The ‘Useable’ Archaeology of African Farming Systems

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Abstract

Rural African farming has often been viewed as ephemeral, shifting cultivation with low output and high unreliability. At the same time, it is often understood as static and relatively unchanged for centuries. More recent historical and archaeological studies of African ‘intensive’ farming systems have challenged this narrative, yet detailed analyses of such systems and the potential to draw ‘lessons’ from them for the future remain limited and restricted to relatively few locations. This paper presents an overview of a new research network designed to share and generate insights into African farming systems across the continent. The network links projects in Kenya (Marakwet), Nigeria (Tiv) and South Africa (Bokoni) in an attempt to develop comparative and pan-African approaches, as well as build unique research capacity, experience, approaches and knowledge in Africa and for Africa. In the paper we introduce each of the partner projects and the specific interdisciplinary and locally engaged approaches under development. We highlight some of the main theoretical and methodological issues addressed by the network, including diachronic approaches to physical geography (soils, water, vegetation), demography (population densities, settlement patterns), farming practice (crops and crop regimes, fallowing, fertility), regional exchange (reciprocity, market exchange, related pastoral systems), broad cultural changes (the nation/region, governance, religion), land tenure (kinship and inheritance, land law), landscape (mapping, perception, temporality), challenges of integrating science and humanities disciplines (social anthropology, landscape archaeology, geo-archaeology, archaeo-botany, paleo-ecology) and local community engagement (public anthropology/archaeology, indigenous knowledge).

Résumé

L’agriculture rurale africaine a souvent été considérée comme éphémère, culture itinérante avec une faible production et un manque de fiabilité. En même temps, elle est souvent comprise comme statique et relativement...
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inchangée pendant des siècles. Les plus récentes études historiques et archéologiques des systèmes agricoles intensifs africains ont contesté ce récit, mais des analyses détaillées de ces systèmes et la possibilité d’en tirer des « leçons » pour l’avenir restent peu développées et relativement limitées à quelques endroits. Cet article présente une synthèse des travaux issus d’un nouveau réseau de recherche visant à partager et générer des connaissances sur les systèmes agricoles africains à travers tout le continent. Le réseau relie les projets au Kenya (Marakwet), au Nigeria (Tiv) et en Afrique du Sud (Bokoni) dans une tentative de développer des approches panafricaines comparatives, ainsi que de renforcer les capacités de recherche, l’expérience, les connaissances et approches en Afrique et pour l’Afrique. Dans cet article, nous présentons chacun des partenaires du projet ainsi que les approches interdisciplinaires locales en cours de développement. Nous soulignons quelques-unes des principales questions théoriques et méthodologiques abordées par le réseau, notamment les approches diachroniques de la géographie physique (sols, eau, végétation), la démographie (densité de population, les modes d’hébergement), la pratique de l’agriculture (cultures et régimes agricoles, la mise en jachère, la fertilité), les échanges régionaux (réciprocité, échange sur le marché lié à des systèmes pastoraux), les grands changements culturels (la nation/région, la gouvernance, la religion), le régime foncier (de parenté et d’héritage, le droit de la terre), le paysage (cartographie, perception, temporalité), les défis de l’intégration de la science et des disciplines humaines (anthropologie sociale, archéologie du paysage, géo-archéologie, archéo-botanique, paléoécologie) et l’engagement de la communauté locale (anthropologie publique/archéologie, connaissance indigène).

Introduction

Most archaeological research into African farming has tended to focus on origins, domestication and spread (see Lane 2004; Casey 2005; Neumann 2005; Manning et al. 2011), with comparably less emphasis on recent developments, diversification, specialisation and intensification (although see Widgren & Sutton 2004 for an exception). Diverse bodies of research are, however, demonstrating how Africa’s present-day environments are the products of deep human engagements with nature (such as Johnson & Anderson 1988; Leach & Mearns 1996), and how these complex, recursive human–environment histories must be understood if we are to effectively manage the present and plan for the future (see Lane 2011; Davies 2012; Marchant & Lane 2013; Stump 2013). This process involves understanding the ongoing environmental trends that extend across the pre- to the postcolonial (Davies 2012, 2013: 21–22), alongside deeper understandings of indigenous knowledges and technologies (Lane 2011; Stump 2006, 2013; Davies et al. 2014a, b). The process also involves understanding and critiquing the ways in which present-day environmental planners utilise inaccurate pseudo-historical narratives to justify modern development interventions, support colonial land management practices (Lane 2010; Stump 2010) and impose forms of exclusionary conservation (Brockington 2002). Interdisciplinary archaeology can
and should play a leading role in this process in both Africa and globally (Davies & M’Mbogori 2013; Stump 2013), while African case studies and approaches have the potential to take a leading role in the increasingly significant global fields of historical ecology (see Balée 2006) and resilience theory (see Redman 2005).

This desire to develop such ‘useable’ (Davies 2012) and ‘indigenous’ (Lane 2011) archaeologies of historic African farming systems inspired us to form the African Farming Network in early 2013 (see www.farminginafrica.wordpress.com). The network aims to explore comparative approaches to recent African farming systems across the continent by sharing knowledge and approaches and developing common research aims, questions and methods across three partner projects in Kenya (Marakwet), Nigeria (Tiv) and South Africa (Bokoni). Despite the seemingly divergent ecological and agricultural nature of each partner project, we emphasise the common issues and challenges faced across Africa, such as poor local research knowledge and funding, legacies of colonial and postcolonial environment/land policy, low or unreliable agricultural output and land alienation. With variation, the partner projects share a loose common timeframe spanning the last 500 years, as well as certain common cultivars (sorghum \[Sorghum bicolor\], pearl millet \[Pennisetum glaucum\] and maize \[Zea mays\]) and similar land management challenges (water management, soil management, agro-pastoral management). The network further highlights the benefits to be gained by engaging in a pan-African dialogue bringing together established and emerging scholars from different backgrounds and research environments across Africa’s internal frontiers (especially the west/east/south divide) and across temporal divisions (past vs present; archaeology vs anthropology) to rethink existing research aims and goals, develop comparative approaches and generate new interdisciplinary ideas and capacities. The network consequently links scholars with backgrounds in social anthropology, cultural heritage, ethnoarchaeology, landscape archaeology, geo-archaeology, archaeo-botany and palynology from six institutions in four countries including the University of Ibadan in Nigeria, the National Museums of Kenya and the British Institute in Eastern Africa in Kenya, the University of the Witwatersrand in South Africa and the universities of Cambridge and University College London in the UK (further information on the network members can be found via the network website). The network has operated through practical field workshops, with four workshops in Marakwet, Kenya; Bokoni, South Africa; Tiv, Nigeria; and Cambridge, UK, already completed. We expect the network to develop beyond its initial three-year cycle into a formal pan-African research and training programme.

In this paper we briefly introduce each of the three partner projects and summarise their research goals and results to date. We then outline how the African Farming Network has and will contribute to each project and what comparative generalisations
are beginning to emerge. Finally, we outline our plans for the future of the network including programmes of research, capacity building and training. Overall, this paper attempts to set an agenda for future interdisciplinary studies of recent African farming systems.

**Partner projects**

The African Farming Network has explicitly developed as a dialogue between Africa’s diverse regions and ecologies by linking projects in East, West and South Africa. Each partner project aims to explore the history of a precolonial agricultural system over approximately the last 500 years and into the twentieth century, linking deeper-time archaeological and historic data to contemporary issues of land management. Despite great differences in ecology, climate and culture history, each partner project is linked by its commitment to a diachronic approach to Africa’s recent past and present, and by the desire to better understand the complex interconnections of human social and cultural phenomena with ecological and biophysical processes. Each project explores temporal and spatial patterns of human settlement, demography, political economy, consumption, kinship, labour mobilisation, gender, exchange and land tenure, in conjunction with questions of soil fertility and conservation, vegetation patterns, crop and animal ecology, water management and climate. Consequently, each project aims to apply a range of anthropological, historical and archaeological techniques including oral historical interviews, participant observation, archaeological survey and GIS-based mapping, standard excavation, geo-archaeology (soil chemistry, micro-morphology), paleo-ecology (climatic records and especially pollen), archaeobotany (crop recovery, experimental cultivation, crop genetics and phytoliths) and remote sensing (historic aerial and satellite imagery). Each project holds a commitment to local community engagement and the development of new channels of communication, which present research results to the community and relevant stakeholders in effective and useful formats.

Each of the projects has its own history of research in which different approaches have been emphasised and in which differing constraints are apparent. However, we see these differences as opportunities to learn from each other and to apply the full range of approaches across each project. In Marakwet, research has largely been ethnographic and ethnohistorical with a major component of landscape mapping. In Bokoni, the research is focused to a greater degree on archaeology, because cultural continuity into the twentieth century is challenged by the disruptions of nineteenth-century conflict and colonial land alienation. Nevertheless, knowledge of precolonial land management at Bokoni has much to contribute to contemporary challenges and the Bokoni research team are beginning to explore these possibilities. In Tiv, previous work has been both archaeological and ethnoarchaeological, spanning the
greatest temporal range and demonstrating cultural continuity over more than the last 500 years. However, here previous research has focused less directly on the technology and practice of agriculture. While these differences of research history might seem challenging, we would argue that they open up space for the respective projects to learn from one another in productive ways. As outlined below, ethnographic insights into the complexities of African farming systems gained from Marakwet and Tiv provide important context for the interpretation of data from Bokoni. Similarly, the archaeological research applied in Bokoni and Tiv has much to contribute to the predominantly ethnographic approach at Marakwet. Ethnographic work on soils and crops at Marakwet complements archaeological work on soils and phytoliths in Bokoni, and both offer techniques and methods transferable to Tiv. This list of shared insights and developing complementary methods could be extended considerably and is explored in detail in the discussion below. We begin, however, by introducing each project in turn.

Marakwet, Kenya
The Marakwet number around 300,000 people (KNBS 2009) and inhabit the low-lying central and western portion of the semi-arid Kerio Valley, the adjacent Elgeyo Escarpment and, increasingly, the wetter highlands of the eastern Cherangany Hills of north-west Kenya (figure 1.1). Our current research primarily concerns the Kerio Valley and Elgeyo Escarpment region comprising a 40 km north-south stretch of the valley from Arror in the south to Chesegon in the north (Kipkorir 1973; Kipkorir, et al. 1983; Moore 1986; Dietz et al. 1987). The underlying geology is of the basaltic crystalline basement complex and soils tend to be moderately acidic with low nitrogen content but moderately well suited to agriculture (Dietz et al. 1987: 10–16; French 2014). Rainfall in the valley is around 900–950 mm per annum but with considerable variation (Dietz et al. 1987: 16–22).

Settlement tends to concentrate on the escarpment in the west and at small centres joining the road at the foot of the escarpment. A number of seasonal and perennial streams dissect the hillside into hill-spurs on which people build their homes, and provide water for both domestic use and irrigation. High on the escarpment small dams are constructed to take water from these streams which are then contoured in channels (locally known as ‘furrows’) through the habitation areas and down onto the fertile alluvial and colluvial fans at the foot of the escarpment. Here networks of irrigation and complex field systems extend across the valley floor to the Kerio River where a wide range of crops are grown including maize, finger millet, sorghum, cassava, beans, yams and various fruit and vegetables.

The Marakwet are well known for their ethnography and history (Kipkorir 1973, 2010) as well as more detailed studies of domestic space, gender, daily practice and
modernity (Moore 1986, 2011). They have attracted attention in development and agronomic circles in relation to their intensive irrigation-based agricultural system (Soper 1983; Ssennyonga 1983; Dietz et al. 1987; Adams et al. 1997; Östberg 2004, 2014; Watson 2004), which has occasionally been upheld as a possible model for sustainable agricultural development both locally (Kipkorir et al. 1983; Adams 1996; Watson et al. 1998; Adams & Watson 2003) and generally (Adams & Anderson 1988; Widgren 2000: 255, 2004: 11), as well as an analogy for past farming systems such as Engaruka in northern Tanzania (Sutton 1989: 109, 2004: 119). While large parts of the system were in existence during the late nineteenth century (Thomson 1887) and the oldest evidence for intensive farming in the region likely stems back to around 300 years ago (see below), the longevity and stability of this agricultural system has yet to be explored since no detailed historical or archaeological investigations have been conducted (although see Soper 1983 for an exception). Similarly, studies of the recent history of the farming system, including the history of various external interventions, remain largely piecemeal and/or outdated (such as Barrow 1983; Critchley 1983; Kipkorir 1983; Watson et al. 1998).
Our recent work has built on the longstanding anthropological research of Henrietta Moore and has largely focused on the Marakwet landscape, especially the history and layout of the irrigation system and its role in broader agricultural practice (Davies et al. 2014a, b). We have worked with a trained team of local researchers to GPS/GIS-map the extent of the irrigation network, detailing some 91 main irrigation channels totalling more than 315 km in length. The largest channel runs for more than 14 km and descends some 1,400 m from its off-take high on the escarpment to the fields on the valley floor.

Particularly notable has been the expansion of the irrigation system since 1980, with 30 new channels added, alongside various reorganisations (Davies et al. 2014a, b). We conducted higher resolution mapping of the secondary and tertiary branches in the Tot-Sibou region in the north of Marakwet. These form an extensive capillary network extending from the main branch and out into the patchwork of fields.

Mapping field boundaries and the collection of data pertaining to the history of more than 200 separate fields (including information of cropping schemes and yields) has demonstrated complex patterns of land access, tenure and management that explicitly reference deeper histories of clans and lineages and historic instances of relatedness and reciprocal obligation. A wide variety of social networks and exchange relationships extend across the landscape linking diverse parts of the Marakwet region, often across ecological zones (especially between the lowlands and highlands). These networks (based on formal friendships known as tilia as well as on marriage ties, patrilineal and matrilineal descent and age-set/initiation groups) extend across ethnic and economic boundaries, thus linking the Marakwet to neighbouring Pokot herder groups (Pollard et al. forthcoming). We further mapped out and recorded more than 500 instances of historic agricultural interventions – mostly minor repairs in concrete and stone to traditional irrigation structures, but including larger-scale interventions such as the construction of a major irrigation pipeline by the Red Cross in 2012. Our recent detailed mapping of demography and household structures alongside comparable data from the early 1980s (Moore 1986) allows for analysis of changing population dynamics, which can be related to histories of fields and irrigation. Ongoing analysis of historic aerial photography from 1964 alongside recent satellite imagery should allow for further quantification of changes to areas of cultivation, settlement and vegetation (especially highland forest).

Overall, our data present an emerging, finely resolved historical analysis of the Marakwet farming landscape over the last 30 to 40 years, but also speak to deeper timescales and the ‘temporalities’ inherent in African farming landscape construction. We have argued (Davies et al. 2014a, b) that the Marakwet system of farming has a time depth of some 300 years based on oral histories and sequences of generations. This is supported by radiometric dates from both settlement sites and irrigation channels.
from neighbouring communities with similar agricultural technology (Davies 2008, 2012). However, this deeper chronology requires further clarification and we plan to explore the dating of historic settlement sites, landscape features (such as irrigation) and geo-archaeological signatures (especially soil profiles), alongside standard archaeological investigations of multiple sites with a deeper antiquity including various Iron Age and Later Stone Age localities. Nevertheless, we argue that at the broadest scale, the Marakwet landscape seems to demonstrate enduring continuity through time with the last 35 years typified by expansions of both population and farming – a trend especially evidenced by the foundations of new irrigation channels.

At higher temporal resolutions our data point to the lived experiences of farming practice and the daily, seasonal and longer-term decisions made by Marakwet farmers, which combine to construct the landscape. Analysis of the Marakwet landscape at Tot-Sibou village in the north of the region reveals not one simple form of farming, but rather four major forms with multiple subtle variations. These include irrigated ‘semi-permanent’ fields at the foot of the escarpment cultivated by individual households on land held by specific households and lineages. These are contrasted with areas of shifting communal cultivation further downslope on land held communally at the clan level. In these communal fields, the entire clan comes together to select an area for temporary cultivation (for two to three years). This land is then cleared by all males of the clan working together before being parcelled out to individual lineages and then households in equal proportion. While the semi-permanent fields therefore represent a short fallowing system of between one and five years, the communal fields represent a long fallow system of 15 to 20, and both evidence widely different forms and scales of labour mobilisation, organisation and decision making. In addition to these two types of cultivation, many families are able to cultivate along the permanent river banks using forms of flood recession, while other families have small gardens on the escarpment alongside their homes (figure 1.2).

These varying forms of cultivation represent a small selection of the daily activities undertaken by any one individual or household. Choices of where, when and what to cultivate, how to manage labour, how to fulfil kin-based and other obligations, how to participate in local networks of exchange and alliance all impact on what tasks are undertaken, where, when and at what timescales, and they each leave a physical mark on the landscape. Ingold (1993) has referred to this as the taskscape of activities through which the landscape is formed. He further points to the inherent temporality of these activities (and thus of the landscape) which stem from daily routines of waking, working and sleeping, seasonal routines of planting, weeding, irrigating and harvesting, and life cycles of births, initiations, marriages and deaths. Households themselves have cycles of growth and decline as demonstrated by Moore (1986) and so do aspects of the landscape (c.f. Davies 2014) – indeed, physically and cognitively
Figure 1.2  Fields and irrigation in Tot-Sibou, northern Marakwet. The map shows main clan boundaries (Shaban, Kapishoi, Kapsiren, Kapchepsom), the irrigation furrow of Kapishoi clan, the semi-permanent fields (grid pattern bottom centre), areas of shifting cultivation (circled right of centre), areas of riverside flood recession cultivation (circled around water courses) and the habitation zone (bottom left). Source: M. Davies
the Marakwet household extends into the landscape and vice versa. Nested household relations (especially those of gender and generation) are themselves nested in and shape the landscape. For example, the capillary networks of irrigation flex and shift across the landscape along with the growth and decline of the households that use them (and which, among other things, relates to balances of gender and generation). Similarly, field boundaries alter, disappear and reappear, and soil fertility and structure change, all in line with these human routines and cycles. Within the landscape, certain features such as the main irrigation channels and houses are constructed consciously in single phases or stages, while other elements such as changes to vegetation, soils and field boundaries occur unconsciously and incrementally through the tasks that form the daily practice of farming.

A major aim of this analysis, shared with the other African Farming Network projects, is to provide insights from the long-term history of the Marakwet landscape to address contemporary landscape challenges. As noted above, we have recorded multiple major agricultural interventions spanning the last century, including a substantial new irrigation project established by the Canadian Red Cross in 2012 (see Davies & Moore 2016 for further details). These previous landscape interventions have largely been unsuccessful because they failed to take into account the broader history of landscape management (soils, fertility, labour, crops, water) and its temporalities as elucidated by our ongoing research. For example, there has been a recurrent assumption since the 1940s that ‘traditional’ irrigation is ineffective and at risk of immediate degeneration, a theme most recently reiterated by Kipkorir and Kareithi (2013) and an idea that underpins the recent creation of a ‘modern’ irrigation scheme by the Red Cross. In contrast, our data demonstrate the longer-term sustainability of Marakwet farming and water management practices and highlight the expansion of irrigation structures through time, especially over the last 35 years. Our data thus challenge the basis on which many external agricultural interventions have been and continue to be made.

While these human, material, temporal and spatial understandings of the Marakwet landscape remain partial and preliminary, we believe that our research trajectory operates, learns from and intersects with the other partner projects at a number of levels. On the one hand we are developing particularistic understandings of the dynamics of the Marakwet landscape and community itself, but at the same time we are attempting to demonstrate the sheer human and ecological complexity of indigenous African farming systems. At this second level, we aim to demonstrate the more general interplay of population, labour, gender, kinship, exchange, soils, water, vegetation, crops, animals, climate and history that must be explored in any study of an indigenous farming community, past or present. Our data are therefore to some extent ‘ethnoarchaeological’ in their relationship with the Nigerian and South
African projects but not in the way of direct analogy. Rather, our data highlight the possible interplay of different factors and the possible temporal (daily, annual, decadal, centennial), spatial (household, village, landscape), quantitative (population size/density, yields, rainfall) and human (individual, family, lineage, clan, community) ranges within which these interactions may occur.

The Marakwet research has some distance to go; indeed, we are only just beginning to scratch the surface. However, our immediate plans will draw directly on the knowledge and skills of the Bokoni and Tiv projects to focus further on the dating of landscape features and settlement sites, soils (chemistry and micro-morphology) and archaeo-botany (crop genetics, phytoliths and ethnobotany), as well as developing more effective means of engaging and communicating with the local community. As will be explored below, in each of these regards the African Farming Network has a strong role to play in shaping, facilitating and sharing necessary research capacity.

**Tiv, Nigeria**

The Middle Benue Valley of Nigeria, referred to here as Tiv-land, has been the focus of systematic anthropological and archaeological investigations since 1975 by a team of researchers from the University of Ibadan, originally led by the late professor Bassey Andah. The goals of the multidisciplinary investigations were to shed light on the settlement history and settlement patterns, land-use patterns, technological and social developments, and the beginnings of food production and iron working in the area (Folorunso & Ogundele 1993; Folorunso 2005). The project also explored ethnoarchaeological and oral historical perspectives on the cultural characteristics of the populations living in the area today (Folorunso 1992, 1993b, 1998, 2003), including patterns of migrations and the implication of this evidence for understanding the question of the Bantu homeland (see also Andah et al. 1981; Andah 1983, 1998). The Tiv are well known ethnographically, being the subject of many studies (see Bohannan & Bohannan 1953; Bohannan 1954).

The Tiv homeland is mostly south of the Benue River in central Nigeria and our renewed study, developed under the African Farming Network, is located in the Katsina-Ala Valley, in the south-eastern part of Tiv-land. The Tiv are the largest ethnic group in Benue state with approximately 5.1 million people (National Population Commission 2006). The climate is tropical, having a wet season from May to October and a dry season from November to April. From December to February a dry north-easterly wind, known as ‘harmattan’, blows off the Sahara, causing a marked drop in humidity. The vegetation is principally Guinea savanna grassland consisting of tall grasses interspersed with trees of moderate height. The vegetation is thick during the wet season and becomes patchy during the dry season. The soils are generally characteristic of tropical ferruginous
types derived from crystalline rocks with appreciable quantities of ferromagnesium minerals. The area is well watered by rivers and streams that are usually flooded during the rainy season, inundating wide stretches along their banks.

The Tiv are principally subsistence farmers whose staple crops are varieties of yams \((Dioscorea\ sp.)\), bulrush or pearl millet \((Pennisetum\ glaucum)\) and guinea corn or sorghum \((Sorghum\ bicolor)\). The Benue Valley area allows participation in both the grain-based economies to the north and the yam-based economies of the regions to the south. This ecological position permits year-round farming activity. Yams are harvested in July or August and guinea corn ripens in May or June. Yams are the primary and the most prized crop and are planted at the start of the crop-rotation cycle. They form a major part of the Tiv diet and it is not unusual to see yam being pounded in the early morning for breakfast. Sweet potatoes \((Ipomoea\ batatas)\), cocoyams \((Colocasia\ esculenta)\), maize \((Zea\ mays)\), cassava \((Manihot\ esculenta)\) and groundnuts \((Arachis\ hypogaea)\) were probably introduced in the sixteenth century or later (with the possible exception of one sort of cocoyam and one sort of groundnut) and are considered mere substitutes for the main staples; they are planted on lands lying fallow from other crops (Folorunso & Ogundele 1993).

Extensive survey and ethnographic mapping conducted from the 1980s to 1990s revealed that the choice of farmland is determined by its closeness to the compound, yet it must be far enough away (approximately 400 to 500 m) not to be menaced by goats. The compounds (Folorunso 1998) are part and parcel of the farms, surrounded by kitchen gardens where a large proportion of the vegetables are grown, including garden eggs, as well as tobacco and cotton, mostly for local use. A small number of livestock is kept in the compound with occasional sheep, goats and chickens. Most kitchen gardens adjoin orchards where oranges, grapefruit and guava are grown. Immediately beyond the orchards are the farmlands. It can be said that the Tiv live on their farms; however, people in need of additional farming land may move away from their compounds. People usually go to their collateral kinsmen to seek such additional farming land, and they are provided with one or two rooms in the compound of their hosts, which they use while visiting their farms (Folorunso & Ogundele 1993). In general, the Tiv have a complex pattern of settlement through time with homesteads inherited by the eldest son and younger sons establishing satellite settlements radiating away from their childhood home. Pressure on land appears to be increasing as this radial pattern of expansion gradually populates the landscape. However, elucidating the broader historic dynamics of this pattern following models from Marakwet and Bokoni will be undertaken in future research.

The Tiv have a clear gendered division of labour with both men and women clearing the land, but men undertake the hoeing of mounds and ridges and prepare the land for planting, while women undertake planting and weeding (Folorunso & Ogundele
Women harvest yams and other root and vegetable crops, but both sexes perform complementary tasks in the harvesting of grain crops. Both men and women see themselves first and foremost as farmers, and any other craft they practise is carried out in their spare time. Every married woman in Tiv-land has the right to access a farm sufficient to cater for the needs of herself and her dependants. It is obligatory for her husband to provide such a farm and to perform or supervise the heavy work on it. Correlating changing historic patterns of settlement with household structures and thus household labour and land requirements will form a major focus of future research and will complement previously undertaken archaeological research.

Several archaeological sites ranging from the Late Stone Age through the Early Iron Age to the historic period have been identified in the study area (Folorunso 1993a, b, 2005). Excavations at several of these sites (figure 1.3) confirm that populations utilised rock shelters from around the third century BC to the end of the first millennium AD. However, from the fourteenth century, open hilltop settlements dominate the archaeological landscape of Tiv-land. Excavations conducted in two rock shelters at Tse Dura Hill yielded three occupation phases (Folorunso 1993a). The earliest
contained stone chopping tools and small quantities of pottery. Following a hiatus, the second occupation phase contained iron slag, ‘Neolithic’-type artefacts and pottery with radiocarbon dates suggesting it began around the third century BC and ended towards the end of the first millennium AD. The latest phase was restricted to the top-soil and belongs to the historic period, as it contained clay smoking pipes and pottery (Folorunso 2005: 176). Contemporaneous with these recent rock shelter horizons are hilltop settlements. These are characterised by circular-based houses and granaries resembling present-day Tiv compounds and a number have been mapped and excavated in various parts of the Katsina-Ala Valley. These include key sites such as Ushongo and Tse Dura (Folorunso 1993a, b, 2005; Folorunso & Ogundele 1993). Radiocarbon dates suggest fourteenth and fifteenth centuries for these occupations; however, settlement sites with earlier and contemporary occupation may be located on the lower plains where they may be overprinted by more recent settlement and are consequently yet to be identified.

This previous research has exclusively focused on sites of ‘deeper’ antiquity with clearly ‘archaeological’ characteristics and has consequently paid little or no attention to the more recent evolution of the farming traditions of the Tiv, including their field systems and terracing. Six decades of casual observation of Tiv agricultural technology and techniques have shown superficially little variation or change (Bohannan 1954). The crops cultivated and the methods of cultivation certainly reflect an intimate understanding of the environment but Tiv farming traditions have a long history, and changes must have taken place with the adoption of crops introduced from Asia and the New World alongside small-scale innovations and variations. It is this gap in the knowledge of the evolution of the farming traditions of the Tiv that forms the subject for future research in Tiv-land. Building on the existing archaeological and ethnoarchaeological research, we hope to elaborate the changing interplay of social structures and labour with the qualities of land, crops, animals and climate across the recent past and into the present.

Following a successful network meeting in Tiv in January 2015, it is apparent that multiple methods already employed in the Marakwet and Bokoni projects can be usefully applied in Tiv. In particular, oral historical encounters with a range of informants quickly elucidated a range of historic agricultural knowledge concerning changing farming practices, crops and environmental characteristics. The maintenance of soil fertility through time up to the present appears a particularly complex challenge but one not unsusceptible to the types of micro-morphological and chemical soil analysis being applied in Bokoni and Marakwet. Crop histories are complex, with not only a wide range of species apparent but also multiple local varieties, each with detailed historical narratives. Creating botanic collections of these alongside their oral histories would seem to prove especially important. Informants offered considerable detail on
changing settlement patterns over the recent past and suggested means to map, record and explore these historic changes in settlement and population size/structure. The meeting also presented an opportunity to collect samples from riverine soil profiles for palynological and micro-morphological analyses, thus beginning the process of constructing a finely resolved local paleo-ecological sequence.

Following this meeting, the primary objectives will be to establish (a) the earliest crops associated with the Tiv, (b) the timing and introduction of ‘new’ crops and dynamics associated with these events, (c) the effects of the latter on indigenous farming traditions (layout and quantities of land, labour structures and so on), (d) the uses of plants in symbolisms and linguistic expressions of the people, and (e) the impact of these long-term understandings on the operation and implementation of present-day land use and management, especially contemporary challenges of soil fertility and the increasing scarcity of land. The project will rely on ethnography, environmental archaeology, geo-archaeology and oral traditions to achieve these set objectives, making use of both the theoretical and practical insights and capacities developed through the African Farming Network (see discussion below).

**Bokoni, South Africa**

The initial focus of the Bokoni project was less anthropological than the Marakwet and Tiv projects because, unlike in Marakwet and Tiv, there is little continuity between the precolonial and present occupants of the region. However, drawing on the Tiv and Marakwet projects, we have started to broaden our research scope since we recognise that there are substantial continuities in the challenges, such as soil and moisture management, faced by farmers in this region. Moreover, our understandings of the dynamics of farming will remain partial if we do not grapple with historical and current land-use patterns. While our understanding of farming in precolonial Bokoni remains tentative, insights gained through our archaeological research have the potential to contribute to current land reform discussions in the region.

In Bokoni, a series of historical and colonial events from the eighteenth century onwards fundamentally transformed the nature of occupation and farming. However, the agricultural remains found at Bokoni evidence a previously intensively cultivated and densely populated landscape, knowledge of which has much to say about contemporary land use, especially under the current situation of land restitution (figure 1.4). Nevertheless, the only avenue into traditional farming in Bokoni is through the physical network of stone walls, terraces, stone-lined paths and stonewalled roads that mark the location of past agricultural communities (Delius & Schoeman 2008; Delius *et al.* 2012). This archaeological footprint stretches for approximately 150 km south to north, from the rolling grasslands of Carolina in the south, to the rugged mountainous mixed bushveld landscape around Orighstad in the north.
The geography and geology of this region is complex. Among others, the Komati, Elands and Crocodile rivers cut through the numerous valleys and hills in the region. The underlying geology (and thus associated surface soils) is dominated by shale, arenite, granite and gabbro. Most of the regional soils are suitable for forestry and grazing or intermediately well suited for contemporary arable agriculture (Coetzee forthcoming). In the southern and central parts of the region, diabase intrusions occur often. The soils associated with the diabase intrusions are generally nutrient-rich clay soils, but due to the rocky terrain associated with diabase, outcrops are not suited to contemporary mechanised large-scale farming, but could prove useful to small-scale labour-intensive farming. Like the geography, rainfall is variable across the region, ranging from 600 to 1 200 mm per annum (Dent et al. 1989).

The geology and geography of Bokoni helped to shape the configuration of Bokoni stonewalled settlements, but did not determine it. Many of the choices were social. The Bokoni project strives to better understand the choices that informed the past in this region through combining multiple sources of evidence, including archaeological (such as site distribution, soil chemistry, settlement patterns and terrace construction) and historical data (such as oral traditions about Bokoni and missionary records),
alongside ethnographic inspiration and other techniques drawn from the network partners and elsewhere. This combination of sources allows for deeper insights into the experiences of people who lived at these sites, their indigenous technology and regional distribution. These insights into successful past farming practices have relevance in contemporary South Africa where small-scale farming is often viewed as unproductive and government approaches to land reform tend to favour large-scale mechanised farming (Hall 2009).

The Bokoni sites were previously interpreted as the remains of occupations by historically known African communities (Van Hoepen 1939), in particular the neighbouring Pedi (see Evers 1973, 1975; Marker & Evers 1976; Collett 1979, 1982). In the mid-1990s, Schoeman (1997, 1998) linked these stonewalled settlements to oral traditions about Pedi attacks on the Koni, as recorded by Hunt (1931). Consequently, she suggested that these stonewalled sites were the remains of Koni occupations. This insight facilitated the Bokoni project’s search for additional sources on the history of the region. One of the key sources identified was the Master’s dissertation of C.W. Prinsloo (1936), who interviewed people living in the region and wrote a brief account of Bokoni history based on the oral traditions he had recorded (Delius & Schoeman 2008). The dissertation contained important information, including that the northern part of the region that today is marked by stone walls and terraced architecture was remembered in the 1930s as the ancestral homeland of Sekoni speakers. Prinsloo’s (1936) informants referred to the area as Bokoni.

The large-scale spatial correlation between the oral and archaeological data is present at a more refined scale. Sites are not distributed evenly through the region; clusters occur in the Carolina-Machadodorp area, north of Machadodorp, as well as near Lydenburg (Coetzee forthcoming; Mason 1968; Maggs 2008). These clusters are located in similar areas to the sites referred to as the ‘capitals’ Moxamatsi, Moxholxi-Pela and Khuwaneng in the oral traditions recorded by Prinsloo (1936).

The traditions recorded by Prinsloo (1936) facilitated the untangling of the occupation sequence (see Schoeman & Delius 2011; Delius et al. 2012), which had previously been treated as largely contemporaneous (Evers 1973, 1975; Marker & Evers 1976; Collett 1979, 1982). Now four phases are recognised. The earliest phase, which predates the eighteenth century, centred on the Komati River valley. Site selection was informed by agricultural concerns, and nutrient-rich diabase soils were favoured (Solomon 2012). The largest site density in Bokoni occurs in this southernmost zone (Coetzee forthcoming), and several sites show substantial amounts of superpositioning, which speaks to the duration of this occupation phase (Schoeman forthcoming). This phase came to an end when the violence in the region increased, leading to the abandonment of Moxamatsi. During the next phase, sites remained located on open rolling hills that were well suited to terrace agriculture. It is likely
that refugia situated in gorges and other defensive locations were established at this time, but they would have been used only when needed. The third phase, dating from the mid-eighteenth to the mid-nineteenth centuries, was characterised by endemic regional conflict. Consequently, refugia became sites of permanent settlement and were transformed into strongholds; open-air sites were largely abandoned. This appears to have been a widespread pattern and important sites in neighbouring polities, such as KoNomtjarhelho in the Ndzundza area, also become fortified strongholds. The final phase in Bokoni history is characterised by dispossession and dispersal, and signalled an end to the distinct Bokoni stonewalled and terraced architecture (Schoeman & Delius 2011; Delius et al. 2012).

While violence dominates the historical narratives (see Hunt 1931; Prinsloo 1936; Van Warmelo 1944a, b), the majority of archaeological sites in the region are located on gentle slopes in non-defensive contexts close to streams and rivers. These locations speak to farming-related choices and the development of an agricultural system in which managing land, crops and livestock played a central role. This system is materialised in the dense hillside agricultural terraces, which are intersected with roads that led livestock out of the villages and homesteads to the valleys, presumably to grazing.

The importance of agriculture is also manifest in Southern Phase 1 villages and isolated homesteads that show a strong preference for clay soils. Some of these nutrient-rich clay soils resulted from diabase weathering (Solomon 2012). The magnesium calcium cation ratios of these diabase soils are not ideal for agriculture. However, magnesium leaches out more easily than calcium and consequently the cation ratios on the slopes are suitable for agriculture while the cation ratios in the valleys are not (Delius & Schoeman 2008). Managing these soils to ensure maximum yield for African domesticates would have been an important strategy during the changing climatic conditions in the region over the last 600 years (see Hattingh 2013; Sjöström 2013). Terracing and a range of soil management strategies ensured that these clay soils were suitable for farming African crops (Solomon 2012), which according to preliminary macro- and micro-botanical remains initially included finger millet (*Eleusine coracana*), pearl millet (*Pennisetum glaucum*) and sorghum (*Sorghum bicolor*) (Collett 1979; Hattingh 2013). In order to better understand how traditional African crops would have responded to the conditions, an experimental cultivation plot was established in southern Bokoni. Here a range of traditional African crops are cultivated. These crops are used to establish a comparative phytolith database. In addition, changes in soil chemistry are monitored annually and results will be presented in future articles.

Systematic archaeological research has been conducted for only the last four years by the Bokoni archaeological research project, but our research has placed Bokoni back on the southern African historical and archaeological agenda. The significance
of Bokoni for contemporary research is twofold. First, the approach to farming in this region is visible and thus creates scope for a new approach to the archaeology of farming and farming communities in South Africa. Second, because Bokoni was ‘forgotten’ in academic discourse for most of the twentieth century, it has largely remained outside of colonial and apartheid identity categories. This tabula rasa has aided the Bokoni research team (such as Delius et al. 2012; see also Widgren et al. forthcoming) to develop a finer understanding of the formation and character of this precolonial society. Notwithstanding this nuanced approach to farming, landscapes and society advocated by the Bokoni archaeological research project, some scholars have tried to impose colonial and apartheid categories onto the people of Bokoni.

The Bokoni archaeological research project is also trying to shift the focus away from generalised cultural systems to a scale where households become visible. Focusing on the household offers ‘a theoretically informed counterweight to the large-scale systems and processes that are frequently invoked by archaeologists to explain social and cultural change’ (Pluckhahn 2010: 332). Working at this scale allows us to focus on what households do and this facilitates the development of a humanised reconstruction (Tringham 2001: 6925–6926) of the Bokoni past. Central to our focus on households is the recognition that during the first two phases of the Bokoni sequence, hillside slopes were not reserved for farming, but were also the location of the homesteads. The homesteads were generally surrounded by terracing, and tended to consist of multiple houses around a central livestock enclosure. This homestead configuration is similar to that of most farming communities in southern Africa (see Kuper 1980), and if these spatial similarities reflect social similarities, each house would have been under the control of a woman. Similar to the women in Marakwet and Tiv, these women would have been responsible for running the households, as well as for the day-to-day labour associated with farming. In this context, the embeddedness of the homesteads in the terraces would have assisted women in balancing their household and farming duties.

Our present understanding of the relationship between labour and space will be deepened through further research. The pursuit of this topic in Bokoni will articulate with the collaborative and comparative research by all three projects into the relationship between space, social structure and the management of agricultural labour. This is one of the areas of ongoing comparative research discussed in the next section.

**Discussion: comparative research topics and developing capacity**

Over the last three years, the African Farming Network has provided the space to share and discuss a wide range of common research interests and methods. Although widely disparate in terms of context and geography, the many intersecting concerns of the partner projects, some already noted above, have been encouraging. In particular,
we would like to highlight five complementary areas in which each project will continue or develop research. We also hope to develop skills and training across these themes and to share these research capacities between the partner projects. We have already had some success in this regard with a number of complementary graduate and postdoctoral research projects under way, supported and informed by the network.2

1) Archaeologies of households, settlement patterns and land use

Each of the network projects is grappling with understandings of the physical layout of domestic households/compounds and how these reflect social structure (kinship, descent, marriage), which in turn relates to the availability and management of agricultural labour. In both Marakwet and Tiv, contemporary compounds and direct historical data provide a rich context to explore the material manifestations of social organisation. However, in both projects there is a need to extend this present-day and late twentieth-century data backwards in time through detailed survey, excavation and sampling (of both recently and older abandoned households). Such studies are significant for they help us to better understand present-day demographic trends, carrying capacity, changing relations of gender and generation and local population impacts. The intersection between household compositions and the life cycle of households also helps us to understand the nature of changing settlement patterns and what these mean in terms of fluctuating population sizes and density. In particular, understanding how, why and where people abandon and create new households and over what timescales (annual, decadal, generational) allows us to begin to quantify what the archaeological record actually means in terms of population size and structure. At the same time, understanding the temporal and spatial nature of settlement also impacts on understandings of land use, including the kinds and quantities of land required at any one time and the positioning of those lands vs settlement. This allows us to make predictions as to the nature and extent of land use and human impacts, and to actively test this through targeted surveys, analyses of soil profiles (chemistry and micro-morphology) and vegetation regrowth patterns. In both Marakwet and Tiv, earlier ethnographic work on household compounds and social organisation is being revitalised and combined with wider surveys of recent and historic settlement patterns and land use. This work is informing the 'household' approach at Bokoni, which is grappling with high-resolution habitation sequences and possible geo-archaeological (especially soil chemistry), archaeo-botanical (especially phytoliths) and dating (OSL [optically stimulated luminescence] and TL [thermoluminescence]) methods of understanding spatial behaviour at domestic and landscape scales. These specific technical analyses being developed in Bokoni will be usefully employed in Marakwet and Tiv to extend those sequences backwards in time.
Each of the projects aims at a high chronological resolution reflecting continuous lived experiences (decadal analysis vs centennial) rather than discontinuous chronological ‘periods’.

2) *Archaeologies of land and labour*

Closely allied to analysis of households and settlement patterns is understandings of social structure and its role in labour mobilisation and access to land. Again, both Marakwet and Tiv point to the ways in which patterns of descent and marriage condition access to land and the labour available to work land at household and wider social scales. Patterns of descent often condition the size of productive units (as in single household vs communal cultivation by lineages), which in turn shape settlement patterns and pattern of land use. For example, in Marakwet, patrilineal descent and residence creates clustered patterns of related male-headed households with adjacent cultivation plots. However, labour is mobilised in at least two ways with some plots cultivated solely at the household level and others (in different locations and with a different system of fallow) cultivated communally at the lineage level. These different patterns of labour and land use thus also have different temporal and biophysical characteristics with different soil chemistries and micro-structures. Similarly, patterns of marriage condition the size of households (via degrees of polygamy and patterns of patri-/matrilocality) and thus the labour force and quantity of land available/needed. There is a balancing act between having enough people to cultivate land, enough land to support the extended household and enough ‘capital’ (especially bride wealth, cattle and so on) to marry. However, while this is well understood ethnographically, it has rarely been explored through time, despite the fact that changing household sizes and structures (identified by structures, hearths, grindstones and refuse deposits) have much to say about relative wealth, population density, land pressure and anthropogenic impact. Again, in Marakwet and Tiv, ethnography and ethno-history provide context, but the archaeological methods developing in Bokoni offer the potential to extend these sequences into deeper time. In Bokoni, the extensive evidence of stone-built households, field walls and terraces offers unique potential to understand changing land–labour relationships, even in the absence of relevant ethnography, and also to relate these deeper-time understandings of land management to present-day land-use conditions.

3) *Archaeologies of soils, plants, animals and water*

Each network project deals with specific issues of soil and water management, which might be recast as indigenous technical and environmental knowledge. The projects evidence sophisticated and innovative forms of soil conservation (terracing, lynchets, stone lines, field boundaries), soil fertility maintenance
(possible manuring, mulching, burning of regrowth), fallowing regimes (with multiple cycles in each system), crop rotations, inter-cropping (cereals, legumes, vegetables) and histories of crop succession (African domesticates, Asian domesticates, American domesticates, cash crops).

Also evident is the inter-management of animals and crops with a range of possibilities, from the complex animal enclosures and cattle roads of the mixed Bokoni system through to the development of specialised separate herding communities (such as the Pokot) around the specialised Marakwet farmers. Each project thus investigates how these different techniques are balanced in specific contexts alongside issues of labour, demography, land quality and climate. Again, the projects demonstrate not only the sophistication of the engineering and technology of precolonial African agricultural systems, but also the range of variation employed across the continent and through time.

As sub-fields, we envisage the development of distinct archaeologies on topics such as ‘anthropogenic soils’, ‘anthropogenic vegetation’ and ‘human–crop relations’, with each explored through a range of archaeological, oral historical and ethnographic techniques and taking into account both scientific and humanistic perspectives.

4) Archaeologies of daily lives, landscapes and time

The diachronic and household–landscape perspectives applied by each project offer a unique temporal and spatial resolution not normally applied in standard ethnographic and experimental studies of rural farming systems. One key is the mapping out of landscape activities (from daily tasks to more singular events) and features at a range of scales both archaeologically and ethnographically. Thus the projects aim to move beyond the analysis of single ‘sites’ and toward an understanding of more continuous landscape features such as field boundaries, paths, irrigation channels, vegetation patterns and anthropogenic soils. A second key is the recognition of the temporal scales (daily, annual, life cycle, generation) at which activities are conducted and thus over which the landscape is formed. Understanding these scales provides a more nuanced concept of the palimpsest which is the landscape and how this might be explored archaeologically. Of particular importance is the issue that certain elements of the landscape accrue incrementally, being shaped and altered continuously over time, while others are subject to varying degrees of punctuated change involving single or multiple discrete phases of construction (but also with abandonment, reconstruction and reorganisation at different temporal and spatial scales). Thus we are beginning to realise how necessary it is to not simply refine our periodisation, but to move beyond standard archaeological notions of distinct chronological phases and punctuated change and toward continuous
views of human action with variable cycles or scales, including concepts of social time involving the rhythms of daily life, the life cycle and inter-generational time. Naturally this requires finely resolved systems of dating and each project already employs a range of (ethno) historical sources alongside radiometric techniques, but we will continue to pursue the development and correlation of high-resolution temporal analyses. Marakwet and Tiv provide the ethnographic inspiration for these temporal and spatial analyses but in each case the temporal patterns observed in the recent past need deeper historical context. In Bokoni, the lack of an ethnographic present has driven experimentation with detailed excavation and sampling, and while these techniques are yet to come to full fruition, the expertise already developed bodes well for Bokoni and the partner projects.

5) **Community research and useable pasts**

When working on the history and archaeology of living landscapes we believe that it is necessary to draw on the deep historical understandings of the local community itself. Consequently, each partner project holds a commitment not only to provide feedback to the local community but also to engage the community in the research process and to utilise local understandings and knowledge so as to drive interpretation and project design. In Bokoni this aim is more complex, but the team has begun to engage with communities who now live in the region. Local engagements are well established in Marakwet and are being reignited in Tiv. Complementary to this general aim is the attempt to produce knowledge with contemporary relevance for present-day environmental and agricultural management. As the topics above indicate, the types of economic, social and environmental data under exploration should be of considerable contemporary relevance (see for example Davies 2012). However, the means of presenting and communicating this information in an effective format are still under development. In Marakwet, the employment of a full-time local research team and the establishment of a permanent research centre seem to be positive experiments in community engagement, but time will tell how successful these and other developing techniques (schools education programmes, online resources and so on) will be. Certainly, moving our research engagements (and publications) beyond the archaeological community and into development practice and policy will be one major future challenge. As noted above, in Marakwet, the research is already engaging with an ongoing agricultural development project funded by the Red Cross and is utilising project data to develop a critical understanding of this initiative. In Bokoni, engagement with broader heritage stakeholders is well under way and a heritage tourism project has been piloted. In addition, the team has started to work with small-scale farmers in southern
Bokoni. In Tiv, preliminary data collected in January 2009 suggest that there is considerable contemporary scope for developing archaeologies and oral histories of settlement patterns, population growth, soil fertility and crops with real contemporary relevance.

**Conclusions: resource sharing and capacity building**

The African Farming Network hopes to contribute to a re-evaluation of precolonial African farming systems by demonstrating their often underestimated complexity and sophistication. Ultimately, we hope that comparison of common themes across the network will allow for an assessment of some of the Africa-wide variations and common solutions in each area while also generating knowledge that will be of use in the management of present-day African landscapes. We hope also to establish effective common methods for the study of these topics applicable across the continent. Key to this endeavour is the establishment of common pools of shared talent and research capacity which may be deployed and utilised by different projects, irrespective of country or region.

The final and perhaps most significant immediate outcome of the African Farming Network thus appears to be the potential for collaboration on issues of scientific analysis and developing opportunities for collaborative training, capacity building and resource sharing. The Bokoni team hopes to share scientific archaeological insights and skills with Kenyan and Nigerian students in areas such as dating, soil science and the analysis of phytoliths, and to build up unique reference botanic collections (Hattingh 2013; Sjöström 2013). Also apparent are opportunities through the UK contingent to develop analyses of African crop genetics and to build on the existing Bokoni expertise in soil science through the addition of micro-morphology. Similarly, the Tiv team has an important skills set in palynological research focused on the relatively recent past, which will deepen insights into environmental context and farming in both Bokoni and Marakwet (Orijemie & Adebisi Sowunmi 2013). Indeed, pollen samples from both Tiv and Marakwet have already been collected for analysis by one of us (Orijemie), with the aim of exploring agriculture-related pollen regimes across Africa. In Marakwet, the extensive use of local researchers to GPS-map the landscape, the integration of landscape and oral historical data, and the establishment of a major project GIS offer replicable field methods and a source of expertise in spatial analysis which can be exported across the network. Finally, the ethnographic components of both Marakwet and Tiv provide well-established testing and training grounds for ethnographic and ethnoarchaeological research and to build contemporary reference collections (of crops and soils, among others), which we hope will be explored by students from each of the respective partner countries.
Ultimately, the African Farming Network remains at an experimental stage, but the insights already generated and the possibilities for future collaborative and pan-African research seem extensive and exciting.

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**Notes**

1 Full details on the Marakwet project will be presented in future articles. Unpublished project reports from 2011, 2012 and 2013 can be accessed via the project website: http://marakwetheritage.com/writing/project-reports/.

2 Davies, three-year Leverhulme postdoc on ‘applied agro-archaeology of Eastern African farming systems’ (Cambridge); Orijemie, application for two-year Newton International Fellowship postdoc on the long-term history of farming in Tiv (Cambridge); Hattingh, doctoral project on African domesticate phytoliths (Witwatersrand); Lunn-Rockliffe, doctoral project on Marakwet foragers (Oxford); Warren, planned doctoral project on Bokoni ceramics (Witwatersrand); Nongadi, doctoral project on farming in south-east Nigeria (Cambridge); Solomon, Master’s project on Bokoni soil chemistry (Witwatersrand); Coetzee, Master’s project on the regional distribution of Bokoni sites (Pretoria).

**References**


