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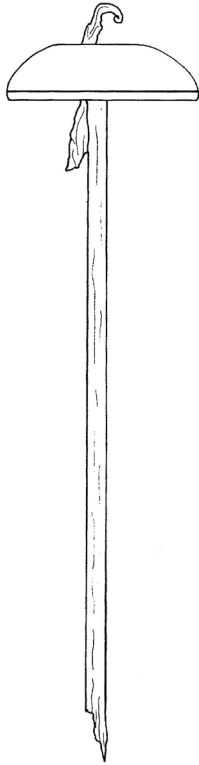
Spinning in Meroitic Sudan: Textile Production Implements from Abu Geili

Elsa Yvanez

Looking around us, it is easy to recognize the very important place assumed by textiles and other yarn products in our environment. Even more so in pre-industrial societies, threads and strings participated in many quotidian activities and crafts. The first among them, weaving, requires both raw materials and skills involved in multiple time-consuming stages of production. From growing and harvesting the fibers, to weaving and assembling a cloth, textile making is a fundamental aspect of a material culture.¹ Thanks to an arid climate allowing for the partial preservation of organic remains, Sudan and Nubia have proved to be a very valuable context to study the archaeology of textile production during the Meroitic and post-Meroitic periods (300 BC–550 AD).² Before even considering weaving, it is essential to transform the loose fibers in a usable yarn. In ancient societies, a family was generally responsible for their own textile and yarn production, which naturally monopolized a great amount of time.³ If we consider that a 1 m² simple cloth required an average of 1224 m of yarn and 25 hours of spinning,⁴ we can imagine the efforts involved, if only for spinning, for the creation of the large mantles or thick blankets in looped pile discovered for example at Ballana

- 1 BENDER JØRGENSEN, "The World According to Textiles," p. 7.
- 2 The hydrological situation in Sudan varies from a hyper-arid climate in Lower Nubia to a tropical rainy climate in the South (see WALSH, "Climate, Hydrology, and Water Resources," pp. 19–25). Consequently, textile remains have survived very unequally, with the majority of specimens coming from Nubia. See for example the corpus from Ballana and Qustul (MAYER-THURMAN & WILLIAMS, *Ancient Textiles from Nubia*) and Lower Nubia cemeteries (BERGMAN, *Late Nubian Textiles*).
- 3 BARBER, *Prehistoric Textiles*, p. 4.
- 4 Calculations established on the basis of a 18 g spindle whorl and a 870 g loom weight, for a thread density of 6 warps per cm, see MÅRTENSSON, NOSH & STRAND, "Shape of Things," p. 395, table 3. These measurements are congruent with the Meroitic material.

Pl. 1. Complete spindle, Ballana, tomb B58. Reproduced from WILLIAMS, *Meroitic Remains from Qustul*, vol. 1, p. 159, fig. 61e. OIM 22527, Courtesy of the Oriental Institute of the University of Chicago.



and Qustul.⁵ In this article, I would like to bring into focus this important but often overlooked activity of spinning.

In Sudan and Nubia, the analysis of ancient textiles is closely related to other fields of study, namely archaeobotany and archaeozoology, which connect the manufacture of fabrics to the larger economic issues of agriculture and animal husbandry. The evolution of both resource systems during Meroitic times is reflected in the choice of raw material used for spinning and weaving. Nubian textiles from the 1st and 2nd c. A.D. witness the introduction of cotton, which subsequently represents up to 80% of occurrences. The development of woolen sheep species, and the arrival of camels, is also demonstrated by the fabrics. As the Meroitic period came to an end, the consumption of cotton fibers declined notably, to be replaced by wool from both animals.⁶

The majority of preserved textiles comes from Nubia, particularly from funerary contexts, but numerous settlement sites across the Kushite territory also provide us with a rich corpus of tools.⁷ Besides loom weights, weaving combs and needles, the bulk of the textile implements are formed by spindle whorls. This small and apparently mundane tool, generally associated with the domestic world, remains our best source for understanding the technology of spinning. The excavations of the Meroitic settlement of Abu Geili revealed a very large assemblage of ceramic spindle whorls, reflecting the importance of yarn manufacture on the site. Their analysis can give us a comprehensive view of a craft that undoubtedly occupied a preeminent part of the lives of Abu Geili's inhabitants.

5 See, e.g., the particularly large blanket, measuring 2.44 × 1.68 m, which received the inhumation of a child in grave 113 of cemetery R. (MAYER-THURMAN & WILLIAMS, *Ancient Textiles from Nubia*, cat. n° 155, p. 131).

6 This general pattern of fiber consumption is visible on many sites, notably Ballana and Qasr Ibrim, see *ibid.*, p. 36. and ADAMS, "Political Affinities and Economic Fluctuations," p. 293.

7 For information purposes, the database compiled during our doctoral research counts 975 entries.

1. Hand-spinning in Meroitic Sudan

No study of spinning would be complete without the mention of Grace Crowfoot, who described in great detail the spinning and weaving processes of traditional Sudanese populations, as she observed them at the beginning of the 20th century.⁸ A comparison between her work and archaeological remains indicates many technical similarities between the two eras. A complete wooden spindle, discovered in the Meroitic grave B58 at Ballana,⁹ shows the whorl positioned at the top of the spindle, and secured by the insertion of an iron hook between the shaft and the whorl central perforation (*pl. 1*).

This kind of tool is particularly well suited for two spinning methods: the first is called “hand-spinning,” and consists of rotating the spindle in the hand and/or rolling it on the thigh; and the second is the “suspended spindle” method, in which the spinner drops the tool with a rotating movement.¹⁰ The first step is the drawing of a few fibers out of the assembled mass, and twisting them between the thumb and fingers of the right hand. This preliminary draft is then gently lengthen, by pulling and twisting with the right hand while the left one controls the quantity of fibers added from the main mass. Once the new yarn attains a sufficient length, it is attached to the hook on top of the spindle (*pl. 2*). In the “suspended spindle” technique, the spinner lets go of the spindle with a vigorous twist, allowing the tool to rotate freely and thus firmly twisting the fibers together in a solid yarn (*pl. 3*). This thread is then detached from the hook and wound around the spindle shaft, its extremity finally hitched on the hook again. This first operation can afterwards be repeated, each spinning phase being used to draw even more fibers.¹¹ In this process, the spindle whorl acts as a flywheel, increasing the momentum of the spindle in order to maintain a longer and more effective revolution. More yarn is created in one movement, notably speeding up one’s labor.

In Sudan, the standard direction of spinning is counter-clockwise, conventionally indicated by the letter S.¹² This technical specificity finds its origin in the Egyptian tradition of flax-spinning, for this fiber naturally curls to the left (S) when dampened.¹³ The Kushite spinner, after working with linen during the C-group and Kerma

8 CROWFOOT, “Spinning and Weaving in the Sudan”; CROWFOOT, “The Handspinning of Cotton in the Sudan”; CROWFOOT, *Methods of Hand Spinning in Egypt and the Sudan*.

9 WILLIAMS, *Meroitic Remains from Qustul*, p. 159, fig. 61e.

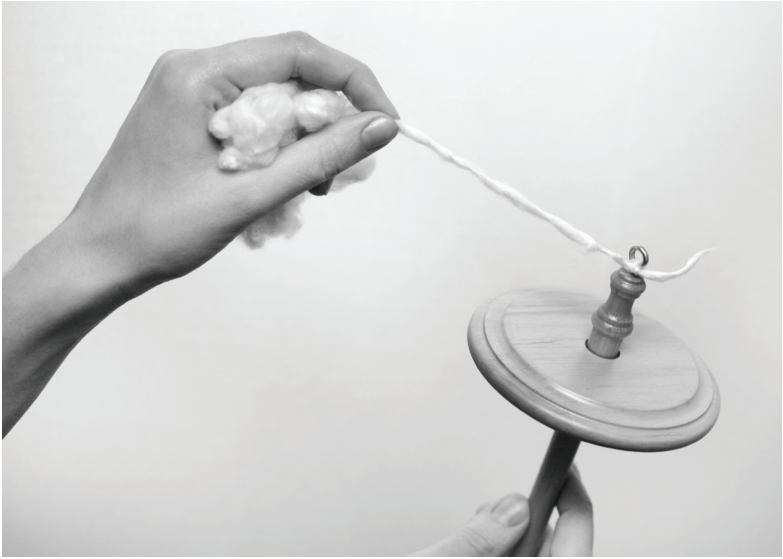
10 *Ibid.*, pp. 10–14, 17–21.

11 WILD, *Textiles in Archaeology*, pp. 28–29.

12 *Ibid.*, p. 28. “The central stroke of the letter S matches the direction in which the twisted fibers lie.” The clockwise direction, principally observed on textiles from other regions, is noted by the letter Z.

13 BARBER, *Prehistoric Textiles*, p. 66.

Pl. 2. Spinning with a top whorl, first stage: preliminary draft of the yarn. Photo Halstad/Yvanez.



Pl. 3. Spinning with a suspended spindle: twisting of the yarn. Photo Halstad/Yvanez.



periods¹⁴ to the Napatan period,¹⁵ seems to have logically applied the same gesture to his or her new fiber, cotton.

Unlike the spindle shaft itself, usually made of perishable materials, the whorl is a common archaeological find. Spindle whorls appear on numerous sites, generally in settlements but also in a few Nubian cemeteries. They can be made out of ceramic, unfired clay, stone, wood, bone, faience, and potsherds. The confrontation between the sites' location map and the list of objects and materials clearly shows an important technological break, contrasting Lower Nubia to the rest of the Kushite territory. The wooden and bone spindle whorls are exclusively restricted to the Nubian sites of Jebel Adda, Karanog, Qasr Ibrim, Arminna West, Ballana, Qustul, and Tila Island.¹⁶ Interestingly, the few objects discovered in a funerary context are also of the same corpus. The influence of Egyptian techniques and traditions is here clearly evident.¹⁷ Every other material is represented in sites further south, with a distinct predilection for ceramic. The data collected from the 228 spindle whorls discovered in the domestic and industrial areas of Meroe City¹⁸ show that 79% of them are made of ceramic, while 8% are made of unfired clay, 5% of pierced potsherds, 4% of stone, and 4% of faience. If a few examples of ceramic spindle whorls come from the 2nd cataract region,¹⁹ the majority has been discovered in the Island of Meroe, notably at el-Hassa,²⁰ Hamadab,²¹ Mouweis,²² and Meroe²³ itself, as well as in the Gezira. This vast area stretches along the White and Blue Nile rivers as far south as Sennar. It remains little-known by archaeologists but nonetheless revealed a surprisingly high number of spindle whorls (*pl.* 4). Found at Fiki Mahmoud, Saqadi, Begawi,

14 BATES & DUNHAM, *Excavations at Gammai*, pp. 1–21; REISNER, *Excavations at Kerma, Part IV–V*, pp. 19, 300–1; RYDER & GABRA-SANDERS, “A Microscopic Study of Remains of Textiles Made from Plant Fibers,” pp. 91–107.

15 See, e.g., ADAMS, “Political Affinities and Economic Fluctuations,” p. 293, fig. 3; VINCENTELLI, “Tomb 19 in the Cemetery of Hillat el-Arab,” p. 224.

16 Jebel Adda: Royal Ontario Museum excavations archives (unpublished). Karanog: WOOLLEY & MACIVER, *Karanog: The Romano-Nubian Cemetery*, passim. Qasr Ibrim: see, e.g., ADAMS & ADAMS, *Qasr Ibrim: The Ballana Phase*, pp. 195–7, pl. 21–2. Arminna West: TRIGGER, *The Late Nubian Settlement at Armina West*, p. 41, fig. 24b. Ballana and Qustul: WILLIAMS, *Meroitic Remains from Qustul*, p. 159, pl. 90. Tila Island: EDWARDS, *The Archaeology of the Meroitic State*, p. 111.

17 The wooden and bone spindle whorls from Lower Nubia are typologically very close to their Egyptian counterparts, see, e.g., RUTSCHOWSCAYA, *Catalogue des bois de l'Égypte copte*, pp. 43–52.

18 GARSTANG, SAYCE & GRIFFITH, *Meroe: The City of the Ethiopians*, p. 47; TÖRÖK, *Meroe City*, p. 173–74, pl. 144; SHINNIE & BRADLEY, *The Capital of Kush I*, pp. 216–18, fig. 81–83, passim; SHINNIE & ANDERSON, *The Capital of Kush II*, p. 255, fig. 123, passim.

19 Especially on the islands of Meili, Kasanarti, and Gaminarti, see ADAMS, *The West Bank Survey from Faras to Gemai 2*, pp. 32, 76–77, fig. 22.

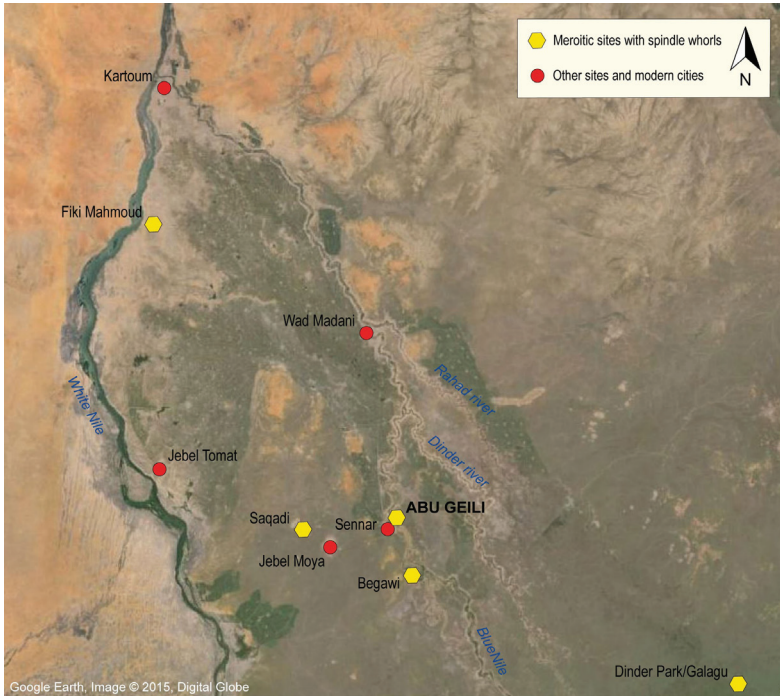
20 Excavations under the direction of Vincent Rondot (SFDAS and MAEE), pers. comm.

21 WOLF & NOWOTNICK, “Hamadab,” pl. VIIIb.

22 Excavations under the direction of Marie Millet (Musée du Louvre), pers. comm.

23 Cf. *supra*.

Pl. 4. Map of Central Sudan, south of Khartoum, showing the locations of spindle whorls discoveries. Map E. Yvanez, Image © Google Earth, Digital Globe.



and in Dinder Park,²⁴ they were particularly frequent on the settlement of Abu Geili.²⁵

2. The spindle whorls from Abu Geili

a. The site and the discovery of the spindle whorls

Abu Geili is located on the eastern shore of the Blue Nile, 3 km north of Sennar and on the same latitude as Saqqadi and Jebel Moya. The settlement was established on a rocky outcrop, interpreted as an ancient island separated from the main land by a paleochannel of the Nile. The site itself is formed by two small tells (site n° 400), built up by the remains of mud bricks buildings. The village is dated from the Late Meroitic period, from the 2nd to the 4th c. AD The excavation was undertaken by O.G.S. Crawford as part of the Wellcome Excavations in the Sudan. It took place in the beginning of the year 1914, in a rather extensive scale, before being interrupted by the

24 CRAWFORD, "Field Archaeology of the Middle Nile Region," p. 27; CRAWFORD & ADDISON, *Abu Geili and Saqqadi*, pp. 123-25, pl. 69A; CHATAWAY, "Archaeology in the Southern Sudan," p. 265, fig. 6.; MAHMOUD SULEIMAN BASHIR & WOLF, *Preliminary Report on a Visit to New Archaeological Sites in Dinder National Park*.

25 With 422 objects registered, they form 45% of all Meroitic and post-Meroitic spindle whorls listed in our database.

war. The results, combined with the work done at Saqadi and Dar el-Mek, were published in 1951 with the help of F. Addison.²⁶

The material recovered from the site includes the objects traditionally viewed as markers of the Meroitic culture, i.e. the archer's rings, the stamped and painted fine ware pottery, and the amulets with Egyptian symbols.²⁷ The rest of the pottery assemblage shows the handmade black jars decorated with impressed and incised geometric designs, common at Jebel Moya and associated with an autochthon, "African," ceramic tradition.²⁸ As a whole, the site of Abu Geili presents a dual profile, defined by the importance of distinctly local elements combined with clear signs of belonging to the Meroitic sphere of influence. The political significance of this relationship, however, remains poorly understood.

The excavations uncovered a dense network of mud brick walls, composing a series of domestic quarters, complete with storage pits and ovens.²⁹ Among the abundant material collected, the spindle whorls were especially plentiful. Their total number can be estimated at c. 3000 specimens: more than 1000 complete examples have been preserved and analyzed, but another 1946 fragments were only counted and then reburied.³⁰ Of the 1000 objects remaining, I was able to examine 422, of which 88 are kept in the British Museum³¹ and 334 at the Sudan National Museum.³² All of these tools were discovered scattered over the site.

The spindle whorls were first recognized as such by Grace Crowfoot, who had previous knowledge of identical objects from Meroe City. In its purely functional aspects, a spindle whorl is a basic and polyvalent pierced disc or sphere, which can very well be used for other tasks such as a net sinker, as a flywheel for different type of tools, or as a small pulley, to cite only a few. The decorated whorls can also be mistaken for large beads.³³ In the case of Abu Geili's whorls, the identification is reasonably straightforward: the corpus is numerous and homogenous in size and shape, and it finds parallels in many other urban sites in Sudan. Furthermore, the sections

26 CRAWFORD & ADDISON, *Abu Geili and Saqqadi*.

27 *Ibid.*, pl. XL, L.B., LII.A.

28 EVINA, "Une double tradition céramique," pp. 110-13.

29 CRAWFORD & ADDISON, *Abu Geili and Saqqadi*, pp. 9-14, pl. VII-VIII.

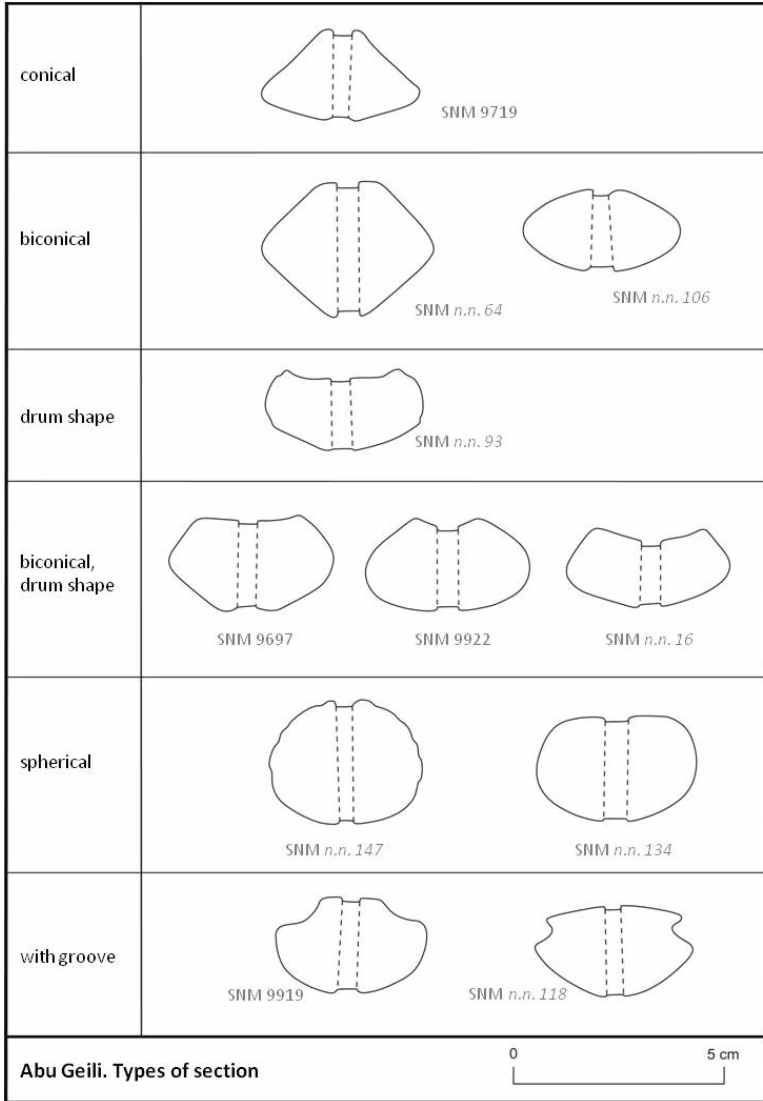
30 A short chapter in the final publication is dedicated to the spindle whorls, see *ibid.*, pp. 88-91, pl. LVI-LIX.

31 British Museum (London), BM 75902-75989. We would like to use this opportunity to thank the staff of the Department of Ancient Egypt and Sudan, especially Marcel Marée, Susanne Woodhouse and Neal Spencer, who facilitated our access to the material.

32 Sudan National Museum (Khartoum), SNM 9555, 9669-9700, 9713-9725, 9778, 9793, 9910-9944, 9991-9993, and a group of 259 objects without accession numbers (indicated in this article by n.n.#). This study would not have been possible without the very generous help of Abdel Rahman Ali Mohamed (Keeper), and Shadia Abdu Rabo, as well as other curators, who spent a lot of time searching for these small objects in the museum store.

33 MÉDARD, "La préhistoire du fil en Europe occidentale," p. 27.

Pl. 5. Typology of Abu Geili's spindle whorls, based on objects from the Sudan National Museum (the *n.n.* numbers are a personal numbering system applied to objects without a permanent SNM registration at the time). Drawing E. Yvanez, courtesy of the Sudan National Museum.



are generally biconical and the decoration is always located on the upper surface, both aspects rendering its use as a bead unpractical and unaesthetic. Even considering eventual misinterpretations or reuse, it appears clear that the thousands of whorls found at Abu Geili, and elsewhere in Meroitic settlements, were effectively used for spinning.

b. Typology of the ceramic spindle whorls

Despite their modest appearance, spindle whorls, if documented fully, can provide a wide range of information about the craft of spinning. Because of their omnipresence on different sites, an encompassing study can feed a database which in turn allows for a statistical approach.³⁴ Beside essential components like the type of material, decoration, or context of discovery, it is paramount to record the measurements of the whorls and especially their weight, which is intrinsically linked to the function of the tool. This information however is often omitted in publications. The material from Abu Geili, with 422 complete sets of data, gives us the opportunity to establish a typology of the Meroitic spindle whorls and draw a few conclusions about their use.

Firstly, the ceramic whorls under examination here appear to have been employed in the same hand spindle described above. The central perforation measures between 3 and 7 mm in diameter, with an average of 4–5 mm, which corresponds perfectly to the preserved wooden spindle shafts from Nubian sites, such as Jebel Adda and Karanog.³⁵ Two metallic hooks, identical in every aspects to the one used on the Ballana spindle, have also been discovered at Abu Geili.³⁶ The notches broken in the ceramic of a few spindle whorls, directly adjacent to the hole, show where the hook was inserted in place to block the whorl on its spindle. Finally, the presence of sometimes elaborate decoration exclusively on the upper surface of the whorl indicates its location on top of the spindle, where it would have been the most visible.

As a whole, the whorls form a very homogenous documentation. All of them are made of terracotta, well executed without firing flaws and often burnished. Their fabric varies from pinkish-buff to black. They follow a variety of forms: conical, biconical, drum-shaped, spherical and discoid, with sometimes a large groove along the side (*pl.* 5). A few pierced potsherds, tentatively identified as spindle whorls, can be added to this list.³⁷ A diagram comparing the statistical representation of the different types of sections (*fig.* 1) shows the clear preference for biconical shapes, especially truncated (in a drum-like profile) so as to keep a flat area around the perforation.

³⁴ *Ibid.*, p. 28.

³⁵ The examples from Jebel Adda measure between 4 and 6 mm (Royal Ontario Museum, unpublished excavations archives, pers. comm.) and the one from Karanog 5 mm (University of Pennsylvania, Museum of Archaeology and Anthropology E7668). The southern location of Abu Geili, with a climate notably more humid than Lower Nubia (rainfall of 468 mm/year vs. 1 mm/year), did not allow for a good preservation of organic remains.

³⁶ CRAWFORD & ADDISON, *Abu Geili and Saqqadi*, 1951, pl. LIII.B, n° 17–18.

³⁷ In order not to distort our calculations, the measurements from these pierced potsherds are not integrated in the following data.

Fig. 1. Statistical representation of spindle whorls sections (Abu Geili).

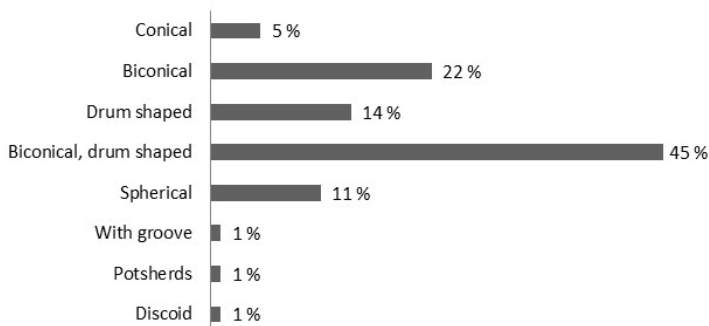
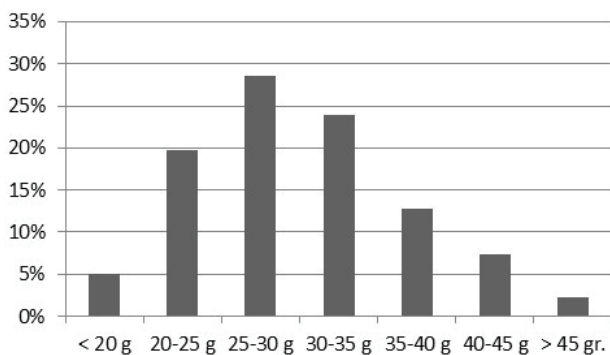


Fig. 2. Statistical representation of spindle whorls weight (Abu Geili).



The predilection for biconical shapes is easily explained for technical reasons, as this type of section allows the weight of the object to be adjusted during the manufacturing process by changing its thickness rather than its diameter. In this way, the spindle whorl can keep a well defined center of gravity and thus turn faster.³⁸ The frequent presence of a flat top is more difficult to understand. A similar feature can be observed on numerous spindle whorls around the world, notably on Bronze Age examples from Europe and Anatolia where the whorl was traditionally used at the bottom of the spindle.³⁹ Rather than supposing a radical technical change between Egypt and Lower Nubia on one hand, employing an upper whorl, and Central Sudan on the other hand, using a low whorl,⁴⁰ I would like to suggest that the flat area on top of spindle whorls must have resulted from a specific manufacturing process, standardized to a

38 BARBER, *Prehistoric Textiles*, p. 53.

39 The specimens from Troy especially present a range of sections close to those of Abu Geili, see *ibid.*, p. 308, fig. 14.9.

40 These regions are very close, both geographically and culturally. As a rule, the spinning traditions are deeply embedded in each population, so much that they are generally reflected in modern customs. At the time of the excavation, the archaeologists photographed an inhabitant of Abu Geili village spinning with an upper whorl, see CRAWFORD & ADDISON, *Abu Geili and Saqqadi*, pl. LIV.B.

large part of the production for practical reasons. It could also have been designed to help during the actual spinning, to easily tie the yarn to the hook for example.

In spite of their diversity of shapes, the measurements of the spindle whorls are surprisingly homogeneous. Their diameter goes from 23 to 46 mm, with an average fixed at 38 mm. The great majority of the corpus fits in the restricted interval of 35–40 mm.⁴¹ The thickness is also quite regular, generally comprised between 20 and 25 mm.

The equilibrium observed in the dimensions is reflected by the weight of the spindle whorls, which is consequently uniform. If the gap between the lightest spindle whorl (10 g) and the heaviest one (58 g) is important, the weight of the majority of them is set between 20 and 40 g, with an average of 30 g (*fig. 2*). The thickness of the object, rather than its diameter, is variable, the thinner whorl being also the lightest.

More than considerations of shape and material, the decisive criterion of a spindle whorl is its weight. Added to the weight of the spindle shaft, it has a critical influence on the finished product, especially on the thinness of the yarn. To each type of fiber corresponds a category of spindle whorl, heavy or light. A very light one (c. 10 g) is essential to spin short and fragile fibers into thin threads; a medium whorl (c. 30 g) is suitable for long or medium wool fibers and for thin to average yarns; and finally a heavy whorl (c. 100 g) allows one to work with very long wool and flax fibers and to spin them into thick or plied yarns.⁴² According to these theoretical values, the Abu Geili spindle whorls fit into the description of a medium to light whorl, employed for spinning short fibers, such as cotton, or medium length fibers, such as wool. In the case of cotton however, their weight would not have permitted the creation of very thin yarns.

The corpus of spindle whorls from Abu Geili presents a consistent typology, forming a relatively standardized model. A comparison with other Meroitic sites shows that this model is widespread to a large region. The similarities of measurements and shapes between the whorls from Abu Geili and Saqqadi,⁴³ also in the Gezira, is striking (*cf. table 1*). In Central Sudan, the spindle whorls from Meroe City⁴⁴ also fit into a 2 mm and 4 g interval with those from the Gezira.

41 1% of the whorls measure less than 30 mm, 15% between 30–35 mm, 66% between 35–40 mm and 18% over 40 mm.

42 BARBER, *Prehistoric textiles*, p. 52. This classification was built upon a multitude of data compiled by archaeology, ethnology and experimental testing.

43 Sudan National Museum (Khartoum), SNM 9796–9863. CRAWFORD & ADDISON, *Abu Geili and Saqqadi*, pp. 123–25, pl. LXIX.A.

44 The publication of the Meroe spindle whorls (see note 18) is uneven. On the 180 examples of ceramic whorls from the site, 94 have typological information and only 34 have complete

Table 1.
Comparison of
measurements
between spindle
whorls from Abu
Geili, Saqadi,
Dinder Park, and
Meroe.

	Abou Geili	Saqadi	Meroe	Dinder Park
Biconical, drum-shaped	45%	35%	1%	
Drum-shaped	14%	7%	1%	
Biconical	22%	31%	44%	
Conical	5%	5%	38%	
Spherical	11%	18%	1%	
Discoid	1%	4%	13%	
With groove	1%		1%	
Diameter (average)	38 mm	37 mm	39 mm	40 mm
Thickness (average)	23 mm	19 mm	21 mm	33 mm
Hole diameter (average)	4.5 mm	4 mm	5 mm	5 mm
Weight (average)	29 g	30 g	25 g	41 g

The propensity for biconical shapes is manifest, while the flat top seems limited to the Gezira. We also note a higher proportion of conical and discoid whorls in Meroe Island.⁴⁵ Globally, the homogeneity of the Meroitic ceramic spindle whorls is remarkable. We can observe a typological consistency between the south of the Gezira and Central Sudan, which is based on the continuity of shapes and regularity of dimensions. Outside of this region, the production seems less standardized. The spindle whorls from the Second Cataract area for example, are made of diverse materials (wood, clay, terracotta, stone, and faience) and follow different typological models.⁴⁶ They are notably lighter than the corpus under study here, with a weight closer to the Lower Nubia wooden specimens. In the periphery of the Gezira, our knowledge is limited to the two sites of Begawi, on the Blue Nile, and Galagu in the Dinder National Park. The first group of 4(?) spindle whorls comes from a surface collection, and includes 3 plain biconical whorls, and one conical, decorated with herringbone patterns or radiant lines made with a comb.⁴⁷ The archaeological survey conducted in 2008 by the NCAM in the region of Galagu led to the discovery of another group of 10 spindle whorls⁴⁸ (pl. 6). Located between two tributaries of the Blue Nile, the rivers Dinder and Rahad (pl. 4), the northern part of the park is dotted with several occupation sites, especially along the banks of the river and of seasonal lakes (*maya*). The ceramics recovered on the sites of Ras A'mir (I-II), Wad Musa and Galagu II links these settlements to the culture of Jebel Moya and Abu Geili. The

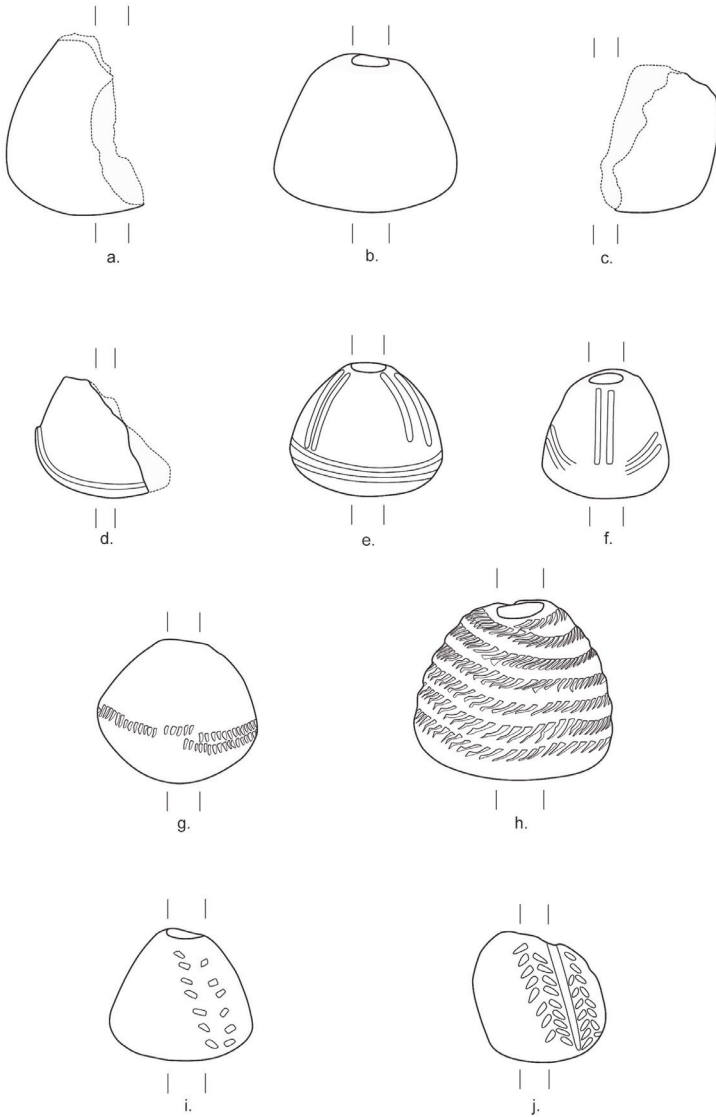
measurements. They are mainly the ones I examined at the Sudan National Museum (SNM 602-7, 2227, 2941a-f-2942, 24514-16).

45 This is confirmed by other corpus, notably from el-Hassa (Vincent Rondot, pers. comm.).

46 From Tila, Gaminarti, Kasanarti, Meili, and Gezira Dabarosa, see ADAMS, *The West Bank Survey from Faras to Gemai* 2, pp. 32, 76-7, fig. 22; EDWARDS, *The Archaeology of the Meroitic State*, p. 111.

47 CHATAWAY, "Archaeology in the Southern Sudan," p. 265, fig. 6.

48 MAHMOUD SULEIMAN BASHIR & WOLF, *Preliminary Report*. I would like to thank the authors for granting me access to the material.



Pl. 6. Spindle whorls from Dinder Park/ Galagu. Drawing E. Yvanez, courtesy of the National Corporation for Antiquities and Museum.

Spindle whorls from Dinder Park.

a, f : Ras A'mir I
 b, d, h : Ras A'mir II
 c, e, g, i, j : Galagu II



spindle whorls represent a large portion of the material, which also consists of sherds, beads of ostrich eggshell, hammer stones, and a grinder, depicting a typical domestic occupation. All spindle whorls from Dinder Park are roughly conical in section, and their measurements indicate a bigger caliber than the whorls from Abu Geili (cf. *table 1*). We can therefore assume that these tools were used to make thicker yarns than the ones from the Island of Meroe and the Central Gezira. Their ornamentation is also different: beside 3 examples of radiant or circular incised lines (*pl. 6.d-e-f*), the other artifacts were decorated with impressed designs applied with the help of a twig or a comb (*pl. 6.g-i-j*). One whorl even bears circular impressions of a string (*pl. 6.h*). These attributes are comparable to the Begawi whorls, and find perfect parallels on the potsherds from the same sites. The ceramics from Abu Geili also show the widespread use of comb-impressed patterns,⁴⁹ but this apparatus is very rarely employed on the spindle whorls, which do not document any string impression either. Therefore, the spinning tools from the south and south-east of the Gezira do not seem to be part of the same production context as the ones from Abu Geili and Saqadi. They could have been used to spin different fibers, maybe longer or thicker. In any case, these spindle whorls illustrate the common occurrence of spinning at the very fringes of the Kushite world, in localities apparently much further detached from the influence of Meroe than Abu Geili was, and belonging, as far as we can say, to the same cultural sphere of Jebel Moya.⁵⁰

c. *Décor*

This brief exploration of the spindle whorls from Dinder Park/Galagu shows the importance of decorations on this otherwise utilitarian tool. The ceramic whorls are characterized by the abundance and variety of their ornaments. Of course, plain examples also exist but they remain very rare (only 1.7% of all Abu Geili assemblage). They are often associated with atypical shapes, like the one with a large groove.

The ornaments were always placed on the upper surface of the tool, on the slanted sides of biconical whorls or on the rounded ones in the case of a drum-shaped whorl. The flat top is never decorated, but is often outlined by an incised line. The circular shape of

49 CRAWFORD & ADDISON, *Abu Geili and Saqadi*, pp. 41-45, pl. xxxiv-xxxvii.

50 These hypotheses are only founded on comparisons between ceramic productions. Abu Geili produced a mixed assemblage, consisting of ceramics of African tradition and a few pieces of fine ware, painted with Meroitic designs. The rest of the collections shows the same cultural dichotomy. It is not however the case at Jebel Moya and Dinder Park, where the assemblage is clearly dominated by objects belonging to the African tradition (see ADDISON, *Jebel Moya*). The continuation of archaeological work in the Galagu region would be of great interest to understand the general dynamics of this region.



Pl. 7.a. Examples of decorated ceramic spindle whorls from Abu Geili, showing the traditional radiant composition of patterns – here triangles – with a circular line around the central perforation. From top left corner: SNM n.n. 72, 82, 62, 61, 73, 80, 60, 75, 76, 80, SNM 9676, 7697, 7685, 7694, 9918, 9917, 9683, 9930, 9672, 9925. Photo E. Yvanez, courtesy of the Sudan National Museum.



Pl. 7.b. Examples of spindle whorls with red and white pigments in the impressions. SNM 9931, 9936, 9940. Photo E. Yvanez, courtesy of the Sudan National Museum.

the spindle whorl is naturally conducive to a radiant composition around the central perforation, although not systematically (*pl. 7.a*). Some recurring patterns, especially figurative elements, are arranged in a standardized way into four equal quadrants.

The majority of the ornaments decorating the spindle whorls are enhanced with pigments, applied inside the grooves drawing the patterns (*pl. 7.b*). Frequently white, the pigments can also be red or yellow. The craftsman could then alternate the colors. The filling of incised or impressed patterns with pigments is a distinctive feature of African tradition ceramics.⁵¹ The use of this technique illustrates the careful efforts devoted to the making of spinning implements.

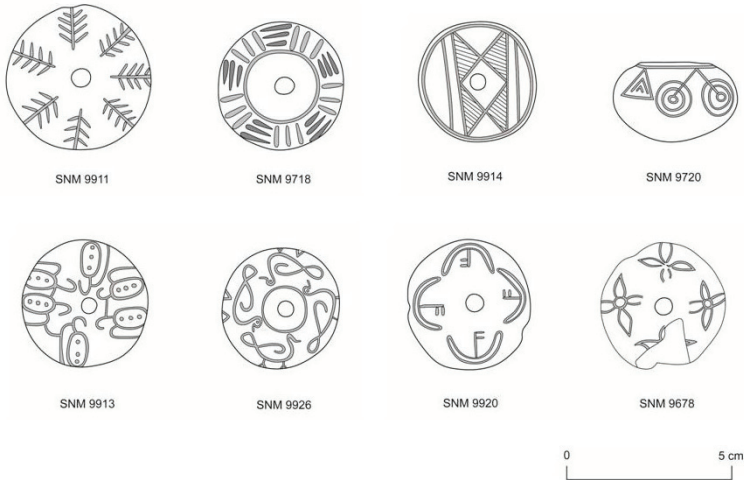
The study of the entire corpus of ceramic spindle whorls led to the differentiation of 31 categories of motifs, which we choose to

51 This technique was already used on Neolithic pottery, see EVINA, “Une double tradition céramique,” pp. 110–11.

Pl. 8.a. Examples of spindle whorls with incised designs, here with cruciform and triangular patterns. From top left corner: SNM n.n. 134, 123, 128, 133, 132, 131, 130, 129, 127, 126, 125, 124, 122, 121, SNM 9670, 9910. Photo E. Yvanez, courtesy of the Sudan National Museum.



Pl. 8.b. Examples of spindle whorls with abstract and figurative incised designs. Drawing E. Yvanez, courtesy of the Sudan National Museum.



distribute according to techniques (incised or impressed) and patterns (abstract or figurative). The incised patterns were made with a pointed tool or a thin stick, applied before firing the clay. Most of the examples show diverse decorations formed with small and linear juxtaposed incisions, organized in an abstract and/or geometric décor. Rarely, the incisions draw a figurative object, such as a bird. The impressed ornaments can be created with different implements: a thin stick, used to pierce the surface of the clay with little circular holes or draw radiant lines; a comb, sometimes used to make simple and linear designs; and a stamp. This last tool bears a pattern on one of its extremities and is used across the Meroitic world to quickly decorate bowls of fine ware pottery. The presence at Abu Geili of stamps and corresponding stamped spindle whorls shows the adoption of this practical process to the decoration of whorls, for a fast and rationalized production.

Here is the list of ornaments observed on Abu Geili spindle whorls (*pl.* 8-9):

Incised patterns	Incised patterns	Impressed patterns	Impressed patterns
<i>Abstract</i>	<i>Figurative</i>	<i>Abstract</i>	<i>Figurative</i>
Linear incisions	Crescent and symbol	Radiant lines	Religious symbols
Geometric	Bird	Dots and circles	Rosette or star
Cruciform, triangle based	Sun	Cruciform, in a square	Sun
Herringbone	Offering tables		
Hatching	Egyptian signs		
Radiant triangles	Floral		
Zigzags	Sorghum		
"F" motifs			

The iconographic repertoire has much in common with other Meroitic artistic productions, especially with pottery decoration, but also with the more informal graffiti and potmarks.⁵² The linear incisions, crescents, and birds are particularly well attested in the corpus of graffiti from Mussawarat es-Sufra.⁵³ The same temple walls also bear numerous cruciform drawings enclosed in a square, no doubt a schematic representation of an offering table. The influ-

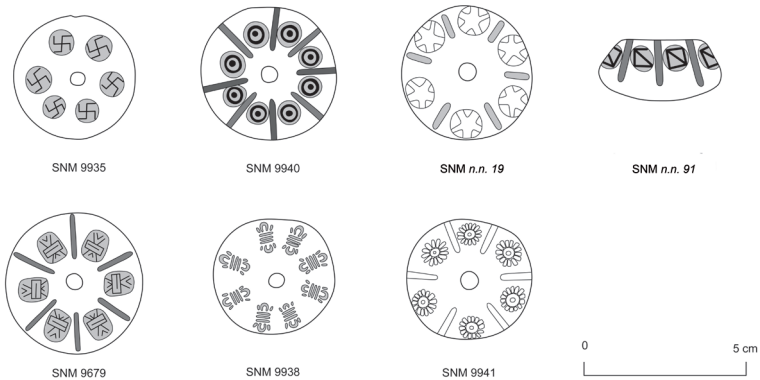
52 For the potmarks, see, e.g. DUNHAM, "A Collection of Pot-Marks from Kush and Nubia," pp. 131-47; TÖRÖK, "A Special group of Meroitic Property Marks from the 1st to 2nd Centuries A.D.," pp. 35-44.

53 For comparison, see the online database <http://musawwaratgraffiti.mpiwg-berlin.mpg.de/> (consulted on March 28, 2015).

Pl. 9.a. Examples of spindle whorls with stamped designs. From top left corner: SNM 9674, 9687, 9935, 9938, 9944, 9929, 9934, 9943. Photo E. Yvanez, courtesy of the Sudan National Museum.



Pl. 9.b. Examples of spindle whorls with stamped designs (swastikas, circles, stars, schematic offering tables, sA knots and sun). Drawing E. Yvanez, courtesy of the Sudan National Museum.



ence from African ceramic tradition is also clearly visible, especially through geometric designs like triangles, lozenges, and zigzags, arranged in repeating compositions and filled with white pigments.⁵⁴ Both mediums show a pronounced taste for hatchings as an overall filling element. The drawing of the sun also finds a direct parallel in this type of pottery, at Abu Geili itself.⁵⁵ Finally, the wide range of figurative patterns, as well as the herringbone motives, can be observed on fine ware ceramics. Bowls and jars offer a large catalogue of stamped and painted décor,⁵⁶ which is comparable with many of the spindle whorls, albeit in a somewhat simplified form and scale.

54 See for example the inventory of incised designs from Meroe (SHINNIE & ANDERSON, *The Capital of Kush II*, pl. 5) or the ceramics from Abu Geili itself (CRAWFORD & ADDISON, *Abu Geili and Saqadi*, pl. xxii.b, xxvii-xxix, and xxxviii.).

55 *Ibid.*, pl. xxxviii.a.6.

56 See for example AHMED ABUELGASIM ELHASSAN, *Religious Motifs in Meroitic Painted and Stamped Pottery*; TÖRÖK, *Meroe City*.

These ornaments are strongly associated with symbolic values developed by the Meroitic religion, such as protection and the after-life (e.g., 53 knots). If Abu Geili spindle whorls display a great variety of decorations, the local iconographic heritage with its triangles and zigzags, is the preferred one. Not one category however represents over 13% of the total assemblage.

It is noteworthy to observe that stamped figurative patterns are only attested at Abu Geili, despite the regular use of stamps on the fine ware bowls discovered in great number in the Meroe region. This argument leads us to consider the manufacturing context of the spindle whorls, which at least at Abu Geili, seems to be in part related to stamped ceramic production. Several spindle whorls, discovered inside an artisanal area with pottery kilns at Meroe (sector M620), seem to confirm the mass-production of some of the spindle whorls by craftsmen instead of the spinners themselves.

Whatever it may be, the corpus of terracotta spindle whorls from Abu Geili and many other sites, exploits the full iconographic repertoire developed on many mediums, particularly on ceramics with which it shares a common raw material. The decorative diversity exhibited by these small tools, as well as their good quality of execution, illustrates the privileged role of the spindle whorls and the importance of spinning activities in the everyday life of the Meroitic population.

3. Abu Geili: A Center for Fiber Production?

If we consider the very high number of spindle whorls discovered on the sites of Abu Geili and Saqadi, as well as the material from regions further away along the Blue Nile and its tributaries, we can wonder about the role of the Gezira as a center for fiber production. This documentation is particularly striking when comparing the thousands of objects from Abu Geili to the mere 228 identified on the otherwise major site of Meroe. To my knowledge, no other Sudanese or Nubian site gave us so many spinning tools to consider. Important collections from the settlements of Qasr Ibrim, Hamadab, el-Hassa, or Mouweis have been preserved, but never in such quantities.⁵⁷ Despite the high number of spindle whorls found at Abu Geili, nothing indicates the existence of a textile production workshop, like for example at Gordion in Anatolia, where an Iron Age structure revealed over a thousand spindle whorls and thousands

57 None of these collections of spindle whorls have been published yet, as the material is still under study. For comparison purposes, 53 whorls come from domestic reoccupation levels in the Amun temple of el-Hassa (see RONDOT & NOGARA, *Le temple d'el-Hassa et son dromos*) and 35 from artisanal and domestic quarters in Mouweis (Marie Millet, pers. comm.).

of loomweights.⁵⁸ Nonetheless, Abu Geili still displays a remarkable collection. This profusion of tools was discovered in 88 rooms and 149 corresponding floor levels, which implies the concentration of some of the objects by groups. Admitting that each spinner could own several spindle whorls, it seems possible for only a few generations of a densely populated settlement to produce such a corpus. The general impression given by the Gezira and Blue Nile documentation is one of a population dedicating a substantial part of its time to fiber production. Why?

Unfortunately, we know nothing about the product of their labor, as no textile has survived in the archaeological record of this humid region. The unfired clay loom weights, otherwise conspicuous on northern sites,⁵⁹ were not preserved either. However, the archaeobotanical studies, as well as the numerous textiles from Nubia and the Island of Meroe, both show the great importance of cotton. Could we then postulate a correlation between the production of cotton and spinning in the Gezira?

Cotton, being a very thirsty crop, grows best in tropical and subtropical climates.⁶⁰ In Sudan and Nubia, its culture is possible in various regions depending on the management of an effective irrigation system. It is firmly attested in Lower Nubia since the beginning of the 1st c. AD, by both literary sources⁶¹ and archaeobotanical remains from Qasr Ibrim.⁶² The plant, *Gossypium herbaceum* L., constitutes the oldest occurrence of cotton domestication in Africa, from irrefutably local wild species. It is interesting to note that by the time it appeared in Nubia, the cotton bush had already evolved to better adapt to its Nubian environment. Its DNA shows the expression of specific genes helping it to survive and grow with restricted quantities of water.⁶³ At Qasr Ibrim and elsewhere in Nubia, the cultivation of cotton is intrinsically linked to the development of mechanical irrigation systems, and especially to the introduction of the waterwheel or *saqia*.⁶⁴ However, cotton, as a summer crop, belongs to a group of species originating from the humid savannahs

58 BURKE, "The Kingdom of Midas and Royal Cloth Production," pp. 64–70.

59 See, e.g., the set of loom weights discovered at Umm Muri (4th cataract), PAYNE, "Excavations of the Late Kushite and Medieval Settlement on Umm Muri," p. 9, pl. 3.

60 It requires a minimum of 500 mm of water during its growing period, especially at the beginning of the cycle. WILD, WILD & CLAPHAM, "Irrigation and the Spread of Cotton Growing in Roman Times," p. 16.

61 PLINE THE ELDER, *Natural History*, XIII.28, XIX.2.

62 CLAPHAM & ROWLEY-CONWY, "The Archaeobotany of Cotton (*Gossypium* sp. L) in Egypt and Nubia with special reference to Qasr Ibrim, Egyptian Nubia," pp. 244–53.

63 PALMER et al., "Archaeogenomic Evidence of Punctuated Genome Evolution in *Gossypium*," pp. 2031–38.

64 WILD, WILD & CLAPHAM, "Irrigation and the Spread of Cotton Growing in Roman Times," p. 16.

stretching in the south and south-east of Sudan (i.e., Kordofan and Gash Delta),⁶⁵ in regions geographically much closer to the Gezira.

The climate of the Gezira, benefiting from seasonal rains and from its proximity to a vast river system feeding the Blue Nile, provides a similar environment of semi-humid savannahs, particularly well adapted to the cultivation of crops from the “savannah package.” The soil of this region is characterized by thick deposits of clay and alluviums coming from the rivers and *wadis*.⁶⁶ Called “vertisols,” the vast plains of the Gezira turn after the rains into a muddy and very fertile soil. On the East side of the Blue Nile, south of the modern town of Wad Madani, an area of alluviums and wet *wadis*, further irrigated by the Rahad and Dinder rivers, offers an ideal context to the cultivation of cotton. The plant can be grown according to a rainy agricultural system,⁶⁷ augmented by a secondary irrigation mean such as the *shadouf*. We recognize here a *nagda* type of agricultural land, considered by the modern Sudanese as the most fertile of the country.⁶⁸ In this context, it is natural to postulate a southern origin for the Meroitic cotton. It was often assumed by different authors, but never very clearly expressed.⁶⁹ Taking into consideration the easily available natural resources (according to the similar “site catchment analysis”⁷⁰), the savannahs of the Gezira and the neighboring regions of the Blue Nile seem ideally suited to the crops of the “savannah package.”

Despite our limited knowledge about the southern regions of the Meroitic territory, recent studies are bringing a new light on the rich material uncovered by the Wellcome Excavations in the Sudan. No archaeobotanical remains of cotton has been found in the Gezira, not even on the large site of Abu Geili. However, the cultivation of another iconic crop of the “savannah package,” sorghum, is well attested by carbonized seeds from Abu Geili and by an assemblage of seeds and stems discovered in a storage pit at Jebel Tomat. The C14 analyses anchor the production of sorghum into the Late Meroitic period, respectively in the 2nd–4th c. AD and the 1st–5th c. AD.⁷¹

65 FULLER, “Agricultural Innovation and State Collapse in Meroitic Nubia,” pp. 165–77. The author groups these different plant species under the appellation “savannah package.”

66 MITCHELL, “Physiography, Geology, and Soils,” pp. 5–9.

67 In modern times, the annual rain precipitations at Sennar is estimated at 468 mm, see WALSH, “Climate, Hydrology, and Water Resources,” pp. 19–25.

68 KHIDIR ABDELKARIM AHMED, *Meroitic Settlement in the Central Sudan*, p. 90. The natural resources of the Gezira have long been recognized by the local population, who further developed them by the construction of the Sennar Dam and the Gezira Irrigation Scheme at the beginning of the 20th century. The region then became specialized in the mass production of cotton, which still remains today the second exported product of the country. See BACON, “Crops of the Sudan,” pp. 325, 331–36.

69 GERVERS, “Cotton and Cotton Weaving in Meroitic Nubia and Medieval Ethiopia,” p. 15.

70 For the integration of this theory into the Sudanese territory, see GRZYMSKI, “Territory and Landscape Archaeology in the Middle Nile Valley,” pp. 378–82.

71 The samples from Abu Geili are stored at University College London and were studied by Dorian Fuller. See FULLER, “Agricultural Innovation and State Collapse in Meroitic Nubia,”

In the absence of cotton remains, we cannot assert with certainty that cotton was effectively grown there. Nonetheless, the body of evidence constituted by environmental studies and archaeobotany presents it as a valuable hypothesis. Adding to it the thousands of spinning tools from Abu Geili and neighboring sites, I would like to propose the Gezira as an important center for cotton production. The region of the Blue Nile and the river Dinder, in the vicinity of Wad Madani and Abu Geili, appears to have been particularly favorable to its development.

I hope to have shown that the study of textile production implements is not limited to the elementary description of a tool. The carefully recorded data only becomes interesting when cross-referenced with other sources and objects. The case of Abu Geili's spindle whorls is symptomatic of this approach, as many conclusions derive directly from their material observation and typology. It becomes possible, on the sole basis of the spindle whorls, to reconstruct a craft, from its gestures and techniques to its product, the yarn. The elaborated ornamentation of these small utilitarian objects clearly illustrates the importance of the tool itself, but more significantly of spinning, in the daily life of Abu Geili's inhabitants. The understanding of the manufacturing process of the spindle whorls and their décor places the artifact in its artisanal context, and connects it to the global industrial activities of the town. As we have seen, the spindle whorls reflect the different cultural affiliations of Abu Geili and its people. Moreover, the spinning craft needs to be correlated with its primary object, the fiber, and considered in the general context of textile production. Together with environmental data, the exceptional corpus of spindle whorls from Abu Geili raises questions as to the agricultural economy of the Gezira and of the Meroitic space as a whole. This documentation sheds light on a poorly understood region and presents it as a major center of fiber production during the Meroitic period.

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