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Front cover. Cattle and two goats\gazelle from Site GRD-14 in the Wadi Gorgod (photo Hamad Mohamed Hamdeen).

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The biocultural heritage and historical ecology of date palm cultivation in Nubian villages, northern Sudan

Philippa Ryan, Mohammed Hassan, Mohamed Saad, Marcus Jaeger, Caroline Cartwright, Dorian Fuller and Neal Spencer

Introduction

The date palm (*Phoenix dactylifera* L., Nobiin *fenti*, Dongolawi *benti*, Arabic *baleh*) has long been a culturally and economically important fruit crop in arid regions of North Africa and Western Asia (Osman 1984; Zaid and de Wet 2002; Chao and Krueger 2007; Hazzouri *et al.* 2020). Its cultural importance is embedded in its multiple uses for food, medicine and diverse crafts, and its antiquity is well established from archaeological, artistic, and textual sources (Batal 1991; Nevling Porter 1993; Bell 2006; Zohary *et al.* 2012, 157). Reflecting this, the ‘knowledge, skills, traditions, and practices’ of the date palm were recently inscribed on the UNESCO Representative List of the Intangible Cultural Heritage of Humanity (NO. 01509). The application was jointly proposed by 14 states, including Sudan.

Loss of crop diversity, disappearing local knowledge about crop varieties and practices, and climate change are major global challenges (IPBES 2019). Whilst date palms are key crops within arid regions, due to their ability to cope with stress, productive cultivation also requires large amounts of water, thus is increasingly challenging to sustain (Chao and Krueger 2007; Hazzouri *et al.* 2020). Biodiversity and traditional cultivars in many countries in North Africa are under threat, including Sudan, and reasons cited include land use and environmental change, pests and ageing groves, and, along the Nile, habitat loss following the construction of dams (Elshibli and Korpelainen 2009; Bekheet and Taha 2013; Ezebilo *et al.* 2013).

Sudan has the driest conditions for date cultivation across the globe, and aside from Pakistan, also the hottest (Zaid and Wet 2002). There are date varieties specific to Sudan described as especially arid resistant (Elsafy *et al.* 2015). Small-scale date palm cultivation persists alongside modern large-scale irrigated plantations. This paper takes a long-durée view of regional date cultivation, drawing on archival and archaeological sources, grounded in the perspectives of Nubian farmers in the Sukoot region (Figure 1). This long-term view allows exploration of how today’s cultivation practices are rooted in the past, what is continuous or changing alongside newer approaches, and the relevance of older practices to future resilience. We also ask how present day/recent past perspectives can help us further interpret the archaeological record of date cultivation and consumption.

Background

Date palm biology, biogeography, and early cultivation

The date palm is in the palm family *Arecaceae* and is dioecious, meaning that there are separate male and female plants. Trees grow up to 30m in height, and their average age is 40-50 years, although they can be productive for up to 150 (Chao and Krueger 2007). The distribution is restricted to semi-arid to arid climates, today including parts of the Americas and Australia, but its long-term cultivation is centred on North Africa, the southern Levant and Iraq, and South Asia (Sauer 1993, 182).

Date palms were first cultivated in the Arabian Peninsula and Iraq c. 7000-6000 years ago, spreading with the rise of urban societies to the Indus, the Levant, and the Nile Valley (Tengberg 2012; Flowers *et al.* 2019; Fuller and Stevens 2019). Early cultivation selected for increasing fruit size, especially between 3500 BC and AD 500 (Fuller 2018). Wild dates have been identified in Oman, and the Arabian Peninsula is suggested as the main region of domestication (Gros-Balthazard *et al.* 2017). Genomic studies have revealed

that date palms in Arabia and North Africa form distinctive genetic groups, and this has been shown to be particularly connected to past hybridisation between North African date palms and its sister *Phoenix* species, notably the Cretan palm *P. theophrasti* (Mathew *et al.* 2015; Flowers *et al.* 2019; Pérez-Escobar *et al.* 2021).

Cultivated date palms were established in Egypt and northern Sudan by c. 2000 BC, during the Egyptian Middle Kingdom. Date stones have been recovered from numerous sites in Egypt, from more sites than Sudan, and following a similar pattern. Some cultivation in the Middle Kingdom is suggested by stones recovered from several sites, but the numbers of sites increases after this time, suggesting cultivation was more established by the New Kingdom (Flowers *et al.* 2019; Murray 2000, 617; Zohary *et al.* 2012, 161). Finds prior to the Middle Kingdom are of unclear status. The finds recovered from predynastic and Neolithic contexts are regarded as intrusive, whilst fragments of fruits recovered from Giza may reflect trade (De Vartavan and Amoros 1997; Murray 2000, 617; Malleson and Miracle 2018; Tallet 2019; Flowers *et al.* 2019, SI table; R. Friedman pers. comm.). In the New Kingdom, palm trees are depicted in tomb art, and in ornamental gardens such as in the tomb of Nebamun (Parkinson 2008). Similarly, there are images in tomb paintings of date palms together with *doum* palms in the tomb of the Nubian prince Djehutyhotep from Debeira (18th dynasty) in northern Sudan (Säve-Söderbergh 1960). These images suggest date palms were now widely known and cultivated, but it may still be the case that their cultivation was relatively specialised or limited. Wendrich's (1999, 145) study of basketry from New Kingdom Amarna found none made of date palm.

Several factors probably enabled the transition from small-scale cultivation to more established and productive groves. Firstly, by the New Kingdom in Egypt and Sudan the *shaduf* would have aided the establishment of new seedlings, but this would have been labour intensive, and thus easier after the introduction of the *saqia* by the 1st millennium AD. Secondly, although the practice of artificial pollination



Figure 1 (from left). a) Map showing the location of Ernetta and the Sukoot; b) Google earth image of Ernetta Island and Abri, February 2017; c) Corona Satellite imagery of Ernetta Island and Abri 1968.11.17.

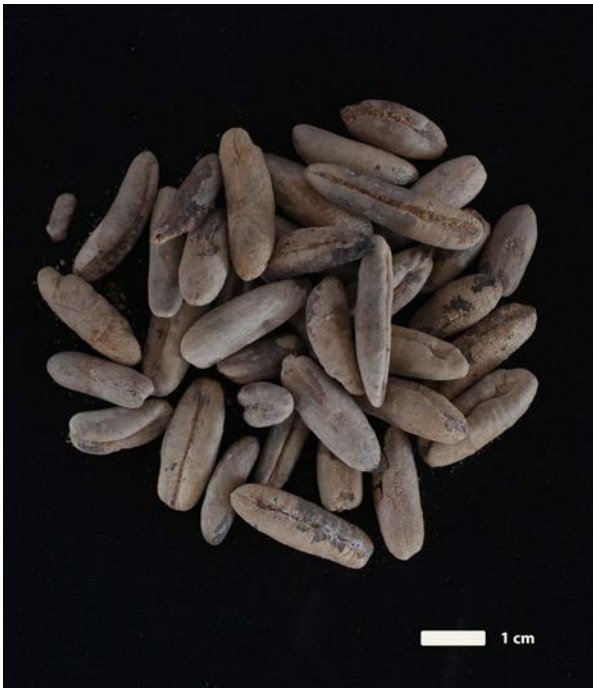


Figure 2. Date palm stones from Tomb G321 in cemetery D at Amara West.

and propagation may have arrived with dates in North Africa, setting up established areas of vegetatively propagated dates takes at least four years to know if trees from seeds are female or male, and ten years for a tree to start producing offshoots. Areas of long-term date palm cultivation would have been periodically interrupted by shifting riverine dynamics, including phases of Nile channel contractions in Sudan, which became more stable after the mid-1st millennium BC (Macklin *et al.* 2015).

In northern Sudan date palm cultivation follows a similar history to Egypt. The earliest finds are from three sites dating to the first half of the 2nd millennium BC, one of which was a Middle Kingdom Egyptian fort, and the other two Kerma period graves, where possible date palm charcoal was also recovered (NDRS: P1 and P37) (Cartwright 2001). Subsequently, there are limited finds dating to the New Kingdom at Sai Island in the second half of the 2nd millennium BC (Heinrich and Hansen 2000). Finds from an elite grave at Amara West (Figure 2) were found

within a context that included pottery spanning the late New-Kingdom and Napatan (late 2nd millennium-early 1st millennium BC), but wild *doum* palm fruits and charcoal were commonly recovered from the New Kingdom town (Ryan *et al.* 2012; Cartwright and Ryan 2017). Dates were more frequently recovered, though in small numbers, from the Napatan period at Kawa in the 1st millennium BC (Fuller 2004).

The rich data set from Qasr Ibrim extends evidence of established cultivation spanning the 1st millennium BC to the 16th century AD, indicating a continuous history. Additionally, residue analyses from the ceramics indicate the processing of palm fruits in the post-Meroitic era, whilst a wide range of basketry forms from the 1st millennium AD onwards indicate that the date palm was grown widely enough to be a multipurpose crop (for food, crafts, materials etc.) (Wendrich 1999, 145; Copley *et al.* 2001; Clapham and Rowley-Conwy 2007). There are relatively limited finds of date stones across wider Nubia, from just four other sites, during the 1st millennium-mid-2nd millennium AD (Fuller and Edwards 2001; Madani *et al.* 2015, and see SI tables Flowers *et al.* 2019). However, the establishment of the date palm during the Meroitic and post-Meroitic periods is further indicated by its use as an artistic motif (Fuller and Lucas 2021).

Old Nubian texts indicate the existence of riverine groves from around 1000 years ago. A text recovered from Qasr Ibrim, in Lower Nubia (close to the border with Sudan), refers to a legal document drawn up to secure the passing on of an inherited date palm to the owner's eight descendants in the 12th century AD (Ruffini 2012, 88), clear evidence for multigenerational ownership of trees, a phenomenon that persists today.

Traditional cultivation in Sudan

In Sudan, the historic region of date palm cultivation has been northwards of the Atbara along the Nile, with some cultivation southwards towards Khartoum, and in small oases in the Red Sea area and Darfur (Bacon 1948; Ahti *et al.* 1973; Osman 1984; Elshibli and Korpelainen 2009). This distribution reflects rainfall patterns, which are virtually nil at the border with Egypt, have a mean of 68mm around the Atbara and 162mm by Khartoum (Walsh 1991). Riverine stretches of the core area of date palm diversity and heritage were submerged by the building of the Aswan High Dam in the 1960s, which flooded the town of Wadi Halfa and villages stretching northwards of the Sukoot between the Dal Cataract and Aswan in Egypt, and by the building of the Merowe Dam between 2003 and 2009 at the 4th Nile Cataract (Ahti *et al.* 1973; Malterer 2013).

The use of canals and diesel pumps, and further advances in irrigation technology, has enabled the expansion of agriculture and date cultivation into previously uncultivated areas further from the Nile (Tracey 1948; Wilson 1991; Fragaszy and Closas 2016). The development of larger agricultural schemes in the 20th century has been concentrated in inland depression areas between the 3rd to 6th Cataracts, for example the Seleim and Kerma Basins in the Northern Dongola Reach. In contrast, northwards from the 3rd Cataract as the river flows through the Mahas and Sukoot regions, the riverbanks become steeper and stretches of cultivable land more limited (Tahir 2007, 6).

In general, the cultivation of date palms is achieved through vegetative propagation to obtain consistent production and quality (Sauer 1993, 183). Dates can grow from seedlings, but growing dates from seed is unpredictable as the palm can be male or female, and the quality of the fruit will not be known for at least four years, and by the early 20th century in Egypt clonal propagation had long been the favoured practice (Foaden and Fletcher 1910, 647). Historic literature (discussed below) shows that plantation irrigation and large-scale canal systems were far more established by the early 20th century in Egypt than Sudan (Mason 1927, pls 1 and 2), but also that stretches of the river in southern Egypt were still dominated by ‘seedling’ cultivation.

For fruit production, male plants can be used to fertilise around 20-50 female trees, although some wind or insect pollination may still occur (Chao and Krueger 2007). This long-established practice of manually pollinating trees has been identified from artistic sources dating back around 4000 years in Mesopotamia (Nevling Porter 1993). Offshoots produced towards the base of the trunk of specific trees are selected, and there are possibly thousands of distinctive cultivar varieties, distinguished on the basis of fruit traits including around 400 identified in Sudan (Barrow 1998; Osman 1984; Sauer 1993, 184; Zaid and de Wet 2002). Selection of fruits leads to variation in size, texture, fleshiness, colour, taste, sweetness, and storage quality.

Diversity within Sudanese date palms is increasingly well-documented. A common kind mentioned in the recent and historic literature (and the interviews, below) is ‘jaw’, but this is a type or category of date palm rather than a true cultivar, as it includes palms grown as seedlings or from seedlings (and sometimes just means ‘other’). Analyses of selected key cultivars have shown high morphological and genetic diversity; the *jaw* type is especially diverse. As dates grown from seedlings can result in new genotypes and phenotypes, it is possible they are a key source of variation in the regions’ date palms (Elshibli and Korpelainen 2008; 2009; Elsafy *et al.* 2015; 2016). Dates growing feral, or from seedlings and ‘jaw’ types, are described in historic sources, discussed further below (Bacon 1948).

Date cultivation is especially associated with oases, irrigated orchards/farms, and commercial plantations across North Africa and Western Asia (Jaradat 2011). However, dates are also grown without irrigation near rivers where root systems reach the water table, and this is infrequently referred to. In Sudan, the historic cultivation of dates is centred on the strip of palms often paralleling the river, which includes trees that largely rely on proximity to the water table (Popenoe 1913, 37; Leach 1919; Ferguson 1954). Obied (2002) explains that trees closest to the river need irrigating for a couple of years, those set back from the river for around ten years, and those further inland potentially for the lifetime of the palm.

Date palm cultivation and uses in the Sukoot

The research focused upon the Sukoot, and especially the island of Ernetta and the small town of Abri, around 130km north of Dongola (Figure 1a-c). The name Sukoot refers to the region, people, and dialect of Nobiin. Nobiin is one of three riverine Nubian languages still spoken, with Arabic as both the official language and *lingua franca*. Today, Andaandi (Dongolawi), is a Nubian language spoken in areas of the Northern Dongola Reach between ed-Debba and the 3rd Cataract, and is closely related to Mattokki (Kenzi), spoken around Aswan. Nobiin is spoken between these areas by the Mahas, Sukoot and Halfawi in Sudan and Fadija in Egypt (Batal

1991; Rowan 2017).¹ Modern Nobiin is closely related to Old Nubian, which is known from documents dating to the medieval Nubian kingdoms, located between Aswan and Khartoum (Bell 2006; Ruffini 2012).

In the Sukoot, villages and farms are mostly situated on the east bank of the Nile, and on two main occupied islands, Sai and Ernetta. North of Sai, the west bank (actually the north bank, as the river runs west-east) is largely uninhabited, as sand dunes of up to 15m in height flank much of the riverbank. Date palms are predominantly found in riverine strips. We observed a modern pump scheme set up in the desert to grow dates 1km to the north of Ernetta near the archaeological site of Amara West of c. 170m². On Google Earth (July 2021) this was not cultivated. Traces of other past schemes (dates, other) are also visible, further into the desert. The ethnobotanical and oral history interviews discussed here formed part of two broader interdisciplinary research projects on Nubian agriculture and long-term patterns of crop change, with a focus on the region around the Abri and the nearby archaeological site of Amara West. Broad changes to riverine farming have included the shift from the culturally iconic *saqia* (waterwheel) to diesel pumps (1950s-1970s), the reduction of the annual flood since the completion of the Merowe Dam in 2009, and the introduction of many new commercial seeds (Abu Salim 1980; Batal 1991; Wilson 1991; Dirar 1993; Ryan 2017). The research focused on the overall agri- and food-system in household farming, how it had changed in living memory, and situated findings within the context of long-term crop histories.

Farmers were asked about the crops they grew and their relative importance, and how this had been changing over time. Interviews especially focused on Ernetta Island in the Abri region, although some short trips were also made to other regions in the Sukoot and the Northern Dongola Reach. Interviews were both semi-structured and open-ended and were conducted in a mix of Nubian (Nobiin) and Arabic. A key aim was to compare farming today with farming that existed when the *saqia* was used. The interviews often focused upon cereals and pulses, which form key major components of the daily diet. Nonetheless, over the course of the field seasons (2014, 2015, 2018, 2019) a diverse range of information about date palms was recounted by farmers: this paper gathers this local knowledge together.

There have been substantial changes to the range of crops grown since the 1960s related to new crop introductions, irrigation, and land-use, and to changes in processing and food preparation. The overall shift has been to increase crops to sell (wheat, broadbeans, chickpeas, haricot beans, spices), while some crops that were previously grown over wide areas are now grown mostly in small patches for household use, and for fodder rather than food (hulled barley, sorghum, lablab, cowpea).

Date palms often featured in conversations, especially in the parts of the interviews involving the relative importance of crops today and in the past. The cultivation and significance of dates was mentioned in 18 of the interviews on Ernetta Island about present-day cropping practices, in eight oral history interviews with elderly farmers (70+) about farming when they were young, and in two interviews in Abri (between 2014-2015). Additional conversations about dates occurred in 2018 during a project focused on producing a community book, and again in 2019 when the focus was on the use of plants (wild/crop) as material resources. The following section reports information from these interviews.

Interviews with Nubian farmers: Ernetta and Abri

Discussing the categories of land on which different crops are grown was an early focus in the interviews (Ryan 2017). Date palm groves that stretch along the river are located along the inland boundary of the area that was previously flooded. This is called *saluka* land and was where ‘*salwka*’ crops were sown as floodwater receded. *Saluka* land can be divided into the sloping riverbanks (*garf*), and the flatter upper riverbank (*gurer*) that can stretch variable distances inland. Stretching further inland, the sandier cultivatable soils are known as *barju* land. Since the 2009 completion of the Merowe Dam the river is high between July-September, but only

¹ There are also other settled Arabic groups in the Northern Dongola Reach and Mahas regions (Batal 1994). Alongside growing towns, schemes, and gold mining, there is also now an increased mobility of Sudanese populations. In Abri there are also small populations of Egyptian, Ethiopian, and south Sudanese migrants.



Figure 3. Palms growing parallel to the river, Ernetta.

inundates the low land and sloping riverbanks. The location of the palm belts throughout the region is now a useful way to roughly gauge the past range of the floods.

On Ernetta, the palm groves along most of the southern side of the island are set behind wide stretches of *saluka* land and have no other crops cultivated beneath them, the area is extremely sandy with dunes forming in places (Figure 3). Along the north of the island, in contrast, there are more irrigated plots interspersed amongst date palms. On stretches of the main riverbank either side of Abri, palm trees fringe the area just inland of former *saluka* land, and the width of groves is variable. Southwards from Abri there is a wide area with farming amongst trees and then further along the river, areas that become more like a palm forest and not close to cultivated fields.

We were told that today there are around 9000 trees on Ernetta. Dates are not only the most important fruit crop, but for many, the most important crop. One farmer showed us 15 different varieties growing in the southern part of the island, named Barakawi, Gaw, Kulma, Gondaila, Kokolowa, Bettamuda, Gargoda, Shanada, Moanja, Aosa, Gosidola, Nowa, Dokona, Agisinjar and Sharwa (Figure 4). Date palm names are discussed in detail below.

Some of the date palms on Ernetta were described as up to four generations old, and one farmer in his mid-50s said that some of his were planted by his great-grandfather. This longevity, and ubiquity, makes the palm trees lasting features in the landscape, which together with their long histories within families, gives them a different sort of status than any other crop. From parallel interviews in Ernetta and Abri on housebuilding, which also incorporated discussions on date palms, it was noted that shares in date palms (owned by both women and men) (Dalton 2017) continue to provide an important source of wealth in the Sukoot today.

Female dates are pollinated by hand around February-April and harvesting takes place around late August-September, and these are still important times in the agricultural calendar, and some family members who are away (which is common today, for work or university) return if they can. We were shown the male flowers (*adun*) used during pollination, and how these are tied together (Figure 5). They are cut, folded, and tied with grass stems, stored and used to fertilise female trees. We were shown how they are given a sharp tap which



Figure 4. Examples of date varieties on Ernetta. From top left: A) Gargoda; B) Barakawi; C) Bettamura; D) Gondaila; E) Dokona; F) Nowa; G) Gosidola.

releases a cloud of pollen. Some of the female flowers start to open in February. The practice of taking shoots from the base of trees to cultivate new trees is seen across Ernetta. Cloths are wrapped around the base of off-shoots to help the process (Figure 6).

One farmer in Abri described planting several palms on his family farm: he placed the young palms 6m apart and watered them when young, while older trees rely on the water table. On Ernetta, new palm trees are cultivated near the corners of the small irrigation plots rather than within them. Here, and in the region generally (in contrast to more developed regions), irrigation channels are still narrow (<0.5m width) lattice-like networks constructed by individual farmers around small variably sized plots (a few m²), with it being easy to divert water by



Figure 5. Male date palm flowers (*adun*) being tied in preparation to pollinate female dates.



Figure 6. Preparing off-shoots for removal to propagate new date palms.

lowering and opening narrow mud wall bunds.

Elderly farmers on Ernetta and in Abri noted general shifts in attitudes towards date palm cultivation: many of the palms on Ernetta are not irrigated, while watering can make them more productive, and that in comparison to the past, this has become infrequent. Secondly, they noted that for long term maintenance, it is best to routinely remove older fronds and that this has also become less frequent. In four of the household interviews, farmers mentioned that they now invest less time in looking after their trees. One said that they used to water their palms, and now that they do not, they have become less productive. Another said that his trees were very old and no longer productive, but he has no space to grow new ones. Other farmers were planting occasional new trees within their existing family farms, but overall space to expand cultivation within the riverine household farming zone is limited. Similarly, families we met on Sai and Aartigaasha islands (near Kerma) said that dates were still important but that people took less care of them.

From the structured parts of the interviews, dates were the only crop recorded as amongst the most important today and during the mid-20th century. Date palms were ranked as either the most or 2nd most important crop by all the farmers. Out of 18 on Ernetta who discussed their relative ranking to other crops, 13 ranked them as the most important, and of these two said they were of equal importance to broadbeans, while a further four said that broadbeans were now the most important crop with the date palm being secondary. One farmer explained that he and his family now produce mostly broadbeans to sell, but that until seven years ago they used to focus on selling dates, and that at that time ‘they would only sell small quantities of other food crops, perhaps to travellers, or people on buses would buy or exchange goods for small quantities of crop’. In contrast, other (elderly) farmers described dates always being the number one crop when they were young and still possibly more valuable than broad beans. One farmer noted that dates are the most important crop overall, with ‘everything else important in its own season’.

The definition of ‘importance’ for the ‘present-day’ crops referred to their value for household income. This provided a contrast to the discussions with elderly farmers about which crops were most important in the past, in which crops were described in relation to their importance to subsistence. As one farmer phrased it, ‘the important of

dates today is especially as a cash crop to sell, whereas in the past it was a very important food'. Dates had a broader role than other crops at that time, being especially valuable. As another elderly farmer said, 'dates were one of the main foods and the life support', and two further described dates as 'almost like currency'. One explained they could be effectively used as money, 'that few people locally had any coins, and that they would usually keep hold of these'.

All the elderly farmers recalled that crops during the mid-20th century were grown for home use and exchanged or traded at the *souk* in Abri or with boats that came to the island. At that time in Abri, many houses were located close to the main riverbank but now houses are built by new roads, which have become the main conduits for transport (roads to Khartoum and Wadi Halfa) and getting crops to market. One Abri farmer explained, 'the water in the summer used to reach the edge of the homes. People liked to live directly on the Nile. Today they have moved away to be near the roads and *souk*'. All the farmers explained how this local exchange economy began to change with the increasing commercialisation and monetisation of agriculture, centred on the new varieties of wheat grown with diesel pumps by the 1970s. Another recent change is the introduction of motorboats from the 1980s, which has made transport to market (including dates) much easier.

Today, dates in Abri and Ernetta are kept for household use and for sale. The majority are sun-dried, but some are kept fresh/soft. As one farmer explained 'some of the dates are cut fresh from the tree and stored directly, these make '*koureh*' or 'fresh dates' that are succulent, 'like *deglet nour* dates'. Some are boiled in water for a day, which makes date syrup/honey '*asal baleh*'. Dates are often used as gifts and within hospitality, and we were almost always offered dates with cups of tea when visiting interviewees.

When discussing the past role of dates, elderly farmers on Ernetta recalled eating dates together with fresh milk early in the morning, describing this as a light meal before going to the fields. A connected change from the past is that fresh milk is now limited as families keep less cattle on the island. This early morning food is different from breakfast (*fatur*), which is taken at mid-morning and the main meal. Another elderly farmer told us that dates were also used for the later midday meal: 'People would take a handful of dates in each pocket to the farm, and dates and tea were enough for the midday meal. This diet protected people against health problems. People don't eat dates much anymore and they have shifted from the original diet'. Today, people on the island often carry dates in their pockets to snack on, rather than perceiving them as a meal.

Dates were reported during the Ernetta and Abri interviews as ingredients within various types of food dishes, more commonly in the past. Two elderly farmers described a thick pancake bread (Arabic: *gurassa*) made from sorghum rather than wheat (still common today), that contained dates. One explained that this sort of sorghum *gurassa* (Nobiin: *booka*) is not considered tasty unless prepared with mashed dates mixed into the dough, with soured milk/yoghurt and/or clarified butter (*semna*) made from cow's milk. Another farmer said *booka* has two versions, with or without dates, with the latter being a more savoury version eaten with, for example a leafy green vegetable like *Corchorus olitorius* (Arabic: *moloheya*). Elderly women we met on Aartigaasha Island near Kerma described the same sort of sorghum/maize based *gurassa* dish '*booka*', and that it is sometimes made with soured milk and mashed dates. Co-author Jaegar documented a similar flatbread, that included spices, near Kerma in 2017.

Date palm fronds are still sometimes burnt as fuel on Ernetta to make thin flatbreads (Arabic: *kisra*) in traditional kitchens. These persist more on Ernetta than in Abri (Dalton 2017). This mode of cooking is now less common as houses now have newer kitchens with gas stoves. We were shown how to make *kisra*. Batter is smoothed over a round metal hotplate (previously ceramic) fixed on top of a low stove. The routine use of palm fronds for fuel to cook *kisra* in the past inadvertently helped to preserve trees.

Dates and other crops are now mostly stored in sacks. The use of mud-built storage containers is now rare, but more common is the use of clay sealed pottery jars for storing dates (Figure 7a, b). One farmer in Abri explained that they still use the jars to 'store dates for home consumption, and for Ramadan fasting time, but for a long time now they have used sacks for all the crops for sale'. A farmer from Magaasir Island near



Figure 7a (left) and b (right). Traditional date palm storage, Ernetta Island.



Figure 8. Coiled baskets made with palm leaves.

Dongola told co-author Jaeger in 2010 about a past mode of storage using cowhides, and so far, we have not heard of this in the Sukoot. Two farmers explained how date palm ash was used in the past in cereal storage as an insecticide.

Parts of the date palm have multiple craft uses, but there are fewer forms of baskets made today. We were told date or *doum* palm (*Hyphaene thebaica*) leaves (which are seen as stronger) are the most commonly used materials in basketry. One family showed us old basketry and said that until the 1980s women on Ernetta gathered together to make basketry and ‘would take what they needed for their homes, would start after

breakfast and stay for the whole day’. Some forms of basketry used for crop and food processing have been replaced by new methods and materials. A common form of traditional basketry are the mats made for serving and covering food. We were shown the weaving of these coiled basket trays/lids in Abri. Palm leaves are soaked to soften them (otherwise they are brittle), and are used as the inner part (bundle). Today modern coloured cotton thread is wound around the bundle (Figure 8), whereas previously palm leaves were used.

Most of the houses on Ernetta are still built using vernacular techniques, including the one we lived in during fieldwork, though in Abri modern materials and styles had become more prevalent. Traditional roofing is made from a combination of palm trunks and woven palm leaves, but examples of this became rare over the later decade as these older roofs are routinely replaced by metal (Figure 9a, b). Some houses have a distinct palm-like patterning created within the tempered alluvial clay that is smoothed over the walls and floors. Dalton (2017) cites an interviewee from Ernetta who described the patterns as representing fronds branching from the trunk of a date palm, but others felt it was geometric and decorative, or without symbolic meaning.

The Sukoot in the context of date palm cultivation in Nubia from recent and historic sources

The multi-purpose nature of the date palm is evident within literary and artistic sources with Sudan. It is, for



Figure 9a (top) and b (bottom). Date palm leaves used in traditional roofing, Ernetta Island.

of the older trees could reach the water table. He noted occasionally that trees were grown alongside (small) irrigation channels, but not as plantations, and that the focus was on trees forming a strip along the Nile. Ahti (1973) reported that date palms were generally left to grow by themselves in the Wadi Halfa area and were semi-spontaneous. Dafalla (1975) described how off-shoots were left to grow by themselves, replacing the mother tree, creating a grove of trees of different ages that were regarded as having a heritage spanning several human generations. Similarly, for stretches between the 3rd-4th Cataracts Mason (1927) notes that in old riverine stretches up to eight ‘daughter trees’ could grow up around the ‘mother tree’, creating a very different appearance from the straight, formal, plantations in Egypt. This description still applies to areas of dates grown in the Sukoot and Ernetta today.

As in Ernetta, Leach (1919) described shared ownership, especially for older trees passed down several generations. He described how this led to old date trees being located some distance from the family farm and even within *saqia* areas belonging to other families, and that there could be very patchy areas of land/tree ownership. He notes, however, that whilst this made it difficult for him, it was not perceived as difficult locally, given that the older trees were reliant on ground water it was easy to divide and share the fruits after harvest. Shared ownership of dates is noted by co-author Jaeger as one of the pillars of the social network that joins Nubians together.

Batal (1991) documents, from the Mahas region in the late 1980s, the process of clonal separation occurring in March or when the river was high, with the latter preferred as it was easier to water new transplants, which needed to be frequent and by hand. Malterer (2013), in his study of agriculture practices by the Manasir in the 4th Cataract area prior to its flooding by the Merowe Dam, similarly notes the watering of new transplants by

example, the theme of a poem by the Andaandi poet Jalāl ‘Umar Merowaarti, performed as a song by Manāl ‘Abd al-Rassūl, the former lead-singer of the Dongola Association on many occasions. Throughout the riverine areas in the arid north of Sudan, and in Nubian areas in southern Egypt, the date is prominent for its cultural, symbolic and economic importance, including its role in weaving and construction, connection to wealth and land ownership, providing shade, ceremonial use and for artistic motifs (Wenzel 1972; Hale 1973; Hohenwart-Gerlachstein and Ali 1979; Batal 1991; Wendrich 1999, 186, 201; Malterer 2013; Dalton 2017). A broad range of uses was especially noted in the Mahas region during the late 1980s by Batal (1991), including for farming implements and the *saqia*.

Riverine date palm groves such as those on Ernetta, where settled trees rely on the watertable, are discussed in several accounts of date cultivation in the early to mid-20th century. Leach (1919) described how date groves in the Wadi Halfa area were grown in a strip along the Nile, between the *salwka* and inner *saqia* cultivation zone, and that the roots

hand, sometimes using a gourd, and that palms there, like further north, were situated near the river or a little further back in irrigated areas, where newly planted dates would be spaced around 10-20m apart, and within or adjacent to small irrigation plots. Such accounts vary slightly (say to Ernetta), but Popenoe (1913, 66) points out the actual amount of spacing can be variable (within and beyond Sudan), and Mason (1927, 4-8) notes that spacing is just relevant for newly planted trees in irrigated stretches, not those in the riverine strip.

Alongside the major cultivars, diverse local forms proliferate (Osman 2004), perhaps up to 400 varieties in Sudan. Fifteen date palm varieties were noted on Ernetta, and Batal documented eight names for date palms in the neighbouring Mahas region (Batal 1991). Barakawi, Gaw and Kulma were noted in both lists, and from Ernetta Gondaila, Bettamuda and Gargoda are referenced in other sources and locations. There are variable spellings, which is natural over time and regions, but also because some names are of Nubian dialect (e.g. Bettamuda from the word Benti) and there is no consistent way to write these in Arabic/Latin script. Some of the remainder may reflect more local types. There are also some slight differences within the geographic predominance of some cultivars, for example, with more of the soft date types cultivated towards the 4th or 5th Cataracts. Recent surveys show on average a slightly higher range of cultivars were documented in the north (Ezebilo *et al.* 2013). Major cultivar names are common in recent and older sources (Bacon 1948). It is unclear the extent to which folk categories are clearly distinguished in the genetics.

Within these names, Gaw and Kulma are categories rather than varieties. As noted earlier, the term *jaw/gaw* can describe palms grown from a seedling or from an offshoot of a self-sown parent, and this term is referenced throughout the last century (Bacon 1948; Elsafy *et al.* 2015). Bacon (1948) noted that within this category there can be palms with their own local names. Komla (possibly the same as Kulma, above) is also noted as of 'seedling origin' (Elsafy *et al.* 2015). *Jaw* types are especially found in the riverine strips where some trees are left to grow semi-wild as described by several writers in reference to the Wadi Halfa area and the Dongola Reach in the first half of the 20th century (Leach 1919; Mason 1927, 4-8; Ahti *et al.* 1973; Dafalla 1975), and present-day Sukoot.

The names of some of the current major cultivars are traceable back to the 1800s, suggesting commercial activities prior to this period, and in connection with the Sukoot. Burckhardt, reporting on his journey up the Nile, spoke of the Sukoot as having the best varieties of dates, and that in contrast, the dates in the Merowe area (4th Cataract) were of lesser quality and indeed that the Sukoot dates were traded in this region (Burckhardt 1819). He notes 'the dates of Sukkot and Say (referring to Sai Island) are preferred to those of Ibrim, and are considered superior to all that grow on the banks of the Nile, from Sennaar down to Alexandria: they are of the largest kind, generally three inches in length'.

Mason (1927, 4-8) writes, after investigating comments in Burckhardt's travels, that the chief men of Merowe reported four main types of dates ('Barakawai, Bentamoda, Gondeila, and Kulma') that were introduced from the Sukoot. Bentamoda (also spelt Bartamoda) was described as a seedling variety from the Sukoot that was first cultivated in the Dongola region, and that during the early 20th century, was still described as a 'new' date. Mason (1927, 4) reported that he was told that, some time ago, some of the soft date varieties grown close to the 4th Cataract region (around Nouri) were originally from Medina, and that there was a popular tradition that some cultivars from the Sukoot came from Algeria (Biskra). The Nouri region, opposite Karima, still grows more soft date varieties than further north, and the soft and dry groups of dates are also genetically distinctive (Elshibli and Korpelainen 2008).

In the early 20th century Popenoe (1913, 238) noted Gondela (also the spellings Gondila, Gundila) and Barakawi as the main commercial varieties, and Bentamoda as the best and only commercial soft date. These were traded to Egypt and the US. Mason (1927, 4-8) recorded that when imported to Egypt, the dates often took on new trade names. The Barakawi dates from the Sukoot would be named 'Sukkot' when they reached Wadi Halfa, past Ibrim the trading name could change to 'Ibrimi', and in general, between Cairo and Dongola Barakawi dates can be sold under any of these names. He also reports that satellite seedlings were marketed

under the same names.

There are still date varieties named Sukooti in Egypt, and also Gargoda, Gondaila, Bartamoda, in Upper Egypt and especially Aswan (Allam *et al.* 1973; Bekheet and El-Sharabasy 2015). As such, several cultivars of dry dates in Upper Egypt can be historically linked to northern Sudan and patterns of trade and Nubian date culture prior to the construction of the Aswan High Dam (and it is possible that the Sukooti type, being originally a trade name, may be the same as Barakawi).

Conclusions

The cultivation of date palms by Nubian households in riverine strips along the middle Nile valley in the Sukoot, represents a *longue durée* practice that contrasts with modern irrigated commercial plantations. Historic accounts emphasise the importance of dates from the Sukoot in the 1800s and early 1900s, and today, the region still seems to have high diversity. These historic accounts reflect the trade of dates from the Sukoot to Egypt prior to the Aswan High Dam, after which this trade route ended. Conversations with farmers charted subtle changes in recent decades within local date growing, with aspects of commerciality, food and material uses, cultivation and maintenance all shifting.

Date-palm trees, if tended, can survive for four generations and be productive for over 100 years. This underpins their cultural, economic value and historical roots, and represents a highly sustainable practice. The multigenerational histories of older date-palms and groves operate on a different timescale to other crops or agricultural practices, tying communities to areas of land. This durability, and the range of sustainable resources they offer, makes them irreplaceable. The special nature of this mode of cultivation is that it is low input, making dates the easiest, most productive, and valuable crop within these river edge systems.

The presence of productive old trees (potentially 100 years +) owned for several generations, is a system documented for at least 1000 years. It may be that date palm cultivation was initially small-scale, but by the 1st millennium AD if not before, established groves became more established across the date-palms' optimal growing niche. This can be described as the inland boundary of the flood to the distance from the river where roots can still reach the water table, and these parameters will naturally influence the width of old groves.

The multi-generation cultivation of date-palms and ongoing cultivation of seeding types suggest such areas are key areas of historic biodiversity. Date palm diversity is threatened by habitat loss, environmental change, varietal loss, and increased desertification. The full impact of the Merowe Dam on hydrology and the longevity of some older groves is not yet clear. Additionally, local diversity is interconnected with cultural practices, ecology of local cultivation practices, multipurpose use of the trees, and food heritage, and the conversations with elderly farmers on Ernetta highlighted changes in all these domains. As such the conservation of date palms requires strategies to preserve local knowledge and practices, as well as to protect ecological diversity.

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