

Neolithic pottery in Central Sudan Summary

A book under this title was to come out in 1987. Although it was ready to go to print then and was announced as volume 6 in the *Studies in African Archaeology* series, it has never been published. The gap in the series, we are glad to announce, is filled by this book.

The source base for the discussion is Neolithic material, coming from the Nile Valley and adjacent lands, extending between Kosti on the White Nile and Sennar on the Blue Nile, in the south, and the confluence with the Atbara in the north (Fig. 1).

Pottery has been known in central Sudan since the 8th millennium BC. It was made by the societies of hunter-gatherers who led a sedentary life thanks to the rich Nile Valley ecosystem. In this context, the genetic connections of Neolithic pottery to the older materials from this region raise no doubts.

The study of the Neolithic in central Sudan and Neolithic pottery was begun by A. J. Arkell in the 1940s. Only since the 1970s, however, have substantial advances in the study been made. It was then that excavations began in Kadero, Geili, Kadada and Ghaba. Later our knowledge was expanded by excavations in Shaqadud, Zakiab, Um Direiwa, Sarurab, Nofalab, Islang and many other sites on the main and Blue Nile. Major contributions have come from the latest investigations in Salha, Es Sur and Khor Shambat.

Although a considerable number of Neolithic sites have been investigated, in many cases the excavated materials have not been published in full. Comprehensive studies of pottery are available only for Omdurman Bridge, Shaheinab, Kadero, Zakiab, Umm Direiwa, Geili, Kadada, Ghaba, Hag Jusuf, Sheikh el-Amin and Shaqadud, with their degree of detail being varied.

The change in the economy, i.e. moving to the production economy, entailed significant changes in tool inventories and pottery in the late 6th and early 5th millennia BC. The Neolithic flourished in the second half of the 5th millennium BC and it is this period that most known radiocarbon dates fall on. The 4th millennium BC coincided with the Late Neolithic, which is best represented by the Kadada cemetery. The Neolithic declined in central Sudan between ca 3000 BC and 2500 BC.

The Neolithic materials come from several dozen sites, both settlements and cemeteries (Fig. 1). Certain disproportions can be observed in the number of Neolithic sites, depending on their location. West of the Nile, they are much fewer than east of it as a result of the fact that the river valley is considerably narrower here. On the Blue Nile, on a number of sites, early and late Neolithic materials were identified on the surface, where several sites have been excavated. The crucial site for the study of the Neolithic in Sudan appears to be Shaqadud, located 50 km away from the Nile. Very little is known as yet about the Neolithic between the White Nile and Blue Nile.

The oldest publications devoted relatively little space to the analysis of technology. Their authors focused mainly on vessel ornamentation. Only recently have comprehensive technological analyses been conducted of larger samples. Still, however, the study of the technology of Neolithic pottery in central Sudan relies mainly on macroscopic descriptions.

The principal component to make pottery in central Sudan was Nile silt, tempered mostly with alluvial quartz sand of usually fine or at best medium-coarse grains. Some pottery from Neolithic sites contains large amounts of feldspar whose grains are often angular and usually coarser. In this case, it cannot be ruled out that we are dealing with crushed granite. Neither can it be ignored that Neolithic sites yield organic-temper pottery as well.

A characteristic trait of Neolithic pottery is the burnishing of vessel surfaces. Another important trait is the use of red ochre to colour vessel surfaces. Now we know that both traits emerged already in the Mesolithic. Central Sudanese pottery is characterised by various shades of brown, while in the later phases of the Neolithic, grey and black (or rather dark grey) colours gain in importance.

The most characteristic pottery has burnished, well-smoothed and sometimes polished surfaces. A category of its own, vital for chronological studies, is rippled ware. A third group is made up of vessels whose outer surfaces were purposefully roughened by combing or, less often, scraping.

Wall thickness is an important trait, characterising the technical quality of vessels. As a rule, vessel walls are 5-7 mm thick, but usually closer to the lower limit. Average wall thickness next to rims approaches 5.5 mm on all sites. The thinnest pottery shards are only 2.0–2.5 mm thick, while the thickest – 15 mm. Among the known hand-forming techniques of vessels, two are worth noting: coiling and paddle-and-anvil.

The Neolithic pottery of central Sudan can be divided into a number of groups or pottery fabrics. Distinguishing them, we have relied on the hitherto proposed systematisations. The principal fabric is based on the temper of quartz sand. Its coarseness may vary and it may contain additional components such as limestone particles, grog, mica or organic particles. Another fabric, much more rarely used, features a high share of feldspar – usually crushed granite. Both fabrics are rooted in the pottery of the Early Khartoum culture. Relying largely on the set of pottery fabrics defined for Ghaba and supplementing it with fabrics known from other sites, the following fabric groups and subgroups were distinguished:

The first group (N) is formed of pottery made directly from silt with only a very small amount of temper, invisible to the naked eye, being a natural component found in the raw-material deposit. The second group (S), the most common in the Neolithic, is made up of pottery with a dominant content of quartz sand and only a small share of feldspar, grog and other minerals. In the third group (Q), temper is dominated by feldspar particles. The fourth group (M) comprises pottery in the temper of which neither quartz sand nor feldspar play a major role, but the principal components are mica, white limestone particles and pieces of red ferruginous rock. The final group (R) is composed of items with a clear, sometimes dominant component of organic temper.

One special combination of pottery fabrics and surface properties is ceramic ware. Using the kind of temper as a criterion, a number of groups (S, Q, M, R) were distinguished and further broken down into types, using surface treatment as a criterion. The following types were defined: 1 – coarse, 2 – combed or scraped, 3 – brown burnished or well-smoothed, 4 – black burnished or well-smoothed, 5 – red slip, 5 – black top, 7 – rippled. In this way, twenty different technological types were arrived at.

It is important to note that technological differences noticeable between sites reflect chronological differences between them. This is particularly true of differences in surface treatment.

The study of central Sudanese pottery has not developed so far any cohesive classification system of vessel morphology that would cover the whole range of known forms. To classify vessels according to their morphology, the present work adapted H. Å. Nordström's system of description developed for Neolithic pottery and A-Group in northern Nubia. The system, however, works well only with complete or almost complete vessels. Nevertheless, using the system's underpinnings, based on the geometric analysis of shapes, the following vessel shape groups were distinguished (Fig. 4): US – simple unrestricted, UD – flowerpot, UV – cylindrical, UI – S-shaped, RD – conical, RV – cylindrical-conical, RS – simple restricted, RC – composite, RN – necked.

Not all shapes were equally popular. On both settlements and cemeteries, vessels belonging to shape groups US and RS dominated. Specimens of other groups were rare or were found only on some sites (Tab. 6). Taking the position of characteristic points as the criterion, the groups were broken down into 21 vessel types of the US contour, 35 vessel types of the RS contour, and 14 vessel types of the RN contour. They were arranged according to the decreasing value of the main vessel index (Wg) (Figs. 3–6). RC contour vessels were broken down into three types, UI contour vessels – five types, UD contour vessels – two types, UV contour vessels – six types and RD contour vessels had a single type distinguished. The shape modes we distinguished (Figs. 7–15) are, in fact, statistic abstractions developed for the purpose of comparing vessel shape differences between sites. Their makers did not necessarily have to be aware of them; neither did the modes need to have a special functional significance.

A major limitation of this system is the fact that it can be applied only to complete or almost complete vessels. Hence, it does not work for settlement materials usually consisting of small shards.

In the case of settlement materials, as a rule, shape groups can be identified, while as regards types, it is necessary to distinguish them arbitrarily, using a specific index. Usually, it is the vessel index (Wg). Between these two classifications, there are determinable relationships, which is shown in Tab. 7.

A comparison of vessel distribution among the sites at Kadero, Ghaba and Kadada reveals a greater similarity between the first two sites (Tab. 10). At Kadada, in turn, there are many more shallow forms and deep ones with much narrower orifices. Entirely different relationships hold in Shaheinab; they are radi-

cally different at Omdurman Bridge, where vessels with a pronounced neck have a huge share.

The shape models we have constructed served to define 75 vessel types (Figs. 7–15). The number of vessels that could be assigned to the same type varied from single items up to over a dozen (Tab. 11). The younger the chronology of a site is, the greater the variety of vessel shapes. This is particularly noticeable in the youngest phases, witnessing the rise of both very shallow vessels (US 1–4) and deep ones – slim (RS 34–35) and necked (RN).

The observation of unrestricted vessels shows that in the cemeteries of an older chronology, such as Kadero or Ghaba, deep vessels dominate (US 9–21), representing 94 and 96 per cent of open bowls, respectively. Meanwhile, on sites considered chronologically younger, such as Kadada, Shaheinab or Es-Sur, shallow vessels (US 1–8) are in the majority.

The most varied shape group is composed of restricted vessels. It has few shallow vessels (RS 1–6). More interestingly, however, it includes vessels of deep oval shapes (RS 25–33). While at Kadero and Ghaba they represent only 5 and 8 per cent, respectively, at Kadada their share is significant, amounting to as much as 42 per cent. It can be added, that at Omdurman Bridge, very deep vessels with a strongly narrowed neck account for 65 per cent of all RS group vessels. This makes for a clear trend of deep narrow-orifice vessels becoming popular in the later phases of the Neolithic.

Restricted necked vessels (RN) are encountered solely on sites of a later chronology; they are few and one can hardly speak of their standardization since practically every specimen is different. A similar absence of standardization is seen in the case of beakers (RC, RV, UD, UV, UI).

Some vessels were purposefully deformed, making them oval or ellipsoidal in horizontal cross-section. They are especially frequent at Ghaba, but are encountered on other sites as well. They were included in the category of boat-shaped vessels. The deformations often go together with the elevations of the vessel rim above the level of the lip. The elevations may be shaped like a horn, forming a handle on one side of a vessel, known as a ladle pot. A separate category is formed of small rather deep vessels with spouts, known as feeding cups or feeding bowls.

On all Neolithic sites, direct rims (A) dominate, with modelled, reverted rims (B) being less frequent and usually restricted only to larger vessels. Only rarely do we encounter modelled everted rims (C). Specimens in which such rims are clearly modelled into a lip (C2) emerged only in the Late Neolithic (Fig. 20, Tab. 14).

On Neolithic sites in Sudan, rounded vessel bases dominate. Later-chronology sites see also flattened bases (A4) while flat, pointed and slightly concave bases are recorded only in beakers (Fig. 21, Tab. 15).

The vessel size differentiation is usually represented by the rim diameter. This is a parameter available most of the time and which is possible to reconstruct even from small shards. The study of rim diameter distribution (Fig. 23) reveals a similarity between assemblages from Kadero and Ghaba. Assemblages from Shaheinab and Omdurman Bridge form a separate group while Kadada materials stand apart from the others. They comprise the greatest number of vessels with very small rim diameters (up to 8 cm) and, at the other extreme, very large ones, whose rim diameter is approx. 50 cm.

A comparison of the estimated rim diameters of pottery coming from settlements with those of pottery from cemeteries reveals a radical difference between the size of vessels found in graves and others extracted from settlements (Fig. 24).

A far more objective parameter representing vessel size is the diagonal of the rectangular formed by the height and largest diameter of a vessel – being its largest dimension. This parameter correlates with capacity, which is especially well seen in the case of smaller vessels (Fig. 25-26). Pottery size differences between individual sites are illustrated in Fig. 27. Vessel sizes and shapes are often correlated (Figs. 28-30).

A still better measurement of vessel size is its capacity. Given in Fig. 31, the capacity of vessels from selected cemeteries (those yielding the greatest number of specimens) shows that 1–4-litre vessels dominate. A completely different size structure is seen on the site at Omdurman Bridge, which is dominated by large vessels holding 16–32 litres.

Figure 31, however, does not show the size structure of Neolithic vessels in its full complexity. Vessels larger than those from Omdurman Bridge come from Es-Sur and Kadada, where they were used as containers for burying a child (Sadiq 2010, Reinold 2007). Their capacity reached approx. almost 100 litres. If one considers three best explored (published) sites – Ghaba, Kadero and Kadada – it can be said that most commonly used vessels held 1–2 litres. They make up about 1/3 of the inventories discovered there. However, if we consider vessels of a capacity of 0.5–3.0 litre, we find that about 2/3 of all specimens fit into this range.

The morphological classification of vessels took account of their shape, size, base form and rim line. A type, in this approach, is a concept encompassing vessels of a similar shape, depth and size as well as having identically formed bases and rim lines. To record a vessel form four symbols are used. The first refers to the

shape group and modifications visible in a vertical cross-section such as handles and spouts: 1 – simple unrestricted vessels (US), 2 – simple restricted vessels (RS), 3 – restricted composite vessels (RC), 4 – necked vessels (RN), 5 – caliciform beakers (UI), 6 – cylindrical beakers (UD, UV, RD, RV), 7 – ladle-pots and spoons (US, RS), 8 – spouted vessels (RS).

The second symbol represents vessel depth: 1 – shallow, 2 – medium deep, 3 – deep, 4 – very deep. The third symbol represents vessel size: 1 – small, 2 – medium, 3 – large, 4 – very large. The fourth symbol defines characteristic, non-parametric traits of a given vessel – its vertical and horizontal cross-sections and the shape of rim line and base. The classification of vessel forms is shown in tables, covering all basic traits identifying a given type (Tab. 18–27). Individual vessel types are shown in Figures 32–57 and ordered according to their size. This allows grouping on individual figures vessels of a similar function.

The ornamentation of the Neolithic pottery of central Sudan is given most attention in the relevant literature. In the case of settlement materials, body decoration is frequently the only criterion of classification. The most characteristic ornaments of the pottery are relief motifs, above all impressed but also incised ones. The most common implement used to make ornaments was a rocker stamp. Another technique used, alternately pivoting stamp technique (APS), is basically a simplified version of the rocker technique. It was described as a separate technique by Caneva (1988) and recognised in the relevant literature. This technique leaves parallel horizontal dotted lines, occurring in pairs, or dotted wavy lines. Alternatively, they can be arranged in semicircular or fan-like panels. Yet another technique of making impressed ornaments involved pressing an implement against the vessel surface and then lifting it completely. It left dotted lines resembling those left by the APS technique but could also produce more complex geometric patterns. Incision was also common. Incisions were made using all kinds of combs, pronged implements or burins. Painted ornaments were rarely made.

In contrast, rim top decoration is common, but not on all vessel types. Usually, it goes together with specific body ornamentation while on other vessels it is rare or non-existent. It is also found on vessels with unornamented bellies. On individual sites, usually about 20–40 per cent of rim tops are ornamented. Motifs on lips are greatly varied (Arkell 1953, Chłodnicki 1982), but only some are more common. To ornament lips, all three techniques were used: rocker stamp, alternately pivoting stamp and simple impressions or incisions (Tab. 32, Fig. 58). The rocker stamp technique left mostly plain zigzag ornaments on lips. In turn, the alternately pivoting stamp technique was only rarely used; it is known from only

single artefacts. Although the ornamentation of lips is quite varied, only a few types are more common. They are dominated by simple motifs such as oblique or dotted lines. At the Kadero settlement, they represent over 70 per cent of all ornamented rims and at the cemetery – over 90 per cent. Other motifs account everywhere for only a small percentage of ornaments.

A separate rim bands is very rarely found. If it is, it consists of horizontal incised or dotted lines, accompanying belly ornaments in the form of semicircular festoons. Very characteristic and more common, black blobs or triangles usually are found below the lip rim on red ware, providing for a strong contrast. Only rarely do we find simple stamp impressions. These are either parallel impressions forming checks, or more complex patterns (Fig. 59, Tab. 33).

Body decoration usually follows a concentric pattern (A, Fig. 60). Another frequent pattern is one with many sides, mostly four (B). Only rarely is it radial (C) or radial-concentric (D). In the Late Neolithic, a chequered pattern can be encountered (E). Other patterns include an asymmetric one (F), in which bands of ornaments run across the vessel surface irregularly without any relation to vessel tectonics, or one in which the whole vessel surface is evenly covered with stamp impressions without any visible regularities (G) or one involving a different arrangement of the motif in different parts of the vessel or arrangements that cannot be defined in simple geometric terms (H). The concentric and asymmetric patterns are especially characteristic of sites of an older chronology. It is also then that the four-sided ornament pattern is frequently encountered. The Late Neolithic witnesses more complex motif patterns.

The classification of body decoration relies in principle on the system proposed by Caneva (1988, Tab. 4). Some classification tiers, however, have been expanded by adding variants. Besides the three impression techniques: rocker stamp, alternately pivoting stamp and simple impression as well as the incision technique, there have been complex motifs distinguished, combining impression and incision techniques and coloured ornaments. Using the technique employed and kind of implement as criteria, belly ornaments have been grouped as follows: RSP – rocker stamp plain, RSR – rocker stamp regular, RSI – rocker stamp irregular, APS – alternately pivoting stamp, SIC – simple impressions of comb, SIS – impressions of single point, SID – impressions of double pronged point, SIR – cord impressions, INC – scraping comb incisions, IRI – comb incisions and burnishing, IND – double-pronged implement incisions, INS – stylus incisions, COL – painted. The classification system is shown in detail in Table 34.

The RSP group comprises ornaments made with a smooth-surface implement, leaving a continuous zigzag (Figs. 61, 62.1–3, 75). Motifs are arranged in regular horizontal bands or form irregular patterns (Fig. 75.1–34). This pattern is known from both the Nile Valley and the Sahara (Caneva 1987) – though not very frequent.

In the RSR group, in which ornaments were made with a toothed implement with equal teeth, the effect is a zigzag of dots or dashes (Figs. 62.4–10, 63, 76–78). This ornament has a very long tradition in central Sudan and whole north-eastern Africa.

The RSI group is made up of ornaments made with an implement with unequal teeth and arranged in various combinations of triangles and dots (Fig. 64, 79–80). These ornaments are very common and the most characteristic of the Early Neolithic in central Sudan.

In the case of the APS group (Figs. 65–67, 81–87), the ornament is not a zigzag as in the above-mentioned groups, but only a plain band lined with two rows of impressions. This ornament is widespread in the Sahara as well. Pottery bearing it, although very characteristic, accounts for only a small percentage of material. This ornament emerged already in the Mesolithic and was not very popular in the Early Neolithic, though it can be frequently encountered in Late Neolithic assemblages.

A rare ornament was made by pressing an implement against the vessel surface, lifting it and pressing it again (Figs. 68–69, 87.3, 88). This technique produced various combinations of dots, forming lines and bands, covering the entire vessel surface or filling complex geometric patterns. Not used in the Mesolithic, the technique became common only in the Late Neolithic. A number of types can be distinguished, depending on the implement used. It could be a many-toothed comb (SIC), double-pronged implement (SID), single stamp or a fingernail (SIS). This category covers also cord impressions (SIR). The last-mentioned ornament is known above all from Heilig Cord Impressed Ware from Shaqadud.

The material evidence informs that incised vessel ornaments were highly popular. They could be made with a comb by combing or scraping vessel surfaces (INC; Figs. 70.1–2, 89). When resulting grooves were carefully smoothed out, rippled surfaces were obtained (Figs. 70.3–4, 90.1–4). Rather infrequently, the ornament was made with a double-pronged implement (INC). It was used, though, for making parallel straight and wavy lines usually occurring together (Figs. 70, 92).

Far more often, ornaments were made with a stylus (INS). In such cases, parallel lines can run horizontally, coiling into a spiral at the base (INS1; Figs. 71.1–

4; 91.1–2); less often, these are shorter interconnected lines (INS2; Fig. 91. 4). In addition, groups of lines can form various panels (INS3), running obliquely, (Figs. 92; 71.6) or being arranged into geometric patterns (Fig. 93) or semicircular festoons in various configurations. This was how luxury vessels, coated with red ochre, were ornamented (Figs. 71.7–8; 94.1–2, 94.5; 95.1).

Only rarely are ornaments encountered that are made up of short lines (INS4; Figs. 71.10–11, 71.15, 95.2, 71.13) or chequered patterns (INS5; Fig. 71.16).

A separate and much diversified group is made up of vessels ornamented with complex geometric patterns (INS6). In them, an incised line outlines the basic ornamentation elements (bands, fields) that can be filled with incisions, cuts and impressions. They may form chequered motifs (INSA; Figs. 72.1; 96.2, 97, 98.1, 96.2, 97, 98.1), filled triangles (INS6B; Figs. 72.2, 98.2–4, Fig. 72.3), or geometric patterns made by filling a band (INS6C; Fig. 72.10–11, Figs. 72.4–5; 100.1, Figs. 72.6, 8; 100.3–4, Fig. 72.7, Fig. 101.1). Sometimes, an ornament is made up of many motifs. A single vessel may boast filled chevrons, concentric rectangles and triangles, and horizontal bands. This ornamentation type is found above all in zone ornaments on caliciform beakers (Fig. 101.2). Opposite situations are rare: only plain fields or bands standing out from the hatched rest of the surface (INS6D; Fig. 102.1, Fig. 102.3), or meanders or rectangles arranged in bands of parallel incised lines, covering the vessel surface (INS6E; Fig. 103). So far, only from Kadada, do we know of potmarks (INS7; Fig. 74); they appear solely on rippled ware.

Painted ornaments (COL) have survived only on few vessels. At Shaheinab, these are bowls with a four-spike wheel painted inside (Fig. 104).

Although very many ornamentation motifs have been distinguished (Tab. 34), the Neolithic pottery of central Sudan is highly homogeneous in terms of ornamentation because only few ornaments were widely used. Some patterns show a lot of persistence while others fade out or emerge in various periods. On the sites of an older chronology, such as settlements at Kadero, Shaheinab or Zakiab, rocker stamp ornaments dominate. APS ornaments are widespread, too. On some sites, there is a large share of pottery with incised ornaments, especially of the INS1 and INS3B types. Some patterns, such as APS, RSP or ones with complex geometric motifs (INS6), are considerably more frequent on the sites of a younger chronology (Tabs. 35–36).

Frequently, vessels have holes bored or – less often – pierced in walls right under the rim in most cases. They are found on vessels of various size (Tab. 37) and ornamentation, and thus cannot be tied to a specific vessel type. Nonetheless,

it seems that they are more frequent on the vessels of a greater capacity, but relatively small vessels, even badly damaged ones (Fig. 105), had holes occasionally bored in them, too. It is believed generally that holes were bored to repair vessels. Holes in vessel walls could be also used for suspending the vessel, fastening a lid or mounting decorations. Such uses were most likely made of pierced holes.

Establishing chronological relationships between particular pottery types is possible, owing to stratigraphy, radiocarbon dating and comparison with the materials of neighbouring cultures. Unfortunately, strongly eroded Neolithic sites for the most part allow for identifying only general development trends.

There is no doubt that the settlement and cemetery at Shaheinab represent two clearly different development stages. However, they neither give a full picture of the differences between them, nor do they allow us to trace changes slowly occurring on them. All what the Shaheinab and Kadero materials show with regard to development tendencies is a minor drop in the share of pottery unornamented brown ware. Moreover, it is worth noting that with the development of settlement both sites witnessed a surge in the share of RSI-ornamented pottery and that black-top ware (BT) is absent from the lowest strata.

The most extensive stratigraphic sequence is found at the Shaqadud site. Despite the fact that some material is mixed, two clear phases can be distinguished there. The early one shows strong connections to Shaheinab pottery from the Nile Valley (Mohammed Ali 1991), while the late one displays major differences when compared with Late Neolithic materials from the Nile Valley (Robertson 1991).

As regards burial pottery – due to the unavailability of vertical stratigraphy data – all that could be done was to study the question of the co-occurrence of various pottery types in graves. Data for the study were collected at the cemeteries in Kadero, Shaheinab, Kadada, Ghaba and Omdurman Bridge. Nowhere, so far, have co-occurring rippled ware and black-top ware been attested.

In spite of the large number of distinguished ornamentation types, only few were found to co-occur in grave assemblages. This is a result of burial pottery being much less diversified in terms of ornamentation than settlement pottery, and the practice of not placing vessels bearing different ornaments in a single grave.

Many sites have radiocarbon dates referring to them (Tab. 1). Some dates measure the age of settlement materials from sites where distorted stratigraphy prevents them from being precisely tied to specific vessel types. The most valuable, no doubt, are dates referring to grave assemblages (Kadero, Ghaba, Kadada), but there are not very many and they do not cover the full sequence of graves (Salvatorini *et al.* 2016).

Interestingly, in graves dated to as early as the 5th millennium BC, cylindrical beakers bearing geometric ornaments appear in the context of vessels ornamented with dotted zigzags (RSP2B1) and festoons of dotted lines (APS1A3), and black-lip ware (BT) as well as unornamented grey and brown bowls (Salvatori *et al.* 2016). Without radiocarbon dates, until recently, such pottery would have been called Late Neolithic.

The radiocarbon dates help set a chronological dividing line in the development of pottery to ca 3800 BC. This is the time indicated by the oldest dates from Kadada where rippled ware (RV) is common while black-top ware fades out. It has been believed until recently that in the older phase we dealt solely with simple vessel forms (RS and US). Owing to the radiocarbon dates, we know now that already in the older phase both cylindrical and caliciform beakers appeared (Chłodnicki, Kabaciński 2015; Chłodnicki 2018). After ca 3800 BC, black-top rims disappear as do some impressed (RSI) and incised (INS2A, INS3B1) motifs.

Later assemblages witnessed much greater morphological diversification of vessels, including necked ones (RN). Caliciform beakers took on much more refined forms (US1). Rippled vessel surfaces became common and everted rims appeared (chiefly of the C2 type).

All earlier classifications are summarized by a vessel typology in which pottery types or taxonomic units, combine technological, morphological and ornamentation traits. The taxonomic units are moderately homogeneous in terms of style, chronology and culture. At the same time, the boundaries of these units are not marked as precisely as is the case with the classification of individual traits.

Individual types are distinguished using various criteria because particular vessel traits have different classification values. Usually, this trait is used as a classification criterion that most noticeably sets apart a given pottery group and identifies best a given specimen. This can be a technological trait, in particular, the manner of treating the vessel outer surface, a more complex vessel form, or a special ornament characteristic of a particular phase of pottery-making.

Thus, surface treatment and an ornamentation technique define a pottery group, while vessel shapes and sizes, and specific ornamentation traits define types and subtypes. If it is necessary to break down the taxonomy further, detailed variants may be added. The following groups were distinguished: plain brown (PB), plain gray (PG), polished red (PR), black-topped (BT), rippled (RW), combed (CW), rocker stamp (RS), alternately pivoting stamp (AP), single stamp (ST), incised ware (IW), geometric ware (GW) and painted ware (PW).

The type, or the basic taxonomic unit, is thus characterised by – next to similar technology – a common ornamentation style and vessel form. Types were sometimes divided into lower-tier units (subtypes and variants) to provide more precise descriptions of some pottery kinds. Such typology expansions, however, are possible only with complete specimens (Figs. 106–126).

The Neolithic pottery of central Sudan is rooted in the pottery of Early Khartoum culture populations. This question is finally settled now. The vessels of both cultures share technological traits (use of the same mineral temper), morphological ones (simple vessel forms, rim and base shapes) as well as ornamentation ones (occurrence of some older ornamentation motifs in the Neolithic). The Neolithic pottery, having a lot in common with Mesolithic wares in its early phase, departed from them considerably later on. Only the simplest forms of vessels and ornamentation continued to be used throughout the Neolithic. The most persistent turned out to have been the tradition of making ceramic body. Mineral temper continued to be used, while in the neighbouring lands, organic tempers had become popular. Admittedly, there are certain technological differences between ceramic bodies made by Mesolithic and Neolithic potters, but they are merely quantitative, not qualitative: on Neolithic sites, the amount of temper of quartz sand is larger but its grains are finer and better sorted (Francaviglia, Palmieri 1983, Dal Sasso *et al.* 2015).

Three major phases of Neolithic pottery can be distinguished: early, late and final. The markers of the beginnings of individual phases, distinguishing given materials from older pottery, are as follows: for the early phase – the smoothing out of vessel surfaces became more popular while pottery ornamented with wavy lines faded out, for the late phase – the rise of rippled and necked ware, for the declining phase, of which the least is known – the fading out of vessel surface rippling and the emergence of wares resembling the materials of the so-called C-Group horizon. The phases can be further broken down chronologically, but such finer distinctions are still difficult to grasp at this stage of research.

The Early Neolithic in central Sudan is encountered on such sites as settlements at Shaheinab, Kadero, Geili, Zakiab, UmDireiwa and Ushara, the oldest strata of the Shaqadud settlement as well as the cemeteries at Kadero, Ghaba and Khor Shambat. Moreover, Early Neolithic material is sometimes found mixed with the pottery of the Early Khartoum type. A tradition deriving no doubt from the preceding period involved covering the entire vessel surface with ornaments, especially impressed ones, which dominated throughout the Neolithic.

A dotted-line zigzag (RSR1A) and parallel lines of impressed dots share an older tradition. Characteristically, these motifs belonged to a few that were popu-

lar in both the early and late phases; only in the final phase did they become rare. Of course, they did undergo some modifications. For instance, zigzag lines were originally packed without exception (RSR1A, RSR2A) but later were considerably spaced (RSR1B, RSR2B).

The most characteristic of the early phase, pottery ornamented using the rocker stamp technique bears concentric rows of triangles and dots (RSI1A, RSI 1B1–2). While they were very popular in the early phase, in the late phase they went out of use completely. In turn, the original invention of Neolithic potters, black-top ware (BT) differed radically from vessels called by the same term, known from Nubia and Egypt (BT). However, the initial growth in the number of this type of pottery was followed by its complete disappearance towards the end of the early phase. It is more popular in cemeteries while among settlement finds, it accounts for only a negligible percentage.

The early phase saw also the popular custom of ornamenting entire vessel surfaces with parallel incised lines. However, in this case too, after initially growing in importance, vessels so ornamented lost their popularity at the end of this phase. Additionally, whereas initially such lines were usually concentric (INS2), later they could equally often be arranged in four-sided festoons (INS3B1). Already the early phase witnessed the rise of complex geometric patterns but only on beakers. Only in the late phase did such patterns appear on other vessel forms.

With respect to morphology, simple unrestricted and restricted vessels with rounded bases dominated. The Early Neolithic witnessed the rise of boat-shaped vessels and ladle-pots, distinction into serving and kitchen pottery, and the emergence of thin-walled vessels with red, ochre-coated and well-polished surface. Furthermore, differences in vessel size grew: there were very small items holding only 0.1 litre and less and, at the other extreme, huge storage vessels, holding up to about 100 litres. Towards the end of this phase, the technique of making vessels with dark-grey surface could have been mastered.

In the Late Neolithic, pottery took a quantum leap in terms of diversity. Next to already known vessel types, a number of new ones appeared, greatly diversified with respect to morphology and ornamentation. As a technological novelty, rippled ware won large popularity. Vessels with grey and black surfaces (PG) were more frequent than in the previous phase, while vessels with red coated surfaces became rare (PR). Black-top ware (BT) disappeared altogether.

In terms of morphology, the rise of necked vessels was a major novelty. Vessel necks, however, were not strongly pronounced and initially were rather seen on

small vessels. Next, very shallow bowls appeared both round and ellipsoidal in horizontal cross section. Caliciform beakers took on forms that are more refined: strongly everted rims and very small bellies.

The late phase saw the disappearance of concentric motifs executed using the rocker stamp technique (RSI). What survived only was zigzag motifs (RSR1B, RSP1) and the motifs of parallel horizontal dotted lines (APS1). Festoons of semicircular incised or dotted lines evolved from four-sided patterns (APA1A3a; INS3B1) into more irregular festoons or series of numerous small festoons shaped like circular segments (APS1A3c,f; INS3A2). It was also then that the blackening of lips faded out, which had the form of a row of black triangles and was characteristic of the early phase. In contrast, complex geometric patterns (INS6) were more frequent than in the previous phase.

The sites assigned to the late phase include the cemeteries at Kadada, Es Sur, Geili, Shaheinab, Omdurman Bridge as well as the settlement at Kadada. The sites differ among themselves more strongly than do the sites of the early phase. In the late phase, the Neolithic pottery of central Sudan was no longer so stylistically diversified as before. It came to resemble more closely the materials of other cultures in the Nile Valley, in particular those of A-Group.

The pottery-making of the final phase is least known, with specimens being preserved only in fragments. To the existence of this phase point ceramic materials from the upper strata at Shaqadud. No ornamentation differences occurred in them, compared to the pottery of the late phase, that could be observed now. The only observable trait now that can serve to distinguish between Final-Neolithic and Late-Neolithic assemblages is the absence of rippled ware from the former. Moreover, it appears that in the final phase the use of organic temper could have grown in importance. The mobility of societies in that period explains why there is little settlement material that could be dated to the final phase. So far, no cemetery could be associated with this phase either.

The Neolithic pottery of central Sudan is closely related to the older pottery traditions of north-eastern Africa. However, it also reflects most cultural trends, rising in this region. Throughout the Neolithic, it is nonetheless easy to distinguish the specific character of the Neolithic culture of central Sudan from that of neighbouring lands. This is possible owing to, in the first place, vessel ornamentation, i.e. patterns known from nowhere else and the popularity of ornamenting the entire surfaces of vessels.

The study of now available Neolithic pottery from central Sudan supports a number of conclusions concerning the history of pottery in that part of Africa

in the period in question. There is no doubt that it derived from the local tradition rooted in the experience of hunters-gathers-fishermen settling this area earlier. It underwent slow changes from simple vessel forms and ornaments to a diversified inventory of such forms, ornamentation methods or surface treatments, with the technology of making the ceramic body not changing much though.

It appears that the Early Neolithic can be divided now into two sub-phases: Early Neolithic A and Early Neolithic B. The chronological boundary between them would fall on ca 4500 BC. In Sub-phase B, caliciform and cylindrical beakers with rich geometric ornaments appeared and black-top ware – not encountered in the late phase – continued to be produced. Since the beakers are known almost exclusively from cemeteries, it is not possible to separate the two sub-phases on settlements.

The Late Neolithic witnessed a considerable diversification of forms, surface treatment and belly ornamentation. Although mostly vessels of simple shapes continued to be made, necked specimens appeared then as well. The hallmark of the late phase is believed to be rippled ware, although simple burnishing was still common in it. While in the early phase pottery of brown or red-coated outer surfaces was made almost exclusively, later grey or occasionally even black surfaces were encountered equally often. Only some ornamentation motifs used by potters in the early phase did not go out of use in the late phase (solid and dotted-line zigzags, horizontal line of dots). Greater popularity was achieved by geometric patterns formed by alternating filled and plain bands or fields.

With respect to the final phase, the research does not support any far-reaching conclusions on pottery. Vessels surely continued to be ornamented with geometric patterns and simple impressed motifs (zigzags). The only observable trait now that can serve to distinguish between Final-Neolithic and late phase assemblages, is the absence of rippled ware. The settlement changes at the time resulted in the fact that most sites from this period are located outside the Nile Valley and only the most representative – Shaqadud – yielded relevant material.

Thus one can venture in conclusion that the Neolithic pottery in central Sudan did not exist in isolation, for it reflected a number of cultural trends that were in evidence in north-eastern Africa. Central Sudan wasn't merely a recipient in this cultural exchange of pottery concepts. On the contrary, a number of designs seen in the pottery of north-eastern Africa were born, as it seems, locally (e.g. rippling of vessel surfaces, black pottery ornamented with geometric patterns, caliciform beakers).