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Harvesting tools and the spread of the neolithic into the Central-Western Mediterranean area

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ABSTRACT

This paper discusses the current state of research on harvesting technologies of the first farming communities of the central and western Mediterranean area between ca. 6000–5900 cal BC and 4800–4700 cal BC. New data obtained from the analysis of almost 40 sites from the Italian Peninsula is compared with data previously collected from the Iberian Peninsula and southern France. Results indicate the existence of at least two different harvesting traditions, one characterized by curved sickles used for harvesting at a low or middle height; the other characterized by reaping knives with parallel hafted blades, probably mainly used for ear harvesting. Processes of innovation and change have been highlighted, suggesting that harvesting techniques changed and evolved through time. Besides, the mechanism and pace of diffusion of curved sickles have been explored, too.

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1. Introduction

Harvesting tools are an important source of information on agricultural systems. From prehistory to modern and contemporary times, the choice of an appropriate crop harvesting technique has always represented a fundamental aspect of agrarian production. The adoption of sickles, scythes or other hand or mechanical harvesting methods, largely responds to both technical and economic determinants. For example, harvesting techniques are often adapted to the type of cultivated plants and sought products (e.g. whole plants, whole ears only, individual grains, leaves only, etc.) (Anderson and Sigaut, 2014); at the same time, especially during the last century, most of the crops have been genetically modified to make them more suitable for the mechanized harvesting systems available (Donald, 1968).

Harvesting itself probably played a role in the domestication process, bringing about an unconscious selection of plants, favouring non-shattering specimens over shattering morphotypes (Hillman and Davies, 1990; Anderson, 1999; Fuller et al., 2010). On

the basis of recent data, it seems that stone tools were used for harvesting since the earliest trials of cultivation, almost ten thousand years before the appearance of the so-called Neolithic revolution (Snir et al., 2015). During the twelfth millennium BC, Natufian groups used sickle blades for harvesting green cereals; during Late Natufian and PPNA periods, harvesting tools were used to collect (semi-cultivated) semi-ripe cereals, while the Middle/Late PPNA would correspond to the period when morphologically domestic crops began to be more abundantly harvested (Ibáñez et al., 2016). Through all of these periods, harvesting tools underwent several changes from both a technological, in terms of the flaking system related to the production of the stone inserts, and a morphological point of view, in terms of the overall shape and morphology of the harvesting tool (Rosen, 1997; Anderson, 1999; Ibáñez et al., 2007; Shirai, 2016; Maeda et al., 2016).

As agriculture began to spread into the Mediterranean basin around the end of the eighth millennium BC, Neolithic groups brought domesticated crops to new regions together with a complex set of technologies and knowledge necessary to cultivate, harvest, store, process and consume them. Harvesting tools were definitely one part of this package. Unfortunately, in most of the archaeological contexts perishable materials are not preserved and stone inserts are all that remains of those instruments. Those stone

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tools, made of chert and, to a lesser extent, obsidian, are usually called 'glossy' or 'sickle' blades by archaeologists, because of their characteristic sheen. This sheen or lustre is the result of a both additive and abrasive wear process caused by the contact between the stone edge and the reaped plant while harvesting (Anderson, 1999).

Over the last ten years, an international team of use-wear specialists has started a research project focusing on the first evidence of agriculture in the Iberian Peninsula and South-East France during the Neolithic Age. As a result, it has been demonstrated that the harvesting technologies, largely adopted by the first European farmers, were not homogeneous, since a variety of different tools and techniques existed (Ibáñez et al., 2008; Gassin et al., 2010; Gibaja et al., 2016; Pichon, 2017).

In more recent papers (Mazzucco et al., 2016; Ibáñez et al., 2017), we have been trying to relate the variability observed amongst the Neolithic harvesting traditions to different routes of expansion followed by the colonizing groups, suggesting the existence of at least three waves of expansion across Europe: the *Linearbandkeramik* route towards central and northern Europe, a maritime route along the Tyrrhenian coasts and a land route along the northern Mediterranean basin.

However, our previous point of view on harvesting technologies amongst Early Neolithic communities in the central-western Mediterranean area was limited by the scanty direct data from Italian sites. In order to strengthen our hypothesis about the expansion of Neolithic groups in the central-western Mediterranean regions, and taking into account 34 of the most important lithic collections of the Italian Early Neolithic Age, this paper aims to provide a detailed and direct evidence of the type of harvesting tools used by the first migrants that settled in the Italian Peninsula during the sixth and the first quarter of the fifth millennium cal BC, more specifically between 6000 and 5900 cal BC and 4800–4700 cal BC. The analysis of lithic inserts, their technological characteristics and the use-wear marks found on the edges will give information on their methods of hafting, use and management. The hypothesis of a dichotomy (Mazzucco et al., 2016), in terms of harvesting tradition adopted, between the peninsular and the alpine-continental regions of Italy will be explored. Moreover, in order to test a wave-of-advance model of the spread of harvesting technologies throughout the Mediterranean area, a kriging interpolation will be applied to a sample of the collected data.

2. Background of the study: the western Mediterranean area

Starting from the inverse perspective, from west towards east, the Neolithic arrived on the westernmost European coasts between ca. 5600 and 5500 cal BC. Sites such as Vale Pincel I (Alentejo), Cabranosa and Padrão (Algarve), bear evidence of the beginning of farming practices in such an early phase. Despite that, the Neolithization of Portugal is still a moot question in several respects. The local radiocarbon framework is still deficient in dates from domesticated species and the poor preservation of the bio-archaeological remains does not allow for a detailed description of the locally adopted farming system. Moreover, while clear similarities exist between Andalusian and Portuguese Neolithic contexts, the role of a possible North African wave of expansion is more difficult to assess. Probably a recomposition of the Neolithic package took place, with some elements that were modified and some new ones that were introduced through contacts and exchanges between the two shores of the Strait of Gibraltar (Manen et al., 2007; Cortés Sánchez et al., 2012; Linstädter et al., 2012, 2016). However, on the basis of current data, a North African route of expansion for harvesting technologies seems unlikely, as until this moment no glossy blades have been recognized in this region

(Gibaja et al., 2012). Moreover, in several Neolithic sites of North Africa cereals covered a minor role in the economy, while wild plants appear more intensively exploited (Lucarini et al., 2016; Morales et al., 2016).

Vale Pincel I is the site that has provided more data about the early harvesting techniques in Portugal (Soares et al., 2016), even if a few sickle blades have also been recovered from the sites of Cortiçóis (Carvalho et al., 2013). All of them witness the employment of a curved sickle with diagonally-inserted stone cutting edges; lithic artefacts, often intentionally broken to produce a sharp ninety-degree corner, range from 1.6 to 4 cm in length, from 0.7 to 1.3 cm in width and from 0.2 to 0.4 cm in thickness, and always consist of tools made on blade or bladelet blanks, occasionally shaped by abrupt retouch at one or both ends in order to facilitate its insertion into the haft.

Technical traditions observed in Portugal were largely shared amongst Andalusian Neolithic groups, not only for what concerns harvesting techniques, but also about other technical know-how (i.e. heat treatment, abruptly-retouched segments and pottery decoration motifs) (Manen et al., 2007; García-Borja et al., 2014). Also southern Spanish lithic production relies on small blades and bladelets –on average 0.6–1.3 cm wide, 0.2–0.4 cm thick–, which often bear signs of heat treatment and were flaked by the pressure technique (Carvalho et al., 2012; Perales et al., 2015). To produce sickle inserts, blades were intentionally broken and little time was spent for retouching tools. At Los Murciélagos de Albuñol Cave, near Granada, a complete sickle of this type was found in the mid-nineteenth century (Góngora, 1868: 199); although the original tool has been lost, some old drawings seem to confirm that it was similar to the ones recovered at La Marmotta in Central Italy (Fugazzola Delpino et al., 1993) (Fig. 1).

The use of this type of sickle characterized the entire southern coast of the Iberian Peninsula, from the Spanish Levant to the Portuguese coasts, including some early 'pioneering' occupation (ca. 5600–5500 cal BC) in Catalonia and southern France, such as at Les Guixeres de Vilobí (Barcelona, Early Cardial) (Ibáñez et al., 2017), and Peiro Signado (Languedoc, Impressed-Ware period) (Philibert et al., 2014). The characteristics of the sickle blades are the same as previously stated. A few larger blades, up to 6–8 cm in length, have been detected at Cova de l'Or and Cova Sarsa; however, they show a diagonally-distributed gloss as well. They might belong to curved sickle of larger dimensions, or might be part of the same sickle together with the smaller bladelets; this confirms that even when larger blanks were available the hafting method did not change (Gibaja et al., 2010).

Carpological data for Levantine and southern Spain indicates a prevalence of free-threshing cereals (*Triticum aestivum-durum* and, to a lesser extent, *Hordeum vulgare* var. *nudum*), although hulled wheat (*Triticum monococcum-dicoccum*) is also represented, especially in early Valencian sites (Pérez-Jordà, 2005). Some remains of low-growing cereal weeds such as *Asperula arvensis* and *Valerianella dentata* suggest that at least in some sites plants were cut at low heights, thus collecting a large part of the stralk (Pérez-Jordà et al., 2011).

Moving north into Catalonia and southern France, harvesting technology radically changes, with the appearance of L-shaped wooden sickles. This harvesting tradition quickly penetrated (ca. 5400–5300 cal BC) the inner areas of the Iberian Peninsula, while on the Atlantic façade late hunter-gatherer populations probably adopted an alternative method, namely ear plucking or plant uprooting (Ibáñez et al., 2001, 2008).

Several wooden L-shaped sickles have been recovered from the waterlogged site of La Draga (Palomo et al., 2011) (Fig. 1); they show two different variants: the first with a fairly long blade (5–9 cm in length), inserted parallel to the wooden handle, whilst, in the

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