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Food Storage among the Iberians of the Iron Age North-West Mediterranean (c. 225-c. 50 BC)

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1. Water Cisterns, Tombs, and Silos.

1.1. Introduction.

Any archaeological study of underground storage pits in the Mediterranean basin and mainland Europe starts with a reference to the ancient narratives of the Roman agronomists Pliny the Elder, Varro and Columella, considered the principal authorities on the subject in Antiquity. These often highlight the storage potential of pits, by stating that grain could be kept in good condition for many years or even decades. It has been acknowledged that these writers were the first to recognise the hermetic nature that made it possible to store produce underground effectively. The Roman agronomist Varro (*On Agriculture* 1.57), for instance, noted that wheat could keep as long as fifty years, and millet more than a hundred). Columella (*On Agriculture* 1.6.10) and Pliny the Elder (*Natural History* 18.73.306) offer a very similar account to that of Varro. This has been often styled as an exaggeration, although by confusing intentions with consequences, it is commonly believed that subterranean storage was meant to keep the grains stored for long periods (Burch 1996: 207-8).

It was not until the eighteenth century and beyond, when some travellers, scholars, and ethnographers came into contact with North Africa and other remote regions, that subterranean storage was rediscovered in France and in Europe more generally. This prompted all sorts of experiments and agronomic treatises with the aim to reproduce this mode of storage, from Reneaume in 1708 to Peter Reynolds at the Butser Ancient Farm project in the 1970s. Even though it is commonly known today that storage in pits – also broadly known as silos – had been widely used in mainland Europe throughout the Neolithic and Iron Ages and the Middle Ages, this historical fact later became almost completely forgotten. This chapter explores how this long-standing colonial legacy, ancient and modern, has framed some of our own conceptions of this method of food preservation and the focus of most archaeological enquiries, which have centred their interests on the airtight conditions of storage in pits, their lining materials, and more generally the physical properties of the grain stored in them.

1.2. The continuous rediscovering of a storage method.

Pit storage was first described by the Roman agronomists Varro, Columella, and Pliny, who are together considered the principal authorities on the subject in antiquity. These classical authors confirm that under certain conditions grain may be effectively stored underground. In a rather confusing and misleading account, Varro (116-27 B.C.), the earliest author among the three to mention the silos, distinguished between two types of subterranean structures, the so-called *siri*, underground caves, and so-called *putei*, which were essentially wells. Varro also noted that wheat could be kept as long as fifty years, and millet for more than a hundred (*De Re Rustica*, 1.57):

‘Some use underground caves as granaries, the so-called *sirus*, such as occur in Cappadocia and Thrace; and still others use wells, as in the Carthaginian and Oscensian districts in Hither Spain. They cover the bottom of these with straw, and are careful not to let moisture or air touch them, except when the grain is removed for use; for the weevil does not breed where air does not reach. Wheat stored in this way keeps as long as fifty years, and millet more than a hundred.’ (Loeb, 1934).¹

Columella (A.D. 4-ca 70), who seems to have reported a different account to that of Varro (Sáez 1987: 98), comments that in drier climates storing grain in underground pits can be managed successfully, since it protects the grain from damage and injury by weevils and similar vermin (*De Re Rustica*, 1.6.10):

‘This seems to be the most advantageous method of protecting stored produce from damage by weevils and like vermin, and if it is not carefully laid away they quickly destroy it. But the type of granary just described, unless it be in a

¹ ‘Quidam granaria habent sub terris speluncas, quas vocant sirus, ut in Cappadocia ac Thracia; alii, ut in agro Carthaginiensi et Oscensi in Hispania citeriore, puteos. Horum solum paleis substernunt et curant ne umor aut aer tangere possit, nisi cum promitur ad usum; quo enim spiritus non pervenit, ibi non oritur curculio. Sic conditum triticum manet vel annos L, milium vero plus annos C.’

dry section of the steading, causes even the hardest grain to spoil with mustiness; and if it were not for this, it would be possible to keep grain even buried underground, as in certain districts across the sea where the earth, dug out in the manner of pits, which they call *siri*, takes back to itself the fruits which it has produced. But we, living in regions which abound in moisture, approve rather the granary that stands on supports above the ground and the attention to pavements and walls as just mentioned, because, as I have said, the floors and sides of storerooms so protected keep out the weevil.’ (Loeb, 1948).²

Finally, Pliny the Elder (A.D. 23-79), who was considered the main source of information and the most significant authority on the subject out of the three, offers a very similar account to that of Varro, who was his main source (*Varro auctor est...*). However, Pliny (*Historia Naturalis*, 18.73.306) made no reference to Varro’s *putei*, but only to the underground caves (*siri*):

‘The most paying method however of keeping grain is in holes, called *siri*, as is done in Cappadocia and Thrace, and in Spain and Africa; and before all things care is taken to make them in dry soil and then to floor them with chaff; moreover the corn is stored in this way in the ear. If no air is allowed to penetrate, it is certain that no pests will breed in the grain.’ (Loeb, 1971).³

The main sources of information on this method of storage were the classical authors up until the nineteenth century, and they seemed to be very specific regarding the

² ‘Ea res ab noxia curculionum et similium animalium commodissime videtur conditas fruges defendere, quae nisi diligenter repositae sint, celeriter ab iis consumuntur. Sed id genus horrei, quod scripsimus, nisi sicca positione villae quamvis granum robustissimum corrumpit situ; qui si nullus adsit, possit etiam defossa frumenta servare, sicut transmarinis quibusdam provinciis, ubi puteorum in modum, quos apellant siros, exhausta humus editos a se fructus recipit. Sed nos in nostris regionibus, quae redundant uligine, magis illam positionem pensilis horrei et hanc curam pavementorum et parietum probamus, quoniam, ut rettuli, sic emunita sola et latera horreorum prohibent curculionem.’

³ ‘Nec fere condita in spica laeduntur, utilissime tamen servantur in scrobibus, quos siros vocant, ut in Cappadocia ac Thracia et Hispania, Africa, et ante omnia ut sicco solo fiant curatur, mox ut palea substernantur; praeterea cum spica sua conduntur ita frumenta. si nullus spiritus penetret, certum est nihil maleficum nasci.’

location where these were in use.⁴ Varro pointed out the geographical spread of these silos in Thrace, Cappadocia, and Nearer Spain (*ut in Cappadocia, ac Thracia... ut in Hispania citeriore...ut in agro Carthaginiensi et Oscensi*). Pliny, probably as a generalization stemming from what he had read in Varro, extends their use to all of Spain and Africa. Some scholars suggest that, given the mention of *agro Carthaginiensi*, Pliny confused New Carthage in southeast Spain for the Carthage of North Africa (Sáez 1987, 99). As Sigaut (1981) pointed out, pits are documented all over the European continent and across multiple periods. Nonetheless, as Sigaut put it, '[for] more than three centuries Western agronomists periodically rediscovered grain pits, each time with the same astonishment, sometimes incredulous and sometimes amazed' (Sigaut 1981: 16). It is at this point important to emphasize that storage in silos was as strange to the Roman observer as to the scientist of the nineteenth century. One of the earliest modern references is from Luis del Mármol y Carvajal's *Africa* (1573):

‘Miat Bir, que quiere decir ciepozos, es vna villa grande derramada amanera de aldea, puesta sobre vna peña muy blanda, la qual parece auer sido edificada por los naturales de la tierra, fue subjecta algún tiempo al capitán de Safi, siendo la ciudad de Christianos. Los moradores son Beréberes Cobeyles, y entre ellos viuen algunos Iudios de los Berberiscos pobre y miserablemente, es memorable esta villa, porque fuera della ay muchas mazmorras y cuevas, que con facilidad se labran en aquella peña, donde los moradores y los Alarabes de Duquela encierran el pan, y es cosa marauillosa lo que cuentan destas mazmorras, donde dizen que se conserua el pan muchos años y que se han hallado algunas donde auia mas de ochenta años que auia trigo, y sin auer destapandolas, ni sacadolo en todo aquel tiempo, lo hallaron tan seco y tan bueno, como si de vn año o menos estuuiera encerrado enellas. Finalmente es

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el lugar donde mejor se conserua el trigo que ay en todas aquellas Prouincias, y porque ay tantas mazmorras y Cueuas, llaman esta villa cien pozos.’ (3.60).

In the first half of the 20th century, storage pits were systematically excavated for the first time, of which we do not have much information to evaluate them at present. Before then, the earliest information we have are descriptions of visitors to the site of Plana Basarda, which indicates that the silos had been previously excavated. The site is located on a high plateau in the Serra de Cadiretes or Sant Grau, 300m above sea level (Aicart et al. 2007). In an article published on May 31, 1874 in *La Renaxensa*, Joaquim Botet i Sisó offers the oldest description of the archaeological structures that could be observed in Plana Basarda (Santa Cristina d'Aro, Girona), among which stand out cavities excavated in the rock that he interpreted as grain containers. González Hurtebise oversaw the excavation at Els Guíxols (Sant Feliu de Guíxols, Girona), which after the excavation of the first pit he interpreted as an incineration necropolis. In total, he excavated 34 pits in two campaigns successively, but we do not know the data obtained nor the circumstances of the finding, since no record has been found in any of his writings (Aicart et al. 2007).⁵ Unlike what we have seen for Plana Basarda, the interpretation of these pits as burials in a certain way was determined by the interpretation of their clogging.⁶ In the same vein, Josep Colominas i Roca interpreted the 44 pits that he excavated associated with the Laeetan settlement of Turó de la Rovira (Barcelona; Fig. 1).⁷ The hypothesis that the pits were burials, initiated

⁵ From the start, parallels were established with the site of Punta del Castell (Palamós, Girona), discovered in 1935. Unfortunately, at the time of the first excavations (1944-1949), no stratigraphy was taken into account (Casas 1984). Thus, inside the more than 50 silos that were documented appeared a wide range of materials: Attic fine ware, hand-made pottery, Roman amphoras, Ampuritan and Campanian ware, etc.

⁶ The pits were approximately 2m deep and had a diameter of 2.20m, with a chronology that spanned between the 3rd and 1st century BC. González Hurtebise classified the pits according to their degree of preservation (Aicart et al., 2007). In this way, he offered descriptions such as the following: ‘Intactas.- En éstas parece que el orden de colocación de su contenido era el siguiente, de abajo a arriba. En el fondo se echaba una ligera capa de arcilla, y sobre ella eran colocadas las grandes vasijas que contenían los restos incinerados mezclados con la misma clase de tierra, poniéndose aquéllas en círculo y otras dentro de éste; los vasos de ofrendas y libaciones (rotos en símbolo de dolor), se depositaron entre las urnas centrales, o entre las que formaban círculo y las paredes de la tumba. Cuando sobre aquel plano ya no podían colocarse más, cubriase de arcilla apisonada y encima poníanse piedras sin desbatar, a fin de formar un nuevo pavimento que con el intermedio de otra capa de tierra recibía nuevas urnas y nuevos vasos. Y así sucesivamente hasta quedar llena la fosa, lo que venía a ocurrir a la 3ª ó 4ª hilada de enterramientos.’ (cited in Aicart et al. 2007).

⁷ In this case, although he distinguishes each one of the fillings of the pits, he does not offer a stratigraphic description, placing them roughly between the 3rd and 2nd century BC (Granados 1977b): ‘Lo más interesante de la estación fue sin duda la necrópolis. Ésta ocupaba el lugar firme que dejaba el camino sur y al pie del mismo poblado. Las excavaciones descubrieron cuarenta y cuatro silos agrupados, sin seguir

by Hurtebise, takes its maximum relevance with the thesis of Pere Bosch Gimpera, who considered sites such as Sant Feliu de Guíxols and Plana Basarda as Iberian necropolises (Bosch i Gimpera 1919: 12, 19, 268-69; Aicart et al. 2007: 35).



Figure 1. *Overview of the pits excavated at Turó de la Rovira (Colominas 1945: 210).*

Between 1920 and 1921, Joan Serra i Vilaró excavated the site of Sant Miquel de Sorba (Montmajor; Fig. 2), located on top of a hill of approximately 2,200 m². In total, the scholar excavated and documented 163 silos covering almost the entire platform. It seems that later some structures were built on the hill, cutting some of the silos, the chronology of which cannot be determined with certainty. The material remains found in the pits cover a wide chronological span between the 4th century BC, and some fragments of *terra sigillata* that date from between the 1st and 2nd centuries AD (Asensio et al. 2001; 2002). The methodological shortcomings of the archaeological intervention led by Serra i Vilaró poses

orientación determinada, todos ellos abiertos en la parte blanda del terreno que bordea las pizarras más duras y de fácil exfoliación. Su forma es casi siempre uniforme, siguiendo dos tipos con pequeñas diferencias; éstos son esféricos u ovales y de distintos tamaños, llegando a la altura máxima de 3.40m por 2.60 de diámetro.' (Colominas 1945).

some problems in dating the site and its structures, since all the archaeological materials were deposited in the Diocesan Museum of Solsona without a stratigraphic reference. In 2010, archaeological work was resumed, focusing its intervention on one of the limits of the hill that had not previously been excavated by Serra i Vilaró. During this recent archaeological excavation, 5 more pits were excavated, three of them belonging to the second half of the 3rd century BC, and the other two to the second half of the 2nd century BC. (Morer et al. 2015).

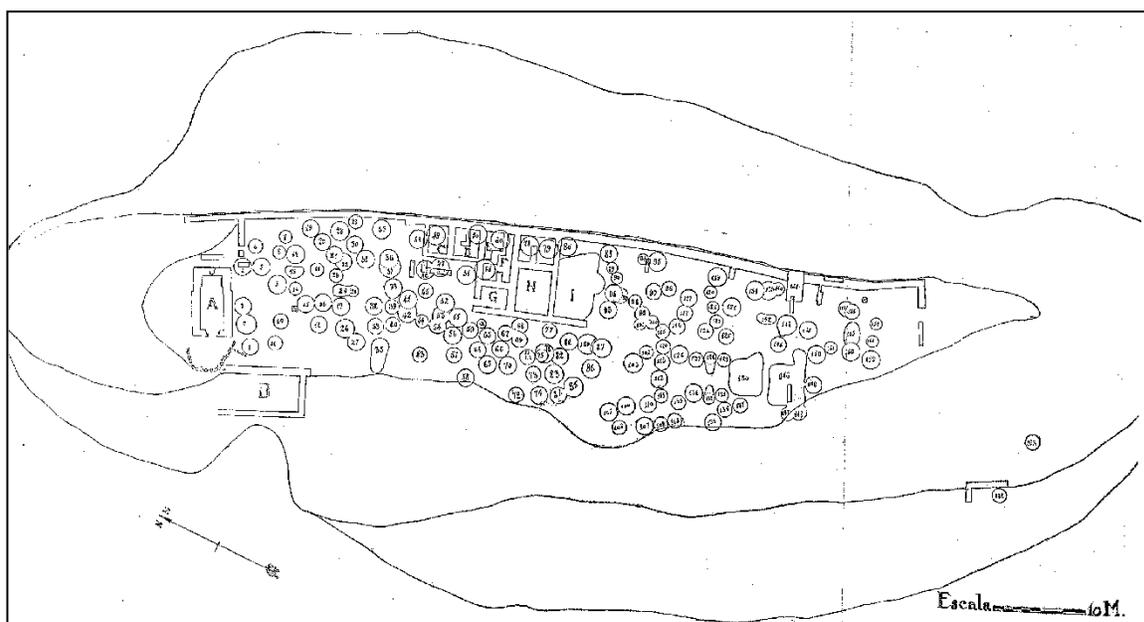


Figure 2. *Plan of Sant Miquel de Sorba (Serra i Vilaró 1922).*

In spite of the absence of architectonic remains beyond the closing wall that surrounded the group of pits, Serra i Vilaró understood that it was a village. For this reason, Serra i Vilaró no longer interpreted the silos as tombs, which was the most widespread interpretation, but as fresh places for the preservation of food, since ‘encima [de los silos] había las casas o chozas construídas con ramas, barro y piedras’ (Serra i Vilaró 1922). Josep Lluís Cabré devoted an article to the site of Plana Basarda, in which he argued that Plana Basarda was also an Iberian settlement and not a necropolis, and cited the Roman agronomists Cato and Varro in order to argue that the pits were intended for the storage of cereals and fruits (Aicart et al. 2007: 49).

1.3. The spirit of progress: Doyère and the *ensilage rationnel des grains*.

Agronomists, economists, and biologists were both the first and the most eminent scientists to address the question of storage and preservation, at least until the 1950s (Russel et al. 2014: 191). The earliest work on this storage method that is ‘truly scientific’ according to Sigaut (1979: 16), is Reneaume’s article ‘Sur la manière de conserver les grains’, published in 1708 at the *Mémoires de l’Académie des Sciences*. According to François Sigaut, ‘the only thing that Reneaume added to Varro’s was the result of his own observations’; in other words, Reneaume, unlike Varro, performed experiments:

‘Une des choses qui contribue le plus à la conservation du bled c’est la croûte qui se forme sur toute la superficie de la couche de l’épaisseur d’un doigt et demi, tantôt plus, tantôt moins : elle est formée de la poussiere qui voltige continuellement dans l’air et de l’humidité de ce même air qui en fait la liaison avec les grains. Cette croûte défend toute la masse des approches de l’air. Celui qui m’a apporté du bled de Metz m’a assuré qu’il s’étoit promené sur le tas sans que la croûte eût obéi, tant elle est forte.’ (cited in Sigaut 1979: 16).

The revelation of the hermetic nature of storage pits by Reneaume in 1708 demonstrated that pit storage was very expedient for future use. As a result, some French agronomists believed that the use of storage pits could serve as an economic solution for the preservation of cereals in other parts of the continent (Miret 2008: 223), especially after a few episodes of food shortage in highly populated areas. It proved (at least on paper) so attractive that new experiments were continuously attempted ever since, especially during the first half of the nineteenth century. Around 1800, ‘the growing body of agricultural writers in Northwest Europe had acquired a roughly *correct idea* of subterranean storage functioning essentially as airtight grain storage’ (Sigaut 1980: 5; my emphasis). Louis Michel François Doyère carried out between 1852 and 1862 one of the most important and prolific series of experiments with storage pits, driven by the demands of the French administration in Algeria after a few failed attempts in ‘replacing the old silos’:

‘L’approvisionnement de l’armée d’Afrique et de notre colonie, contre toutes les éventualités, préoccupait vivement les esprits à cette époque. Des essais venaient d’être faits dans plusieurs centres militaires de l’Algérie pour remplacer les anciens silos, dans lesquels on avait reconnu l’influence fâcheuse de l’humidité souterraine, par des constructions isolées du sol et parfaitement sèches.’ (Doyère 1862: 22)

This undertaking as they conceived it required an adaptation of the Algerians’ storage practices to the advances of science and technology, or what Doyère categorized in 1863 as the *ensilage rationnel des grains*. Pliny’s reference to these structures was taken as evidence of their use in Roman Africa:

‘Ces greniers souterrains furent adoptés par les conquérants de l’Afrique, car nous voyons Pline préconiser ce moyen, comme le plus sûr et, conséquemment, le plus avantageux.’ (Lacroix 1870: 105)

Despite the lack of (credible) archaeological and literary evidence, Doyère believed that the Romans had made use of subterranean granaries in Spain and North Africa in the past, and that they had excelled in building such storage locales. The French agronomist (1862: 21) referred to two Algerian cities, Oran and Arzew, where, according to his account he was able to examine instances of the so-called Roman subterranean granaries, acknowledging that ‘the Romans implemented for their underground granaries all the resources of their marvellous skill in the art of masonry constructions’. He provides (ibid.) a more boastful, though not really a more detailed, description of the lining materials of these so-called subterranean granaries, which in all likelihood were not what he claimed to be.⁸ He looked unsuccessfully for such ‘Roman’ structures also in Spain, probably being inspired by Pliny’s reference to their extended use in Roman Spain. On the same grounds, the so-called ‘silos de Burjassot’ (cf. Fig. 3), 43 large silos that were dug in order to store the grain that

⁸ Another example of this are the so-called ‘Greniers de César’, a storage complex in Amboise (Indre-et-Loire, south France), which has been given a chronology that varies from Caesar’s campaigns in the *Galliae* to the 16th century (Mauny 1985).

was shipped from the Mediterranean, mainly Sicily, that once it had been unloaded at the harbour of Valencia, it was taken 10km away from the city to the small residential district of Burjassot, since Valencia was subjected to frequent pirate raids (Ballesteros 2014: 96), were thought by local historian Gaspar Escolano (1560-1619) to date back to the Romans:

‘Los silos, o sijas (que es una de las cosas dignas de ser vistas en Valencia) en que guardamos el trigo, a tres millas della, en una aldea llamada Burjaçote, debaxo de tierra, en grandes cuevas y sotanos, también son reliquias de tiempo de Romanos. Testigo es de ello Plinio, que contando las varias preuenciones de que todas las Prouincias del mundo usan, para conservar sin daño los granos, dize asi [...] Dellos tenemos tanta cantidad, y tan profundos en la peña seca de dicho lugar de Burjaçote, que se pueden conservar de cien mil cahizes de trigo arriba.’⁹

Doyère’s emphasis also goes in line with his belief that the hermetism of a storage pit, and by derivation of its hermetism its full effectiveness, was heavily dependent on the lining materials that were used, which allowed the grain to be isolated from humidity. His improvement was grounded on the idea, already transmitted by the Roman agronomists, that the effectiveness of underground storage in certain areas was due to its particular soil and climate conditions. Subterranean pits would normally need to be properly placed in suitable soil in order to isolate the pits from water and thereby avoid spoilage of the stored foodstuffs (gentle slopes and clayey soils tend to work best in this regard), so that the optimal conditions of the placement of these deposits play a key role in keeping the grain at a low level of humidity, which prevents the formation of microorganisms and the germination of the grain (Michel 1997: 143-44).¹⁰ In his opinion, one of the main problems

⁹ It is worth noting that in 1946 López Laguarda referred to an Iberian, not a Roman, precedent, probably as a result of a greater knowledge of the Iberian archaeological record: ‘no encontrándose entre los alrededores de la capital otro punto más adecuado que aquél para el objeto, es posible que lo utilizaran los íberos para granero de sus cereales, aprovechando alguna cueva natural [...]’ (López 1946: 34).

¹⁰ Thus, for example, the calcareous and impermeable nature of the soil in Almendralejo (Tierra de Barros, Extremadura) favored the excavation of silos in that locality. However, the situation was quite different in other neighboring villages, as described by Doyère: ‘On ne m’a indiqué, dans le voisinage, que sept autres pueblos où il existe des silos, et, dans plusieurs, ils sont en très-petit nombre, et ne donnent que de très-médiocres résultats. Beaucoup de tentatives ont été faites pour en établir ailleurs, et tout récemment encore ; mais elles n’ont abouti qu’à faire trouver du blé pourri dans la terre, ou au moins très-avarié, après deux ou

1.4. An ideology of Roman precedence.

Louis Noguier, founder of the epigraphic museum in Béziers and president of the *Société Archéologique de Béziers*, wrote a short paper in 1874 on the archaeology of Ensérune (Nissan-lez-Ensérune, Béziers) and its surrounding area. This represented one of the earliest archaeological studies on the Gallo-Roman site, which was one of the most prominent Iron Age sites in the Languedoc region of southern France. One of the most prolific structures on this site, which has a chronology of occupation that spans from the sixth century B.C. to the first century A.D., are cavities excavated in the ground, already categorized as ‘silos’ since at least the 1850s (cf. Fig. 4). He emphasized concealment as the main advantage of storage pits. The peace brought by the Romans and a ‘strongly organized’ Roman administration that guaranteed protection to its colonists, according to Noguier (1874, 238-39), would have eventually rendered this method of storage unnecessary and pointless, since there was no longer any need to cache their harvests. For these reasons, pits documented in Ensérune had necessarily to predate the Roman phase of the site, that is, between the fifth and fourth centuries.¹¹ The inhabitants of pre-Roman France before the establishment of the ‘Latin civilization’, could be compared to contemporary Arabs in North Africa:

‘Les conserver et les cacher, tel est le double but auquel répondent à merveille les silos souterrains si faciles à dissimuler. Tous les peuples civilisés sont passés par cet état social, dont les arabes de l’Algérie nous donnent une idée parfaitement exacte. Disséminés sur de vastes territoires, tout est précaire pour eux, même le fruit de leurs maigres cultures. Ces conditions d’existence n’ont pas changé depuis des siècles; aussi creusent-ils des silos comme leurs ancêtres du temps de César ou d’Alexandre.’ (Noguier 1874: 237-38)

¹¹ This dating for the pits of Ensérune would be upheld by successive archaeologists such as L. Sigal and J. Jannoray, even though the material evidence in them suggested a much later date (Ugolini and Olive 2013, 350-54).



Figure 4. *Nissan-lez-Ensérune, Ensérune. View of the area known as ‘châteaux d’eau’ (insula XII).*

It was precisely in the 1820s that the Spanish word *silo* was popularized in the international scientific literature (Sigaut 1991: 11). Reneaume in his reports of the experiments carried out in 1709, for instance, refers to them simply as *fosses à grains*, and the term ‘silo’ does not appear a single time. In fact, the use of the word ‘silo’ to refer to a storage pit appeared for the first time in Jourdain’s *Ensilage des grains*, published in 1819 at the *Annales de l’Agriculture Française*. It was generally believed that there was a direct etymological connection between the term *sirus*, in Latin, probably borrowed from the Greek σειρο, and the Spanish word *silo* (Fantar 2007: 231). By using the word *silo*, French scholars were using a word that could be easily traced back to the Classical sources and the Roman agronomists. Therefore, it is no coincidence that the usage of the term appears for the first time at the beginning of the nineteenth century, when the experiments with underground storage were more popular. In this manner they were also refusing to draw on the term *matamores* or *matmura*,¹² transliteration of an Arabic term very often used in most

¹² The term *matmura* is formed with the root *tmr* which means ‘to hide’ or ‘treasure up’ (Rosenberger 1985: 239).

pre-modern ethnographic descriptions of these storage structures, not only those found in North Africa but also elsewhere, which in most cases consisted of a pit dug into the ground or carved in a rock. In fact, the use of the term was so widespread that sometimes its Arab origin was ignored, as it can be observed on the belief that the word *matamores* derived from the Spanish words *matamoros* and *mazmorra*:

‘Ce mot de matamore provient de l’espagnol matamoros et mazmorras,¹³ qui étaient des souterrains où les Espagnols enfermaient les esclaves africains ou les maures. Ces souterrains ont également servi, chez ce peuple, à cacher les productions de la terre, lorsque, chassé de la Castille et des royaumes de Cordoue, Grenade, Valence, etc., il se réfugia dans les Asturies’ (Benoit and Fontenelle 1836: 67).

This passage also serves as a good piece of evidence on how Arab sources, in this case on an eminently Arab practice back then, tended to be neglected. As Lorcin (2002: 298) put it, ‘the French may have looked to the Romans as colonial precursors, but there was the added advantage of cultural familiarity.’ It was therefore natural for the French to draw on the Roman agronomists as their primary source of knowledge on the recently occupied territory, where subterranean storage was still in practice. The reliance on this ideology of Roman precedence allowed Doyère and many other modern scholars to see a seemingly ‘new thing’ as versions of a previously known thing. In this regard, see for instance M. Miles’ passage in his *Silos, ensilage and silage*, published in 1889:

‘In an interesting article on Ensilage by Mr. H. W. Jenkins, Secretary of the Royal Agricultural Society of England, it is stated that the practice of storing grain in silos was brought by the Moors into Spain ; but the statement of Pliny given above, in connection with other historical data, would lead to the more probable supposition that the Romans introduced the system into Spain, as well as other grain-growing provinces of the Empire, and that if the Moors

¹³ It is actually the other way around, the Spanish word *mazmorra* (prison) is derived from the Arabic *matmura*, since on occasion deep pits were used to keep captives.

brought silos into notice for the preservation of grain, it was but a revival of an old Roman practice, from the many valuable suggestions in regard to the storing of grain contained in the paper by Mr. Jenkins' (Miles 1889: 11).

Doyère, in this regard, looked at the storage locales used by local Algerians by comparison with the so-called Roman equivalents. In this regard, the great efforts made at that time in order to improve their own techniques, made these agronomists quite severe when judging what they deemed as unsuitable within their linear perspective of progress. In this sense, the 'imagined' Roman subterranean granaries acted as a sort of 'median category'. As Said (1978: 58-59) defined it, 'such a category is not so much a way of receiving new information as it is a method of controlling what seems to be a threat to some established view of things.' Rome, in this regard, acted as a cultural idiom of French domination. As Mattingly (1996: 52) puts it, 'it was the mission of the colonizer to educate the Africans about their own cultural heritage.'

These objectives may be recognized as equivalent to the so-called 'fertility myth' in Algeria, which was grounded on the idea that Algeria had an exceptionally productive and fertile land, whose potential had remained unexploited since the fall of the Roman Empire and the arrival of the Arab hordes. As Sessions (2011: 208) notes, 'the myth of Algeria's great fertility had long roots in the classical texts and early modern travel accounts that were the main sources of French knowledge of the region in the early nineteenth.' The Roman past was idealised and imagined as a time of splendour, and one of the main objectives -and indeed justifications- of the French presence in North Africa and their civilizing mission (*mission civilisatrice* in French) was to bring back to Algeria its lost splendour (Lorcin 2002; Leveau 2016). When using the classical sources as a reference (and it must be taken into account that their knowledge of Arabic was rather scanty), they were establishing a point of reference that was culturally familiar, and in this way, they could claim a certain agency and moral authority over the object of their examination.

1.5. ‘Safer than a savings bank’: a most productive storage method.

During the construction of a new railway track in 1929 across the north-west slope of Barcelona Montjuïc hill, several large storage pits were cut by a trench. Serra-Ràfols, chief of the Barcelona Archaeological Commission, carried out a very short excavation in 1946, during which eight pits were identified, and only four of them were excavated (Fig. 5).¹⁴ According to the excavation diary, these Iberian grain silos, of unprecedented size at that time, did not contain much archaeological information,¹⁵ apart from a few pottery shards and an Iron chariot wheel. All the same, this allowed Serra-Ràfols to publish posthumously in 1974 a short paper, *Las relaciones comerciales entre Iberia y Grecia durante la Segunda Edad del Hierro*, in which he attributed a strictly economic and market-oriented interpretation to the use of these storage pits, based on their gigantic size, and associated these as part of a colonial trade network, specially aimed at a Greek market. He raised the following question:

‘Si en el siglo IV, por lo menos, ya existía organizado en esta forma, en el nordeste de la Península, el comercio de granos, ¿es posible pensar que ya en él intervenían los griegos y que eran sus naves las que cargaban este producto para transportarlo ya sea a la lejana Grecia, ya a la próxima Massalia, que podía ser la intermediaria a través de la cual llegasen a Iberia las manufacturas griegas?’ (Serra i Ràfols 1974: 221).

¹⁴ Other pits excavated by Serra i Ràfols in Montjuïc, on which information is scarce, consist of two Iberian pits in the southwest cemetery in 1931, with a maximum depth and diameter of 2.5m, with the particularity that in the interior of one of the pits four human skeletons appeared (Asensio et al., 2009: 16). In 1984 an intervention took place in the Font de la Mamella, where the oldest remains corresponding to the Iberian period appeared, consisting of the remains of a possible hut, post holes, a hearth, and a pit (Asensio et al. 2009: 15-16). In 1990, as a result of some surveys carried out in 1989 due to the construction works for the 1992 Olympic Games, the Museu d’Història de la Ciutat resumed the excavations in Via Magòria, where the Pont de l’Esparver was located (Miró 1998). During this excavation, in the area designated as ‘Pits Zone’, an area of 600m², 18 silos were documented, of which 15 were excavated, plus the three already excavated by Serra i Ràfols in 1946 (Blanch et al. 1993). With regard to its chronology, these were dated between the 4th and 2nd centuries BC. A large number of the pits, however, did not contain enough dating materials.

¹⁵ The location of levels belonging to the 4th century BC below the openings of the alleged pits excavated by Serra i Ràfols made some excavators believe that these should not be classified as Iberian silos. However, more recently that level has been considered by other archaeologists as intrusions coming from an old torrent (Miró 2001: 114).



Figure 5. *Serra i Ràfols (right) during the excavation of the silos of Montjuïc in 1946.*

Source: Servei d'Arqueologia de Barcelona.

Previously throughout most of the eighteenth and nineteenth centuries, several travellers and observers, such as Desfontaines, came across with a storage method that, in European eyes, seemed very profitable for exchange purposes. As he and his travelling companion wrote, '[a] French merchant, established for many years in Algiers, told me that I had bought some [grain] that had been kept for twenty years in matamores' (Peyssonnel and Desfontaines 1838, 280). The veracity of this statement was further reinforced by some locals who told them that they had kept grain in pits for forty years. In line with this belief, in the introduction to the report of his experiments, Doyère makes it clear that what he offered with his experiments was 'the most productive and safest savings bank', since there

were no other products, including precious metals, that were unalterable and that offered a safer collateral than wheat or other cereals stored in a subterranean silo. Similarly, he visited Tierra de Barros (Extremadura) in Spain in ca 1850. It seems that this region concentrated a portion of its surplus underground in order to export it to Seville, from where it was redistributed afterwards. Doyère argued that grain was stored in underground pits to benefit from price fluctuations, so grain could be sold when the best conditions arose.

The agronomist and ethno-historian François Sigaut gathered all these modern sources in his contribution for the first volume of *Les techniques de conservation des grains à long terme: leur rôle dans la dynamique des systèmes de cultures et des sociétés*, published in three volumes between 1978 and 1985 and directed by François Sigaut and Marceau Gast (Fig. 6), in what would later become a seminal work on the study of long-term storage. This volume is probably one of the most extensive studies on long-term grain storage, mainly focused on early modern accounts and ethnography, but also archaeological case studies. All the above examples allowed Sigaut to distinguish between what he labelled as *silos paysans* (peasant silos) and *silos marchands* (trader silos), being the latter those intended for trade and speculative purposes, as well as those that had drawn the most interest to agronomists such as Reneaume or Doyère. These two categories of silos, according to Sigaut (1979, 20), would differ on how the silos were built, where they were located, and above all what their capacity was:

‘Dans le domaine socio-économique, enfin, les témoignages nous apprennent une foule de choses. Ils nous apprennent par exemple à distinguer les silos *paysans*, ceux de Hongrie ou de Toscane, des silos *marchands*, que l’on trouve à Barcelone, à La Valette et dans la plupart des villes et des ports d’Italie du Sud. Silos paysans et silos marchands diffèrent entre eux par leur situation, leur mode de construction, et surtout leur capacité.’

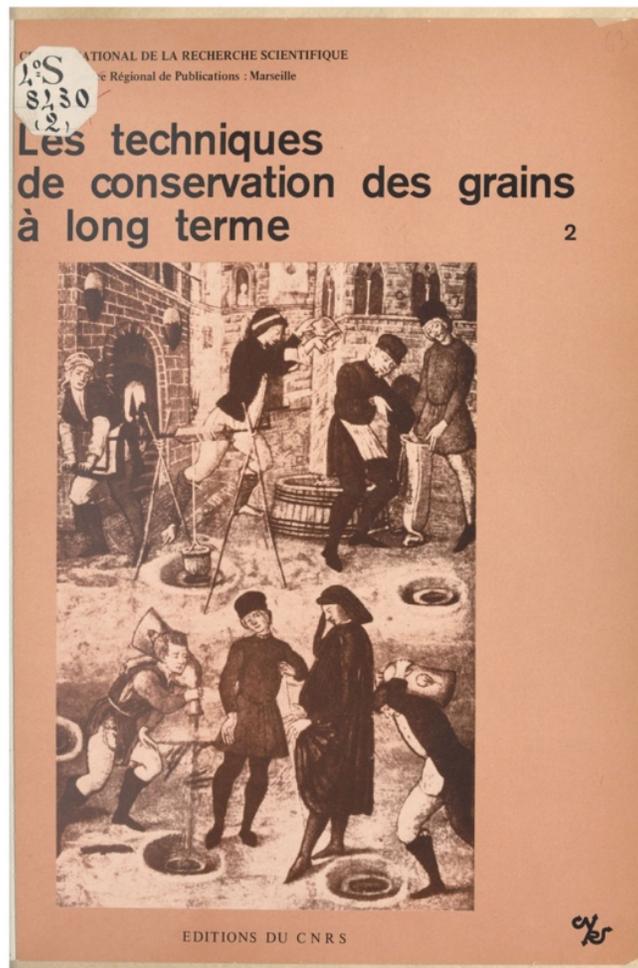


Figure 6. *Front cover of the second volume of the three-volume series edited by M. Gast and F. Sigaut (1981).*

The constant reproduction of these narratives, along with the lack of a thorough survey of both historical and ethnographic evidence, has distorted most of the modern studies on pit storage. Less than a decade after Sigaut's publication, Garcia (1987: 93), acknowledging of the impossibility of repeatedly reopening a storage pit due to its sealed environment (cf. Fig. 7 for reference), argued that silos were meant for 'speculative purposes rather than home economics', due to the necessity of rapidly consuming the stored grain once the pit was opened. Garcia's suggestion was later adopted by Josep Burch (1996) and the case of the extensive pit clusters documented in Iron Age Iberia. Indeed Josep Burch's use of Doyère and the example of Tierra de Barros as evidence is

particularly remarkable for this proposal. Moreover, Doyère later on would be elevated to the category of ‘ethnographic source’ (Asensio et al. 2001):

‘[...] aquest tipus de conservació els permetia mantenir el gra en perfectes condicions fins al moment de l’intercanvi o, àdhuc, conservar el gra fins que les condicions d’intercanvi els fossin més favorables, tal i com succeeix a Tierra de Barros (Extremadura) en temps recents.’

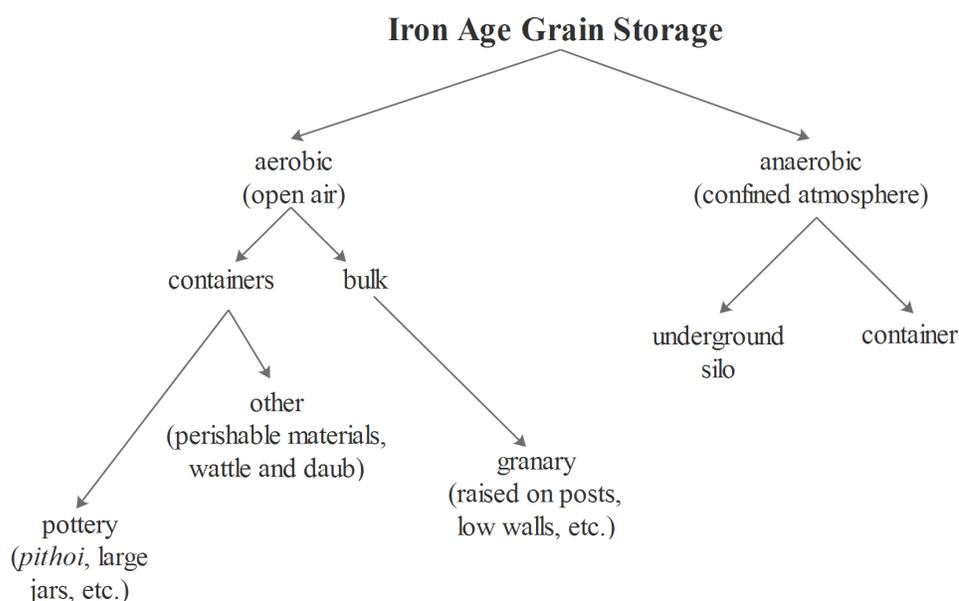


Figure 7. Diagram showing the classification of the different storage systems, based on Garcia 1987.

This view responds to another widespread misconception that relates specifically to subterranean storage: ‘This [the hermetically sealed underground store] is highly effective against insect damage, and therefore encourages relatively high estimates of disposable surpluses.’ (Horden and Purcell, 2000: 205). This statement offers a good summary of what is commonly agreed in modern scholarship. As a result, when defining storage in pits as a ‘hermetically sealed underground store’, this automatically goes hand in hand with the idea that such pits were propitious for amassing high estimates of agricultural surplus, a leap which is based on the very same convictions and values that led modern agronomists to

experiment with pit storage. This reductive statement is also, to some extent, due to the lack of studies on pit storage: ‘a method which has not been well known’, as they also point out (Horden and Purcell 2000: 205).

1.6. Peter J. Reynolds and the Butser Ancient Farm.

Modern scholars have traditionally relied more on the information provided by ancient literature than on ethnohistorical or first-hand archaeological evidence, following suit on what modern agronomists had done during most of the 19th century. For instance, in G.E. Rickman’s reference book *Roman Granaries & Store Buildings* (Cambridge, 1971), pit clusters were not mentioned at all, but he only offered in the appendices a mere description of Varro and Columella’s accounts. In his later work, *The Corn Supply of Ancient Rome* (Oxford, 1980), nonetheless, Rickman would provide a longer reference to the use of pits, extending its use to countries such as Britain:

‘Storage pits sunk into the ground were known to writers like Varro and Pliny the Elder, as being typical in various countries such as Cappadocia, Thrace, Spain, and Africa. It is clear from excavation that this method of storage was commonly practised even in relatively damp countries such as Britain where the corn had to be parched before being inserted, and it is known from papyri in Egypt. The advantage of such a system was that it was easy and cheap for ordinary farmers, and provided no air was allowed to get in, the build up of carbon dioxide produced by the metabolism of the grain and anything else in the pit killed off any insects and fungi. If the storage pits were properly placed in suitable soil considerable success might be achieved by this method, but it was not really a method that could be adopted for state purposes in Rome.’ (Rickman 1980: 135).

In Iron Age Britain, where pits are also common in the archaeological record, these had been interpreted as ‘pit dwellings’ at least until Gerhard Bersu came to publish his

excavation of the Iron Age settlement at Little Woodbury (Wiltshire), undertaken between 1938 and 1939. He put forward the hypothesis that these were in fact underground granaries.¹⁶ Now, the fact that Columella hinted at the idea that relatively damp countries were not suitable for pit storage and none of the agronomists mentioned the use of silos in Britain generated some scepticism about the possibility that the cavities excavated in British iron age sites actually corresponded to grain containers, something that needed to be confirmed empirically:

‘Pliny is the authority for pit storage in ancient times, but he was writing of Spain and the Mediterranean fringes. There is no reliable classical reference to such storage in early Britain’ (Bowen and Wood 1968: 2).

This *vacuum* in the ancient sources motivated the first experiments in Britain, in which the pits dug by Gerhard Bersu in Little Woodbury between 1938 and 1939, which he was the first to interpret them as storage pits, were replicated at Broad Chalke. Under the same premises, Peter J. Reynolds, inspired by the experiments carried out in Broad Chalke, in turn performed several experimental studies in the 1960s and 1970s in Great Britain, those which were carried out at the Butser Ancient Farm being the most prominent (Fig. 8). Tacitus’ second-hand description of the Germans, according to Reynolds (1979: 71), ‘provides us a small glimmer of hope’ to the prospective of identifying iron age pits in Britain as storage facilities, since the Roman author indicated that it was common among the German peoples to store grain underground (*Germania* 16.3), an area with a similarly damp climate to that of Britain. Reynolds’ experimental studies set the groundwork for all sorts of future experimental studies, which are inspired to test the effectiveness of subterranean storage and its detection in the archaeological record, performed all over the

¹⁶ It is also common to interpret these as ‘robber pits’, since these pits were usually reused as rubbish receptacles once they had been emptied. This was the interpretation given by Toombs and Wright (1961) to the cylindrical pits found at Shechem. Once these silos had been used for their primary function of grain storage, they were used to dump waste from the reorganization or urbanization of the area or, in some other cases, the tilling of land. Therefore, the chronology provided by the material found, gives us the latest date by which these silos were abandoned. In fact, Plana Basarda had been interpreted in the same vein, and it was believed that treasures were buried in the pits (Aicart et al. 2007: 13).

European continent (cf. Annex 1).¹⁷ This legacy has framed some of our own conceptions on subterranean storage and the focus of most archaeological enquiries in particular, which have centered their interest in the airtight condition of underground storage, thus conflating subterranean storage with storage in general. In a paper published in 1988, Warren R. DeBoer questioned the interpretative conventions that very often, following his own words, ‘misrepresent the ecological and social function of subterranean storage’ (DeBoer 1988: 1):

‘Pits, unlike informants, do not speak. They do not automatically identify themselves as storage devices, earth ovens, borrow pits, hide-smoking or pot-smudging facilities, root casts, refuse containers, latrines, or by any other conceivable label. For the archaeologists, such labels must be laboriously achieved inferences.’



Figure 8. *The Butser Ancient Farm (left) and experimental pit at l'Esquerda (Roda de Ter, Barcelona).*

¹⁷ In Thrace and the Geto-Dacian area, for instance, many extensive pit fields have been documented during the last decades. Many of these concentrations share many features with the ones documented in Iberia, such as both the shape and size of the pits as well as their chronology. However, the idea that these pits were used to store grain has been almost unanimously rejected, based on the interpretation of their filling. In their own opinion, the absence of any data indicating their use as either clay sources or food storage, in addition to the nature of the filling of a small number of the pits, these should be interpreted as pit sanctuaries where rituals of different sorts were performed (Sîrbu and Dăvîncă 2014).

DeBoer summarized the methodological literature on subterranean storage in terms of several questions. Even though DeBoer's study is focused on aboriginal North America, his discussion is extremely relevant for the subject in northeastern Iberia (DeBoer 1988: 3):

- (a) Under what environmental conditions is subterranean storage technically feasible;
- (b) What are the most likely formal properties (e.g., size and shape) of storage pits vis-à-vis other subterranean receptacles with different functions;
- (c) What taphonomic factors might alter these formal properties;
- (d) What is the relationship between pit "fill" and original pit function; and
- (e) How might pits be reliably assigned to units of contemporaneity?

As a result, all the accounts that do not provide technical information about the use and preparation of storage pits are all deemed pointless or redundant and thus neglected. Once these pits had been used for their primary function of grain storage, they were used to dump waste from the reorganization or urbanization of the area or, in some other cases, the tilling of land.¹⁸ Therefore, the chronology provided by the material found, if one is lucky enough (around 40% of pits in northeast Iberia are not datable according to Gracia 2009: 35) gives us the latest date by which these pits were abandoned. However, it is also worth pointing out that in many cases undatable material is found (i.e. grinding stones, seeds, etc.), so the pits remain undated. As a result, the chronological difficulties that arise are not encouraging when studying the silos. Some scholars argue though that the silos, once used, were immediately filled with waste, over a period that could extend probably to ten or twenty years, too wide a gap for a precise chronology. Therefore, most archeologists are only able to propose general trends or undertake superficial analyses, and do not venture a deeper study. On the basis of the aforementioned principles, it is generally assumed that the status of an individual site and the interpretation of a whole economy 'can depend upon

¹⁸ The problems of identifying silos as barns is not exclusive to silos or underground warehouses. The problem of identifying buildings as barns is also latent and remains today a matter of discussion among archaeologists, since there is not always explicit evidence of the use of a building as a barn. In addition, sometimes these buildings could have been used as barns on an occasional basis, without the function of that building being originally intended for the storage of grain.

whether or which pits held corn', an idea already expressed by Reynolds (1979: 71). In this regard, we need not only to analyse storage in purely functional terms, but also to consider the social and moral aspects associated with it. Otherwise, we risk conflating subterranean storage with storage in general (DeBoer 1988: 1).

1.7. Concluding remarks.

This chapter has resulted in showcasing a limited and doubly inflected view of the use of ancient agronomical texts by later readers, and how this has considerably limited the direction and targets of archaeological research. These texts are perceived through the prism of the highly partial judgements of ancient agronomists, which are in turn further refracted through the lens of modern readers who have been formed by both a culture of admiration for Greco-Roman "civilization" and the experience and rationale of modern imperial ventures. As a process this has been well described by Dietler (2010, 14). Consequently, archaeologists run the risk of perpetuating the same misconceptions and attitudes into our own inquiry of the past, and consequently incurring in some sort of 'second colonization', one that is 'even more pervasive' than the first colonization. This long-standing colonial legacy, both ancient and modern, has become the source of many misinterpretations (both intentional and unintentional by nature).

In spite of the fact that Varro's statement that grain could be stored for decades has been often styled as an exaggeration, later readers and interpreters have favoured the general idea that the main advantage of storage in pits was to maintain the grain for many years. Varro and Columella's works, both of which are entitled *De re rustica* (*On Agriculture*; Pliny, on this matter, limits his account to reproducing Varro's), were aimed at an audience of Roman estate owners seeking advice on how to proceed in farming. In light of this projected readership, their description of subterranean storage as both inexpensive and economically advantageous, due to the longevity of the grain stored in them, does not offer a different reading from the one adopted by later modern agronomists. This legacy has framed some of our own conceptions on subterranean storage and the focus of most

archaeological enquiries in particular, which have centered their interest in the airtight condition of underground storage, thus conflating subterranean storage with storage in general. Any given time is apt to change our own perception about the meaning of this storage method, and all subsequent works will be tainted by these notions.