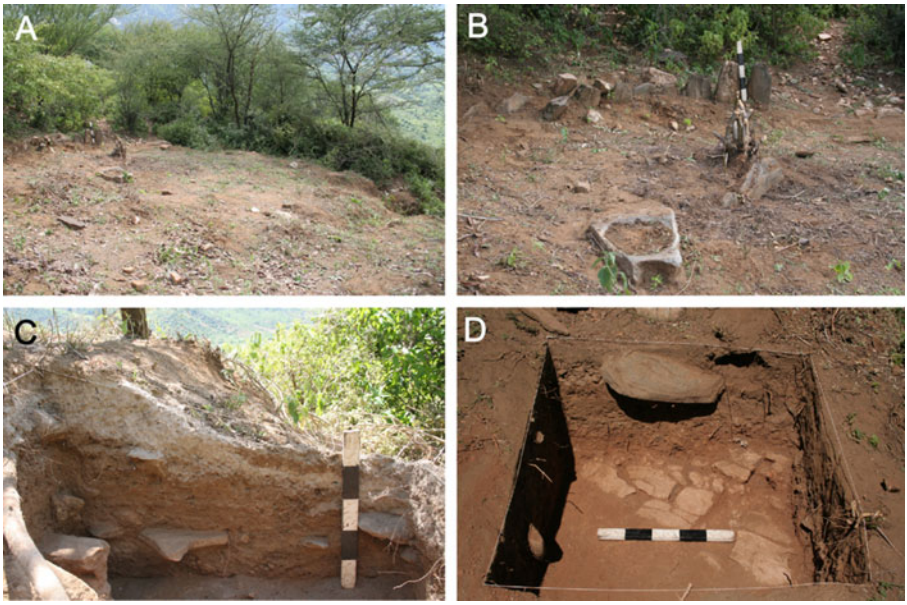

Fig. 12 **a** AH93, **b** close-up of grindstone, hearthstone and kerbstones at AH93, **c** east-facing section, Unit 1, AH93, **d** AH93, Unit 2, Bottom of spit 4 (original platform cut)

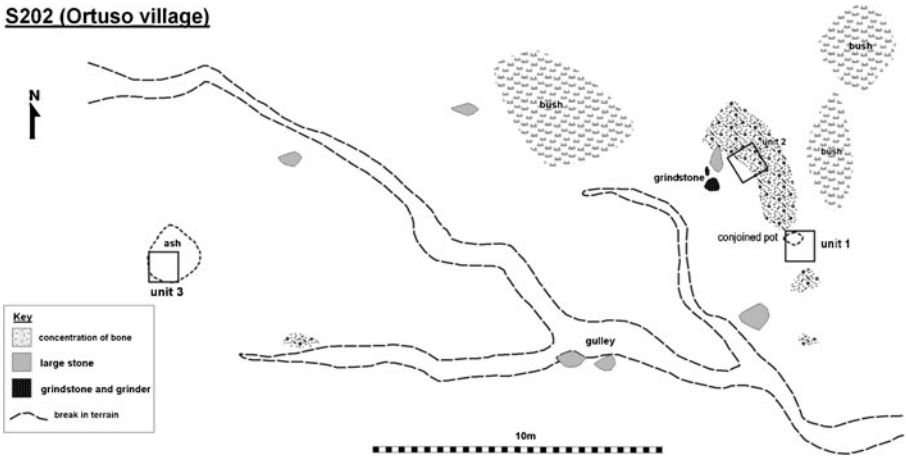

Fig. 13 Plan of S202 'Ortuso Village', showing location of excavation Units 1-3

roulette-decorated ceramics quite distinct from those of the modern Pokot. They also display relatively large quantities of bovid bone, probably cattle (Watene, personal communication). S202 covers approximately 21,700 m^2, with ceramic densities ranging from a few sherds to over 100 per m^2. The highest concentrations of bone and ceramics were found in the southeast of the site and this smaller area was selected for detailed planning and test excavation (Fig. 13). Particularly dense surface concentrations of bone, ash and ceramics were planned. In addition, a small grindstone and associated millstone were located together *in situ*, as were numerous fragments of conjoined pottery, suggesting that the site represented primary deposits uncovered by recent erosion.

Three 1×1 m Units were opened across the site and each revealed a single occupation horizon extending from the present ground surface to a depth of no more than 30 cm. The surface of Unit 1 produced 105 sherds, including six decorated sherds and one small pot handle of the rouletted type (see below). The subsurface context produced some 69 ceramic sherds including two undecorated rim sherds, one spout, one decorated rim sherd, one decorated body sherd and two handles of the rouletted type, all being consistent in terms of decoration, form, paste, thickness and fragmentation (Fig. 14).

A sample of charcoal well stratified between fragments of roulette type ceramics and 15 cm below the surface in Unit 1 produced a date of 240±24 b.p. (OxA-18868). Calibrated to 2σ, this strongly suggests a date between 1630 and 1680 cal AD (59.7 %) or, less strongly, 1760 to 1800 AD (29.8 %). Given the lack of rouletted ceramics at AH93 and the dates obtained for such ceramics elsewhere in western Kenya, the earlier mid- to late seventeenth-century date seems more appropriate.

Although the faunal assemblage is small, it confirms the presence of both domestic cattle (*Bos taurus*) and domestic sheep/goat (*Ovis aries/Capra hircus*). Most of the identifiable bone comes from large bovids, probably domestic cattle, but potentially also from wild species. Tentatively, the faunal evidence supports the contention that S202 (and by association similar sites S201, S204 and S301) was some kind of pastoral kraal site.

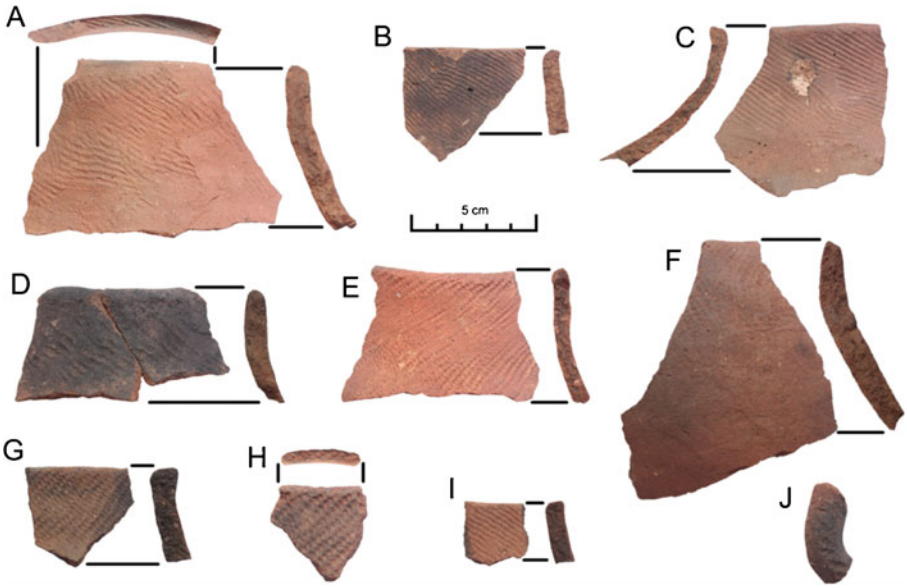

Fig. 14 Rouletted ceramics from S202

Summary and Discussion of Excavation and Survey Data

The excavated abandoned hillside homesteads and the scatter S202 provide a coherent sequence of dates (Table 6) for the settlement and abandonment of the study region. These strongly support the relative chronology based on house ratios, house types and surface features, as well as the oral historical chronology based on the irrigation system (Davies 2008). These dates are further supported by the distribution of rouletted ceramics, which are strongly associated with the first northern settlements. These rouletted ceramics are also associated with broader regional traditions related to an archaeological tradition known as the Sirikwa and the early Kalenjin (Bollig 1990; Sutton 1973, 1987) and fit well with the relevant archaeological and oral historical data for this region.

The north of the valley was settled first in the late seventeenth century by proto-Pokot with a more pastoral economy as evidenced at S202. By the early- to mid-eighteenth century, settlement seems to have spread to the northern hillsides as evidenced by the distribution of roulette-decorated ceramics (Table 2). There is no direct evidence of intensive agriculture from this period, but experiments with irrigation in the north of the region may have begun at this time and these inhabitants would almost certainly have engaged in both agricultural and pastoral production, both of which are suited to the ecotonal nature of this region. During the second half of the eighteenth century, hillside agricultural settlement expanded southwards into the valley as evidenced by the dates from AH93. At a few sites, the distinctive rouletted ceramics persisted, but by the early nineteenth century they seem to have largely disappeared. This movement was important as it marked the transition into regions of the valley that are more isolated from pastoral zones and may have marked the development of a more specialised community with some families/sections

focusing on agriculture. Again, there is no direct evidence for irrigation, but it would seem likely that experiments with small-scale irrigation were ongoing. There is also no reason to assume that maximum population densities had yet been reached in any part of the valley.

During the early nineteenth century, expansion continued southwards and we can now envisage the development of the kind of intensive irrigation agriculture that we see today. The channels in the north of the region were likely built around this time (*c.* 1800–1850; see Davies 2008). Interestingly, this period of agricultural intensification is also one of significant Pokot pastoral expansion, as attested by oral histories from the Pastoral Pokot and their neighbours (Beech 1911; Bollig 1990; Spencer 1973), and it would seem reasonable to assume that the demands of agricultural–pastoral exchange played a major role in the intensification of Pokot agriculture at this time. Oral histories collected among the agricultural Pokot from within the study area also support this chronology with various clan section genealogies arguing for an origin within the study area during the early to mid-nineteenth century (see Davies 2009b appendix F).

Following this initial intensification of irrigated agriculture in the north of the valley, farming seems to have spread fairly rapidly through the centre of the valley. A number of major irrigation channels were constructed in the late nineteenth century, as attested by both oral histories and radiometric dates (Davies 2008), and by the turn of the twentieth century settlement had reached the area around the present-day market centre of Tamkal. By this stage, it seems likely that the northernmost slopes were already being abandoned, but settlement around AH93 in the central part of the region persisted up to 1950–1960. Throughout the middle of the twentieth century, settlement spread southwards well beyond Tamkal, reaching the area around Transect 2 by the 1940s and passing Transect 1 in the 1950s. By the 1970s settlement was pressing into the forests at the south of the valley with numerous new irrigation channels being created at this time (Davies 2008). This process of southward expansion is ongoing to the present. By the 1950s the first generation of houses around Tamkal were being abandoned as shown by EH01, but in the area south of Transect 1 most homesteads are still inhabited by the first generation of settlers and very few homesteads have been abandoned.

Throughout the process of expansion and abandonment, maximum population densities seem to have remained relatively constant and there is no clear evidence for an overall increase in population size. General population pressure therefore does not seem to have been the primary driver of agricultural intensification and the ability to move to new lands seems to have offered an outlet to any population increase. In the following section, I offer some suggestions as to other possible drivers of both intensification and expansion, as well as their associated implications for an applied archaeology.

Reconsidering the Drivers of Change and their Practical Application

Rather than considering changes in land-use and settlement as expressions of a single primary driver such as population pressure, the fact that at least two trends (intensification and expansion) are in evidence suggests that we must instead view Pokot

farming in terms of socially embedded decision making whereby various actors chose from a range of strategies, paramount among which are the options to stay in one location and intensify or move and cultivate new areas of land.

Regional Exchange and Socially Embedded Production (1e)

In any analysis of an agricultural system, it seems pertinent to look first towards the factors that motivate production. While many archaeological accounts tend to view economy in terms of subsistence, even casual observation of the Pokot economy today demonstrates that production is geared very strongly towards a range of exchanges and socially prescribed consumption aimed at building social capital (Håkansson 1989, 1994), including marriages and bridewealth, initiations, ceremonial sacrifices (Peristiany 1951) and stock friendships (Bollig 1998). Agricultural decision making therefore exists within this complex social context and the decision-making of each family resides within a web of competing ambitions and commitments.

Moreover, Pokot farming does not sit as an isolated subsistence practice but rather is one element in a more dynamic regional exchange system that links farming communities with lowland herders and highland forest foragers. Various social institutions including marriages, initiations, clan histories and stock friendships crosscut economic and ethnic boundaries and link diverse communities (especially pastoralists and intensive farmers) in regional exchange networks. Such relationships have been documented in a wide range of cases across eastern Africa (Anderson 1988, 1989; Börjeson, 2004; Hodder 1982; Spear 1993, 1997; Spencer 1998; Waller 1985, 1988). In the Pokot case, inter-marriage between the farming and pastoral sections has been marked, with both Conant (1965, 1966) and Kurita (1983) recording some 20 % of marriages as such and Meyerhoff (1981) and Hodder (1982) giving similar figures. Similarly, Bollig (1998), Schneider (1957) and Kurita (1983) have documented extensive exchange relations in the region including ritual *tilia* stock friendships, more immediate *kipukat* barter exchanges and market activities. Recent work under the current project has further analysed exchange practices in three market centres around the Cherangani Hills, documenting extensive interactions between farmers and pastoralists and the extension of the concept of *tilia* to include not only male stock friendships but also a range of special exchange relations between women involving items such as milk, pots and grain.[5]

Although we must be wary of stretching the ethnographic present backwards in time, these archaeological data do seem to bear some support for the past existence of this regional economic system. Firstly, the data from S202 strongly supports an initial agro-pastoral settlement in the north of the study region some 250 years ago and the subsequent gradual specialisation of Pokot agriculture from this initial settlement. Oral historical work with the Pastoral Pokot (Bollig 1990) further suggests that Pokot agricultural intensification and expansion over the last 200 years occurred in tandem with significant pastoral specialisation and expansion from a more generalised community. As the modern socio-economic data attest, it seems likely that these communities have relied upon each other to maintain their specialised life-ways.

[5] Davies & Bright, unpublished survey and interview material stored at the British Institute in Eastern Africa, Nairobi.

The dynamics of expansion and intensification, outlined above, should therefore be viewed in the light of this regional socio-economic system. In particular, a number of potentially testable scenarios appear. For example, as with other cases, including some Maasai sections (Spear 1993; Waller 1988) and the Il Chamus of Baringo (Anderson 1988), it seems that the Pastoral Pokot community would have relied upon its farming neighbours for support at times of climatic crisis and conflict. We might argue then that contrary to expectation, the Pokot agricultural system could increase in size and scale during periods of climatic deterioration, due to an influx of pastoralists impoverished by drought. Conversely, the agricultural system might shrink as climatic conditions favoured herding and communities moved back to pastoralism. The role of climate will be considered in more detail below.

More significantly, the changing relationship between pastoral and agricultural production may provide us with applied insight into problems in the current regional economic system. For example, while pastoralists may have found respite with their farming neighbours in the past, the partial erosion of such support ties in more recent times may have placed extra burdens upon the pastoral community and added to their problems during more recent crises. One potentially effective but rarely considered means of regional development might therefore be to help re-establish these long-standing inter-ethnic/economic ties rather than to encourage cash-cropping and the export of agricultural produce. Another important consideration might be to realise that any modern agricultural development might not necessarily improve regional food security if it only benefitted farmers. Also, farmers might not be willing to participate in development schemes if those schemes limited their access to traditional forms of social capital built through various marriage alliances, feasting ceremonies and sacrifices, initiations and stock friendships.

Pokot Land-Tenure (1f)

While agricultural production is in large part socially motivated, production is physically constrained by access to land, which itself is conditioned by the traditional system of land tenure, as well as by the quality of one's land including soil depth, quality and nutrients. Changes in the balance of any of these physical elements or in the socially prescribed requirements and ambitions of a family will also act as major drivers in agricultural change alongside climate and population. As the data presented above suggest, overall population pressure does not seem to have been a primary driver. However, when looking at modern Pokot land-tenure, localised population pressures resulting from the current system of access to land do seem to be more influential and this in turn provides a powerful explanation for the twin process of intensification and expansion as evidenced by the archaeological data.

The Pokot system of land tenure primarily derives from a patrilineal system of kinship such that individual clans and their lineages (and within them, households) tend to occupy congruent strips of land running parallel, perpendicular to the valley, from the valley bottom into the highlands (Fig. 15). The right to cultivate a piece of land derives from one's attachment to a clan section that claims *de facto* ownership of a piece of land through historically being the first to clear it by burning the bush. At any one time then, a clan section will hold a finite area of land, constrained in either direction by adjacent clan sections, which will be distributed between its member

households (Widgren 2006). Within each household, this finite amount of land will be divided between the sons of the next generation, such that within a household that produces a large number of male offspring the amount of land available to each generation will decrease exponentially. While there is some leeway in this situation, with some large households being able to increase the amount of land at their disposal though encroachment on that of their neighbours, it necessarily results in a situation where some lineages and households outgrow the land available to them. As such, while Pokot society in general and the system of land inheritance in particular aim towards equitable distribution of land, the system nevertheless implicitly encompasses inequalities and localised pressures on access to land (Shipton 1984a:119).

Individuals who are unable to acquire a satisfactory quantity or quality of land may be inspired to move away from their kin to less densely populated regions, perhaps even pioneering the clearance of virgin forest (Shipton 1984b:628), or alternatively to make improvements to their existing lands so as to increase production (intensify). In the case of movement (expansion), if the new lands prove particularly fertile and attractive (perhaps with the previous core of clan settlement becoming moderately degraded due to overworking) the exodus of emigrants from traditional lands may result in a gradual depopulation in favour of the new location. Naturally, this situation results in the expansion of settlement and cultivation away from the core areas of initial settlement (and their gradual abandonment), as well as intensification within each clan territory. It should also result in a repetitively stripped pattern of land tenure, where some clan lands are repeated in strips along the valley, and this is clearly in evidence in the region today (Figs. 15 and 16). Moreover, oral histories seem to confirm this historical process by recognising that northern blocks of clan territories were settled prior to more southern blocks.

The traditional system of kinship and land tenure therefore seems to play a major role in the diachronic development of Pokot agriculture and helps to explain the changing pattern of land-use and settlement evidenced in the archaeological data. More importantly, this long-term analysis prompted by archaeological investigation

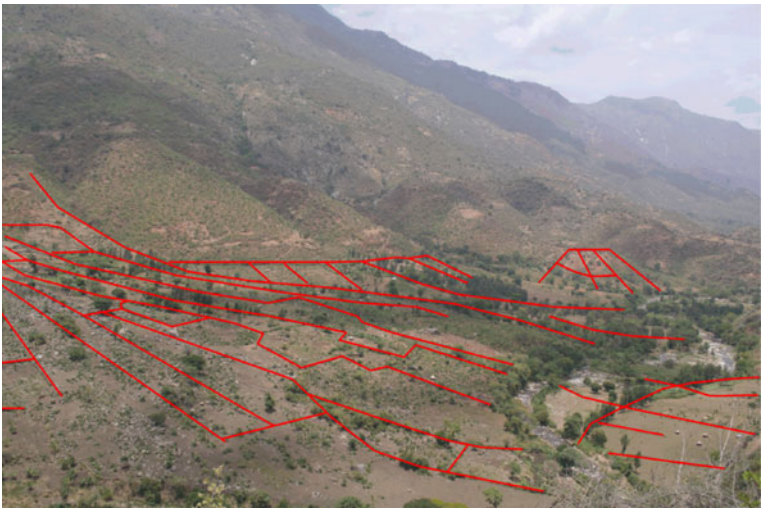

Fig. 15 Stripped pattern of land holdings in the Wei wei Valley

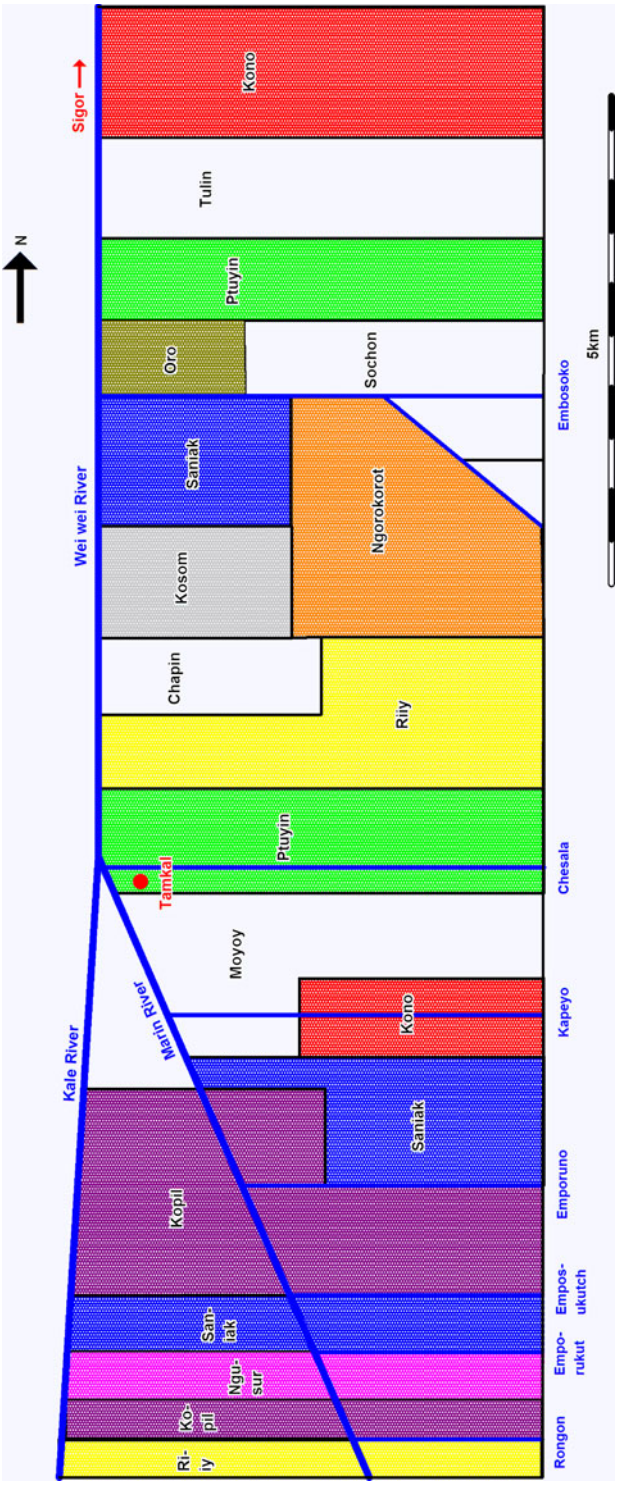

Fig. 16 Repetitive pattern of clan lands on the eastern side of the Wei wei Valley

and identified through archaeological data has significant applied relevance. For example, the abandonment of the north of the region does not appear to result solely from degradation or climate change. Rather it appears, at least in part, to be a function of the traditional system of land-tenure. As such, simple technological investments to reinstate the northern irrigation channels might not be wholly effective (Hogg 1984). Similarly, if the Pokot system were to be exported as a model for development elsewhere, the new system would need to deal explicitly with issues of inheritance and expansion; a system with inflexible boundaries and little room for households to increase production might fail after the first generation. These data are also extremely relevant in the applied context of ongoing land adjudication and demarcation across Kenya, although such political issues are too extensive to be developed further in the current paper.

Climatic Change (1g)

Currently it is difficult to fully and satisfactorily correlate the settlement and land-use chronology outlined above with palaeoenvironmental records because they lack sufficient resolution. Nevertheless, the lake level records reconstructed from historical sources by Nicholson (1998) and correlated with broader lake level analyses (*e.g.*, Alin & Cohen 2003; Stager *et al.* 1997; Verschuren 2000) do offer a general outline against which the Pokot data can be assessed. The general climatic sequence is correlated with the Pokot land-use and settlement chronology in Table 7 (space here precludes further detailed discussion but much additional detail can be found in Davies 2009b).

In general, these data currently suggest that there is no simple correlation between climate and expansion, intensification and abandonment. Over the course of the operation of the system, there is no clear trend towards increasing or decreasing aridity and instead the period is marked by major fluctuations to both extremes. The system has existed through both wet and dry phases and most notably seems to have 'taken off' during a relatively dry phase *c*. 1700–1850 while most of the irrigation channels can be seen to have been built during the *c*. 1895–1930 arid phase (Davies 2008). We might tentatively argue therefore that increased aridity has encouraged irrigation construction, but also that arid phases have seen both expansions and intensifications of Pokot agriculture rather than contraction of the system.[6] At the very least, these data argue against the retraction of the system during arid phases and, although impossible to verify, the current data do not preclude the notion that the system may have swelled with incoming pastoralists and/or increased production so as to buffer neighbouring communities at times of climatic crisis.

These palaeoenvironmental data tentatively suggest that the Pokot system may be particularly effective in the face of climate change rather than in need of external support. However, it is also clear that this effectiveness only emerges from the ability of Pokot farmers to move across the landscape within a complex socio-economic web of production, exchange and kinship. The Pokot system may therefore be very worthy of consideration in the face of major anthropogenic climate change, but the

[6] Resilience through climatic fluctuations might also be argued for other similar systems such as Engaruka in Northern Tanzania (Westerberg *et al.* 2010).

Table 7 Correlation of major events within the settlement, and land-use chronology, with major climatic fluctuations

Event	Climatic conditions
c. AD 1650–1700: settlement of 'agro-pastoralist' proto-Pokot (Sirikwa) in the north of the study region	Favourable climate, a little wetter than that of today. North of region suitable for both rain-fed agriculture and localised pastoralism
c. AD 1700–1800: division of 'proto-Pokot' community into specialised pastoral and agricultural sections and development of Pokot hillside settlement in north of the study region. Small-scale irrigation	Increasingly arid conditions, drier than any period in 20th century. Major droughts in 1760s, 1770s and late 1790s (first arid phase)
c. AD 1800–1850: start of Pokot pastoral explosion. Expansion of agricultural settlement into central part of the study region. Larger scale irrigation initiated	Continuation of arid phase. Major droughts and famines in 1820s and 1830s
c. AD 1850–1895: continued agricultural and pastoral expansion. Construction of major northern irrigation channels by 1895	Increased rainfall to levels above those of the twentieth century
c. AD 1895–1930: major phase of furrow building throughout central part of the study region. Continued agricultural and pastoral expansion. Pastoral Pokot prosper relative to neighbours	Second phase of arid conditions. Major droughts and famines throughout 1890s (compounded by epidemics), 1920s and 1930s
c. AD 1955–present: ongoing abandonment of settlement and irrigation channels in the north of the study region, but continuing agricultural expansion in south of study region	Higher levels of rainfall, though droughts in early 1970s and 1980s

complexities of the system need to be fully appreciated if it is to be best used. Again, these climatic data hint that one of the most effective roles of the Pokot agricultural system at times of increasing aridity may have been to buffer neighbouring pastoral communities. These issues are discussed in more detail below.

Archaeological Data and 'Development' in Pokot

'Development' is a highly contested term and this is not the venue for deeper discussion of the concept. Nevertheless, in order to ground the suggestions made above within a real 'development' situation (broadly defined), I wish to briefly describe a range of development issues within the Pokot study area and make clear how the archaeological data presented might impact upon them. To date, this project has not fully explored the wealth of relevant grey administrative (local and national) and unpublished non-Governmental (NGO) literature, let alone (in any detail) the actual practice of 'development' in Pokot. As such the forthcoming suggestions are necessarily somewhat speculative but I hope that they will serve the purpose of demonstrating the real potential for a useable archaeology.

As discussed in the "Introduction" section, the Pokot region comprises both specialised herding communities and the specialised irrigation farmers who form

the subject of this study. The region regularly suffers issues of food insecurity seemingly resulting from various combinations of drought, conflict and environmental management practices (Dietz 1987; Nangulu 2001). Much 'development' activity in the Pokot region is aimed towards mitigating against this situation, although various rationales are applied to explain food shortages and a wide range of 'solutions' are applied. Explanations of food shortage seem to be primarily directed towards poor climate, followed in farming areas by poor quality soils (erosion/degradation and lack of affordable fertilisers, *etc.*; *cf.* Davies 2009b:107-109) and the dilapidation of irrigation infrastructure (Hogg 1984), and in pastoral areas by overgrazing and cattle raiding. Such explanations follow fairly standard environmental narratives that blame problems firstly on increasing climatic insecurity and secondly on poor human environmental management practices. These narratives in turn invoke fairly standard mitigation responses. These include the resettlement of communities on modern irrigation farming schemes, which supposedly iron-out issues of climatic variation, degradation and poor management (for example the Wei wei irrigation scheme at Sigor), small-scale investment in traditional farming practice (such as anti-erosion/degradation measures and regular external reconstruction of irrigation infrastructure), and encouraging economic diversification (cash-cropping, bee-keeping, *etc.*).

Yet, such narratives (2a, Table 1) and the resultant responses require clarification in respect to the diachronic data presented here. Firstly, the data suggest (in contrast to common narratives of climate change) that agricultural systems in the region have been fairly consistent in the face of climatic fluctuation, and that the present period is actually climatically fairly average by historical standards. That is not to say that the system has not seen stress in the past, but rather that local people weathered such disruption and were generally able to find local solutions. The modern solution to climatic change—to encourage communities (particularly pastoralists) to permanently re-settle on modern irrigation schemes, instigate de-stocking, diversify and engage in a cash economy (in brief, to implement major socio-economic change)—is not borne out in the continuity displayed archaeologically. Rather, local development initiatives might have equal or better success without such socio-economic disruption by encouraging the reestablishment of pre-/early colonial regional exchange networks, whereby farmers may invest in livestock and human relations with pastoral communities and pastoral communities may seek temporary support among farming neighbours. In particular, the export of local agricultural and domestic animal produce under the auspices of a 'cash economy' might actually be detrimental to local food security given that such produce might be circulated more effectively at the local level, as seems to have occurred in the past.

Secondly, narratives of human environmental degradation requiring external intervention require some caution. Soil erosion and degradation may be as much factors of the abandonment of land (the cessation of good human management) as the result of poor management (Börjeson 2005). Soil erosion noted by Hogg (1984; *cf.* Davies 2009b) within the study area must be reassessed in relation to the pattern of systemic movement recounted above that may be driven as much by processes of land tenure as degradation or climate (Davies 2009b). As such, local investments in anti-erosion measures (see Hogg 1984;

Nangulu 2001) may be rather futile given that the erosion seems to be the result of people moving out of the area into newer regions of the valley. Similarly, regular local investments in small-scale irrigation repairs (especially by local MPs and church organisations and as argued for by Hogg) seem relatively ineffective given broader patterns of changing settlement. Such developments may benefit a small number of residual farmers but in many cases may have fairly limited impacts.

Indeed, one might question whether the Pokot farming system requires any specific development assistance (including physical landscape rehabilitation, 3a) *in situ*—an assumption itself based on the general development narrative that all traditional systems are fragile and can be improved in some way. As stated, the archaeological data show the agricultural system to have been fairly resilient up to the present. Instead, one might look towards potential future crunch points. The Pokot farming system is moving across the landscape and at some stage that movement might be impeded or result in conflict with other groups; yet this situation is clearly not recognised by the local population, let alone by local administrators or NGOs.

In contrast to *in situ* development, the major development 'lessons' to date seem to relate to the ability to encourage such systems as buffers within regional economies and/or to *export* local knowledge/practice into external contexts. The potential for the Pokot agricultural system to buffer the regional pastoral economy has been discussed above and might be considered as both a form of rehabilitation (3a) and the exportation of knowledge to external contexts (3b). An alternative 'export' application would be to take knowledge of the Pokot agricultural system and work this information into modern agricultural schemes. In particular, issues of traditional forms of inheritance and tenure might be very well applied to modern schemes, allowing both for more effective management (specifying inheritance under traditional terms) and encouraging local participation with modern schemes through sensitivity to local ideals. Similar arguments might be made for modern scheme management structures, such as the decentralised management practices found among the Pokot (Davies 2009a; *cf*. Adams & Watson 2003, Ssennyonga 1983), and for the integration of modern systems into traditional regional patterns of kinship (marriage and descent-based support relations), exchange (stock friendships, traditional loans), value (social status, accumulated livestock), and ceremonies (participation in marriages, initiations, festivals).[7] Such applications might be made very specifically for modern development initiatives in the immediate region and more generally at broader scales. Within the context of the local region, an extensive modern irrigation development scheme has been implemented at Sigor within the Pokot area. While the scheme does seem to take on board some sensitivity to local tradition (Rambaldi 1995), a more detailed investigation of this scheme's operation, successes and problems in light of the data presented here might be an effective next step for this project.

[7] For example, if a modern development requires participants to be tied into various capital-investment schemes that do not allow the economic flexibility to participate in traditional networks then it may incur difficulties.

Conclusion

The integration of a wide range of archaeological data allows us to construct a highly detailed chronology for the development of Pokot agriculture and demography. In turn, this long-term chronology allows us to consider the drivers of agricultural and demographic change in great detail and apply this understanding to a range of possible development interventions. Although space is limited here, I have tried to give a flavour of the real practical questions that these data raise and their possible applications.

These data show that Pokot agriculture is not a static system but rather that it has incorporated dynamic processes of movement, intensification and abandonment through time. Population densities seem to have remained relatively constant, suggesting that overall population pressure is not a major driver of agricultural change and that expansion has provided an outlet for any increase in population size. The dynamic nature of Pokot agriculture suggests that Pokot farmers operate in a field of choice where possible options to increase production include intensification and/or expansion to new areas. This in turn forces us to consider the broader socio-economic and environmental (especially climatic) factors that affect the decision-making of individual farmers. In this paper I have emphasised factors such as the social institutions that motivate Pokot production, the incorporation of Pokot farming into broader regional exchange networks, the role of traditional systems of kinship and land access and the potential impacts of climatic change. Deeper consideration of each of these factors raises points with applied applicability; these include:

1. Pokot farming may appear sustainable when viewed over a period of years, but viewed over multiple decades its sustainability results from an ability to move across the landscape (2c). Any attempt to improve the current system or export the technology and social knowledge would need to factor in this spatial flexibility. This knowledge might be employed quite specifically in the case of local modern irrigation schemes and in general more widely.
2. Diachronic analysis of decision making in Pokot farming and early archaeological sites strongly suggests that the agricultural system emerged as and has been part of a broader regional exchange system involving various economic specialisations, including specialised pastoralism. Any modern development project would need to factor this into its design and ensure farmers have access to traditional networks and traditional forms of capital as well as the ability to increase production as necessary so as to participate in such institutions. Again, this knowledge might be employed quite specifically in the case of local modern irrigation schemes and in general more widely.
3. The integration of Pokot farming within a broader regional system suggests that the agricultural system may have acted as a buffer to pastoral communities at times of climatic crisis. Such ties might be usefully reinstated and/or supported in favour of cash-cropping and export. This seems particularly pertinent in the context of the case-material presented, where Pokot pastoralists regularly suffer food insecurity but are no longer able to easily find support from their agricultural neighbours.

4. Traditional land-tenure seems to play a major role in the diachronic development of Pokot agriculture. Any modern development initiative aiming to support Pokot farming *in situ* would need to consider this. For example, reconstructing irrigation channels in the north of the region would not be effective if a sufficient number of the lineages who own the land in that region were unwilling to re-colonise the area. Similarly, if the Pokot model were to be *exported* to an external irrigation scheme then the new development would need clear procedures to deal with issues of inheritance and household growth.

Returning to Table 1 presented in the introduction, I would argue that the Pokot case study fulfils a number of the proposed directions for a useable or applied archaeology. It has collated empirical data concerning long-term land-use (1a), demographics (1b), regional patterns of production and exchange (1e), access to land, inheritance and tenure (1f) and impacts/responses to climatic change (1 g). It has used these data to challenge current narratives surrounding food shortage, climatic change and degradation (2a), reconsidered the concept of sustainability in the Pokot case (2c), questioned basic attempts at physically rehabilitating old irrigation channels (3a) and considered the potential to export knowledge derived from the Pokot system to buffer the regional economy and aid in the design of modern irrigation schemes (3b).

While the development of this form of useable archaeology is far from complete, I hope to have demonstrated that the archaeological analysis of indigenous socio-environmental systems has much to offer to contemporary issues of food security, sustainability and development. As such, I believe that archaeological enquiry has the potential to take a much more central role in the present: to be practically 'used.'

Acknowledgements This research was supported by a doctoral award from the UK Arts and Humanities Research Council. Radiometric dates were funded by ORADS. Financial and logistical support was provided by the Tweedie Exploration Fund, University of Edinburgh, the Meyerstien Fund, University of Oxford, and the British Institute in Eastern Africa. I am also indebted to the Kenyan Ministry of Education, Science and Technology for research clearance (MOEST 13/001/35 C 592/2) and to the support of the National Museums of Kenya. My deepest gratitude is due to Peter Mitchell for his supervision, and to Emanuel, Joel, William, Abel, Josphat, Irene, and, of course, Laura.

References

Adams, W. M. (2004). When islands expand: Intensification and sustainability. In M. Widgren & J. E. G. Sutton (Eds.), *Islands of intensive agriculture in Eastern Africa* (pp. 133–140). Oxford: James Currey.

Adams, W. M., & Anderson, D. M. (1988). Irrigation before development: Indigenous and induced change in agricultural water management in East Africa. *African Affairs, 87*, 519–535.

Adams, W. M., & Watson, E. E. (2003). Soil erosion, indigenous irrigation and environmental sustainability, Marakwet, Kenya. *Land Degradation and Development, 14*, 109–122.

Alin, S. R., & Cohen, A. S. (2003). Lake-level history of Lake Tanganyika, East Africa, for the past 2500 years based on ostracod-inferred water-depth reconstructions. *Palaeogeography, Palaeoclimatology, Palaeoecology, 199*, 31–49.

Anderson, D. M. (1988). Cultivating pastoralists: Ecology and economy among the Il Chamus of Baringo. In D. H. Johnson & D. M. Anderson (Eds.), *The ecology of survival: Case studies from northeast African history* (pp. 241–260). London: Lester Crook.

Anderson, D. M. (1989). Agriculture and irrigation technology at Lake Baringo. *Azania, 24*, 85–98.
Arazi, N. (2011). Safeguarding archaeological cultural resources in Africa: Policies, methods and issues of (non) compliance. *African Archaeological Review, 28*, 27–38.
Balée, W. (Ed.). (1998). *Advances in historical ecology.* New York: Columbia University Press.
Balée, W. (2006). The research program of historical ecology. *Annual Review of Anthropology, 35*, 75–98.
Balée, W., & Erickson, C. L. (Eds.). (2006). *Time and complexity in historical ecology: Studies in the neotropical lowlands*. New York: Columbia University Press.
Beech, M. W. H. (1911). *The Suk: Their language and folklore*. Oxford: Oxford University Press.
Bollig, M. (1990). An outline of pre-colonial Pokot history. *Afrikanistiche Arbeitspapiere, 23*, 73–91.
Bollig, M. (1998). Moral economy and self-interest: Kinship, friendship, and exchange among the Pokot (N.W. Kenya). In T. Schweizer & D. R. White (Eds.), *Kinship, networks and exchange* (pp. 137–157). Cambridge: Cambridge University Press.
Börjeson, L. (2004). The history of Iraqw intensive agriculture, Tanzania. In M. Widgren & J. E. G. Sutton (Eds.), *Islands of intensive agriculture in Eastern Africa* (pp. 68–104). Oxford: James Currey.
Börjeson, L. (2005). *A history under siege: Intensive agriculture in the Mbulu highlands, Tanzania, 19th century to the present*. Stockholm: Department of Human Geography, Stockholm University.
Boserup, E. (1965). *The conditions of agricultural growth*. London: Allen and Unwin.
Brookfield, H. C. (1986). Intensification intensified. *Archaeology in Oceania, 31*, 177–180.
Conant, F. P. (1965). Korok: A variable unit of physical and social space among the Pokot of East Africa. *American Anthropologist, 67*, 429–434.
Conant, F. P. (1966). The external coherence of Pokot ritual behaviour. *Philosophical Transactions of the Royal Society of London, Series B, 251*, 505–519.
Costanza, R., Graumlich, L. J., & Steffen, W. (Eds.). (2007). *Sustainability or collapse?: An integrated history and future of people on Earth (Dahlem Workshop Reports)*. Cambridge: MIT Press.
Crumley, C. L. (Ed.). (1994). *Historical ecology: Cultural knowledge and changing landscapes*. Santa Fe: School of American Research Press.
Davies, M. I. J. (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*, 16–35.
Davies, M.I.J. (2009b). An applied archaeological and anthropological study of intensive agriculture in the Northern Cherangani Hills, Kenya. Unpublished DPhil Thesis, University of Oxford
Davies, M. I. J. (2010a). A view from the East: An interdisciplinary 'historical ecology' approach to a contemporary agricultural landscape in Northwest Kenya. *African Affairs, 69*, 279–297.
Davies, M. I. J. (2010b). From platforms to people: Rethinking population estimates for the abandoned agricultural settlement of Engaruka, Northern Tanzania. *Azania, 45*(2), 345–356.
Davies, M.I.J. and Nkirote, F.M. (Eds.). (in press). *Humans and the environment: New archaeological approaches for the 21st century.* Oxford: Oxford University Press.
Dawdy, S. L. (2009). Millennial archaeology. Locating the discipline in the age of insecurity. *Archaeological Dialogues, 16*, 131–142.
Dietz, T. (1987). *Pastoralists in dire straits: Survival strategies and external interventions in a semi-arid region at the Kenya–Uganda border: West Pokot, 1900–1986*. Amsterdam: Institute Voor Sociale Greographie, Universiteit van Amsterdam.
Håkansson, N. T. (1989). Social and political aspects of intensive agriculture in East Africa: Some models from cultural anthropology. *Azania, 24*, 12–20.
Håkansson, N. T. (1994). Grain, cattle and power: Social processes of intensive cultivation and exchange in precolonial western Kenya. *Journal of Anthropological Research, 50*, 249–276.
Hayashida, F. M. (2005). Archaeology, ecological history, and conservation. *Annual Review of Anthropology, 34*, 43–65.
Hodder, I. (1982). *Symbols in action: Ethnoarchaeological studies of material culture*. Cambridge: Cambridge University Press.
Hogg, R. (1984). Pokot traditional irrigation and its future development. Unpublished consultancy report, Kapenguria, A.S.A.L.
Kurita, K. (1983). A preliminary report on the economic activities of the Pokot and the Marakwet. In B. E. Kipkorir, R. C. Soper, & J. W. Ssenyonga (Eds.), *Kerio Valley: Past, present and future* (pp. 61–74). Nairobi: Institute of African Studies, University of Nairobi.
Lane, P. J. (2003). African archaeology in Britain: A commentary on current trends and contexts. In P. Mitchell, A. Haour, & J. Hobart (Eds.), *Researching Africa's past: New contributions from British archaeologists* (pp. 145–152). Oxford: School of Archaeology.

Lane, P. J. (2010a). Environmental narratives and the history of soil erosion in Kondoa District, Tanzania: an archaeological perspective. *International Journal of African Historical Studies, 42*, 457–483.
Lane, P. J. (2010b). Developing landscape historical ecologies in Eastern Africa: An outline of current research. *African Affairs, 69*, 299–322.
Mapunda, B. B. B. (1991). The role of archaeology in development: The case of Tanzania. *Transafrican Journal of History, 20*, 19–34.
Meyerhoff, E. L. (1981). *The socio-economic and ritual roles of Pokot women*. PhD thesis, University of Cambridge.
Moore, H. (1986). *Space, text and gender: An anthropological study of the Marakwet of Kenya*. Cambridge: Cambridge University Press.
Musonda, F. B. (1990). African archaeology: Looking forward. *African Archaeological Review, 8*, 3–22.
Nangulu, A. K. (2001). *Food security and coping mechanisms in Kenya's marginal areas: The case of West Pokot.* PhD. Thesis, West Virginia University.
Nicholson, S. E. (1998). Historical fluctuations of Lake Victoria and other lakes in the northern Rift Valley of East Africa. In J. T. Lehman (Ed.), *Environmental change and response in East African lakes* (pp. 7–35). Netherlands: Kulwer Academic Publishers.
Peristiany, J. G. (1951). The age-set system of the pastoral Pokot. *Africa, 21*(188–206), 279–302.
Phillipson, D. W. (2003). *Archaeology in Africa and its museums: An inaugural lecture given at the University of Cambridge, 22 October 2002*. Cambridge: Cambridge University Press.
Rambaldi, G. (1995). *Wei wei integrated development project, Sigor (Kerio Valley)—Kenya: Training, research and consolidation programme*. Rome: Lodagri SpA.
Raymond, G. Jr. (Ed.) (2005). *Ethnologue: Languages of the world, 15th edition.* Dallas: SIL International. See also http://www.ethnologue.com.
Redman, C. L. (2005). Resilience theory in archaeology. *American Anthropologist, 107*, 70–77.
Schladt, M. (1997). *Kognitive struckturen von körpoerteilvokabularien in Kenianischen sprachen.* Köln: Africanistische Monographien *8*, Universität zu Köln.
Schneider, H. K. (1957). The subsistence role of cattle among the Pakot and in East Africa. *American Anthropologist, 59*, 278–300.
Shepherd, N. (2002). The politics of archaeology in Africa. *Annual Review of Anthropology, 31*, 189–209.
Shipton, P. M. (1984a). Strips and patches: A demographic dimension in some African land-holding and political systems. *Man, 19*, 613–634.
Shipton, P. M. (1984b). Lineage and locality as antithetical principles in East African systems of land tenure. *Ethnology, 23*, 117–132.
Sowunmi, M. A. (1998). Beyond academic archaeology in Africa: The human dimension. *African Archaeological Review, 15*, 163–172.
Spear, T. (1993). Being 'Maasai', but not 'people of cattle': Arusha agricultural Maasai in the nineteenth century. In T. Spear & R. Waller (Eds.), *Being Maasai: Ethnicity and identity in East Africa* (pp. 120–136). London: James Currey.
Spear, T. (1997). *Mountain farmers: Moral economies of land and agricultural development in Arusha and Meru*. Oxford: James Currey.
Spencer, P. (1973). *Nomads in alliance: Symbiosis and growth among the Rendille and Samburu of Kenya*. London: Oxford University Press.
Spencer, P. (1998). *The pastoral continuum: The marginalisation of tradition in East Africa*. Oxford: Clarendon.
Ssennyonga, J. W. (1983). The Marakwet irrigation system as a model of a systems-approach to water management. In B. E. Kipkorir, R. C. Soper, & J. W. Ssenyonga (Eds.), *Kerio Valley: Past, present and future* (pp. 96–111). Nairobi: Institute of African Studies, University of Nairobi.
Stager, J. C., Cumming, B., & Meeker, L. (1997). A high-resolution 11,400-yr diatom record from Lake Victoria, East Africa. *Quaternary Research, 47*, 81–89.
Stump, D. (2006). Towards an applied archaeology of East African intensive agriculture. Unpublished PhD thesis, University College London.
Stump, D. S. (2010). Ancient and backward or long-lived and sustainable: The role of the past in debates concerning rural livelihoods and resource conservation in Eastern Africa. *World Development, 38*, 1251–1262.
Sulas, F., Wynne-Jones, S., & Spence, K. (2011). Africa's fragile heritages: Introduction. *African Archaeological Review, 28*, 1–3.
Sutton, J. E. G. (1973). *The archaeology of the Western Highlands of Kenya*. Nairobi: British Institute in Eastern Africa.
Sutton, J. E. G. (1987). Hyrax Hill and the Sirikwa: New excavations on Site II. *Azania, 22*, 1–36.

Turner, B. L., & Doolittle, W. E. (1978). The concept and measure of agricultural intensity. *The Professional Geographer, 30*, 297–301.

Van der Leeuw, S., & Redman, C. L. (2002). Placing archaeology at the centre of socio-natural studies. *American Antiquity, 67*, 597–605.

Verschuren, D., Laird, K. R., & Cumming, B. F. (2000). Rainfall and drought in equatorial East Africa during the past 1,100 years. *Nature, 403*, 410–413.

Waller, R. (1985). Ecology, migration and expansion in East Africa. *African Affairs, 84*, 347–370.

Waller, R. (1988). Emutai: Crisis and response in Maasailand 1883-1902. In D. H. Johnson & D. M. Anderson (Eds.), *The ecology of survival: Case studies from Northeast African history* (pp. 73–112). London: Lester Crook.

Westerberg, L.-O., Holmgren, K., Börjeson, L., Håkansson, T., Laulumaa, V., Ryner, M., et al. (2010). The development of the ancient irrigation system at Engaruka, northern Tanzania: Physical and societal factors. *The Geographical Journal, 176*(4), 304–318.

Widgren, M. (2000). Islands of intensive agriculture in African drylands: Towards an explanatory framework. In G. Barker & D. Gilbertson (Eds.), *The archaeology of drylands: Living at the margin* (pp. 252–267). London: Routledge.

Widgren, M. (2004). Towards a historical geography of intensive farming in Eastern Africa. pp. 1–18. In M. Widgren & J. E. G. Sutton (Eds.), *Islands of intensive agriculture in Eastern Africa* (pp. 1–18). Oxford: James Currey.

Widgren, M. (2006). Reading property in the landscape. *Norwegian Journal of Geography, 60*, 57–64.