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## **The use and exploitation of sorghum and wild plants in the Hidden Valley village (Farafra Oasis Egypt)**

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### **Introduction**

One of the most debated and intriguing aspects of sorghum exploitation is the long period of time between the first gathering of wild species and full domestication of the plant. The earliest evidence indicating that wild sorghum was gathered comes from the Egyptian Western Desert (Farafra and Nabta Playa areas) (Barakat & Fahmy 1999; Fahmy 2001; Wasylikowa 1997; 2001; Wasylikowa et al. 1995) and from the Atbara region (the sites of Abu Darbein, El Damer and Anebis), and dates back to around 8000 bp (Haaland 1995: 159-160; Haaland & Magid 1995).

According to Haaland (1995: 168-171; 1999: 402) an intensified use of wild sorghum is attested alongside the appearance of the first cultivation activities, during the sixth millennium BP, at several sites in the Khartoum area (Zakiab, Kadero 1, Um Direiwa). The Egyptian Western Desert, with the large samples of charred plant remains and the large amount of grinding equipment found there, must have also been a crucial area during these first cultivation experiments (Barich 2004a; Lucarini in press, b; Wasylikowa 2001).

A late occurrence of the first domestic sorghum specimens has been seen at the sites of Jebel Tomat, Meroe and Qasr Ibrim, where it dated from the first century BC to the third century AD. Even if the impressions of domestic sorghum identified by Costantini (Costantini et al. 1983) on potsherds are considered valid, estimated to date from the second millennium BC, the gap between the simple gathering of wild specimens and the occurrence of the first domestic sorghum is still great.

### The Hidden Valley complex

As already briefly mentioned, the Farafra Oasis is one of the regions that has provided the first examples in north Africa of intensive gathering and exploitation of certain wild grass species, in particular *Sorghum*. The oasis is located about 600 km south-west of Cairo, in the middle of a vast 10,000 km<sup>2</sup> depression, surrounded by plateaux that, because their heights are limited, are easy to cross.

Starting in the 1990s, the research of the Archaeological Mission of the University of Rome "La Sapienza", directed by Barbara E. Barich, focussed on the upper course of Wadi el-Obeiyid, a fossil river that "runs" between the two mountain ranges of the region (the Quss Abu Said and the Northern Plateaux). It forms an important artery through the northern sector of the depression, and particularly in the so-called "Hidden Valley" settlement area, a small elliptical drainage basin with a surface area of less than 2 km<sup>2</sup>. The area, located at about 60 km northwest of Qasr Farafra, has provided important evidence of repeated occupation phases related to humid periods during the Early and Middle Holocene. The Hidden Valley research area consists of a settlement system, which is exceptional for such an open-air desert location, made up of a 'village' and a complementary supply area for the raw materials used in stone manufacture, located on the Northern Plateau about two km north of the village. A cave decorated with engravings and wall paintings is also part of the system, and its entrance opens onto the slope of this plateau.

The village (Fig. 1), which had permanent habitation structures and hearths, was the main inhabited nucleus of the area and was located on the shore of an ancient water basin, which is today characterized by a Holocene beach residue (*playa*). The dates obtained from the charcoal sampled in the site range from 7670 to 6190 bp with clear evidence of repeated occupation of the area.

Paleobotanical analysis of soil samples taken from various archaeological features revealed high levels of burnt grass grains inside the village. This floral evidence suggests that the Hidden Valley Village could have hosted an autonomous process of intensive exploitation of wild grasses. Even the large number of grinding stones, clearly indicates the emphasis put on plant resource exploitation by the site's occupants (Lucarini, in press, b).

The geomorphological study carried out at the site highlighted the presence of a stratigraphic section made up of 12 sedimentological layers (Barich & Hassan 2000; Hassan *et al.* 2001), attributed to three main occupation horizons. Barich (2004b) has identified four different occupation horizons (A-D), each correlated to documented aspects of both the Nabta Playa region and the Dakhla Oasis.



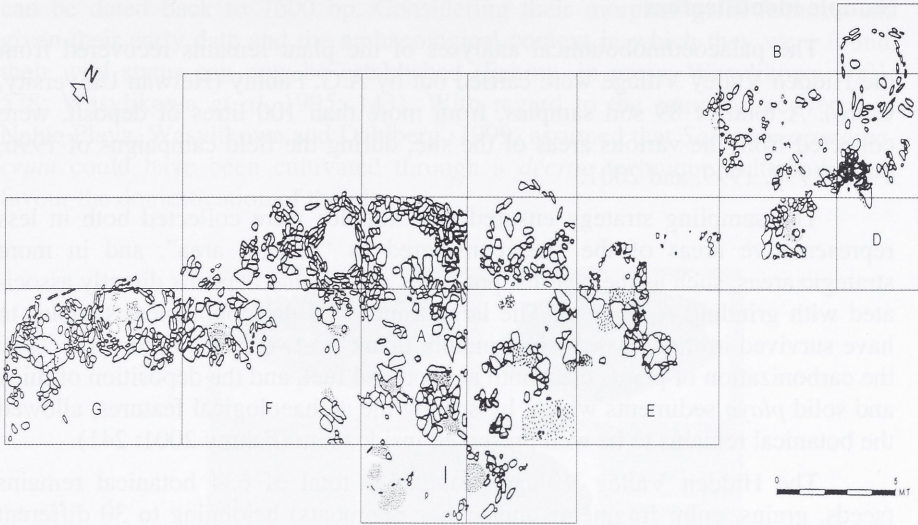


Fig. 1. Hidden Valley Village – Planimetry of the excavated area.

The oldest horizon (In the following sequence I have united Barich's phases B and C into a single horizon "B") can be dated to between 7670 and 7320 bp, when mobile communities began to settle along the northern shore of the lake, developing a more continuous occupation model. The second occupation phase, from 7200 to 6500 bp, was generally characterised by an arid climatic tendency that encouraged further semi-stable settlement. The lithic industry produced retouched bifacial lens-shaped and tanged arrow heads, which indicates small and medium-sized animal hunting. In addition sheep and goat breeding was practised; even ostrich egg fragments have been found, which in the absence of ceramics, were mainly used as containers for liquids. The 30 identified botanical taxa (Fahmy 2001: 241, 243) also show the huge emphasis placed on plant utilization. This exploitation of plant species is also confirmed by the presence of pot-holes: small cooking holes that were filled with ash and used for food preparation, inside of which are often found the remains of carbonized plant material, and in the same layer various lower and upper grinding stones have also been discovered. Finally, during the most recent occupation phase (6500-6100 bp) permanent dwelling structures have been identified, they were outlined by large limestone slabs laid out in circular or oval shapes. These formed proper hut bases, of relatively small dimensions, and were used by the semi-nomadic groups during those periods when they stayed near the lake.

### Sample identification

The palaeoethnobotanical analyses of the plant remains recovered from the Hidden Valley Village were carried out by A.G. Fahmy (Helwan University, Cairo). A total of 89 soil samples, from more than 100 litres of deposit, were collected from the various areas of the site, during the field campaigns of 1996, 1997, 1998, 1999, and 2001.

The sampling strategy ensured that samples were collected both in less representative areas of the site, considered as “general area”, and in more strategic areas, such as the hearths, pot-holes and ground deposits directly associated with grinding equipment. The large number of palaeobotanical samples to have survived in the site deposit is mainly thanks to two preservation processes: the carbonization of plants used both as food and fuel, and the deposition of thick and solid *playa* sediments which, by sealing the archaeological features, allowed the botanical remains to be well preserved inside them (Fahmy 2001: 241).

The Hidden Valley Village provided a total of 634 botanical remains (seeds, grains, culm fragments and leaflet fragments) belonging to 30 different taxa (Fahmy 2001: 241). The botanical complex is highly represented by grasses, which are present in almost all the samples: the small millets, *Brachiaria* sp., *Cenchrus* type, *Digitaria sanguinalis*, *Echinochloa colona*, *Panicum repens* and *Setaria verticillata*, belonging to the Paniceae tribe, and *Sorghum*, belonging to the Andropogonae tribe. These grasses may have been plentiful in the site’s vicinity, and in particular around the water basins and the depressions which characterized the area.

*Sorghum* remains make up 40.6% of the total number of palaeobotanical samples identified from the site. The good preservation state of the sorghum caryopses, mainly due to the carbonization process, allowed the identification of the samples to a subspecies level. The morphological features of these sorghum remains (Fig. 2) look similar to specimens from the site E-75-6 at Nabta Playa, attributed to *Sorghum bicolor* subsp. *arundinaceum* (Fahmy, 2001: 240; Wasylikowa, 1992; Wasylikowa *et al.*, 1995: 143).

Even if the very high frequency of sorghum could be attributed to its large sized grains and to good preservation conditions, it is also possible that these high percentages can be considered the result of cultural preference. As at Nabta Playa, sorghum may have been preferred by human groups for its bigger grains and better nutritional qualities. The large number of grains, which have been found in greater numbers than other parts of the plant, is further evidence of the use of this grass as food (Fahmy 2001: 240).

The sorghum samples from site E-75-6 are dated from 8060 to 7950 bp (Wasylikowa 1997: 102). The oldest specimens from the Hidden Valley Village



can be dated back to 7600 bp. Considering their morphological features and given their early date and the archaeological context in which they were found, their wild status can now be established (Fahmy, in press; Wasylikowa 2001: 578; Wasylikowa *et al.* 1995: 143). With regard to the samples recovered in Nabta Playa, Wasylikowa and Dahlberg (1999) assumed that *Sorghum arundinaceum* could have been cultivated through a *décrue* technique, which did not favour the domestication of the plant.

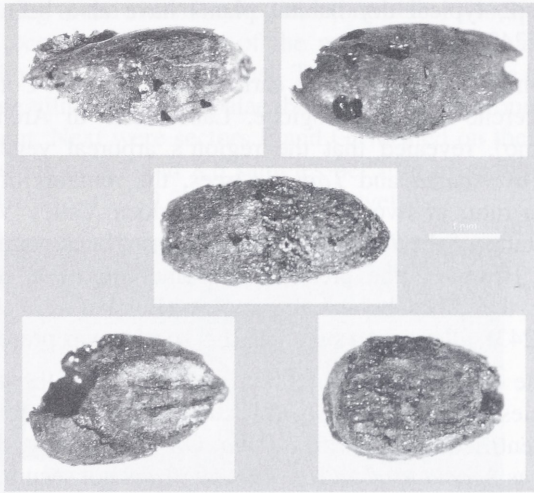


Fig. 2. Hidden Valley Village – *Sorghum arundinaceum* grains.

The other taxa recovered in the site have lower percentages, from 8-15% of the entire palaeobotanical complex. Fahmy (in press) has suggested that the wild species could have been accidentally collected during the gathering of *Sorghum*. Still, even if such low percentages could confirm Fahmy's interpretation, I would argue that the sedentary groups in the Hidden Valley, in addition to mainly exploiting *Sorghum*, also voluntarily and knowingly made use of the other species found. The importance of these other species has been widely testified by the numerous ethnographic observations about African nomadic groups who still use the same plants. Should sickle have been found present, the technique of using them is such that it presupposes that bunches of plants were cut, often with different species clumped together, and this could have helped strengthen the theory that these plants were accidentally present in the sample. However, the absence of these tools in the Hidden Valley area and the use of the

particular gathering techniques that will be analysed in more detail below, instead supports the theory that most of the taxa were knowingly gathered and exploited.

During the village's occupation, the Hidden Valley basin may have been characterized by a savannah environment where grasses were mixed with other wetland and aquatic plants, such as *Carex*, *Coronopus niloticus*, *Juncus* sp., *Phragmites australis*, *Schouwia purpurea* and *Typha* sp. The rhizomes of *Typha* and the leaves of *Schouwia purpurea* could have been eaten, while the entire plant of *Schouwia* could also be used to light fires. Samples of *Ephedra* sp. and *Hyoscyamus* sp., typical dry habitat plants have also been found at the site (Fahmy 2001: 243).

The anthracological analyses carried out by Dr. M. Cottini (ARCO: Cooperativa di Ricerche Archeobiologiche, Laboratorio di Archeobiologia, Musei Civici di Como), revealed that the region's arboreal vegetation was mainly characterized by *Acacia* and *Tamerix* trees, the remains of which have been recovered at a ratio of two to one in the Hidden Valley Village. Due to the preservation status of the *Tamerix* genus, it has not been possible to identify it at species level. However, the presence of some fragments of *Tamerix aphylla* leaves among the palaeobotanical samples (Barakat & Fahmy 1999: 37-38; Fahmy 2001: 243), allow us to state that this species was present in the area.

The state of preservation of *Acacia* remains made the identification of this genus at species level particularly difficult. Only a few fragments have been confidently identified as *Acacia raddiana*. On the contrary, the identification of other samples as *Acacia asak* and *Acacia etbaica* is not secure.

The species *Acacia raddiana*, *Acacia nilotica*, *Acacia ehrenbergiana*, *Tamarix aphylla* and *Tamarix nilotica*, still present in the Egyptian Western Desert, have also been identified in the Dakhla Oasis (Ritchie 1999: 74, 77).

It is not unlikely that branches of *Acacia* and *Tamerix* could be used, not only for fuel, but also in the preparation of hut superstructures that characterized the final occupation horizon of the Hidden Valley Village, or for small structures used for protecting hearths from the wind. *Sorghum* and *Panicum* stalks and leaves could also be used for this purpose, as well as for making mats. *Acacia* and *Tamerix* woods can be considered very good materials for manufacturing small tools.

### **Statistical analysis and intra-site sample dispersal**

An important goal of this study has been to analyze the association of plant taxa with archaeological sectors, layers and features (hearths, potholes and soil deposits near grinding stones) in order to gain a better understanding of the distribution pattern of plants in different areas of the village. In this quantitative



analysis we considered the total number of specimens present in a particular context (abundance) and average number of a single taxon (or all taxa) per litre of analyzed sediment (density).

When looking at the sample distribution in various areas of the settlement, sectors E and F had the highest number of elements (236 and 250 palaeobotanical remains respectively). Next in order were sectors G with 69 units, A with 37 and I with 16. Twenty-six samples were found in Test III, which was a small trench (3 x 2.5 m), located about 15 m south of the village, and opened during the 1998 excavation. It was dug at the site of some limestone slabs, which were similar to those of the final occupation horizon of the main settlement, and which were associated with a level of ash and charcoal. Test III also had the highest average density in the whole village, with 13 palaeobotanical remains found for each litre of analysed sediment. Next were sectors F and G (located on the far west of the village), with densities of 8.3 and 8.6 samples per litre of sediment. Areas E, I and A had lower densities (5.2, 3.2 and 2.5 respectively).



Fig. 3. Hidden Valley Village – Hearth with wood fragments and palaeobotanical remains.

Among the various taxa, *sorghum* proved to occur most frequently in all areas of the village. Of the 250 palaeobotanical remains found in area F, a very high number (180, of which 85 were *Sorghum*) came from sector F1, where a large well-preserved hearth was found (Fig. 3). The high densities of palaeobotanical samples, characteristic of sectors G and F could be due to an accumulation of food preparation remains. The dating of the hearths present in this area of the settlement is to between 7100 and 6700 bp.

As already mentioned, even sector E, located in the central-eastern excavated area of the village, and characterised by the presence of small hearths and some pot-holes, had a large number of samples (236 in total, of which 42 were *Sorghum*). Even if dwelling structures have not been clearly identified, this sector has the most complete stratigraphic sequence in the village, in fact dates have been obtained from it of  $7670\pm 63$  (R-2469) and  $6190\pm 270$  (Gd-9629) bp, which mark the upper and lower limits of the site's use.

The lowest indices of abundance and density of palaeobotanical remains were recorded in sectors A and I. They are located in the centre of the excavated area, the former more to the north, and the latter more southerly, near to the edge of the ancient lake. During the excavation season in 2001, various limestone slabs were found in sector A, buried at about 50 cm from the current surface level and laid out in a circle (Barich & Lucarini 2002: 105). The structure, which had a c. 3 m diameter, was characterised by the presence of large hearths which provided evidence of various occupation phases. The deposit inside these hearths included 37 carbonized palaeobotanical remains, including various samples of wild grasses. The dates obtained were between 7000 and 6900 bp. The limited presence of palaeobotanical samples in area I of the village, can probably be put down to the strong deflation processes that the upper section of the deposit underwent. The stratigraphy and dating, in fact, clearly shows that the hearth structures found on the surface belong to the village's oldest occupation horizon.

Analysis of the associations between the palaeobotanical remains and the archaeological features has shown that the highest abundance of plant remains come from within hearths (454 remains in total, of which 193 are sorghum). A lower number of remains come from pot-holes (32) and from soil samples taken from near grinding stones (16). The remaining 132 items relate to the areas of the site that are not characterised by the presence of particular archaeological features and defined as the "general area".

Soil samples taken from near grinding stones show the highest density (35.6 remains for each litre of analysed deposit), even if the limited number of samples (16) found does not permit, at least in the current state of research, such a relationship to be considered as secure.

The densities of botanical samples (among which the greatest quantities were sorghum and leguminosae) from pot-holes, hearths and general areas had decidedly lower results (8.9, 6.6 and 4 units).

Even if the high percentage of palaeobotanical finds within hearths shows the use of some wild species as fuel (particularly in the first phase of lighting a fire), the presence of spontaneous grasses, and in particular *Sorghum*, *Setaria*, *Echinochloa* and Leguminosae, found within pot-holes and in association with



grinding stones, seems to confirm the theory that these plants were a primary food resource for the human groups in the area.

### Use-wear analysis

The stone tools from the Farafra Oasis and in particular from the Hidden Valley Village have also been functionally analyzed. During the January and December 2003 field campaigns the lithic artefacts underwent a use-wear analysis in order to find any glossy polishes on their working edges that could be attributed to plant exploitation.

Among the 400 objects found in the Hidden Valley Village (sectors D2, E1 and B4), those artefacts were selected that typologically could have been used for this purpose (presumed sickles, notches, denticulates, but also un-retouched blades and flakes, etc).

In the preliminary phase of this work, all the selected implements were investigated by means of a magnifying glass at magnifications of 4x and 10x. All the lithic artefacts showing particular morphological features (especially abrasions and removals) were selected for closer microscopic examination, carried out with a Nikon SMZ-U stereoscopic microscope (at magnifications between 10x and 63x) and then microphotographed with a Nikon Coolpix 4500 digital camera.

No evident bands of gloss were observed on the implements' working edges. On the contrary, some edge removals and edge-roundings were found that could be linked to scraping and cutting medium-hard and hard material.

It should be noted that during stereoscopic microscope observations, a large number of the analysed tools showed signs of alterations, which in some cases were heavily done. In particular, the presence of a luminosity quite commonly found on the surface of the artefacts, in some cases, obstructed any attempt at analysis. In particular those examples found in the higher deposits at the Hidden Valley Village were found to be completely "illegible" in functional terms.

The need to carry out additional analyses to those done on site, in order to integrate an evaluation of the microscopic use-wear analysis, and the impossibility of exporting the archaeological artefacts to Italy, led to the production of high-definition reproductions of the edges of these tools, using *Elite H-D+*, a hydrophilic resin for making impressions, commonly used by dentists. These copies then underwent further and more accurate observations in the laboratory of the Museo delle Origini di Roma, by means of an Eclipse ME-600 metallographic reflected-light microscope (at magnifications between 100x and 200x). This closer analysis has further confirmed the absence of gloss due to working siliceous

plants and revealed that the presence of edge-roundings could have been caused by scraping leather and other hard animal material (maybe bone; Fig. 4).

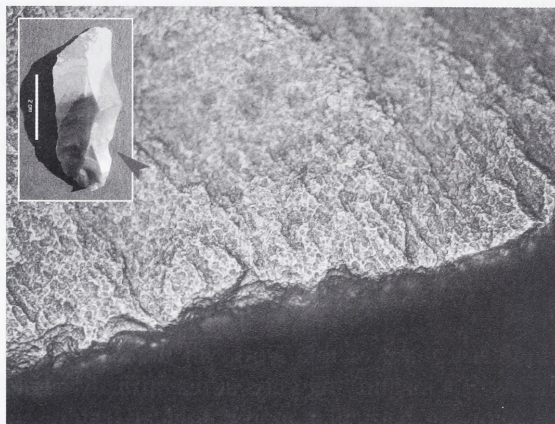


Fig. 4. Hidden Valley Village – Lithic tool showing micro traces caused by use on hard animal material (magn. 100x).

It should be highlighted that the sediment's abrasion formed a widespread light glossy patina on all the surfaces of the lithic artefacts that present medium-grade alterations. Even if this glossy patina makes light polishes less visible, it cannot cover heavy polishes, like the ones due to scraping leather or the high gloss left on implements by cutting siliceous plants.

Moreover, it is interesting to note that no special stone tools associated with soil tillage were found at Nabta Playa (Wasylikowa 2001). Furthermore, the importance of tools made from perishable materials, such as wood, should be noted; these can be confidently hypothesized thanks to ethnographic comparisons, even if it is difficult to prove them on an archaeological basis. Magid (1989: 177) reports that in the Sudanese sites of Abu Darbein, Anebis and El Damer: “*wooden tools were most likely the main tools which were used also in the tilling and sowing activities*” and that harvesting could simply be done by hand. It is interesting to note that even at the site of Upper K, in the Fayum Depression, along with large numbers of complete and fragmentary sickles, some sticks were found, c. 40-75 cm long, made of tamerix wood, that were probably used as threshing sticks (Caton-Thompson & Gardner 1934). The differences between the botanical samples and the evidence for particular activities show that in Fayum there was a more accentuated “*agricultural understanding*”, and it can be ruled out that remains of similar tools could be found at Farafra. In any case,



in the Hidden Valley Depression the use of wooden tools is suggested by the abundant presence of acacia and tamerix remains. These species, apart from being used primarily as firewood, have particular characteristics that made them optimal material for making various types of tool as well.

In April 2004, in the context of a mission to study the archaeological finds from the Farafra excavations, currently stored at the SCA Office of the Kharga Oasis, functional analysis of the artefacts was extended to the entire lithic complex. Some artefacts that already revealed particular characteristics such as high gloss, edge removals, edge roundings and abrasions from use during the initial analysis by stereoscopic microscope, then had their replicas studied more closely with a metallographic microscope, and proved to have traces of gloss and striations probably associated with cutting spontaneous grasses and working wood, both materials found abundantly in the region.

As the wild status of the plant species from Farafra, Nabta Playa and Abu Ballas has been ascertained, it remains to be understood if particular cultivation techniques had been developed, or if simple gathering was practised only.

As already briefly mentioned, no artefacts have been found that can be directly associated with the exploitation of plant resources, with the exception of grinding stones, in the archaeological context of Nabta Playa, nor at other sites of the same chronological phase in the Abu Ballas and Dakhla Oasis areas. In the light of this, the data from the Farafra Oasis take on a greater importance. The analyses carried out on the lithic artefacts have, in fact, allowed us to establish that, alongside the more widespread gathering wild grasses by hand, stone tools were also used, even if only marginally (Lucarini in press, a). From the results of these analyses, it seems that unretouched blades and flakes or barely shaped tools that could be held and used to cut a small number of plants, even without being hafted beforehand. Therefore, even if they cannot be defined as proper sickles, some of the finds from the Hidden Valley Village deposits could have been used as opportunistic small knives, that were then discarded after a short period without being reused.

The main cause of the invisibility of plant-cutting artefacts in other contexts in the Egyptian Western Desert must therefore be due not to a lack of use of these tools, but to a limited and discontinuous usage that has only rarely left clear evidence, and also to the heavily altered state in which these artefacts have come to us.

## **Conclusions**

The more intense population phase in the Hidden Valley Village, between 7200 and 6500 bp, is also the time span to which a large part of the plant species belong that were found in the archaeological features within the site. The human

occupation of the Hidden Valley Village became, in fact, more stable during the course of the seventh millennium bp, when the human groups, attracted by the presence of abundant water, settled in the area. In this phase, the gathering and exploitation of the plant species, among which wild grains and sorghum in particular played a predominant role, was coupled with the raising of domestic caprovids, the oldest examples of which date to about 7000 bp (Barich & Lucarini 2005) and by the hunting of small animals.

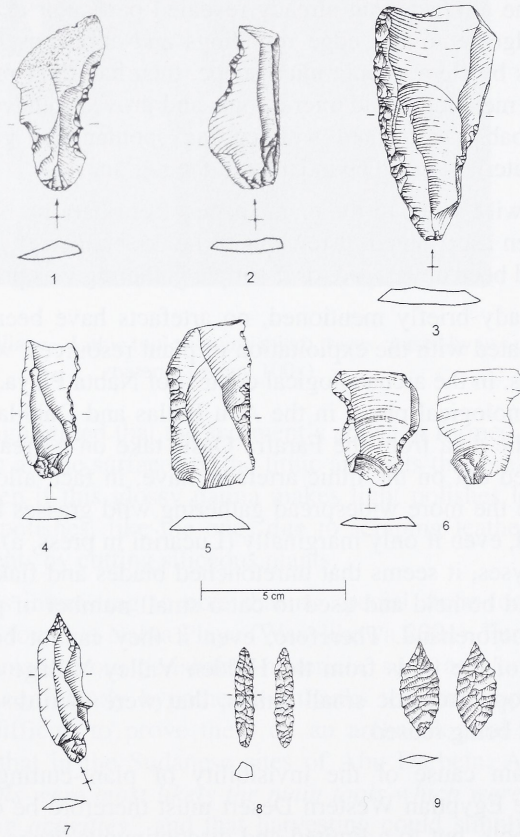


Fig. 5. Hidden Valley Village – Lithic artefacts coming from the site (1-2-4: denticulates; 3: side-scraper; 5: piece with continuous retouch; 6: notch; 7: borer; 8: bifacial drill; 9: lens-shaped bifacial arrowhead).

The stone artefacts belonging to this phase show a simple knapping technique, mainly on flakes, with no core preparation (Fig. 5). As already mentioned some of the debitage elements and retouched tools (among which retouched flakes,



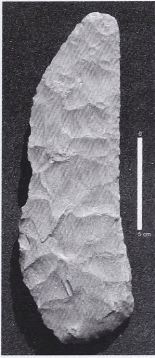


Fig. 6. Sheikh el Obeiyid area – Bifacial knife.



Fig. 7. Sheikh el Obeiyid area – Retouched blade probably used as sickle element.

side-scrapers, notches and denticulates show the highest percentages) could have been used in the wild plant gathering.

On the contrary, the numerous stone tools (bifacial knives, tranchet axe, arrow heads) (Fig. 6) found on the surface of the Hidden Valley basin, having such characteristics as to be seen as forerunners of the classic Predynastic types from the Nile Valley, can be associated with the later occupation horizon of the site, characterised by the presence of well-structured hut bases. It can be supposed that some of these more recent artefacts (particularly bifacial knives, denticulated blades and gouges) that are very numerous in the various areas of the depression, could have been similarly used for the gathering of wild plants and for the exploitation and working of wood (Fig. 7). The large number of grinding stones can be added to this, as they were found in abundance over the whole basin area (Fig. 8).

The first evidence of real cultivation activity in the Nile Valley and right in the Fayum Depression can also be related to this period. Even if the Fayum A phase cannot be considered, *tout court*, as agricultural, the sites attributed to this horizon show an ever increasing importance given to plant exploitation. As is known, the first lithic artefacts to be securely associated with cereal gathering activity are in the Fayum A horizon, and it is noteworthy that the oldest domesticated cereals found in Africa, also from this same cultural phase, came from the *Upper Granaries* including the species *Triticum dicoccum*, *Hordeum hexastichum*, *Hordeum vulgare*, *Hordeum distichum*, and *Triticum vulgare* (Caton-Thompson & Gardner 1934: 46-49).

In the Egyptian Western Desert, the first real sickle elements have been associated with the Sheikh Muftah phase at the Dakhla Oasis, which began at the

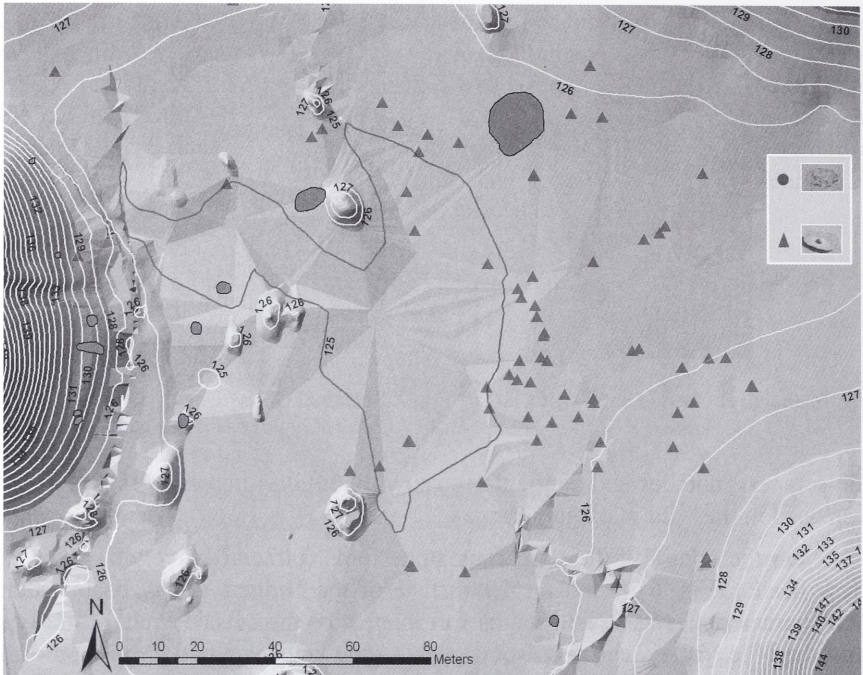


Fig. 8. Hidden Valley Basin – *Digital Elevation Model* of the basin showing the distribution of hearths (circles) and grinding stones (triangles).

end of the sixth millennium bp (McDonald 1999; 2002). The archaeological material both from Fayum and from Dakhla, as well as the appearance of grain from the Levant in the Nile Valley, testify to the Late Neolithic community paying increasing attention to agricultural activity, as well as the raising of domestic animals. This was later further developed, in the following periods and represented one of the fundamental contributions to the birth of the first Predynastic Egyptian cultures.

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