Quaternary International xxx (2017) 1–20

Contents lists available at ScienceDirect

Quaternary International

journal homepage: www.elsevier.com/locate/quaint

Subsistence mosaics, forager-farmer interactions, and the transition to food production in eastern Africa

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ARTICLE INFO

Article history:
Received 16 March 2016
Received in revised form
8 December 2016
Accepted 13 January 2017
Available online xxx

Keywords:
Bantu expansion
Iron age
Pastoralism
Agriculture
Archaeobotany
Zooarchaeology

ABSTRACT

The spread of agriculture across sub-Saharan Africa has long been attributed to the large-scale migration of Bantu-speaking groups out of their west Central African homeland from about 4000 years ago. These groups are seen as having expanded rapidly across the sub-continent, carrying an 'Iron Age' package of farming, metal-working, and pottery, and largely replacing pre-existing hunter-gatherers along the way. While elements of the 'traditional' Bantu model have been deconstructed in recent years, one of the main constraints on developing a more nuanced understanding of the local processes involved in the spread of farming has been the lack of detailed archaeobotanical and zooarchaeological sequences, particularly from key regions such as eastern Africa. Situated at a crossroads between continental Africa and the Indian Ocean, eastern Africa was not only a major corridor on one of the proposed Bantu routes to southern Africa, but also the recipient of several migrations of pastoral groups from the north. In addition, eastern Africa saw the introduction of a range of domesticates from India, Southeast Asia, and other areas of the Indian Ocean sphere through long-distance maritime connections. The possibility that some Asian crops, such as the vegecultural 'tropical trio' (banana, taro, and yam), arrived before the Bantu expansion has in particular raised many questions about the role of eastern Africa's non-agricultural communities in the adoption and subsequent diffusion of crops across the continent. Drawing on new botanical and faunal evidence from recent excavations at a range of hunter-gatherer and early farming sites on eastern Africa's coast and offshore islands, and with comparison to inland sites, this paper will examine the timing and tempo of the agricultural transition, the nature of forager-farmer-pastoralist interactions, and the varying roles that elements of the 'Bantu package', pastoralism, and non-African domesticates played in local economies. This paper highlights the complex pathways and transitions that unfolded, as well as how eastern Africa links into a broader global picture of heterogeneous, dynamic, and extended transformations from forager to farmer that challenge our fundamental understanding of pre-modern Holocene societies.

1. Introduction

Nearly one hundred years after V. Gordon Childe (1936) coined the term 'Neolithic Revolution' to refer to the shift to food production that occurred in various societies globally from the early Holocene, major debates continue to surround our understanding of this transition. In particular, the expansion of agriculture out of core centers of domestication, and the contrasting roles hypothesized for processes of migration, diffusion, replacement, and assimilation, remain key foci of study and discussion. At the heart of the debate concerning the mechanisms and agents involved in the prehistoric spread of agriculture are polarized models that specify primary roles for either migrating farmers or indigenous foragers. With their roots in contrasting hypotheses developed to explain the agricultural expansion across Europe from the Near East (e.g., Dennell, 1983; Ammerman and Cavalli-Sforza, 1984; Price and Gebauer, 1995; Cavalli-Sforza, 2002; Pinhasi and von Cramon-

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http://dx.doi.org/10.1016/j.quaint.2017.01.014

Taubadel, 2009; Morelli et al., 2010), these hypotheses have come to dominate views on the spread of agriculture in nearly every region of the world. Key to addressing the broad question posed by this special volume, 'Did foragers adopt farming', is the development of empirically-informed regional models for farming dispersals based on the systematic collection of well-dated archaeobotanical and zooarchaeological data. Indeed, where such datasets are accumulating worldwide, it is becoming increasingly clear that the spread of agriculture was a complex and multifaceted process that, at different times and places, included historically-contingent factors of migration, diffusion, interaction and innovation (e.g., Fuller, 2006; Zeder, 2008; Barker, 2009; Baird et al., 2012; Denham, 2013; Spengler et al., 2014; among many others).

Although often marginalized or overlooked in the development of models for agricultural origins, Africa presents unique and theoretically informative case studies for global comparison. Eastern Africa is of particular interest for understanding farming expansions, not only because of its location encompassing the hypothesized migration routes of Bantu-speaking farmers and Cushitic- and Nilotic-speaking herders (Fig. 1), but also owing to its potentially early involvement in Indian Ocean trade, which brought novel domesticated plants and animals to its shores in prehistory. It has been suggested that eastern Africa's pre-agricultural communities had a role in dispersing vegetative crops such as banana (*Musa* spp.), taro (*Colocasia esculenta*), and Asian yam (*Dioscorea alata*) (all of which were first domesticated thousands of kilometers to the east in Sahul) across the tropical forests of Africa as early as the first millennium BCE (De Langhe, 2007; Blench, 2009).

A major hindrance to the development and refinement of models for the spread of agriculture in sub-Saharan Africa and the arrival of Indian Ocean crops has been the lack of large-scale, systematically collected, and directly AMS dated archaeobotanical and zooarchaeological data (see Boivin et al., 2013; Lane, 2015 for recent reviews). Until recently, few archaeological projects in Africa employed flotation and other methodologies explicitly aimed at recovering archaeobotanical materials—a situation particularly pronounced in regions outside the main centers of crop origins, where most systematic archaeobotanical efforts have been focused (see studies reviewed in Fuller and Hildebrand, 2013; Fuller et al., 2014). This lacuna has hindered not only agricultural origins research, but also our understanding of how agriculture spread relative to other food production systems such as pastoralism (as noted by Marshall, 1991; Marshall and Hildebrand, 2002), as well as what social conditions underpinned the transitions to food production (discussed by Lane, 2004). In the absence of empirical archaeobotanical and zooarchaeological evidence, most narratives relating to the origins and spread of farming across vast swathes of the sub-continent have been told by historical linguistics, and based on an assumed correlation between archaeological cultures and the spread of food producers (e.g., Ehret, 1974; Philippson and Bahuchet, 1994-95; Ehret, 2002; Phillipson, 2002, 2005). Inadequate datasets have hindered the emergence of more subtle narratives for eastern African prehistory that recognize local complexity, and the operation of diverse processes of replacement, admixture, interaction and resistance in encounters between expanding and existing populations, as well as less dualistic classifications of 'farmers' and 'foragers'. These considerations have been addressed by several researchers in discussions of late Holocene socioeconomic 'mosaics' in eastern Africa (see Section 2 below), but further exploration is impossible without new archaeological datasets.

In this paper, we draw on the results of a recent program of systematic archaeobotanical and zooarchaeological research to attempt a more nuanced discussion of the process by which agriculture spread to the eastern African coast and offshore islands (Fig. 2) over the past two millennia. We not only examine evidence for the roles of 'foragers', 'farmers', and 'herders' in the agricultural transition, but in light of growing evidence showing the fluid and dynamic nature of subsistence during the early farming period, we also discuss the ambiguity of applying these terms archaeologically in eastern Africa (see also Kusimba, 2003; Kusimba and Kusimba, 2005; Kusimba, 2005). We highlight the often poor archaeological visibility of early food production at sites from this region, and consider how this impacts our ability to develop empirically-informed models for the spread of farming. We conclude by discussing the implications of emerging evidence from eastern Africa for broader understandings of agricultural origins and spread, particularly in tropical contexts.

2. Models for early farming in eastern Africa

2.1. Background to African crop and livestock origins

Africa presents unique case studies for agricultural origins research. African pathways to food production were not only regionally diffuse and diverse, but also followed different trajectories to those of more familiar Near Eastern and East Asian narratives in which sedentary foragers become farmers around the turn of the Holocene. In Africa, in contrast, food production initially focused on mobile herding, with crop domestication developing several millennia later in a number of geographically separate centers in the southern Sahara, the Sahel, and Ethiopia (Fig. 1) (Marshall and Hildebrand, 2002; Fuller and Hildebrand, 2013; Lane, 2015). Mobile herding economies focused on cattle (*Bos taurus*), goat (*Capra hircus*), and sheep (*Ovis aries*). The latter two species were introduced to the continent from southwestern Asia by c. 6000 BCE, with proposed translocation routes including the Sinai, Mediterranean and Red Sea coasts, and the Horn. An earlier and contested independent domestication has been proposed for cattle c. 8000–6000 BCE from wild populations of *Bos primigenius africanus* in northeastern Africa (evidence reviewed by Gifford-Gonzalez, 2005; Marshall and Weissbrod, 2011; Stock and Gifford-Gonzalez, 2013); alternatively or additionally, cattle could have been introduced from southwestern Asia. Another African domesticate, often overlooked, is the donkey (*Equus asinus*), which appears on the basis of genetic and limited archaeological data to have been domesticated in two separate events, perhaps as early as the 5th millennium BCE, from populations of wild ass (*Equus africanus*) in northeastern Africa, and possibly also Arabia (Marshall and Weissbrod, 2011; Kimura et al., 2013).

Native African crops were domesticated in at least five different centers of origin (Fig. 1), from which they dispersed not only across the continent and to southern Africa by the late first millennium CE (Mitchell, 2002; Boivin et al., 2013), but also—and, remarkably, much earlier—as far as the Indian subcontinent by the start of the second millennium BCE (Fuller, 2003; Fuller and Boivin, 2009). The crops most relevant to our study are the three major African cereals, pearl millet (*Pennisetum glaucum*), sorghum (*Sorghum bicolor*), and finger millet (*Eleusine coracana*), and the legume cowpea (*Vigna unguiculata*). Pearl millet derives from the West African Sahelian zone, with archaeobotanical evidence for its domestication dating from the second half of the third millennium BCE in northeast Mali (Kahlheber and Neumann, 2007; Manning et al., 2011). Sorghum appears to have been domesticated on the northeastern savannas of Sudan sometime before 2000 BCE (Stemler et al., 1975; Beldados and Costantini, 2011; Fuller, 2014). The third major indigenous African cereal, finger millet, was probably first brought into cultivation somewhere between the uplands of Ethiopia and the Great Lakes region

Please cite this article in press as: Crowther, A., et al., Subsistence mosaics, forager-farmer interactions, and the transition to food production in eastern Africa, Quaternary International (2017), http://dx.doi.org/10.1016/j.quaint.2017.01.014